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No. 9: Part II

Useful Tables From the American Practical Navigator

(Revised edition of 1938)

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APPENDIX II

FORMS FOR WORKING DEAD RECKONING AND ASTRONOMICAL SIGHTS

FORM FOR DAY'S WORK, DEAD RECKONING

Time	Compass Course	Var.	Dev.	Lee-way	Total error	True Course	Patent log	Dist.	N.	S.	E.	W.	Diff. Long.

	Latitude ° ′		*Longitude* ° ′	
Left at departure (or noon)	------	N. *or* S.	------	E. *or* W.
Run to	------	N. *or* S.	------	E. *or* W.
By D. R. at	------	N. *or* S.	------	E. *or* W.
Run to	------	N. *or* S.	------	E. *or* W.
By D. R. at	------	N. *or* S.	------	E. *or* W.

FORM FOR TIME SIGHT OF SUN'S LOWER LIMB (LINE OF POSITION)

	h. m. s.		° ′ ″		° ′ ″		m. s.
W. T.,	----------	Obs. alt.,	⊙ ----------	Dec.	---------- N. *or* S.	Eq. t.	----------
C-W, +	----------	Corr.,	± ----------		″		s
Chro. t.,	----------	*h*	----------	H. D.	± ----------	H. D.	± ----------
C. C., ±	----------		′ ″		*h.*		*h*
G. C. T.,	----------	Corr. (Tab. 40)	----------	G. C. T. Int.	----------	G. C. T. Int.	----------
Eq. t., ±	----------	H. E.	----------				
		I. C.	----------		′ ″		s
G. A. T.,	----------	Corr.	----------	Corr.	± ----------	Corr.	± ----------
					° ′ ″		m. s.
				Dec.	---------- N. *or* S.	Eq. t.	----------
					° ′ ″		
				p	---------- Az.		

	° ′ ″				
h	----------	H. A.		sec.	----------
L	----------	log sec.	----------	sec.	----------
p	----------	log cosec.	----------		
2)	----------				
δ	----------	log cos	----------		
δ-h	----------	log sin	----------	sin	----------
δ-L	----------			sin	----------
	h. m. s.				
G. A. T.	----------				
L. A. T.	----------	log hav. *t*.	----------	log hav. Z,	----------
				Z	=----------

Long { *h. m. s.* ---------- ° ′ ″ ---------- } E. *or* W.

Plot line of position through D. R. Lat. and computed longitude, perpendicular to azimuth.

ALTERNATIVE FORM FOR TIME SIGHT (LINE OF POSITION)

	h. m. s.		° ′				° ′
W. T.,	----------	h_s,	--------			Dec.,	---------- N. *or* S.
C−W,	+----------	Corr.,	--------	*H. A.* (Subtract)	*Az.*	Eq. t.,	----------
		h_o,					
Chron.,	----------	z.,	--------	nat. hav., --------	cosec, --------		
C.C.,	----------	L∼d,	--------	nat. hav., --------			
G. C. T.,	----------			nat. hav., --------			
Eq. T. (R. A. M. S.+12ʰ),	----------						
(Tab. 39), Corr.,	----------			log hav., --------			
				Lat. sec. --------			
G. A. T. (G. S. T.),	----------			dec. sec., --------	cos, --------		
(R. A.∗),	----------						
				log. hav., --------			
G. H. A. (time),	----------			L. H. A. --------	sin, --------		
G. H. A. (arc),	----------						
L. H. A. (arc),	----------				Sin Z, --------		
Long.,	---------- E. *or* W.						

FORM FOR TIME SIGHT OF STAR OR PLANET (LINE OF POSITION)

	h. m. s.			° ′		h. m. s.		° ′	
W. T.,	--------		h_s∗	------	R. A.∗,	------	Dec.,	---- N. *or* S.	
C−W,	+--------		Corr.	------			p.,	----	
Chron.,	--------		h_o,	------					
C. C.,	±--------								
			Tab. 40	------					
G. C. T.,	-------- or,	G. C. T., ------	H. E.,	------	h,	------			log. sec., ----
R. A. M. S.+12ʰ,	--------		I. C.,	------	L,	------	log. sec, ----		log. sec., ----
Corr. (Tab. 39)	--------	G. H. A., ------			p,	------	log. cosec, --		
		Corr., ------	Corr.,	------					
G. S. T.,	--------				2),	------			
R. A. ∗,	--------	G. H. A., ------			S,	------	log. cos, ----		
					S−h,	------	log. sin, ----		log. sin., ----
					S−L,	------			log. sin., ----
G. H. A.,	-------- E. *or* W.								
					L. H. A.,	------ E. *or* W.	log. hav., ----		log hav ---- = Z
					G. H. A.,	------			
					Long.,	------ E. *or* W.			

Plot line of position through D. R. latitude and computed longitude perpendicular to Z

FORM FOR TIME SIGHT OF MOON'S LOWER LIMB (LINE OF POSITION)

	h. m. s.		° ′		*h. m. s.*		° ′
W. T.,	--------	Obs. alt. ☾,	--------	R. A.,	--------	Dec.,	-------- N. *or* S.
C−W,	+--------	I. C.,	--------				′
					s		
Chro. t.,	--------	Corr. (Table 41),	--------	Corr.,	--------	Corr.,	--------
C. C.,	±--------	H. E.,	--------				
		h,					
G. C. T.,	-------- *or*	G. C. T.,	--------	R. A.,	--------	Dec.,	--------
Sid. t. 0ʰ G. C. T.,	+--------						
Corr. (Tab. 39),	+--------	G. H. A.,	--------				
		Corr.,	--------				
G. S. T.,	--------						
R. A. ☾,	--------	G. H. A.,	--------				
G. H. A.,	-------- E. *or* W.						

For the remainder of the work, by which the hour angle and the longitude are found, employ the method given under "Form for Time Sight of a Star (Line of Position)."

FORM FOR MERIDIAN ALTITUDE OF SUN'S LOWER LIMB

	° ′		′		*h. m. s.*		° ′
Obs. alt. ⊙,	--------	Corr. (Tab. 40),	--------	L. A. T.,	--------	Dec.,	-------- N *or* S.
Corr.,	±--------	H. E.,	--------	Long.,	--------		
		I. C.,	--------				′
h,	--------	Corr.,	--------	G. A. T.,	--------	H. D.,	±--------
	° ′			Eq. t.,	--------		*h.*
						G. C. T. Int.,	±--------
z,	-------- N. *or* S.			G. C. T.,	--------		
d,	-------- N. *or* S.						′
						Corr.,	±--------
Lat.,	-------- N. *or* S.						° ′
						Dec.,	-------- N. *or* S.

FORM FOR MERIDIAN ALTITUDE OF A STAR

	° ′ ″		′		° ′
Obs. alt.,	∗--------	Corr. (Tab. 40),	--------	Dec.,	-------- N. *or* S.
Corr.,	±--------	H. E.,	--------		
		I. C.,	--------		
h,	--------	Corr.,	--------		
z,	-------- N. *or* S.				
d,	-------- N. *or* S.				
Lat.,	-------- N. *or* S.				

FORM FOR MERIDIAN ALTITUDE OF A PLANET

	° ′		′		h. m.		° ′
Obs. alt., ⁎	--------	Corr. (Tab. 40),	--------	G. C. T., Gr. trans.,	--------	Dec.,	-------- N. or S.
Corr., ±	--------	par.,	+--------	Corr. for long.,	±--------		′
		I. C.,	+--------			Diff. 24ʰ,	±--------
h,	--------	H. E.,	--------	L. C. T., local trans.,	--------		h.
	° ′			Long.,	±--------	G. C. T., P. P.,	--------
		Corr.,	∓--------				′
z,	-------- N. or S.			G. C. T., local trans.,	--------	Corr.,	±--------
d,	-------- N. or S.						° ′
Lat.,	-------- N. or S.					Dec.,	-------- N. or S.

FORM FOR MERIDIAN ALTITUDE OF MOON'S LOWER LIMB

	° ′		° ′		h. m.		° ′
h,	--------	Obs. alt. ☾,	--------	G. C. T. trans.,	--------	Dec.,	-------- N. or S.
	° ′ ″	I. C.,	--------	Corr. for long. (Tab. 26),	±--------		′
z,	-------- N. or S.	Corr. (Tab. 41),	--------	L. C. T., local trans.,	--------	Corr., ±--------	
d,	-------- N. or S.	H. E.,	--------	Long.,	±--------		
Lat.,	-------- N. or S.	Corr.,	--------	G. C. T., local trans.,	--------		° ′
						Dec.,	-------- N. or S.

Mark zenith distance N. or S. according as zenith is north or south of the body observed; mark Dec. according to its name, subtracting it from 180° for cases of lower transit; then, in combining the two for Lat., have regard to their names.

ALTERNATIVE FORM FOR MERIDIAN ALTITUDE OF A BODY

	±90° 00′ 0	*Rules for signs*	
Dec.	±--------		
Corr.	±--------	Case I. Lat. & Dec. same name, Lat. greater	+90°+Dec.−Corr.−Alt.
		Case II. Lat. & Dec. same name, Dec. greater	−90°+Dec.+Corr.+Alt.
Constant	±--------	Case III. Lat. & Dec. opposite names	+90°−Dec.−Corr.−Alt.
Obs. Alt.	±--------	Case IV. Lower transit	+90°−Dec.+Corr.+Alt.
Lat.	-------- N or S.		

FORM FOR REDUCTION TO THE MERIDIAN

	h. m. s.						
W. T.,	--------	h_s,	--------	a, =	-------- (Tab. 29)		
C−W,	--------	Corr.,	--------	at², =	-------- (Tab. 30)		
Chron.,	--------	h_o,	--------				
C. C.,	--------			h,	--------	log sec,	--------
G. C. T.,	--------	(Tab. 40),	--------	at²,	--------		
Eq. t (R. A. M. S.+12ʰ),	--------	H. E.,	--------				
Corr.,	--------	I. C.,	--------	H,	--------	log sin(t),	--------
G. A. T. (G. S. T.),	--------	Corr.,		z,	-------- N or S		
(R. A. ⁎),	--------			d,	-------- N or S.	log cos,	--------
G. H. A. time,	--------			Lat.,	-------- N or S.	log sin,	--------
G. H. A. Arc,	--------					Z,	--------
Long. D. R.,	--------						
L. H. A.,	--------						
t,	-------- E. or W.						

Plot line of position through Lat. and D. R. Long. perpendicular to Z

FORM FOR THE COMPUTED ALTITUDE AND THE ALTITUDE DIFFERENCE OF THE SUN'S LOWER LIMB FOR LINE OF POSITION

(SINE—COSINE FORMULA)

	h. m. s.				° ′		m. s.
W. T.	--------			Dec.	-------- N. or S.	Eq. t.	--------
C−W	+--------				′		s.
Chro. t.	--------			H. D.	±--------	H. D.	±--------
C. C.	±--------				h.		h.
G. C. T.	--------	or, G. C. T.,	--------	G. C. T. Int.	--------	G. C. T., Int.	--------
Eq. t.	±--------				′		s.
		G. H. A.,	--------	Corr.	±-------- ±	Corr.	±--------
G. A. T.	--------	Corr., h. m.,	--------		° ′		m. s.
	--------	Corr., s.,	--------	d,	-------- ±	Eq. t.	--------
Long. (assumed Pos.)	--------						
		G. H. A.,	--------				
	h. m. s.						
L. A. T. =	--------	--------	--------	log cos	--------	log sin	--------
	° ′	L ± --------	log sin --------	± log cos	--------		
Obs. alt. ⊙	--------	d ± --------	log sin --------	± log cos	--------	log cos	--------
I. C.	--------		(Sum) log A --------	± log B	--------		
Corr. (Tab. 40)	--------		A ± --------	B ± --------			
H. E.	--------						
				A ± --------			
h_o	--------						
				= A + B	--------	log sec	--------
Computed h	--------	--------	nat. sin,			log sin	--------
Alt. Diff.	-------- (toward or away from Z)					Z,	--------

FORM FOR FINDING THE COMPUTED ALTITUDE AND THE INTERCEPT OF THE SUN'S LOWER LIMB FOR LINE OF POSITION

(COSINE—HAVERSINE FORMULA)

	h. m. s.								m. s.
W. T.	----------			Dec.	-- -------	N. *or* S.		Eq. t.	--------
C—W	+----------			H. D.	± ′				s.
Chro. t.	----------				----------			H. D.	±--------
C. C.	±----------			G. C. T.	----------			G. C. T.	h. --------
G. C. T.	----------	*or*, G. C. T.	--------	Corr.	±----------			Corr.	s. ±--------
Eq. t.	±----------			C	° ′				
G. A. T.	----------	G. H. A.	--------	*d*,					m. s.
		Corr., h. m	--------		±----------			Eq. t.	--------
Long. (assumed Pos.)	----------	E. *or* W. Corr., s	--------						
	h. m. s.	G. H. A.	--------						° ′
L. A. T.=*t*	----------			log hav	----------	log sin	--------	Obs. alt. ⊙	--------
	° ′ ″								
L	----------			log cos	----------			I. C.	--------
d	----------			log cos	----------	log cos	--------	Corr. (Tab. 40).	±--------
								H. E.	--------
				log hav φ	----------				
				nat hav φ	----------			h_o	--------
L~d	----------			nat hav	----------				
z	----------			nat hav	----------	log cosec	--------		
h_o	----------					log sin	--------		
h_c						Z	--------		
Int.	----------	(toward or away from Z)							

FORM FOR THE COMPUTED ALTITUDE AND THE INTERCEPT OF A STAR OR PLANET FOR LINE OF POSITION

(COSINE-HAVERSINE FORMULA)

	h. m. s.								° ′
W. T.,	--------			Obs. alt.*	--------			Dec.,	--------N. *or* S
C—W.,	+--------			I. C.,	--------				h. m. s.
				Corr. (Tab. 40)—	--------			R. A.,	--------
Chro. t.,	--------								
C. C.,	±--------			Obs. *h*,	--------				
			° ′		° ′ ″				
G. C. T.,	--------	*Or*, G. C. T.,	--------	t,	----------	Log hav,	--------	Log sin,	--------
Sid. t. of 0^h G. C. T.,	+--------			I	----------	Log cos,	--------		
Corr. (Tab. 39)	+--------	G. H. A. 0^h,	--------	*a*,	--------	Log cos,	--------	Log cos,	--------
		Corr. h, m,	--------						
G. S. T.,	--------	Corr. s.,	--------			Log hav,	--------		
R. A.*	--------								
		G. H. A.,	--------			Nat. hav,	--------		
G. H. A.*,	--------	E. *or* W.		L~*d*,	--------	Nat. hav,	--------		
Long. of assumed Pos.,	--------	E. *or* W.							
				z,	--------		--------	Log cosec,	--------
L. H. A. (*t*),	h. m. s. ° ′ ″								
				n_c,	--------			Log sin,	--------
				h_o,	--------			Z,	--------
				Int.,	--------	(towards or away)			

Plot line of position through D. R. Lat. and Long. perpendicular to Z, then move line as indicated by intercept.

FORM FOR STAR IDENTIFICATION

	h. m. s.									
W. T.,	--------	h_n,	--------	(Tab. 40),	--------	h_o,	--------			
C—W,	+--------	Corr.,	--------	H. E.,	--------			nat. hav,	--------	
				I. C.,	--------			nat. hav,	--------	
Chron.,	--------	h_o,	--------			z,	--------	(Subtract),		
C. C.,	--------			Corr.,	--------	L~d,	--------	nat. hav,	--------	
				hav Z,	--------					
G. C. T.,	--------			cos L,	--------			log hav,	--------	
Sid. t. of 0^h,	--------			cos h_o,	--------	L,	--------	sec.,		
Corr. (Tab. 39),	--------					Dec.,	--------	sec.,	--------	
				log hav,	--------				--------	
G. S. T.,	--------							Log hav,	--------	
Long.,	--------	E. *or* W.		nat. hav,	--------			*t*,	--------	E. *or* W
				(L—h) nat. hav,	--------					
L. S. T.,	--------									
(Approx.) *t*,	--------	*p,	--------	nat. hav,	--------					
		Dec.,	--------							

(Approx.) R. A., --------
(Approx.) Dec., --------
} Enter N. A. with coordinates of R. A. and Dec. for identification.
*When *p* is greater than 90° the declination is named contrary to latitude.

PART II.

TABLES.

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EXPLANATION OF TABLES.

TABLE 1.—RADIO BEARING CONVERSION.

This table is used to convert the radio or true bearing into the mercator bearing, when it is desired to plot the bearing on a mercator chart. The arguments used to find the correction are the middle latitude between the sending radio station and the vessel's D. R. position, and the difference of longitude between the radio station and the vessel. The sign of the correction is as follows,

In north latitude, when the vessel is $\frac{\text{eastward}}{\text{westward}}$ of the station, the correction is $\frac{\text{additive}}{\text{subtractive}}$.

In south latitude, when the vessel is $\frac{\text{eastward}}{\text{westward}}$ of the station, the correction is $\frac{\text{subtractive}}{\text{additive}}$.

Should the bearing be observed from the vessel, the sign of the correction as given above is reversed.

Example: A vessel in D. R. Lat. 38°03′ N.; Long. 55° W.; receives a radio bearing of 118° from Bar Harbor, Maine, radio station (Lat. 44°19′ N.; Long. 68°11′ W.). Find the Mercator bearing.

Bar Harbor station, Lat. 44°19′ N.; Long. 68°11′ W.
Vessel (D. R. position), Lat. 38°03′ N.; Long. 55°00′ W.
Middle Lat. 41°11′ N.; Diff. Long. 13°11′ W.

Enter table with Mid. Lat. 41° and Diff. Long. 13°.2; the correction is +4°.4.
Mercator bearing=Radio bearing plus correction, or 118°+4°.4=122°.4.

The table is computed from the formula, $\tan \text{correction} = \frac{\sin \text{Mid. Lat.}}{\cos \frac{\text{Diff. Lat.}}{2}} \tan \frac{\text{Diff. Long.}}{2}$.

TABLE 2.—CONVERSION OF POINTS TO DEGREES.

This table gives the 32 points of the compass arranged in order from North to East, East to South, South to West, and West to North. The process of naming these points in this order is called "Boxing the Compass." The names of the whole points and fractional points are readily converted by this table into the corresponding degrees, minutes, and seconds, from 0° to 360°.

TABLE 3.—TRAVERSE TABLE, DEGREES.

This table contains the difference of latitude and departure corresponding to distances up to 600 miles and for courses for every degree of the compass. The table may also be employed in the solution of any right triangle. The manner of using these tables is particularly explained under the different problems of Plane, Middle Latitude, and Mercator Sailing in Chapter V, and the interchanges of the designations of the headings of the different columns in order to subserve these various uses, are summarized in the marginal diagram at the foot of each page.

TABLE 4.—CONVERSION OF DEPARTURE INTO DIFFERENCE OF LONGITUDE.

This table is computed from the formula, Departure=Diff. Long.×cosine Mid. Lat., or Diff. Long.$=\frac{\text{Dep.}}{\text{cos. Mid. Lat.}}$ The body of the table gives the difference of longitude (D. Lo.) for every mile of departure from one mile to sixty. The middle latitudes are given from 4° to 60°. The table is entered with the arguments, Mid. Lat. at the top of the page, and the Dep. at the side of the page, from which is found the D. Lo.

Example: In Mid. Lat. 59°30′, the departure was 30 miles. Find the D. Lo.

Under Mid. Lat. 59°30′ and opposite Dep. 30, is found D. Lo. 59′.1.

Example: In Mid. Lat. 54° the D. Lo. was 51.′ Find Dep.

Under Mid. Lat. 54° and in the D. Lo. column is found 51′, opposite in Dep. column is found 30 miles.

TABLE 5.—MERIDIONAL PARTS.

This table contains the meridional parts, or increased latitudes, for every degree and minute to 80°, calculated by the following formula:

$$m=\frac{a}{M}\log\tan\left(45^\circ+\frac{L}{2}\right)-a\left(e^2\sin L+\tfrac{1}{3}e^4\sin^3 L+\tfrac{1}{5}e^6\sin^5 L+\ .\ .\ .\ .\ .\right),$$

in which

the Equatorial radius $a=\frac{10800'}{\pi}=3437'.74677$ (log 3.5362739);

M, the modulus of common logarithms=0.4342945;

$\frac{1}{M}=2.3025851$ (log 0.3622157);

c, the *compression* or meridional ellipticity of the earth according to Clarke (1880) $=\frac{1}{293.465}=0.003407562$ (log 7.5324437);

$e=\sqrt{2c-c^2}=0.0824846$ (log 8.9163666);

from which

$\frac{a}{M}=7915'.7044558$ (log 3.8984895);

$ae^2=23'.38871$ (log 1.3690072);

$\frac{1}{3}ae^4=0'.053042$ (log 8.7246192);

$\frac{1}{5}ae^6=0'.000216523$ (log 6.3355038).

The results are tabulated to one decimal place, which is sufficient for the ordinary problems of navigation.

The practical application of this table is illustrated in Chapters II and V, in articles treating of the Mercator Chart and Mercator Sailing.

TABLE 6.—LENGTH OF DEGREES OF LATITUDE AND LONGITUDE.

This table gives the length of a degree in both latitude and longitude at each parallel of latitude on the earth's surface, in nautical and statute miles and in meters, based upon Clarke's value (1866) of the earth's compression, $\frac{1}{299.15}$. In the case of latitude, the length relates to an arc of which the given degree is the center.

TABLE 7.—DISTANCE OF OBJECT BY TWO BEARINGS—DEGREES.

This table has been computed to facilitate the operation of finding the distance from an object by two bearings from a given distance run and course. The arguments are given in degrees; the first column contains the multiplier of the distance run to give the distance of observed object at second bearing; the second, at time of passing abeam.

The method is explained in Chapter IV.

TABLE 8.—DISTANCE OF VISIBILITY OF OBJECTS.

This table contains the distances, in nautical and statute miles, at which any object is visible at sea. It is calculated by the formulæ:

$$d=1.15\sqrt{x},\ \text{and}\ d'=1.32\sqrt{x},$$

in which d is the distance in nautical miles, d' the distance in statute miles, and x the height of the eye or the object in feet.

To find the distance of visibility of an object, the distance given by the table corresponding to its height should be added to that corresponding to the height of the observer's eye.

Example: Required the distance of visibility of an object 420 feet high, the observer being at an elevation of 15 feet.

Dist. corresponding to 420 feet,	23.5 naut. miles.
Dist. corresponding to 15 feet,	4.4 naut. miles.
Dist. of visibility,	27.9 naut. miles.

TABLE 9.—DISTANCE BY VERTICAL ANGLES (distance less than 5 miles).

This table gives the distance, up to 5 miles, of an object of known height by the vertical angle that it subtends at the position of the observer. It was computed by the formula

$$\tan\alpha=\frac{h}{d},$$

where α=the vertical angle;
h=the height of the observed object in feet; and
d=the distance of the object, also converted into feet.

No correction for Dip is applied.

The employment of this method of finding distance is explained in Chapter IV.

TABLE 10.—DISTANCE BY VERTICAL ANGLES (distance greater than 5 miles).

This table gives the distance greater than 5 miles of an object of known height by the angle it subtends at the position of the observer. The table comprises heights from 400 to 15,500 feet above the sea and distances from 6 miles to 85 miles. It contains correction tables for refraction and dip, both of which are subtracted from the observed angle after applying the index correction of the sextant. Aircraft using the bubble sextant correct the observed altitude for refraction only. This table is used for angles of elevation, or for those cases where the height of object is greater than height of observer.

EXAMPLE: The altitude of a mountain top 15,000 feet high was observed which gave by sextant an elevation of 1°40′; I. C.+1′; height of eye 35 feet, estimated distance 60 miles. Find the required distance. After applying the index correction of plus 1′ the altitude is 1°41′. From the table, the correction for Dip is −5′.8, and the correction for refraction is −4′.4 or a total of −10′.2. This correction subtracted from 1°41′ gives an angle of elevation of 1°30′.8. Enter table ordinarily with the difference between the height of object and height of eye, but when the height of eye is relatively low this may be disregarded. Therefore under the column for 15,000 feet find the angle nearest 1°31′. By interpolation the distance away is found in the side column to be approximately 67.6 nautical miles.

It must be noted that observed bearings are the same as great circle bearings and are not the same as mercator bearings taken from the chart. The mercator bearing requires a correction similar to the correction of a radio bearing. In most cases this correction can be disregarded, unless the mountain is very far away or the vessel is in high latitudes.

TABLE 11.—HORIZON ANGLES.

This shows the distance in yards corresponding to any observed angle between an object and the sea horizon beyond, the observer being at a known height.

The method of use is explained in Chapter IV.

TABLE 12.—SPEED TABLE.

This table shows the rate of speed, in nautical miles per hour, of a vessel which traverses a measured mile in any given number of minutes and seconds. It is entered with the number of minutes at the top and the number of seconds at the side; under one and abreast the other is the number of knots of speed.

TABLE 13.—TIME—SPEED—DISTANCE TABLE.

This table shows the distance in nautical miles steamed in any part of an hour from 5 knots to 37 knots. It is entered with the number of minutes at the side, with speed in knots at the top, abreast of one and under the other is found the distance in nautical miles.

TABLE 14.—CONVERSION TABLES FOR NAUTICAL AND STATUTE MILES.

TABLE 15.—CONVERSION TABLES FOR METRIC AND ENGLISH LINEAR MEASURE.

TABLE 16.—CONVERSION TABLES FOR THERMOMETER SCALES.

TABLE 17.—REDUCTION OF LOCAL CIVIL TIME TO STANDARD MERIDIAN TIME.

This table contains the reduction to be applied to the local time to obtain the corresponding time at any other meridian whose time is adopted as a standard. The results are given to the nearest minute of time only; being intended for the reduction of such approximate quantities as the time of high water or time of sunset.

TABLE 18.—DIP OF SEA HORIZON.

This table contains the dip of the sea horizon, calculated by the formula:

$$D=58''.8\sqrt{F},$$

in which F=height of the eye above the level of the sea in feet.

It is explained in Chapter X.

TABLE 19.—DIP SHORT OF HORIZON.

This table contains the dip for various distances and heights, calculated by the formula:

$$D=\frac{3}{7}d+0.56514\times\frac{h}{d},$$

in which D represents the dip in miles or minutes, d, the distance of the land in sea miles, and h, the height of the eye of the observer in feet.

TABLE 20.—PARALLAX OF SUN.

This table contains the sun's parallax in altitude computed by the formula:

$$\text{par.} = \sin z \times 8''.75,$$

in which z=apparent zenith distance, the sun's horizontal parallax being 8″.75.
It is explained in Chapter X.

TABLE 21.—PARALLAX OF PLANET.

Parallax in altitude of a planet is found by entering at the top with the planet's horizontal parallax, and at the side with the altitude.

TABLE 22.—MEAN REFRACTION.

This table gives the refraction, reduced from Bessel's tables, for a mean atmospheric condition in which the barometer is 30.00 inches, and thermometer 50° Fahr.

TABLE 23.—MEAN REFRACTION AND PARALLAX OF SUN.

This table contains the correction to be applied to the sun's apparent altitude for mean refraction and parallax, being a combination of the quantities for the altitudes given in Tables 20 and 22.

TABLES 24, 25.—CORRECTIONS OF REFRACTION FOR BAROMETER AND THERMOMETER.

These are deduced from Bessel's tables. The method of their employment will be evident.

TABLE 26.—REDUCTION FOR MOON'S TRANSIT.

This table was computed by proportioning the daily variation of the time of the moon's passing the meridian.
The numbers taken from the table are to be added to the Greenwich time of moon's transit in west longitude, but subtracted in east longitude.

TABLE 27.—AMPLITUDES.

This table contains amplitudes of heavenly bodies, at rising and setting, for various latitudes and declinations computed by the formula:

$$\sin \text{amp.} = \sec. \text{Lat.} \times \sin \text{dec.}$$

It is entered with the declination at the top and the latitude at the side.
Its use is explained in Chapter XIII.

TABLE 28.—CORRECTION FOR AMPLITUDES OBSERVED ON THE APPARENT HORIZON.

This table gives a correction to be applied to the observed amplitude to counteract the vertical displacement due to refraction, parallax, and dip, when the body is observed with its center in the visible horizon.
The correction is to be applied for the sun, a planet or a star, as follows:

At Rising in N. Lat. / Setting in S. Lat. } apply the correction to the right.
At Rising in S. Lat. / Setting in N. Lat. } apply the correction to the left.

For the moon, apply *half* the correction in the *contrary* manner.

TABLE 29.—CHANGE OF ALTITUDE IN ONE MINUTE FROM MERIDIAN.

This table gives the variation of the altitude of any heavenly body, for one minute of time from meridian passage, for latitudes up to 60°, declinations to 63°, and altitudes between 6° and 86°. It is based upon the method set forth in Chapter XI under "Reduction to the Meridian" and the values may be computed by the formula:

$$a = \frac{1''.9635 \cos L \cos d}{\sin (L - d)},$$

where a=variation of altitude in one minute from meridian,
L=latitude, and
d=declination—positive for same name and negative for opposite name to latitude at upper transit, and negative for same name at lower transit.

The limits of the table take in all values of latitude, declination, and altitude which are likely to be required. In its employment, care must be taken to enter the table at a place where the declination is appropriately named (of the same or opposite name to the latitude); it should also be noted that at the bottom of the last three pages values are given for the variation of a body at *lower* transit, which can only be observed when the declination and latitude are of the same name, and in which case the reduction to the meridian is subtractive; the limitations in this case are stated at the *foot* of the page, and apply to all values below the heavy rules.

TABLE 30.—CHANGE OF ALTITUDE IN GIVEN TIME FROM MERIDIAN.

This table gives the product of the variation in altitude in one minute of a heavenly body near the meridian, by the square of the number of minutes. Values are given in arc for every 5′ from 0° to 7°, or in time for every 20^s from 0^m to 28^m, and for all variations likely to be employed in the method of "reduction to the meridian."

The formula for computing is:

$$\text{Red.} = a \times t^2,$$

where a = variation in one minute (Table 29), and
t = number of minutes (in units and tenths) from time of meridian passage.

The table is entered in the column of the nearest interval of time or arc from meridian, and the value taken out corresponding to the value of a found from Table 29. The units and tenths are picked out separately and combined, each being corrected by interpolation for intermediate intervals of time or arc.

The result in minutes and tenths of arc is the amount to be applied to the observed altitude to reduce it to the meridian altitude, which is always to be added for upper transits and subtracted for lower.

TABLE 31.—NATURAL TRIGONOMETRIC FUNCTIONS.

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Table of natural values of trigonometric functions.—Table 31 contains the numerical values of the sines, cosines, tangents, and cotangents of angles from 0° to 90° at intervals of 1′. In the case of an angle in the range from 0° to 45°, the number of degrees in the angle and the names of the functions are found at the top of the page and the left-hand minute column applies; in the case of angles in the range from 45° to 90°, the number of degrees in the angle and the names of the functions are found at the bottom of the page and the right-hand minute column applies. Interpolation must be carried out without the aid of difference columns or tables of proportional parts.

The following examples illustrate the method of using the tables.

Example 1: Find sin 68°28′.

Solution.—We first find the page at the bottom of which 68° appears and then find the row of the 68° block containing 28′ in the right-hand minute column. In this row and in the column having sin at its foot we find 020 to which we must prefix 0.93 to obtain sin 68°28′ = 0.93020.

Example 2: Find sin 38°38′27″.

Solution.—Using the tables and computing differences, we find the values exhibited in the following form:

$$\left.\begin{array}{l}\left.\begin{array}{l}\sin 38°38'00'' \\ \sin 38°38'27''\end{array}\right\}27'' \\ \sin 38°39'00''\end{array}\right\}\left.\begin{array}{l}\left.\begin{array}{l}=0.62433 \\ 60''=\ ?\end{array}\right\}x \\ =0.62456\end{array}\right\}23$$

Hence

$$\frac{x}{23}=\frac{27}{60},\ \text{or}\ x=\left(\frac{27}{60}\right)23=10\ \text{(nearly)}.$$

Therefore

$$\sin 38°38'27''=0.62433+0.00010=0.62443. \quad \textit{Ans.}$$

Example 3: If cot θ = 0.37806, find θ.

Solution.—Using the tables and computing differences, we find the values exhibited in the following form:

$$\left.\begin{array}{l}\left.\begin{array}{l}\cot 69°17'00'' \\ \cot\quad ?\end{array}\right\}x \\ \cot 69°18'00''\end{array}\right\}\left.\begin{array}{l}\left.\begin{array}{l}=0.37820 \\ 60=0.37806\end{array}\right\}14 \\ =0.37787\end{array}\right\}33$$

Hence

$$\frac{x}{60}=\frac{14}{33},\ \text{or}\ x=\frac{14}{33}(60)=25''\ \text{(nearly)},\ \text{and}\ \theta=69°17'25''. \quad \textit{Ans.}$$

Since cot θ is positive in the third quadrant, we may also write an answer 180° + 69°17′25″ = 249°17′25″.

TABLE 32.—COMMON LOGARITHMS OF NUMBERS.

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Additional examples in the use of logarithms are contained in Appendix III of Part I of this publication.

Introduction.—*The power L to which a given number b must be raised to produce a number N is called the logarithm of N to the base b.* This relation expressed in symbols is

$$b^L = N.$$

It appears at once that b must not be unity and it must not be negative. In the following set of tables, 10 is used as base.

Characteristic and mantissa.—The common logarithm of any real, positive number may be written as an integer, positive or negative, plus a positive decimal fraction. The integral part is called the *characteristic* and the decimal part the *mantissa.* The characteristic may be written by using the following rules:

RULE 1: *The characteristic of the common logarithm of a number greater than 1 is obtained by subtracting 1 from the number of digits to the left of the decimal point.*

For example, 68.30 has two digits to the left of its decimal point; hence its characteristic is $2-1=1$. Similarly for 6830, the characteristic is $4-1=3$, for 7.864 it is $1-1=0$, and for 5846300 it is 6.

RULE 2: *The characteristic of the common logarithm of a positive number less than 1 is negative and its magnitude is obtained by adding 1 to the number of zeros immediately following the decimal point.*

If the characteristic of a number is $-n$ (n positive), it should be written in the form $(10-n)-10$. *To obtain directly the logarithm of a number less than 1, subtract from 9 the number of zeros immediately following the decimal point, and write the result before the mantissa and −10 after it.*

For example, 0.000785 has three zeros immediately following the decimal point; hence its characteristic is $-(3+1)=-4$, or $6-10$. Similarly for 0.0000587 the characteristic is $-(4+1)=-5$ or $5-10$, for 0.0287 it is -2 or $8-10$, and for 0.684 it is -1 or $9-10$.

To find the mantissa—Special case.—The mantissa, or decimal part of the logarithm of a number, depends only on the sequence of the digits and not on the position of the decimal point. Table 32 lists the mantissas, accurate to five decimal places, of the logarithms of all integers from 1 to 10,000.

The change in the mantissas of the logarithms is very slow. Consequently the first two digits of the mantissas have been omitted from a large percentage of entries. When these two digits are omitted from an entry, they always appear in the column containing the entry both slightly above it and also slightly below it.

To find the mantissa of the logarithm of a number locate the first three digits of this number in the left-hand column headed *No.*, and the fourth digit in the row at the top of the page. Then the mantissa of the given number containing four significant figures is in the row whose first three figures are the first three significant figures of the given number, and in the column headed by the fourth. Thus to find the logarithm of 76.64 find 766 in the column headed *No.*, and follow the corresponding row to the entry in the column headed by 4. This entry 88446 represents the mantissa required. The first two digits 88 of the mantissa were found in the same column with the considered entry but one space lower, and also in the same column, but seven spaces higher.

Hence, we have

$$\log 76.64 = 1.88446.$$

Interpolation.—When a number contains a fifth significant figure, we find the logarithm corresponding to the first four figures as above and then add an increment obtained by a process called interpolation. This process is based on the assumption that *for relatively small changes in the number N the changes in log N are proportional to the changes in N.* The following example will serve to illustrate the process of interpolation.

The expression *tabular difference* will be used frequently in what follows. The tabular difference, when used in connection with a table, means the result of subtracting the lesser of two successive entries from the greater. These differences have been computed in every case and tabulated in the columns headed "d".

EXAMPLE: Find log 235.47.

Solution.—We first find the logarithms in the following form and then compute the difference indicated:

$$\left.\begin{array}{l}\left.\begin{array}{l}\log 235.40\\ \log 235.47\end{array}\right\}7\\ \log 235.50\end{array}\right\}\begin{array}{l}=2.37181\\ 10=?\\ =2.37199\end{array}\left.\right\}d\Big\}18 \text{ (tabular difference).}$$

By the principle of proportional parts, we have

$$\frac{7}{10}=\frac{d}{18}, \text{ or } d=\frac{7}{10}(18)=12.6=13 \text{ (nearly).}$$

Adding 0.00013 to 2.37181, we obtain

$$\log 235.47 = 2.37194.$$

The increment 12.6 was rounded off to 13 because we are not justified in writing more than five decimal places in the mantissa.

The essence of this procedure is embodied in the following statement. *To find the logarithm of a number composed of five significant figures, first find the logarithm corresponding to the first four figures and to it add one-tenth of the tabular difference multiplied by the fifth digit.*

To shorten the process of interpolation, 10^5 times each tabular difference occurring in the table has been multiplied by 0.1, 0.2, . . . 0.9, and the results have been tabulated on the right-hand sides of the pages on which these differences occur. The abbreviation Prop. Parts written at the top of the page over these small tables abbreviates the words *proportional parts.* To interpolate in the example just solved, note the tabular difference 18, locate the Prop. Parts table headed 18 and find opposite 7 in its left-hand column the entry 13. In general, this difference should not be computed but should be obtained from the number opposite the fifth digit in the appropriate table of proportional parts.

To find the number corresponding to a given logarithm.—If log $N=L$, the number N is called the *antilogarithm* of L. The sequence of digits of a number N corresponding to a given logarithm L is found from its mantissa, and the decimal point is then placed in accordance with the italicized rules stated above.

EXAMPLE: Given log $N=1.92955$, find N.

Solution.—The mantissa .92955 lies between the entries .92952 and .92957 of Table 32. Using the table and computing the differences indicated, we write the following form:

$$\left.\begin{array}{l}1.92952\\1.92955\\1.92957\end{array}\right\}3\left.\begin{array}{l}=\log 85.020\\5=\log N\\=\log 85.030\end{array}\right\}x\Big\}10.$$

Assuming that changes in the logarithm are proportional to the corresponding changes in the number, we write

$$\frac{3}{5}=\frac{x}{10},\text{ or } x=10\left(\frac{3}{5}\right)=6.$$

Hence

$$N=85.026.$$

The essence of the process of interpolation is indicated in the foregoing procedure. However, in practice, the student should always interpolate by using the table of proportional parts. The fifth figure 6 should have been obtained from the table of porportional parts. In the small Prop. Parts table corresponding to the tabular difference 5, we read either 5 or 6 in the left-hand column opposite the entry 3. However, the 6 must be chosen; for in case there is a choice between two or more entries one of which is opposite a number printed in **boldface,** give preference to the entry opposite the **bold-faced** figure.

RULE: *Whenever a number lying exactly half way between two entries is under consideration* or is the same as two or more adjacent entries, give preference to that character which has a **bold-faced** part nearest the entry.

TABLE 33.—LOGARITHMS OF TRIGONOMETRIC FUNCTIONS.

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Table of logarithms of trigonometric functions.—Table 33 gives the logarithms of the sines, cosines, tangents, cotangents, secants, and cosecants of angles at intervals of 1′ from 0° to 90°. The names of the functions written at the top of any page apply to angles having the number of degrees written at the top of the page, and the function names written at the bottom apply to angles having the number of degrees written at the bottom. The left-hand or the right-hand minute column applies according as the number of degrees in the angle is written on the left side or on the right side of the block of numbers under consideration. One of the arrowheads attached to each number representing degrees points toward the column of minutes to be used in connection with an angle involving that number of degrees, the other points toward the row of names to be considered.

For example, to find log sin 32°46′, we find the page at the top of which 32° appears, find the row containing 46 in the left-hand minute column, and read 9.73337 in this row and in the column headed **sin.** The part 9.73 was found above the 46′ entry or it could have been found lower down in the column, and 10 is to be subtracted from every logarithm in the table. Again, to find log tan 142°36′, find the page at the top of which 142° appears, find the row containing 36 in the right-hand minute column, and read 9.88341 in this row and in the column headed **tan.** Hence log tan 142°36′=(−) 9.88341−10. The minus sign in parentheses before the log indicates that a negative number is under consideration. The 9.88 was found three spaces higher in the column, or it could have been found lower in the column.

Given the angle to find the logarithm of a trigonometric function—Interpolation.—The principles involved here are the same as those involved in finding logarithms and antilogarithms of numbers. Interpolation for seconds is accomplished by direct interpolation or by using the columns headed "diff." The following example will illustrate the use of the difference columns.

EXAMPLE: Find log tan 65°42′17″.

Solution.—On the page at the foot of which 65° appears, read opposite the 42′ of the right-hand minute column 533; attach to this the 10.34 found four spaces above this entry, to obtain 10.34533. In the nearest difference column opposite 17″ find 9 and add it to the last figures (33) of 10.34533 and finally subtract 10 from the result to obtain

$$\log \tan 65°42'17'' = 10.34542 - 10 = 0.34542$$

In the process of interpolation for seconds, *the difference column, headed* "diff," *nearest to the column of entries involved should be used. The change for seconds is found in this column opposite a number in the adjacent column equal to the number of seconds in the given angle. This difference is added to or subtracted from the number represented by the last three digits of the entry opposite the given number of minutes according as the entry for the next higher number of minutes is a greater or a lesser one.*

Interpolation by means of the columns headed "diff" involve slight errors which are negligible for most purposes of navigation. To avoid this error, direct interpolation may be used. Let n represent the number of seconds, D the difference between the entry corresponding to the given number of minutes and that corresponding to the next higher number of minutes, and d the required change to be added to or subtracted from the entry opposite the given number of minutes. Then

$$d = \frac{n}{60} D.$$

Given the logarithm of a trigonometric function, to find the angle.—The following example will indicate the procedure necessary to find the angle when the logarithm of a trigonometric function of the angle is given.

EXAMPLE: Find θ if $\log \cos \theta = 9.85391 - 10$.

Solution.—On the page at the top of which 44° appears, and in the column headed **cos** find the two entries 9.85399 and 9.85386 between which the given logarithm lies. Write $\theta = 44°24' +$ associated with the entry 9.85399. The difference between 9.85399 and the given logarithm is 0.00008; hence enter the adjacent column headed "diff" and opposite the 8 in **boldface** read 39″ in the associated seconds column. Hence

$$\theta = 44°24'39''.$$

In obtaining approximate position, observe only the two digits in **boldface** at the top of the page while leafing through the table in search of the desired page.

RULE: *Whenever*, in the process of finding the appropriate number of seconds, *there is a choice between two or more entries one of which is printed in* **boldface** *always give preference to the* **bold-faced** *entry.*

Here again direct interpolation may be used. For this purpose solve the formula written above, $d = (n/60)D$ for n to obtain

$$n = \frac{d}{D} 60,$$

where n and D have the same meanings as above and d is the difference between the logarithm corresponding to the correct number of minutes and the given logarithm.

TABLE 34.—LOGARITHMIC AND NATURAL HAVERSINES.

The haversine is defined by the following relation:

$$\text{hav. } A = \tfrac{1}{2} \text{ vers. } A = \tfrac{1}{2}(1 - \cos A) = \sin^2 \tfrac{1}{2} A.$$
$$\text{hav. } A = \text{hav. } (360° - A); \text{ thus hav. } 210° = \text{hav. } 150°.$$

It is a trigonometric function which simplifies the solution of many problems in nautical astronomy as well as in plane trigonometry. To afford the maximum facility in carrying out the processes of solution, the values of the natural haversine and its logarithm are set down together in a single table for all values of angle ranging from 0° to 360°, expressed both in arc and in time.

TABLE 35.—THE LONGITUDE FACTOR.

The change in longitude due to a change of 1′ in latitude, called the longitude factor, F, is given in this table at suitable intervals of latitude and azimuth. The quantities tabulated are computed from the formula—

$$F = \text{sec. Lat.} \times \text{cot. Az.}$$

When a time sight is solved with a dead-reckoning latitude, the resulting longitude is only true if the latitude be correct. This table, by setting forth the number of minutes of longitude due to each minute of error in latitude, gives the means of finding the correction to the longitude for any error that may subsequently be disclosed in the latitude used in the computation.

Regarding the azimuth of the observed celestial body as less than 90° and as measured from either the North or the South point of the horizon toward East or West, the rule for determining whether the correction in longitude is to be applied to the eastward or to the westward will be as follows: If the change in latitude is of the same name as the first letter of the bearing, the change in longitude is of the contrary name to that of the second letter, and vice versa.

Thus, if the body bears S. 45° E. and the change in latitude is to the southward, the change in longitude will be to the westward; and, if the change in latitude is to the northward, the change in longitude will be to the eastward.

The convenient application of the longitude factor in finding the intersection of position lines is explained under "Computing the intersection of position lines," chapter XIV.

TABLE 36.—THE LATITUDE FACTOR.

The change in latitude due to a change of 1′ in the longitude, called the latitude factor, f, is given in this table at suitable intervals of latitude and azimuth. The quantities tabulated, being the reciprocals of the values of the longitude factor, are computed from the formula—

$$f=\frac{1}{F}=\frac{1}{\text{sec. Lat.}\times\text{cot. Az.}}=\text{cos. Lat.}\times\text{tan. Az.}$$

When an ex-meridian sight is solved with a longitude afterwards found to be in error, this table, by setting forth the number of minutes of latitude due to each 1′ of error in longitude, gives the means of finding the correction in the latitude for the amount of error in the longitude used in the calculation.

Regarding the azimuth of the observed celestial body as less than 90° and as measured from either the North or the South point of the horizon toward East or West, the rule for determining whether the correction in latitude is to be applied to the northward or to the southward is as follows: If the change in longitude is of the same name as the second letter of the bearing, the change in latitude is of the contrary name to the first letter, and vice versa. Thus, if the body bears S. 14° E. and the change in longitude is to the westward, the change in latitude will be to the southward, and, if the change in longitude is to the eastward, the change in latitude will be to the northward.

TABLE 37.—NOON INTERVAL FACTOR.

An important item in the day's work is the proper setting of the watch to show the correct time of local apparent noon, or to find the interval of time from the morning sun observation to local apparent noon. The rate of change of longitude of the sun in its diurnal path from east to west is 900′ per hour. If to this is added the hourly change in longitude of the vessel due to course and speed, combined with the current, when this change of longitude is to the eastward, or if to this is subtracted the hourly change in longitude when speed and current are to the westward, the result will be the rate of approach per hour of the meridian of the sun toward the meridian of the observer. Suppose at watch time $7^h\ 59^m\ 43^s$ (G. C. T. $12^h\ 12^m\ 50^s$) the local observation of sun gave an easterly hour angle of $3^h\ 34^m\ 06^s$ ($3^h.5683$), the vessel changes longitude 19′ every hour to the eastward due to course and speed, and that the current in longitude is 0′.6 eastward; then the interval to noon is $3^h.5683\times\frac{900'}{919'.6}$. From the table for 19′.6, Easterly hourly change in longitude the factor found is .97869 and this number multiplied by the hour angle $3^h.5683$ is the interval to noon.

logarithm of .97869 = 9.99065
logarithm of $3^h.5683$ = 0.55246

logarithm of interval = 0.54311 = $3^h.4923$ = $3^h\ 29^m\ 32^s$

W. T. obs.	7^h	59^m	43^s	G. C. T. of obs.	12^h	12^m	50^s
Intv. to noon,	3	29	32	Intv. to noon,	3	29	32
W. T. of L. A. noon,	11	29	15	G. C. T. of L. A. noon,	15	42	22

The declination for noon is found in the nautical almanac for G. C. T $15^h\ 42^m\ 22^s$.

TABLE 38.—CONVERSION OF SIDEREAL INTO MEAN SOLAR TIME.

TABLE 39.—CONVERSION OF MEAN SOLAR INTO SIDEREAL TIME.

These tables give, respectively, the reductions necessary to convert intervals of sidereal time into those of mean solar time, and intervals of mean solar into those of sidereal time. The reduction for any interval is found by entering with the number of hours at the top and the number of minutes at the side, adding the reduction for seconds as given in the margin.

The relations between mean solar and sidereal time intervals, and the methods of conversion of these times, are given in Chapter IX.

TABLE 40.—CORRECTIONS TO BE APPLIED TO FIND THE TRUE ALTITUDE OF A STAR AND ALSO OF THE SUN FROM THE OBSERVED ALTITUDE ABOVE THE HORIZON.

This is a consolidated table in which the tabulated correction for an observed altitude of a star combines the mean refraction, and that for an observed altitude of the sun's lower limb combines the mean refraction, the parallax, and the mean semidiameter, which is taken as 16′. The additional correction for the sun takes account of the variation of the sun's semidiameter in the different months of the year. The auxiliary table for height of eye gives the additional corrections for dip.

TABLE 41.—CORRECTIONS TO BE APPLIED TO FIND THE TRUE ALTITUDE OF THE MOON FROM THE OBSERVED ALTITUDE ABOVE THE HORIZON.

In this table, which is to be entered with the observed altitude in the side column and from the top with the horizontal parallax as obtained from the Nautical Almanac for the time of observation, there are set down the corrections to be applied to the observed altitude of the moon's upper limb above the horizon, and also of the lower limb, giving the combined effect of the astronomical refraction for the mean state of the atmosphere. and of the parallax and semidiameter of the moon. The auxiliary table for height of eye gives the correction for dip.

TABLE 42.—CONVERSION OF ARC AND TIME.

This table, which is divided into three parts, contains: First, angular measures of arc from 0° to 360°, with corresponding values expressed in time (hours and minutes); second, angular measures of arc from 0′00″ to 60′00″ with corresponding values expressed in time (minutes, seconds); third, angular measures of arc 0″ to 60″ with corresponding values expressed in decimals of a second of time.

The table will be especially convenient in dealing with longitude and hour angle when converting from time to arc or vice versa.

TABLE 43.—CONVERSION OF LOCAL CIVIL TIME TO GREENWICH CIVIL TIME.

This table is divided into two parts, the upper part is for places in west longitude and the lower for east longitude. The table is entered with local civil or watch time of place then under the column of longitude or time zone of observer is found the G. C. T. for the local date. If the G. C. T. is found where there are italic type in west longitude, then the Greenwich date is one day ahead of the local date, or the next day; if the G. C. T. is found in italic type in east longitude, then the Greenwich date is one day before the local date.

Example: Find the approximate G. C. T. and the date corresponding to a watch time of 11 p. m. on July 1, Long. 136° W.

Enter table with L. C. T. 23^h and under Long. 135°, the G. C. T. is 8^h, since it is found in italic type the date is one day ahead or July 2.

Example: Find the approximate L. C. T. or watch time of Washington, D. C., when it is 4 a. m. watch time July 4, Manila P. I.

Enter table of East Long. with L. C. T. 4^h and under 120° (−8 zone) is found, G. C. T. 20^h in italic type which is G. C. T. 20^h July 3. In the first table (west longitude) look under 75° (+5 zone) for Washington and for G. C. T. 20^h, then under L. C. T. is found 15^h, or 3 p. m. July 3. Whenever G. C. T. is found in italic type, the date for L. C. T. is changed from the date of the known G. C. T.; in other words, it is a reversal of the process.

TABLE 1.

Radio Bearing Conversion.

Correction to be applied to radio bearing to convert to mercator bearing.

Difference of longitude

Mid. lat.	1°	1.5°	2°	2.5°	3°	3.5°	4°	4.5°	5°	5.5°	6°	6.5°	7°	7.5°	8°	8.5°	Mid. lat.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
4	----	----	----	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	4
5	0.1	0.1	0.1	.1	.1	.2	.2	.2	.2	.2	.3	.3	.3	.3	.4	.4	5
6	.1	.1	.1	.1	.2	.2	.2	.2	.3	.3	.3	.3	.4	.4	.4	.5	6
7	.1	.1	.1	.2	.2	.2	.3	.3	.3	.3	.4	.4	.4	.5	.5	.5	7
8	.1	.1	.1	.2	.2	.2	.3	.3	.4	.4	.4	.5	.5	.5	.6	.6	8
9	.1	.1	.1	.2	.2	.2	.3	.3	.4	.4	.5	.5	.6	.6	.6	.7	9
10	.1	.1	.1	.2	.2	.3	.4	.4	.4	.5	.5	.6	.6	.6	.7	.7	10
11	.1	.1	.2	.2	.3	.3	.4	.4	.5	.5	.6	.6	.7	.7	.8	.8	11
12	.1	.1	.2	.3	.3	.4	.4	.5	.5	.6	.6	.7	.7	.8	.8	.9	12
13	.1	.2	.2	.3	.3	.4	.4	.5	.6	.6	.7	.7	.8	.8	.9	1.0	13
14	.1	.2	.2	.3	.4	.4	.5	.6	.6	.7	.7	.8	.8	.9	1.0	1.0	14
15	.1	.2	.3	.3	.4	.4	.5	.6	.6	.7	.8	.8	.9	1.0	1.0	1.1	15
16	.1	.2	.3	.4	.4	.5	.6	.6	.7	.8	.8	.9	1.0	1.0	1.1	1.2	16
17	.2	.2	.3	.4	.4	.5	.6	.6	.7	.8	.9	1.0	1.0	1.1	1.2	1.2	17
18	.2	.2	.3	.4	.5	.5	.6	.7	.8	.8	.9	1.0	1.1	1.2	1.2	1.3	18
19	.2	.2	.3	.4	.5	.6	.6	.7	.8	.9	1.0	1.1	1.1	1.2	1.3	1.4	19
20	.2	.2	.3	.4	.5	.6	.7	.8	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5	20
21	.2	.3	.4	.5	.5	.6	.7	.8	.9	1.0	1.1	1.2	1.2	1.4	1.4	1.5	21
22	.2	.3	.4	.5	.6	.6	.8	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	22
23	.2	.3	.4	.5	.6	.7	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	23
24	.2	.3	.4	.5	.6	.7	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	24
25	.2	.3	.4	.5	.6	.7	.8	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	25
26	.2	.3	.4	.6	.6	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.8	1.9	26
27	.2	.3	.4	.6	.7	.8	.9	1.0	1.1	1.2	1.4	1.5	1.6	1.7	1.8	1.9	27
28	.2	.4	.5	.6	.7	.8	.9	1.1	1.2	1.3	1.4	1.5	1.6	1.8	1.9	2.0	28
29	.2	.4	.5	.6	.7	.8	1.0	1.1	1.2	1.3	1.4	1.6	1.7	1.8	1.9	2.1	29
30	.2	.4	.5	.6	.8	.9	1.0	1.1	1.2	1.4	1.5	1.6	1.8	1.9	2.0	2.1	30
31	.2	.4	.5	.6	.8	.9	1.0	1.2	1.3	1.4	1.6	1.7	1.8	1.9	2.1	2.2	31
32	.3	.4	.5	.7	.8	.9	1.1	1.2	1.3	1.4	1.6	1.7	1.8	2.0	2.1	2.2	32
33	.3	.4	.6	.7	.8	1.0	1.1	1.2	1.4	1.5	1.6	1.8	1.9	2.1	2.2	2.3	33
34	.3	.4	.6	.7	.8	1.0	1.1	1.2	1.4	1.5	1.7	1.8	2.0	2.1	2.2	2.4	34
35	.3	.4	.6	.7	.9	1.0	1.2	1.3	1.4	1.6	1.7	1.9	2.0	2.2	2.3	2.4	35
36	.3	.4	.6	.7	.9	1.0	1.2	1.3	1.5	1.6	1.8	1.9	2.1	2.2	2.4	2.5	36
37	.3	.4	.6	.8	.9	1.1	1.2	1.4	1.5	1.6	1.8	2.0	2.1	2.2	2.4	2.6	37
38	.3	.5	.6	.8	.9	1.1	1.2	1.4	1.5	1.7	1.8	2.0	2.2	2.3	2.5	2.6	38
39	.3	.5	.6	.8	1.0	1.1	1.2	1.4	1.6	1.7	1.9	2.1	2.2	2.4	2.5	2.7	39
40	.3	.5	.6	.8	1.0	1.1	1.3	1.4	1.6	1.8	1.9	2.1	2.2	2.4	2.6	2.7	40
41	.3	.5	.6	.8	1.0	1.2	1.3	1.5	1.6	1.8	2.0	2.1	2.3	2.5	2.6	2.8	41
42	.3	.5	.7	.8	1.0	1.2	1.3	1.5	1.7	1.8	2.0	2.2	2.3	2.5	2.7	2.8	42
43	.3	.5	.7	.8	1.0	1.2	1.4	1.5	1.7	1.9	2.1	2.2	2.4	2.6	2.7	2.9	43
44	.4	.5	.7	.9	1.1	1.2	1.4	1.6	1.7	1.9	2.1	2.2	2.4	2.6	2.8	3.0	44
45	.4	.5	.7	.9	1.1	1.2	1.4	1.6	1.8	2.0	2.1	2.3	2.5	2.6	2.8	3.0	45
46	.4	.5	.7	.9	1.1	1.3	1.4	1.6	1.8	2.0	2.2	2.3	2.5	2.7	2.9	3.1	46
47	.4	.6	.7	.9	1.1	1.3	1.5	1.7	1.8	2.0	2.2	2.4	2.6	2.8	2.9	3.1	47
48	.4	.6	.8	.9	1.1	1.3	1.5	1.7	1.8	2.1	2.2	2.4	2.6	2.8	3.0	3.2	48
49	.4	.6	.8	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.6	2.8	3.0	3.2	49
50	.4	.6	.8	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.2	50
51	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0	2.1	2.3	2.5	2.7	2.9	3.1	3.3	51
52	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	52
53	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	53
54	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	54
55	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.1	2.2	2.4	2.7	2.9	3.1	3.3	3.5	55
56	.4	.6	.8	1.0	1.2	1.4	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	56
57	.4	.6	.8	1.1	1.2	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.2	3.4	3.6	57
58	.4	.6	.8	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.6	2.8	3.0	3.2	3.4	3.6	58
59	.4	.6	.8	1.1	1.3	1.5	1.7	1.9	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	59
60	.4	.6	.9	1.1	1.3	1.5	1.7	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.5	3.7	60

In north latitude when vessel is $\frac{\text{eastward}}{\text{westward}}$ of station, the correction is $\frac{+}{-}$.

TABLE 1.

Radio Bearing Conversion.

Correction to be applied to radio bearing to convert to mercator bearing.

Difference of longitude

Mid. lat.	9°	9.5°	10°	10.5°	11°	11.5°	12°	12.5°	13°	13.5°	14°	14.5°	15°	15.5°	16°	16.5°	Mid. lat.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
4	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	4
5	.4	.4	.4	.5	.5	.5	.5	.5	.6	.6	.6	.6	.7	.7	.7	.7	5
6	.5	.5	.5	.6	.6	.6	.6	.6	.7	.7	.7	.8	.8	.8	.8	.9	6
7	.6	.6	.6	.6	.7	.7	.7	.8	.8	.8	.9	.9	.9	1.0	1.0	1.0	7
8	.6	.7	.7	.7	.8	.8	.8	.9	.9	.9	1.0	1.0	1.1	1.1	1.1	1.2	8
9	.7	.8	.8	.8	.9	.9	.9	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.3	9
10	.8	.8	.9	.9	1.0	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	10
11	.8	.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.4	1.5	1.5	1.5	1.6	11
12	.9	1.0	1.0	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7	12
13	1.0	1.1	1.1	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.8	1.8	1.9	13
14	1.1	1.2	1.2	1.3	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.8	1.8	1.9	2.0	2.0	14
15	1.2	1.2	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.8	1.8	1.9	1.9	2.0	2.1	2.2	15
16	1.2	1.3	1.4	1.5	1.5	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.2	2.3	16
17	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.4	17
18	1.4	1.5	1.6	1.6	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.6	18
19	1.5	1.6	1.6	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.7	19
20	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.8	20
21	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	21
22	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.8	2.9	3.0	3.1	22
23	1.8	1.8	2.0	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.8	3.0	3.1	3.2	3.3	23
24	1.8	1.9	2.0	2.2	2.3	2.4	2.4	2.6	2.7	2.8	2.8	3.0	3.1	3.2	3.3	3.4	24
25	1.9	2.0	2.1	2.2	2.4	2.5	2.5	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	25
26	2.0	2.1	2.2	2.3	2.4	2.6	2.6	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	26
27	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	3.0	3.1	3.2	3.3	3.4	3.5	3.7	3.8	27
28	2.1	2.2	2.4	2.5	2.6	2.7	2.9	2.9	3.1	3.2	3.3	3.4	3.5	3.7	3.8	3.9	28
29	2.2	2.3	2.4	2.6	2.7	2.8	2.9	3.0	3.2	3.3	3.5	3.6	3.7	3.8	3.9	4.0	29
30	2.2	2.4	2.5	2.7	2.8	2.9	3.0	3.1	3.3	3.4	3.5	3.6	3.8	3.9	4.0	4.1	30
31	2.3	2.5	2.6	2.7	2.9	3.0	3.1	3.2	3.4	3.5	3.6	3.8	3.9	4.0	4.1	4.3	31
32	2.4	2.5	2.6	2.8	3.0	3.1	3.2	3.3	3.5	3.6	3.7	3.8	4.0	4.1	4.3	4.4	32
33	2.4	2.6	2.7	2.9	3.0	3.2	3.3	3.4	3.6	3.7	3.8	3.9	4.1	4.2	4.4	4.5	33
34	2.5	2.6	2.8	3.0	3.1	3.3	3.4	3.5	3.6	3.8	3.9	4.1	4.2	4.4	4.5	4.6	34
35	2.6	2.7	2.9	3.1	3.2	3.3	3.4	3.6	3.7	3.9	4.0	4.2	4.3	4.5	4.6	4.8	35
36	2.6	2.8	2.9	3.1	3.3	3.4	3.5	3.7	3.8	4.0	4.1	4.3	4.4	4.6	4.7	4.9	36
37	2.7	2.9	3.0	3.2	3.4	3.5	3.6	3.8	3.9	4.1	4.2	4.4	4.5	4.7	4.8	5.0	37
38	2.8	2.9	3.1	3.3	3.4	3.6	3.7	3.8	4.0	4.2	4.3	4.5	4.6	4.8	4.9	5.1	38
39	2.8	3.0	3.2	3.3	3.5	3.7	3.8	4.0	4.1	4.3	4.4	4.6	4.7	4.9	5.1	5.2	39
40	2.9	3.1	3.2	3.4	3.6	3.8	3.9	4.0	4.2	4.4	4.5	4.7	4.8	5.0	5.2	5.3	40
41	3.0	3.1	3.3	3.5	3.6	3.8	3.9	4.1	4.3	4.5	4.6	4.8	4.9	5.1	5.3	5.4	41
42	3.0	3.2	3.4	3.6	3.7	3.9	4.0	4.2	4.4	4.5	4.7	4.9	5.0	5.2	5.4	5.5	42
43	3.1	3.2	3.4	3.6	3.8	4.0	4.1	4.3	4.5	4.6	4.8	5.0	5.1	5.3	5.5	5.7	43
44	3.1	3.3	3.5	3.7	3.9	4.0	4.2	4.3	4.5	4.7	4.9	5.1	5.2	5.4	5.6	5.8	44
45	3.2	3.4	3.5	3.7	3.9	4.1	4.3	4.4	4.6	4.8	5.0	5.2	5.3	5.5	5.7	5.9	45
46	3.2	3.4	3.6	3.8	4.0	4.2	4.3	4.5	4.7	4.9	5.1	5.2	5.4	5.6	5.8	6.0	46
47	3.3	3.5	3.7	3.9	4.1	4.2	4.4	4.6	4.8	4.9	5.1	5.3	5.5	5.7	5.9	6.1	47
48	3.4	3.5	3.7	3.9	4.1	4.3	4.5	4.7	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	48
49	3.4	3.6	3.8	4.0	4.2	4.4	4.5	4.7	4.9	5.2	5.3	5.5	5.7	5.9	6.1	6.3	49
50	3.4	3.6	3.8	4.1	4.2	4.5	4.6	4.8	5.0	5.2	5.4	5.6	5.8	5.9	6.1	6.3	50
51	3.5	3.7	3.9	4.1	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	5.8	6.0	6.2	6.4	51
52	3.6	3.8	4.0	4.2	4.4	4.6	4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.1	6.3	6.5	52
53	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	53
54	3.6	3.8	4.1	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.7	54
55	3.7	3.9	4.1	4.4	4.6	4.8	4.9	5.1	5.3	5.5	5.7	6.0	6.2	6.4	6.6	6.8	55
56	3.7	3.9	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	56
57	3.8	4.0	4.2	4.5	4.7	4.9	5.0	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.7	6.9	57
58	3.8	4.0	4.2	4.5	4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.2	6.4	6.6	6.8	7.0	58
59	3.8	4.1	4.3	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.3	6.4	6.7	6.9	7.1	59
60	3.9	4.1	4.3	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.1	6.3	6.5	6.7	6.9	7.2	60

In south latitude when the vessel is $\frac{\text{eastward}}{\text{westward}}$ of station the correction is $\frac{-}{+}$.

TABLE 2.

Conversion of Points to Degrees

	Points.	Angular measure.
NORTH TO EAST.		° ′ ″
North:		
N¼E	¼	2 48 45
N½E	½	5 37 30
N¾E	¾	8 26 15
N. by E	1	11 15 00
N. by E¼E	1¼	14 03 45
N. by E½E	1½	16 52 30
N. by E¾E	1¾	19 41 15
NNE	2	22 30 00
NNE¼E	2¼	25 18 45
NNE½E	2½	28 07 30
NNE¾E	2¾	30 56 15
NE. by N	3	33 45 00
NE¾N	3¼	36 33 45
NE½N	3½	39 22 30
NE¼N	3¾	42 11 15
NE	4	45 00 00
NE¼E	4¼	47 48 45
NE½E	4½	50 37 30
NE¾E	4¾	53 26 15
NE. by E	5	56 15 00
NE. by E¼E	5¼	59 03 45
NE. by E½E	5½	61 52 30
NE. by E¾E	5¾	64 41 15
ENE	6	67 30 00
ENE¼E	6¼	70 18 45
ENE½E	6½	73 07 30
ENE¾E	6¾	75 56 15
E. by N	7	78 45 00
E¾N	7¼	81 33 45
E½N	7½	84 22 30
E¼N	7¾	87 11 15
SOUTH TO WEST.		
South	16	180 00 00
S¼W	16¼	182 48 45
S½W	16½	185 37 30
S¾W	16¾	188 26 15
S. by W	17	191 15 00
S. by W¼W	17¼	194 03 45
S. by W½W	17½	196 52 30
S. by W¾W	17¾	199 41 15
SSW	18	202 30 00
SSW¼W	18¼	205 18 45
SSW½W	18½	208 07 30
SSW¾W	18¾	210 56 15
SW. by S	19	213 45 00
SW¾S	19¼	216 33 45
SW½S	19½	219 22 30
SW¼S	19¾	222 11 15
SW	20	225 00 00
SW¼W	20¼	227 48 45
SW½W	20½	230 37 30
SW¾W	20¾	233 26 15
SW. by W	21	236 15 00
SW. by W¼W	21¼	239 03 45
SW. by W½W	21½	241 52 30
SW. by W¾W	21¾	244 41 15
WSW	22	247 30 00
WSW¼W	22¼	250 18 45
WSW½W	22½	253 07 30
WSW¾W	22¾	255 56 15
W. by S	23	258 45 00
W¾S	23¼	261 33 45
W½S	23½	264 22 30
W¼S	23¾	267 11 15

	Points.	Angular measure.
EAST TO SOUTH.		° ′ ″
East	8	90 00 00
E¼S	8¼	92 48 45
E½S	8½	95 37 30
E¾S	8¾	98 26 15
E. by S	9	101 15 00
ESE¾E	9¼	104 03 45
ESE½E	9½	106 52 30
ESE¼E	9¾	109 41 15
ESE	10	112 30 00
SE. by E¾E	10¼	115 18 45
SE. by E½E	10½	118 07 30
SE. by E¼E	10¾	120 56 15
SE. by E	11	123 45 00
SE¾E	11¼	126 33 45
SE½E	11½	129 22 30
SE¼E	11¾	132 11 15
SE	12	135 00 00
SE¼S	12¼	137 48 45
SE½S	12½	140 37 30
SE¾S	12¾	143 26 15
SE. by S	13	146 15 00
SSE¾E	13¼	149 03 45
SSE½E	13½	151 52 30
SSE¼E	13¾	154 41 15
SSE	14	157 30 00
S. by E¾E	14¼	160 18 45
S. by E½E	14½	163 07 30
S. by E¼E	14¾	165 56 15
S. by E	15	168 45 00
S¾E	15¼	171 33 45
S½E	15½	174 22 30
S¼E	15¾	177 11 15
WEST TO NORTH.		
West	24	270 00 00
W¼N	24¼	272 48 45
W½N	24½	275 37 30
W¾N	24¾	278 26 15
W. by N	25	281 15 00
WNW¾W	25¼	284 03 45
WNW½W	25½	286 52 30
WNW¼W	25¾	289 41 15
WNW	26	292 30 00
NW. by W¾W	26¼	295 18 45
NW. by W½W	26½	298 07 30
NW. by W¼W	26¾	300 56 15
NW. by W	27	303 45 00
NW¾W	27¼	306 33 45
NW½W	27½	309 22 30
NW¼W	27¾	312 11 15
NW	28	315 00 00
NW¼N	28¼	317 48 45
NW½N	28½	320 37 30
NW¾N	28¾	323 26 15
NW. by N	29	326 15 00
NNW¾W	29¼	329 03 45
NNW½W	29½	331 52 30
NNW¼W	29¾	334 41 15
NNW	30	337 30 00
N. by W¾W	30¼	340 18 45
N. by W½W	30½	343 07 30
N. by W¼W	30¾	345 56 15
N. by W	31	348 45 00
N¾W	31¼	351 33 45
N½W	31½	354 22 30
N¼W	31¾	357 11 15
North	32	360 00 00

TABLE 3.

Difference of Latitude and Departure for 1° (179°, 181°, 359°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.0	61	61.0	1.1	121	121.0	2.1	181	181.0	3.2	241	241.0	4.2
2	2.0	0.0	62	62.0	1.1	22	122.0	2.1	82	182.0	3.2	42	242.0	4.2
3	3.0	0.1	63	63.0	1.1	23	123.0	2.1	83	183.0	3.2	43	243.0	4.2
4	4.0	0.1	64	64.0	1.1	24	124.0	2.2	84	184.0	3.2	44	244.0	4.3
5	5.0	0.1	65	65.0	1.1	25	125.0	2.2	85	185.0	3.2	45	245.0	4.3
6	6.0	0.1	66	66.0	1.2	26	126.0	2.2	86	186.0	3.2	46	246.0	4.3
7	7.0	0.1	67	67.0	1.2	27	127.0	2.2	87	187.0	3.3	47	247.0	4.3
8	8.0	0.1	68	68.0	1.2	28	128.0	2.2	88	188.0	3.3	48	248.0	4.3
9	9.0	0.2	69	69.0	1.2	29	129.0	2.3	89	189.0	3.3	49	249.0	4.3
10	10.0	0.2	70	70.0	1.2	30	130.0	2.3	90	190.0	3.3	50	250.0	4.4
11	11.0	0.2	71	71.0	1.2	131	131.0	2.3	191	191.0	3.3	251	251.0	4.4
12	12.0	0.2	72	72.0	1.3	32	132.0	2.3	92	192.0	3.4	52	252.0	4.4
13	13.0	0.2	73	73.0	1.3	33	133.0	2.3	93	193.0	3.4	53	253.0	4.4
14	14.0	0.2	74	74.0	1.3	34	134.0	2.3	94	194.0	3.4	54	254.0	4.4
15	15.0	0.3	75	75.0	1.3	35	135.0	2.4	95	195.0	3.4	55	255.0	4.5
16	16.0	0.3	76	76.0	1.3	36	136.0	2.4	96	196.0	3.4	56	256.0	4.5
17	17.0	0.3	77	77.0	1.3	37	137.0	2.4	97	197.0	3.4	57	257.0	4.5
18	18.0	0.3	78	78.0	1.4	38	138.0	2.4	98	198.0	3.5	58	258.0	4.5
19	19.0	0.3	79	79.0	1.4	39	139.0	2.4	99	199.0	3.5	59	259.0	4.5
20	20.0	0.3	80	80.0	1.4	40	140.0	2.4	200	200.0	3.5	60	260.0	4.5
21	21.0	0.4	81	81.0	1.4	141	141.0	2.5	201	201.0	3.5	261	261.0	4.6
22	22.0	0.4	82	82.0	1.4	42	142.0	2.5	02	202.0	3.5	62	262.0	4.6
23	23.0	0.4	83	83.0	1.4	43	143.0	2.5	03	203.0	3.5	63	263.0	4.6
24	24.0	0.4	84	84.0	1.5	44	144.0	2.5	04	204.0	3.6	64	264.0	4.6
25	25.0	0.4	85	85.0	1.5	45	145.0	2.5	05	205.0	3.6	65	265.0	4.6
26	26.0	0.5	86	86.0	1.5	46	146.0	2.5	06	206.0	3.6	66	266.0	4.6
27	27.0	0.5	87	87.0	1.5	47	147.0	2.6	07	207.0	3.6	67	267.0	4.7
28	28.0	0.5	88	88.0	1.5	48	148.0	2.6	08	208.0	3.6	68	268.0	4.7
29	29.0	0.5	89	89.0	1.6	49	149.0	2.6	09	209.0	3.6	69	269.0	4.7
30	30.0	0.5	90	90.0	1.6	50	150.0	2.6	10	210.0	3.7	70	270.0	4.7
31	31.0	0.5	91	91.0	1.6	151	151.0	2.6	211	211.0	3.7	271	271.0	4.7
32	32.0	0.6	92	92.0	1.6	52	152.0	2.7	12	212.0	3.7	72	272.0	4.7
33	33.0	0.6	93	93.0	1.6	53	153.0	2.7	13	213.0	3.7	73	273.0	4.8
34	34.0	0.6	94	94.0	1.6	54	154.0	2.7	14	214.0	3.7	74	274.0	4.8
35	35.0	0.6	95	95.0	1.7	55	155.0	2.7	15	215.0	3.8	75	275.0	4.8
36	36.0	0.6	96	96.0	1.7	56	156.0	2.7	16	216.0	3.8	76	276.0	4.8
37	37.0	0.6	97	97.0	1.7	57	157.0	2.7	17	217.0	3.8	77	277.0	4.8
38	38.0	0.7	98	98.0	1.7	58	158.0	2.8	18	218.0	3.8	78	278.0	4.9
39	39.0	0.7	99	99.0	1.7	59	159.0	2.8	19	219.0	3.8	79	279.0	4.9
40	40.0	0.7	100	100.0	1.7	60	160.0	2.8	20	220.0	3.8	80	280.0	4.9
41	41.0	0.7	101	101.0	1.8	161	161.0	2.8	221	221.0	3.9	281	281.0	4.9
42	42.0	0.7	02	102.0	1.8	62	162.0	2.8	22	222.0	3.9	82	282.0	4.9
43	43.0	0.8	03	103.0	1.8	63	163.0	2.8	23	223.0	3.9	83	283.0	4.9
44	44.0	0.8	04	104.0	1.8	64	164.0	2.9	24	224.0	3.9	84	284.0	5.0
45	45.0	0.8	05	105.0	1.8	65	165.0	2.9	25	225.0	3.9	85	285.0	5.0
46	46.0	0.8	06	106.0	1.8	66	166.0	2.9	26	226.0	3.9	86	286.0	5.0
47	47.0	0.8	07	107.0	1.9	67	167.0	2.9	27	227.0	4.0	87	287.0	5.0
48	48.0	0.8	08	108.0	1.9	68	168.0	2.9	28	228.0	4.0	88	288.0	5.0
49	49.0	0.9	09	109.0	1.9	69	169.0	2.9	29	229.0	4.0	89	289.0	5.0
50	50.0	0.9	10	110.0	1.9	70	170.0	3.0	30	230.0	4.0	90	290.0	5.1
51	51.0	0.9	111	111.0	1.9	171	171.0	3.0	231	231.0	4.0	291	291.0	5.1
52	52.0	0.9	12	112.0	2.0	72	172.0	3.0	32	232.0	4.0	92	292.0	5.1
53	53.0	0.9	13	113.0	2.0	73	173.0	3.0	33	233.0	4.1	93	293.0	5.1
54	54.0	0.9	14	114.0	2.0	74	174.0	3.0	34	234.0	4.1	94	294.0	5.1
55	55.0	1.0	15	115.0	2.0	75	175.0	3.1	35	235.0	4.1	95	295.0	5.1
56	56.0	1.0	16	116.0	2.0	76	176.0	3.1	36	236.0	4.1	96	296.0	5.2
57	57.0	1.0	17	117.0	2.0	77	177.0	3.1	37	237.0	4.1	97	297.0	5.2
58	58.0	1.0	18	118.0	2.1	78	178.0	3.1	38	238.0	4.2	98	298.0	5.2
59	59.0	1.0	19	119.0	2.1	79	179.0	3.1	39	239.0	4.2	99	299.0	5.2
60	60.0	1.0	20	120.0	2.1	80	180.0	3.1	40	240.0	4.2	300	300.0	5.2
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

89° (91°, 269°, 271°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 1° (179°, 181°, 359°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	301.0	5.3	361	360.9	6.3	421	420.9	7.3	481	480.9	8.4	541	540.9	9.4
02	302.0	5.3	62	361.9	6.3	22	421.9	7.4	82	481.9	8.4	42	541.9	9.5
03	303.0	5.3	63	362.9	6.3	23	422.9	7.4	83	482.9	8.4	43	542.9	9.5
04	304.0	5.3	64	363.9	6.4	24	423.9	7.4	84	483.9	8.4	44	543.9	9.5
05	305.0	5.3	65	364.9	6.4	25	424.9	7.4	85	484.9	8.5	45	544.9	9.5
06	306.0	5.3	66	365.9	6.4	26	425.9	7.4	86	485.9	8.5	46	545.9	9.5
07	307.0	5.4	67	366.9	6.4	27	426.9	7.5	87	486.9	8.5	47	546.9	9.5
08	308.0	5.4	68	367.9	6.4	28	427.9	7.5	88	487.9	8.5	48	547.9	9.6
09	309.0	5.4	69	368.9	6.4	29	428.9	7.5	89	488.9	8.5	49	548.9	9.6
10	310.0	5.4	70	369.9	6.5	30	429.9	7.5	90	489.9	8.6	50	549.9	9.6
311	311.0	5.4	371	370.9	6.5	431	430.9	7.5	491	490.9	8.6	551	550.9	9.6
12	312.0	5.4	72	371.9	6.5	32	431.9	7.5	92	491.9	8.6	52	551.9	9.6
13	313.0	5.5	73	372.9	6.5	33	432.9	7.6	93	492.9	8.6	53	552.9	9.7
14	314.0	5.5	74	373.9	6.5	34	433.9	7.6	94	493.9	8.6	54	553.9	9.7
15	315.0	5.5	75	374.9	6.5	35	434.9	7.6	95	494.9	8.6	55	554.9	9.7
16	316.0	5.5	76	375.9	6.6	36	435.9	7.6	96	495.9	8.7	56	555.9	9.7
17	317.0	5.5	77	376.9	6.6	37	436.9	7.6	97	496.9	8.7	57	556.9	9.7
18	318.0	5.5	78	377.9	6.6	38	437.9	7.6	98	497.9	8.7	58	557.9	9.7
19	319.0	5.6	79	378.9	6.6	39	438.9	7.7	99	498.9	8.7	59	558.9	9.8
20	320.0	5.6	80	379.9	6.6	40	439.9	7.7	500	499.9	8.7	60	559.9	9.8
321	321.0	5.6	381	380.9	6.6	441	440.9	7.7	501	500.9	8.7	561	560.9	9.8
22	322.0	5.6	82	381.9	6.7	42	441.9	7.7	02	501.9	8.8	62	561.9	9.8
23	323.0	5.6	83	382.9	6.7	43	442.9	7.7	03	502.9	8.8	63	562.9	9.8
24	324.0	5.7	84	383.9	6.7	44	443.9	7.7	04	503.9	8.8	64	563.9	9.8
25	325.0	5.7	85	384.9	6.7	45	444.9	7.8	05	504.9	8.8	65	564.9	9.9
26	326.0	5.7	86	385.9	6.7	46	445.9	7.8	06	505.9	8.8	66	565.9	9.9
27	327.0	5.7	87	386.9	6.8	47	446.9	7.8	07	506.9	8.9	67	566.9	9.9
28	328.0	5.7	88	387.9	6.8	48	447.9	7.8	08	507.9	8.9	68	567.9	9.9
29	328.9	5.7	89	388.9	6.8	49	448.9	7.8	09	508.9	8.9	69	568.9	9.9
30	329.9	5.8	90	389.9	6.8	50	449.9	7.9	10	509.9	8.9	70	569.9	9.9
331	330.9	5.8	391	390.9	6.8	451	450.9	7.9	511	510.9	8.9	571	570.9	10.0
32	331.9	5.8	92	391.9	6.8	52	451.9	7.9	12	511.9	9.0	72	571.9	10.0
33	332.9	5.8	93	392.9	6.9	53	452.9	7.9	13	512.9	9.0	73	572.9	10.0
34	333.9	5.8	94	393.9	6.9	54	453.9	7.9	14	513.9	9.0	74	573.9	10.0
35	334.9	5.8	95	394.9	6.9	55	454.9	7.9	15	514.9	9.0	75	574.9	10.0
36	335.9	5.9	96	395.9	6.9	56	455.9	8.0	16	515.9	9.0	76	575.9	10.1
37	336.9	5.9	97	396.9	6.9	57	456.9	8.0	17	516.9	9.0	77	576.9	10.1
38	337.9	5.9	98	397.9	6.9	58	457.9	8.0	18	517.9	9.0	78	577.9	10.1
39	338.9	5.9	99	398.9	7.0	59	458.9	8.0	19	518.9	9.1	79	578.9	10.1
40	339.9	5.9	400	399.9	7.0	60	459.9	8.0	20	519.9	9.1	80	579.9	10.1
341	340.9	6.0	401	400.9	7.0	461	460.9	8.0	521	520.9	9.1	581	580.9	10.1
42	341.9	6.0	02	401.9	7.0	62	461.9	8.1	22	521.9	9.1	82	581.9	10.2
43	342.9	6.0	03	402.9	7.0	63	462.9	8.1	23	522.9	9.1	83	582.9	10.2
44	343.9	6.0	04	403.9	7.1	64	463.9	8.1	24	523.9	9.1	84	583.9	10.2
45	344.9	6.0	05	404.9	7.1	65	464.9	8.1	25	524.9	9.2	85	584.9	10.2
46	345.9	6.0	06	405.9	7.1	66	465.9	8.1	26	525.9	9.2	86	585.9	10.2
47	346.9	6.1	07	406.9	7.1	67	466.9	8.2	27	526.9	9.2	87	586.9	10.2
48	347.9	6.1	08	407.9	7.1	68	467.9	8.2	28	527.9	9.2	88	587.9	10.3
49	348.9	6.1	09	408.9	7.1	69	468.9	8.2	29	528.9	9.2	89	588.9	10.3
50	349.9	6.1	10	409.9	7.2	70	469.9	8.2	30	529.9	9.2	90	589.9	10.3
351	350.9	6.1	411	410.9	7.2	471	470.9	8.2	531	530.9	9.3	591	590.9	10.3
52	351.9	6.1	12	411.9	7.2	72	471.9	8.2	32	531.9	9.3	92	591.9	10.3
53	352.9	6.2	13	412.9	7.2	73	472.9	8.3	33	532.9	9.3	93	592.9	10.3
54	353.9	6.2	14	413.9	7.2	74	473.9	8.3	34	533.9	9.3	94	593.9	10.4
55	354.9	6.2	15	414.9	7.2	75	474.9	8.3	35	534.9	9.3	95	594.9	10.4
56	355.9	6.2	16	415.9	7.3	76	475.9	8.3	36	535.9	9.4	96	595.9	10.4
57	356.9	6.2	17	416.9	7.3	77	476.9	8.3	37	536.9	9.4	97	596.9	10.4
58	357.9	6.2	18	417.9	7.3	78	477.9	8.3	38	537.9	9.4	98	597.9	10.4
59	358.9	6.3	19	418.9	7.3	79	478.9	8.4	39	538.9	9.4	99	598.9	10.5
60	359.9	6.3	20	419.9	7.3	80	479.9	8.4	40	539.9	9.4	600	599.9	10.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

89° (91°, 269°, 271°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

TABLE 3.

Difference of Latitude and Departure for 2° (178°, 182°, 358°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.0	61	61.0	2.1	121	120.9	4.2	181	180.9	6.3	241	240.9	8.4
2	2.0	0.1	62	62.0	2.2	22	121.9	4.3	82	181.9	6.4	42	241.9	8.4
3	3.0	0.1	63	63.0	2.2	23	122.9	4.3	83	182.9	6.4	43	242.9	8.5
4	4.0	0.1	64	64.0	2.2	24	123.9	4.3	84	183.9	6.4	44	243.9	8.5
5	5.0	0.2	65	65.0	2.3	25	124.9	4.4	85	184.9	6.5	45	244.9	8.6
6	6.0	0.2	66	66.0	2.3	26	125.9	4.4	86	185.9	6.5	46	245.9	8.6
7	7.0	0.2	67	67.0	2.3	27	126.9	4.4	87	186.9	6.5	47	246.8	8.6
8	8.0	0.3	68	68.0	2.4	28	127.9	4.5	88	187.9	6.6	48	247.8	8.7
9	9.0	0.3	69	69.0	2.4	29	128.9	4.5	89	188.9	6.6	49	248.8	8.7
10	10.0	0.3	70	70.0	2.4	30	129.9	4.5	90	189.9	6.6	50	249.8	8.7
11	11.0	0.4	71	71.0	2.5	131	130.9	4.6	191	190.9	6.7	251	250.8	8.8
12	12.0	0.4	72	72.0	2.5	32	131.9	4.6	92	191.9	6.7	52	251.8	8.8
13	13.0	0.5	73	73.0	2.5	33	132.9	4.6	93	192.9	6.7	53	252.8	8.8
14	14.0	0.5	74	74.0	2.6	34	133.9	4.7	94	193.9	6.8	54	253.8	8.9
15	15.0	0.5	75	75.0	2.6	35	134.9	4.7	95	194.9	6.8	55	254.8	8.9
16	16.0	0.6	76	76.0	2.7	36	135.9	4.7	96	195.9	6.8	56	255.8	8.9
17	17.0	0.6	77	77.0	2.7	37	136.9	4.8	97	196.9	6.9	57	256.8	9.0
18	18.0	0.6	78	78.0	2.7	38	137.9	4.8	98	197.9	6.9	58	257.8	9.0
19	19.0	0.7	79	79.0	2.8	39	138.9	4.9	99	198.9	6.9	59	258.8	9.0
20	20.0	0.7	80	80.0	2.8	40	139.9	4.9	200	199.9	7.0	60	259.8	9.1
21	21.0	0.7	81	81.0	2.8	141	140.9	4.9	201	200.9	7.0	261	260.8	9.1
22	22.0	0.8	82	82.0	2.9	42	141.9	5.0	02	201.9	7.0	62	261.8	9.1
23	23.0	0.8	83	82.9	2.9	43	142.9	5.0	03	202.9	7.1	63	262.8	9.2
24	24.0	0.8	84	83.9	2.9	44	143.9	5.0	04	203.9	7.1	64	263.8	9.2
25	25.0	0.9	85	84.9	3.0	45	144.9	5.1	05	204.9	7.2	65	264.8	9.2
26	26.0	0.9	86	85.9	3.0	46	145.9	5.1	06	205.9	7.2	66	265.8	9.3
27	27.0	0.9	87	86.9	3.0	47	146.9	5.1	07	206.9	7.2	67	266.8	9.3
28	28.0	1.0	88	87.9	3.1	48	147.9	5.2	08	207.9	7.3	68	267.8	9.4
29	29.0	1.0	89	88.9	3.1	49	148.9	5.2	09	208.9	7.3	69	268.8	9.4
30	30.0	1.0	90	89.9	3.1	50	149.9	5.2	10	209.9	7.3	70	269.8	9.4
31	31.0	1.1	91	90.9	3.2	151	150.9	5.3	211	210.9	7.4	271	270.8	9.5
32	32.0	1.1	92	91.9	3.2	52	151.9	5.3	12	211.9	7.4	72	271.8	9.5
33	33.0	1.2	93	92.9	3.2	53	152.9	5.3	13	212.9	7.4	73	272.8	9.5
34	34.0	1.2	94	93.9	3.3	54	153.9	5.4	14	213.9	7.5	74	273.8	9.6
35	35.0	1.2	95	94.9	3.3	55	154.9	5.4	15	214.9	7.5	75	274.8	9.6
36	36.0	1.3	96	95.9	3.4	56	155.9	5.4	16	215.9	7.5	76	275.8	9.6
37	37.0	1.3	97	96.9	3.4	57	156.9	5.5	17	216.9	7.6	77	276.8	9.7
38	38.0	1.3	98	97.9	3.4	58	157.9	5.5	18	217.9	7.6	78	277.8	9.7
39	39.0	1.4	99	98.9	3.5	59	158.9	5.5	19	218.9	7.6	79	278.8	9.7
40	40.0	1.4	100	99.9	3.5	60	159.9	5.6	20	219.9	7.7	80	279.8	9.8
41	41.0	1.4	101	100.9	3.5	161	160.9	5.6	221	220.9	7.7	281	280.8	9.8
42	42.0	1.5	02	101.9	3.6	62	161.9	5.7	22	221.9	7.7	82	281.8	9.8
43	43.0	1.5	03	102.9	3.6	63	162.9	5.7	23	222.9	7.8	83	282.8	9.9
44	44.0	1.5	04	103.9	3.6	64	163.9	5.7	24	223.9	7.8	84	283.8	9.9
45	45.0	1.6	05	104.9	3.7	65	164.9	5.8	25	224.9	7.9	85	284.8	9.9
46	46.0	1.6	06	105.9	3.7	66	165.9	5.8	26	225.9	7.9	86	285.8	10.0
47	47.0	1.6	07	106.9	3.7	67	166.9	5.8	27	226.9	7.9	87	286.8	10.0
48	48.0	1.7	08	107.9	3.8	68	167.9	5.9	28	227.9	8.0	88	287.8	10.1
49	49.0	1.7	09	108.9	3.8	69	168.9	5.9	29	228.9	8.0	89	288.8	10.1
50	50.0	1.7	10	109.9	3.8	70	169.9	5.9	30	229.9	8.0	90	289.8	10.1
51	51.0	1.8	111	110.9	3.9	171	170.9	6.0	231	230.9	8.1	291	290.8	10.2
52	52.0	1.8	12	111.9	3.9	72	171.9	6.0	32	231.9	8.1	92	291.8	10.2
53	53.0	1.8	13	112.9	3.9	73	172.9	6.0	33	232.9	8.1	93	292.8	10.2
54	54.0	1.9	14	113.9	4.0	74	173.9	6.1	34	233.9	8.2	94	293.8	10.3
55	55.0	1.9	15	114.9	4.0	75	174.9	6.1	35	234.9	8.2	95	294.8	10.3
56	56.0	2.0	16	115.9	4.0	76	175.9	6.1	36	235.9	8.2	96	295.8	10.3
57	57.0	2.0	17	116.9	4.1	77	176.9	6.2	37	236.9	8.3	97	296.8	10.4
58	58.0	2.0	18	117.9	4.1	78	177.9	6.2	38	237.9	8.3	98	297.8	10.4
59	59.0	2.1	19	118.9	4.2	79	178.9	6.2	39	238.9	8.3	99	298.8	10.4
60	60.0	2.1	20	119.9	4.2	80	179.9	6.3	40	239.9	8.4	300	299.8	10.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

88° (92°, 268°, 272°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		*m*	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 2° (178°, 182°, 358°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	300.8	10.5	361	360.8	12.6	421	420.7	14.7	481	480.7	16.8	541	540.7	18.9
02	301.8	10.5	62	361.8	12.6	22	421.7	14.7	82	481.7	16.8	42	541.7	18.9
03	302.8	10.6	63	362.8	12.7	23	422.7	14.7	83	482.7	16.8	43	542.7	19.0
04	303.8	10.6	64	363.8	12.7	24	423.7	14.8	84	483.7	16.9	44	543.7	19.0
05	304.8	10.6	65	364.8	12.7	25	424.7	14.8	85	484.7	16.9	45	544.7	19.0
06	305.8	10.7	66	365.8	12.8	26	425.7	14.9	86	485.7	16.9	46	545.7	19.1
07	306.8	10.7	67	366.8	12.8	27	426.7	14.9	87	486.7	17.0	47	546.7	19.1
08	307.8	10.7	68	367.8	12.8	28	427.7	14.9	88	487.7	17.0	48	547.7	19.1
09	308.8	10.8	69	368.8	12.9	29	428.7	15.0	89	488.7	17.0	49	548.7	19.2
10	309.8	10.8	70	369.8	12.9	30	429.7	15.0	90	489.7	17.1	50	549.7	19.2
311	310.8	10.8	371	370.8	12.9	431	430.7	15.0	491	490.7	17.1	551	550.7	19.2
12	311.8	10.9	72	371.8	13.0	32	431.7	15.1	92	491.7	17.1	52	551.7	19.3
13	312.8	10.9	73	372.8	13.0	33	432.7	15.1	93	492.7	17.2	53	552.7	19.3
14	313.8	10.9	74	373.8	13.0	34	433.7	15.1	94	493.7	17.2	54	553.7	19.3
15	314.8	11.0	75	374.8	13.1	35	434.7	15.2	95	494.7	17.2	55	554.7	19.4
16	315.8	11.0	76	375.8	13.1	36	435.7	15.2	96	495.7	17.3	56	555.7	19.4
17	316.8	11.0	77	376.8	13.1	37	436.7	15.2	97	496.7	17.3	57	556.7	19.4
18	317.8	11.1	78	377.8	13.2	38	437.7	15.3	98	497.7	17.3	58	557.7	19.5
19	318.8	11.1	79	378.8	13.2	39	438.7	15.3	99	498.7	17.4	59	558.7	19.5
20	319.8	11.2	80	379.8	13.2	40	439.7	15.3	500	499.7	17.4	60	559.7	19.5
321	320.8	11.2	381	380.8	13.3	441	440.7	15.4	501	500.7	17.5	561	560.7	19.6
22	321.8	11.2	82	381.8	13.3	42	441.7	15.4	02	501.7	17.5	62	561.7	19.6
23	322.8	11.3	83	382.8	13.3	43	442.7	15.4	03	502.7	17.5	63	562.7	19.6
24	323.8	11.3	84	383.8	13.4	44	443.7	15.5	04	503.7	17.6	64	563.7	19.7
25	324.8	11.3	85	384.8	13.4	45	444.7	15.5	05	504.7	17.6	65	564.7	19.7
26	325.8	11.4	86	385.8	13.5	46	445.7	15.6	06	505.7	17.6	66	565.7	19.8
27	326.8	11.4	87	386.8	13.5	47	446.7	15.6	07	506.7	17.7	67	566.7	19.8
28	327.8	11.4	88	387.8	13.5	48	447.7	15.6	08	507.7	17.7	68	567.7	19.8
29	328.8	11.5	89	388.8	13.6	49	448.7	15.7	09	508.7	17.7	69	568.7	19.9
30	329.8	11.5	90	389.8	13.6	50	449.7	15.7	10	509.7	17.8	70	569.7	19.9
331	330.8	11.5	391	390.8	13.6	451	450.7	15.7	511	510.7	17.9	571	570.7	19.9
32	331.8	11.6	92	391.8	13.7	52	451.7	15.8	12	511.7	17.9	72	571.7	20.0
33	332.8	11.6	93	392.8	13.7	53	452.7	15.8	13	512.7	17.9	73	572.7	20.0
34	333.8	11.6	94	393.8	13.7	54	453.7	15.8	14	513.7	17.9	74	573.7	20.0
35	334.8	11.7	95	394.8	13.8	55	454.7	15.9	15	514.7	18.0	75	574.6	20.1
36	335.8	11.7	96	395.8	13.8	56	455.7	15.9	16	515.7	18.0	76	575.6	20.1
37	336.8	11.7	97	396.8	13.8	57	456.7	15.9	17	516.7	18.0	77	576.6	20.1
38	337.8	11.8	98	397.8	13.9	58	457.7	16.0	18	517.7	18.1	78	577.6	20.2
39	338.8	11.8	99	398.8	13.9	59	458.7	16.0	19	518.7	18.1	79	578.6	20.2
40	339.8	11.9	400	399.8	13.9	60	459.7	16.0	20	519.7	18.1	80	579.6	20.2
341	340.8	11.9	401	400.8	14.0	461	460.7	16.1	521	520.7	18.2	581	580.6	20.3
42	341.8	11.9	02	401.8	14.0	62	461.7	16.1	22	521.7	18.2	82	581.6	20.3
43	342.8	12.0	03	402.8	14.0	63	462.7	16.1	23	522.7	18.3	83	582.6	20.3
44	343.8	12.0	04	403.8	14.1	64	463.7	16.2	24	523.7	18.3	84	583.6	20.4
45	344.8	12.0	05	404.8	14.1	65	464.7	16.2	25	524.7	18.3	85	584.6	20.4
46	345.8	12.1	06	405.8	14.2	66	465.7	16.2	26	525.7	18.4	86	585.6	20.5
47	346.8	12.1	07	406.8	14.2	67	466.7	16.3	27	526.7	18.4	87	586.6	20.5
48	347.8	12.1	08	407.8	14.2	68	467.7	16.3	28	527.7	18.4	88	587.6	20.5
49	348.8	12.2	09	408.8	14.3	69	468.7	16.4	29	528.7	18.5	89	588.6	20.6
50	349.8	12.2	10	409.8	14.3	70	469.7	16.4	30	529.7	18.5	90	589.6	20.6
351	350.8	12.2	411	410.7	14.3	471	470.7	16.4	531	530.7	18.5	591	590.6	20.6
52	351.8	12.3	12	411.7	14.4	72	471.7	16.5	32	531.7	18.6	92	591.6	20.7
53	352.8	12.3	13	412.7	14.4	73	472.7	16.5	33	532.7	18.6	93	592.6	20.7
54	353.8	12.3	14	413.7	14.4	74	473.7	16.5	34	533.7	18.6	94	593.6	20.7
55	354.8	12.4	15	414.7	14.5	75	474.7	16.6	35	534.7	18.7	95	594.6	20.8
56	355.8	12.4	16	415.7	14.5	76	475.7	16.6	36	535.7	18.7	96	595.6	20.8
57	356.8	12.4	17	416.7	14.5	77	476.7	16.6	37	536.7	18.7	97	596.6	20.8
58	357.8	12.5	18	417.7	14.6	78	477.7	16.7	38	537.7	18.8	98	597.6	20.9
59	358.8	12.5	19	418.7	14.6	79	478.7	16.7	39	538.7	18.8	99	598.6	20.9
60	359.8	12.5	20	419.7	14.6	80	479.7	16.7	40	539.7	18.8	600	599.6	20.9
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

88° (92°, 268°, 272°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 3° (177°, 183°, 357°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.1	61	60.9	3.2	121	120.8	6.3	181	180.8	9.5	241	240.7	12.6
2	2.0	0.1	62	61.9	3.2	22	121.8	6.4	82	181.8	9.5	42	241.7	12.7
3	3.0	0.2	63	62.9	3.3	23	122.8	6.4	83	182.7	9.6	43	242.7	12.7
4	4.0	0.2	64	63.9	3.3	24	123.8	6.5	84	183.7	9.6	44	243.7	12.8
5	5.0	0.3	65	64.9	3.4	25	124.8	6.5	85	184.7	9.7	45	244.7	12.8
6	6.0	0.3	66	65.9	3.5	26	125.8	6.6	86	185.7	9.7	46	245.7	12.9
7	7.0	0.4	67	66.9	3.5	27	126.8	6.6	87	186.7	9.8	47	246.7	12.9
8	8.0	0.4	68	67.9	3.6	28	127.8	6.7	88	187.7	9.8	48	247.7	13.0
9	9.0	0.5	69	68.9	3.6	29	128.8	6.8	89	188.7	9.9	49	248.7	13.0
10	10.0	0.5	70	69.9	3.7	30	129.8	6.8	90	189.7	9.9	50	249.7	13.1
11	11.0	0.6	71	70.9	3.7	131	130.8	6.9	191	190.7	10.0	251	250.7	13.1
12	12.0	0.6	72	71.9	3.8	32	131.8	6.9	92	191.7	10.0	52	251.7	13.2
13	13.0	0.7	73	72.9	3.8	33	132.8	7.0	93	192.7	10.1	53	252.7	13.2
14	14.0	0.7	74	73.9	3.9	34	133.8	7.0	94	193.7	10.2	54	253.7	13.3
15	15.0	0.8	75	74.9	3.9	35	134.8	7.1	95	194.7	10.2	55	254.7	13.3
16	16.0	0.8	76	75.9	4.0	36	135.8	7.1	96	195.7	10.3	56	255.6	13.4
17	17.0	0.9	77	76.9	4.0	37	136.8	7.2	97	196.7	10.3	57	256.6	13.5
18	18.0	0.9	78	77.9	4.1	38	137.8	7.2	98	197.7	10.4	58	257.6	13.5
19	19.0	1.0	79	78.9	4.1	39	138.8	7.3	99	198.7	10.4	59	258.6	13.6
20	20.0	1.0	80	79.9	4.2	40	139.8	7.3	200	199.7	10.5	60	259.6	13.6
21	21.0	1.1	81	80.9	4.2	141	140.8	7.4	201	200.7	10.5	261	260.6	13.7
22	22.0	1.2	82	81.9	4.3	42	141.8	7.4	02	201.7	10.6	62	261.6	13.7
23	23.0	1.2	83	82.9	4.3	43	142.8	7.5	03	202.7	10.6	63	262.6	13.8
24	24.0	1.3	84	83.9	4.4	44	143.8	7.5	04	203.7	10.7	64	263.6	13.8
25	25.0	1.3	85	84.9	4.4	45	144.8	7.6	05	204.7	10.7	65	264.6	13.9
26	26.0	1.4	86	85.9	4.5	46	145.8	7.6	06	205.7	10.8	66	265.6	13.9
27	27.0	1.4	87	86.9	4.6	47	146.8	7.7	07	206.7	10.8	67	266.6	14.0
28	28.0	1.5	88	87.9	4.6	48	147.8	7.7	08	207.7	10.9	68	267.6	14.0
29	29.0	1.5	89	88.9	4.7	49	148.8	7.8	09	208.7	10.9	69	268.6	14.1
30	30.0	1.6	90	89.9	4.7	50	149.8	7.9	10	209.7	11.0	70	269.6	14.1
31	31.0	1.6	91	90.9	4.8	151	150.8	7.9	211	210.7	11.0	271	270.6	14.2
32	32.0	1.7	92	91.9	4.8	52	151.8	8.0	12	211.7	11.1	72	271.6	14.2
33	33.0	1.7	93	92.9	4.9	53	152.8	8.0	13	212.7	11.1	73	272.6	14.3
34	34.0	1.8	94	93.9	4.9	54	153.8	8.1	14	213.7	11.2	74	273.6	14.3
35	35.0	1.8	95	94.9	5.0	55	154.8	8.1	15	214.7	11.3	75	274.6	14.4
36	36.0	1.9	96	95.9	5.0	56	155.8	8.2	16	215.7	11.3	76	275.6	14.4
37	36.9	1.9	97	96.9	5.1	57	156.8	8.2	17	216.7	11.4	77	276.6	14.5
38	37.9	2.0	98	97.9	5.1	58	157.8	8.3	18	217.7	11.4	78	277.6	14.5
39	38.9	2.0	99	98.9	5.2	59	158.8	8.3	19	218.7	11.5	79	278.6	14.6
40	39.9	2.1	100	99.9	5.2	60	159.8	8.4	20	219.7	11.5	80	279.6	14.7
41	40.9	2.1	101	100.9	5.3	161	160.8	8.4	221	220.7	11.6	281	280.6	14.7
42	41.9	2.2	02	101.9	5.3	62	161.8	8.5	22	221.7	11.6	82	281.6	14.8
43	42.9	2.3	03	102.9	5.4	63	162.8	8.5	23	222.7	11.7	83	282.6	14.8
44	43.9	2.3	04	103.9	5.4	64	163.8	8.6	24	223.7	11.7	84	283.6	14.9
45	44.9	2.4	05	104.9	5.5	65	164.8	8.6	25	224.7	11.8	85	284.6	14.9
46	45.9	2.4	06	105.9	5.5	66	165.8	8.7	26	225.7	11.8	86	285.6	15.0
47	46.9	2.5	07	106.9	5.6	67	166.8	8.7	27	226.7	11.9	87	286.6	15.0
48	47.9	2.5	08	107.9	5.7	68	167.8	8.8	28	227.7	11.9	88	287.6	15.1
49	48.9	2.6	09	108.9	5.7	69	168.8	8.8	29	228.7	12.0	89	288.6	15.1
50	49.9	2.6	10	109.8	5.8	70	169.8	8.9	30	229.7	12.0	90	289.6	15.2
51	50.9	2.7	111	110.8	5.8	171	170.8	8.9	231	230.7	12.1	291	290.6	15.2
52	51.9	2.7	12	111.8	5.9	72	171.8	9.0	32	231.7	12.1	92	291.6	15.3
53	52.9	2.8	13	112.8	5.9	73	172.8	9.1	33	232.7	12.2	93	292.6	15.3
54	53.9	2.8	14	113.8	6.0	74	173.8	9.1	34	233.7	12.2	94	293.6	15.4
55	54.9	2.9	15	114.8	6.0	75	174.8	9.2	35	234.7	12.3	95	294.6	15.4
56	55.9	2.9	16	115.8	6.1	76	175.8	9.2	36	235.7	12.4	96	295.6	15.5
57	56.9	3.0	17	116.8	6.1	77	176.8	9.3	37	236.7	12.4	97	296.6	15.5
58	57.9	3.0	18	117.8	6.2	78	177.8	9.3	38	237.7	12.5	98	297.6	15.6
59	58.9	3.1	19	118.8	6.2	79	178.8	9.4	39	238.7	12.5	99	298.6	15.6
60	59.9	3.1	20	119.8	6.3	80	179.8	9.4	40	239.7	12.6	300	299.6	15.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

87° (93°, 267°, 273°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 3° (177°, 183°, 357°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	300.6	15.7	361	360.5	18.9	421	420.4	22.0	481	480.3	25.2	541	540.3	28.3
02	301.6	15.8	62	361.5	18.9	22	421.4	22.1	82	481.3	25.2	42	541.3	28.4
03	302.6	15.9	63	362.5	19.0	23	422.4	22.1	83	482.3	25.3	43	542.3	28.4
04	303.6	15.9	64	363.5	19.1	24	423.4	22.2	84	483.3	25.3	44	543.3	28.5
05	304.6	16.0	65	364.5	19.1	25	424.4	22.2	85	484.3	25.4	45	544.3	28.5
06	305.6	16.0	66	365.5	19.2	26	425.4	22.3	86	485.3	25.4	46	545.3	28.6
07	306.6	16.1	67	366.5	19.2	27	426.4	22.3	87	486.3	25.5	47	546.3	28.6
08	307.6	16.1	68	367.5	19.3	28	427.4	22.4	88	487.3	25.5	48	547.2	28.7
09	308.6	16.2	69	368.5	19.3	29	428.4	22.5	89	488.3	25.6	49	548.2	28.7
10	309.6	16.2	70	369.5	19.4	30	429.4	22.5	90	489.3	25.6	50	549.2	28.8
311	310.6	16.3	371	370.5	19.4	431	430.4	22.6	491	490.3	25.7	551	550.2	28.8
12	311.6	16.3	72	371.5	19.5	32	431.4	22.6	92	491.3	25.7	52	551.2	28.9
13	312.6	16.4	73	372.5	19.5	33	432.4	22.7	93	492.3	25.8	53	552.2	28.9
14	313.6	16.4	74	373.5	19.6	34	433.4	22.7	94	493.3	25.9	54	553.2	29.0
15	314.6	16.5	75	374.5	19.6	35	434.4	22.8	95	494.3	25.9	55	554.2	29.0
16	315.6	16.5	76	375.5	19.7	36	435.4	22.8	96	495.3	26.0	56	555.2	29.1
17	316.6	16.6	77	376.5	19.7	37	436.4	22.9	97	496.3	26.0	57	556.2	29.2
18	317.6	16.6	78	377.5	19.8	38	437.4	22.9	98	497.3	26.1	58	557.2	29.2
19	318.6	16.7	79	378.5	19.8	39	438.4	23.0	99	498.3	26.1	59	558.2	29.3
20	319.6	16.7	80	379.5	19.9	40	439.4	23.0	500	499.3	26.2	60	559.2	29.3
321	320.6	16.8	381	380.5	19.9	441	440.4	23.1	501	500.3	26.2	561	560.2	29.4
22	321.6	16.9	82	381.5	20.0	42	441.4	23.1	02	501.3	26.3	62	561.2	29.4
23	322.6	16.9	83	382.5	20.0	43	442.4	23.2	03	502.3	26.3	63	562.2	29.5
24	323.6	17.0	84	383.5	20.1	44	443.4	23.2	04	503.3	26.4	64	563.2	29.5
25	324.6	17.0	85	384.5	20.1	45	444.4	23.3	05	504.3	26.4	65	564.2	29.6
26	325.6	17.1	86	385.5	20.2	46	445.4	23.3	06	505.3	26.5	66	565.2	29.6
27	326.6	17.1	87	386.5	20.3	47	446.4	23.4	07	506.3	26.5	67	566.2	29.7
28	327.6	17.2	88	387.5	20.3	48	447.4	23.4	08	507.3	26.6	68	567.2	29.7
29	328.5	17.2	89	388.5	20.4	49	448.4	23.5	09	508.3	26.6	69	568.2	29.8
30	329.5	17.3	90	389.5	20.4	50	449.4	23.6	10	509.3	26.7	70	569.2	29.8
331	330.5	17.3	391	390.5	20.5	451	450.4	23.6	511	510.3	26.7	571	570.2	29.9
32	331.5	17.4	92	391.5	20.5	52	451.4	23.7	12	511.3	26.8	72	571.2	29.9
33	332.5	17.4	93	392.5	20.6	53	452.4	23.7	13	512.3	26.8	73	572.2	30.0
34	333.5	17.5	94	393.5	20.6	54	453.4	23.8	14	513.3	26.9	74	573.2	30.0
35	334.5	17.5	95	394.5	20.7	55	454.4	23.8	15	514.3	27.0	75	574.2	30.1
36	335.5	17.6	96	395.5	20.7	56	455.4	23.9	16	515.3	27.0	76	575.2	30.1
37	336.5	17.6	97	396.5	20.8	57	456.4	23.9	17	516.3	27.1	77	576.2	30.2
38	337.5	17.7	98	397.5	20.8	58	457.4	24.0	18	517.3	27.1	78	577.2	30.3
39	338.5	17.7	99	398.5	20.9	59	458.4	24.0	19	518.3	27.2	79	578.2	30.3
40	339.5	17.8	400	399.5	20.9	60	459.4	24.1	20	519.3	27.2	80	579.2	30.4
341	340.5	17.8	401	400.5	21.0	461	460.4	24.1	521	520.3	27.3	581	580.2	30.4
42	341.5	17.9	02	401.4	21.0	62	461.4	24.2	22	521.3	27.3	82	581.2	30.5
43	342.5	18.0	03	402.4	21.1	63	462.4	24.2	23	522.3	27.4	83	582.2	30.5
44	343.5	18.0	04	403.4	21.1	64	463.4	24.3	24	523.3	27.4	84	583.2	30.6
45	344.5	18.1	05	404.4	21.2	65	464.4	24.3	25	524.3	27.5	85	584.2	30.6
46	345.5	18.1	06	405.4	21.2	66	465.4	24.4	26	525.3	27.5	86	585.2	30.7
47	346.5	18.2	07	406.4	21.3	67	466.4	24.4	27	526.3	27.6	87	586.2	30.7
48	347.5	18.2	08	407.4	21.4	68	467.4	24.5	28	527.3	27.6	88	587.2	30.8
49	348.5	18.3	09	408.4	21.4	69	468.4	24.5	29	528.3	27.7	89	588.2	30.8
50	349.5	18.3	10	409.4	21.5	70	469.4	24.6	30	529.3	27.7	90	589.2	30.9
351	350.5	18.4	411	410.4	21.5	471	470.4	24.7	531	530.3	27.8	591	590.2	30.9
52	351.5	18.4	12	411.4	21.6	72	471.4	24.7	32	531.3	27.8	92	591.2	31.0
53	352.5	18.5	13	412.4	21.6	73	472.4	24.8	33	532.3	27.9	93	592.2	31.0
54	353.5	18.5	14	413.4	21.7	74	473.4	24.8	34	533.3	27.9	94	593.2	31.1
55	354.5	18.6	15	414.4	21.7	75	474.3	24.9	35	534.3	28.0	95	594.2	31.1
56	355.5	18.6	16	415.4	21.8	76	475.3	24.9	36	535.3	28.1	96	595.2	31.2
57	356.5	18.7	17	416.4	21.8	77	476.3	25.0	37	536.3	28.1	97	596.2	31.2
58	357.5	18.7	18	417.4	21.9	78	477.3	25.0	38	537.3	28.2	98	597.2	31.3
59	358.5	18.8	19	418.4	21.9	79	478.3	25.1	39	538.3	28.2	99	598.2	31.3
60	359.5	18.8	20	419.4	22.0	80	479.3	25.1	40	539.3	28.3	600	599.2	31.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

87° (93°, 267°, 273°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

TABLE 3.

Difference of Latitude and Departure for 4° (176°, 184°, 356°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.1	61	60.9	4.3	121	120.7	8.4	181	180.6	12.6	241	240.4	16.8
2	2.0	0.1	62	61.8	4.3	22	121.7	8.5	82	181.6	12.7	42	241.4	16.9
3	3.0	0.2	63	62.8	4.4	23	122.7	8.6	83	182.6	12.8	43	242.4	17.0
4	4.0	0.3	64	63.8	4.5	24	123.7	8.6	84	183.6	12.8	44	243.4	17.0
5	5.0	0.3	65	64.8	4.5	25	124.7	8.7	85	184.5	12.9	45	244.4	17.1
6	6.0	0.4	66	65.8	4.6	26	125.7	8.8	86	185.5	13.0	46	245.4	17.2
7	7.0	0.5	67	66.8	4.7	27	126.7	8.9	87	186.5	13.0	47	246.4	17.2
8	8.0	0.6	68	67.8	4.7	28	127.7	8.9	88	187.5	13.1	48	247.4	17.3
9	9.0	0.6	69	68.8	4.8	29	128.7	9.0	89	188.5	13.2	49	248.4	17.4
10	10.0	0.7	70	69.8	4.9	30	129.7	9.1	90	189.5	13.3	50	249.4	17.4
11	11.0	0.8	71	70.8	5.0	131	130.7	9.1	191	190.5	13.3	251	250.4	17.5
12	12.0	0.8	72	71.8	5.0	32	131.7	9.2	92	191.5	13.4	52	251.4	17.6
13	13.0	0.9	73	72.8	5.1	33	132.7	9.3	93	192.5	13.5	53	252.4	17.6
14	14.0	1.0	74	73.8	5.2	34	133.7	9.3	94	193.5	13.5	54	253.4	17.7
15	15.0	1.0	75	74.8	5.2	35	134.7	9.4	95	194.5	13.6	55	254.4	17.8
16	16.0	1.1	76	75.8	5.3	36	135.7	9.5	96	195.5	13.7	56	255.4	17.9
17	17.0	1.2	77	76.8	5.4	37	136.7	9.6	97	196.5	13.7	57	256.4	17.9
18	18.0	1.3	78	77.8	5.4	38	137.7	9.6	98	197.5	13.8	58	257.4	18.0
19	19.0	1.3	79	78.8	5.5	39	138.7	9.7	99	198.5	13.9	59	258.4	18.1
20	20.0	1.4	80	79.8	5.6	40	139.7	9.8	200	199.5	14.0	60	259.4	18.1
21	20.9	1.5	81	80.8	5.7	141	140.7	9.8	201	200.5	14.0	261	260.4	18.2
22	21.9	1.5	82	81.8	5.7	42	141.7	9.9	02	201.5	14.1	62	261.4	18.3
23	22.9	1.6	83	82.8	5.8	43	142.7	10.0	03	202.5	14.2	63	262.4	18.3
24	23.9	1.7	84	83.8	5.9	44	143.6	10.0	04	203.5	14.2	64	263.4	18.4
25	24.9	1.7	85	84.8	5.9	45	144.6	10.1	05	204.5	14.3	65	264.4	18.5
26	25.9	1.8	86	85.8	6.0	46	145.6	10.2	06	205.5	14.4	66	265.4	18.6
27	26.9	1.9	87	86.8	6.1	47	146.6	10.3	07	206.5	14.4	67	266.3	18.6
28	27.9	2.0	88	87.8	6.1	48	147.6	10.3	08	207.5	14.5	68	267.3	18.7
29	28.9	2.0	89	88.8	6.2	49	148.6	10.4	09	208.5	14.6	69	268.3	18.8
30	29.9	2.1	90	89.8	6.3	50	149.6	10.5	10	209.5	14.6	70	269.3	18.8
31	30.9	2.2	91	90.8	6.3	151	150.6	10.5	211	210.5	14.7	271	270.3	18.9
32	31.9	2.2	92	91.8	6.4	52	151.6	10.6	12	211.5	14.8	72	271.3	19.0
33	32.9	2.3	93	92.8	6.5	53	152.6	10.7	13	212.5	14.9	73	272.3	19.0
34	33.9	2.4	94	93.8	6.6	54	153.6	10.7	14	213.5	14.9	74	273.3	19.1
35	34.9	2.4	95	94.8	6.6	55	154.6	10.8	15	214.5	15.0	75	274.3	19.2
36	35.9	2.5	96	95.8	6.7	56	155.6	10.9	16	215.5	15.1	76	275.3	19.3
37	36.9	2.6	97	96.8	6.8	57	156.6	11.0	17	216.5	15.1	77	276.3	19.3
38	37.9	2.7	98	97.8	6.8	58	157.6	11.0	18	217.5	15.2	78	277.3	19.4
39	38.9	2.7	99	98.8	6.9	59	158.6	11.1	19	218.5	15.3	79	278.3	19.5
40	39.9	2.8	100	99.8	7.0	60	159.6	11.2	20	219.5	15.3	80	279.3	19.5
41	40.9	2.9	101	100.8	7.0	161	160.6	11.2	221	220.5	15.4	281	280.3	19.6
42	41.9	2.9	02	101.8	7.1	62	161.6	11.3	22	221.5	15.5	82	281.3	19.7
43	42.9	3.0	03	102.7	7.2	63	162.6	11.4	23	222.5	15.6	83	282.3	19.7
44	43.9	3.1	04	103.7	7.3	64	163.6	11.4	24	223.5	15.6	84	283.3	19.8
45	44.9	3.1	05	104.7	7.3	65	164.6	11.5	25	224.5	15.7	85	284.3	19.9
46	45.9	3.2	06	105.7	7.4	66	165.6	11.6	26	225.4	15.8	86	285.3	20.0
47	46.9	3.3	07	106.7	7.5	67	166.6	11.6	27	226.4	15.8	87	286.3	20.0
48	47.9	3.3	08	107.7	7.5	68	167.6	11.7	28	227.4	15.9	88	287.3	20.1
49	48.9	3.4	09	108.7	7.6	69	168.6	11.8	29	228.4	16.0	89	288.3	20.2
50	49.9	3.5	10	109.7	7.7	70	169.6	11.9	30	229.4	16.0	90	289.3	20.2
51	50.9	3.6	111	110.7	7.7	171	170.6	11.9	231	230.4	16.1	291	290.3	20.3
52	51.9	3.6	12	111.7	7.8	72	171.6	12.0	32	231.4	16.2	92	291.3	20.4
53	52.9	3.7	13	112.7	7.9	73	172.6	12.1	33	232.4	16.3	93	292.3	20.4
54	53.9	3.8	14	113.7	8.0	74	173.6	12.1	34	233.4	16.3	94	293.3	20.5
55	54.9	3.8	15	114.7	8.0	75	174.6	12.2	35	234.4	16.4	95	294.3	20.6
56	55.9	3.9	16	115.7	8.1	76	175.6	12.3	36	235.4	16.5	96	295.3	20.6
57	56.9	4.0	17	116.7	8.2	77	176.6	12.3	37	236.4	16.5	97	296.3	20.7
58	57.9	4.0	18	117.7	8.2	78	177.6	12.4	38	237.4	16.6	98	297.3	20.8
59	58.9	4.1	19	118.7	8.3	79	178.6	12.5	39	238.4	16.7	99	298.3	20.9
60	59.9	4.2	20	119.7	8.4	80	179.6	12.6	40	239.4	16.7	300	299.3	20.9
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

86°; (94°, 266°, 274°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		m	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

TABLE 3.

Difference of Latitude and Departure for 4° (176°, 184°, 356°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	300.3	21.0	361	360.1	25.2	421	420.0	29.4	481	479.8	33.6	541	539.7	37.7
02	301.3	21.1	62	361.1	25.2	22	421.0	29.4	82	480.8	33.6	42	540.7	37.8
03	302.3	21.1	63	362.1	25.3	23	422.0	29.5	83	481.8	33.7	43	541.7	37.9
04	303.3	21.2	64	363.1	25.4	24	423.0	29.6	84	482.8	33.8	44	542.7	37.9
05	304.3	21.3	65	364.1	25.5	25	424.0	29.6	85	483.8	33.8	45	543.7	38.0
06	305.3	21.3	66	365.1	25.5	26	425.0	29.7	86	484.8	33.9	46	544.7	38.1
07	306.3	21.4	67	366.1	25.6	27	426.0	29.8	87	485.8	34.0	47	545.7	38.2
08	307.2	21.5	68	367.1	25.7	28	427.0	29.9	88	486.8	34.0	48	546.7	38.2
09	308.2	21.6	69	368.1	25.7	29	428.0	29.9	89	487.8	34.1	49	547.7	38.3
10	309.2	21.6	70	369.1	25.8	30	429.0	30.0	90	488.8	34.2	50	548.7	38.4
311	310.2	21.7	371	370.1	25.9	431	430.0	30.1	491	489.8	34.3	551	549.7	38.4
12	311.2	21.8	72	371.1	25.9	32	430.9	30.1	92	490.8	34.3	52	550.7	38.5
13	312.2	21.8	73	372.1	26.0	33	431.9	30.2	93	491.8	34.4	53	551.7	38.6
14	313.2	21.9	74	373.1	26.1	34	432.9	30.3	94	492.8	34.5	54	552.7	38.6
15	314.2	22.0	75	374.1	26.2	35	433.9	30.3	95	493.8	34.5	55	553.6	38.7
16	315.2	22.1	76	375.1	26.2	36	434.9	30.4	96	494.8	34.6	56	554.6	38.8
17	316.2	22.1	77	376.1	26.3	37	435.9	30.5	97	495.8	34.7	57	555.6	38.9
18	317.2	22.2	78	377.1	26.4	38	436.9	30.6	98	496.8	34.7	58	556.6	38.9
19	318.2	22.3	79	378.1	26.4	39	437.9	30.6	99	497.8	34.8	59	557.6	39.0
20	319.2	22.3	80	379.1	26.5	40	438.9	30.7	500	498.8	34.9	60	558.6	39.1
321	320.2	22.4	381	380.1	26.6	441	439.9	30.8	501	499.8	34.9	561	559.6	39.1
22	321.2	22.5	82	381.1	26.6	42	440.9	30.8	02	500.8	35.0	62	560.6	39.2
23	322.2	22.5	83	382.1	26.7	43	441.9	30.9	03	501.8	35.1	63	561.6	39.3
24	323.2	22.6	84	383.1	26.8	44	442.9	31.0	04	502.8	35.2	64	562.6	39.3
25	324.2	22.7	85	384.1	26.9	45	443.9	31.0	05	503.8	35.2	65	563.6	39.4
26	325.2	22.7	86	385.1	26.9	46	444.9	31.1	06	504.8	35.3	66	564.6	39.5
27	326.2	22.8	87	386.1	27.0	47	445.9	31.2	07	505.8	35.4	67	565.6	39.6
28	327.2	22.9	88	387.1	27.1	48	446.9	31.3	08	506.8	35.4	68	566.6	39.6
29	328.2	22.9	89	388.1	27.1	49	447.9	31.3	09	507.8	35.5	69	567.6	39.7
30	329.2	23.0	90	389.0	27.2	50	448.9	31.4	10	508.8	35.6	70	568.6	39.8
331	330.2	23.1	391	390.0	27.3	451	449.9	31.5	511	509.8	35.6	571	569.6	39.8
32	331.2	23.2	92	391.0	27.3	52	450.9	31.5	12	510.8	35.7	72	570.6	39.9
33	332.2	23.2	93	392.0	27.4	53	451.9	31.6	13	511.8	35.8	73	571.6	40.0
34	333.2	23.3	94	393.0	27.5	54	452.9	31.7	14	512.7	35.9	74	572.6	40.0
35	334.2	23.4	95	394.0	27.6	55	453.9	31.7	15	513.7	35.9	75	573.6	40.1
36	335.2	23.4	96	395.0	27.6	56	454.9	31.8	16	514.7	36.0	76	574.6	40.2
37	336.2	23.5	97	396.0	27.7	57	455.9	31.9	17	515.7	36.1	77	575.6	40.2
38	337.2	23.6	98	397.0	27.8	58	456.9	31.9	18	516.7	36.1	78	576.6	40.3
39	338.2	23.6	99	398.0	27.8	59	457.9	32.0	19	517.7	36.2	79	577.6	40.4
40	339.2	23.7	400	399.0	27.9	60	458.9	32.1	20	518.7	36.3	80	578.6	40.5
341	340.2	23.8	401	400.0	28.0	461	459.9	32.2	521	519.7	36.3	581	579.6	40.5
42	341.2	23.9	02	401.0	28.0	62	460.9	32.2	22	520.7	36.4	82	580.6	40.6
43	342.2	23.9	03	402.0	28.1	63	461.9	32.3	23	521.7	36.5	83	581.6	40.7
44	343.2	24.0	04	403.0	28.2	64	462.9	32.4	24	522.7	36.6	84	582.6	40.7
45	344.2	24.1	05	404.0	28.3	65	463.9	32.4	25	523.7	36.6	85	583.6	40.8
46	345.2	24.1	06	405.0	28.3	66	464.9	32.5	26	524.7	36.7	86	584.6	40.9
47	346.2	24.2	07	406.0	28.4	67	465.9	32.6	27	525.7	36.8	87	585.6	40.9
48	347.2	24.3	08	407.0	28.5	68	466.9	32.6	28	526.7	36.8	88	586.6	41.0
49	348.1	24.3	09	408.0	28.5	69	467.9	32.7	29	527.7	36.9	89	587.6	41.1
50	349.1	24.4	10	409.0	28.6	70	468.9	32.8	30	528.7	37.0	90	588.6	41.2
351	350.1	24.5	411	410.0	28.7	471	469.9	32.9	531	529.7	37.0	591	589.6	41.2
52	351.1	24.6	12	411.0	28.7	72	470.9	32.9	32	530.7	37.1	92	590.6	41.3
53	352.1	24.6	13	412.0	28.8	73	471.8	33.0	33	531.7	37.2	93	591.6	41.4
54	353.1	24.7	14	413.0	28.9	74	472.8	33.1	34	532.7	37.2	94	592.6	41.4
55	354.1	24.8	15	414.0	28.9	75	473.8	33.1	35	533.7	37.3	95	593.6	41.5
56	355.1	24.8	16	415.0	29.0	76	474.8	33.2	36	534.7	37.4	96	594.5	41.6
57	356.1	24.9	17	416.0	29.1	77	475.8	33.3	37	535.7	37.5	97	595.5	41.6
58	357.1	25.0	18	417.0	29.2	78	476.8	33.3	38	536.7	37.5	98	596.5	41.7
59	358.1	25.0	19	418.0	29.2	79	477.8	33.4	39	537.7	37.6	99	597.5	41.8
60	359.1	25.1	20	419.0	29.3	80	478.8	33.5	40	538.7	37.7	600	598.5	41.9
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

86° (94°, 266°, 274°).

	Dist.	Lat.	Dep.
In **Plane Sailing.**			
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 5° (175°, 185°, 355°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1. 0	0. 1	61	60. 8	5. 3	121	120. 5	10. 5	181	180. 3	15. 8	241	240. 1	21. 0
2	2. 0	0. 2	62	61. 8	5. 4	22	121. 5	10. 6	82	181. 3	15. 9	42	241. 1	21. 1
3	3. 0	0. 3	63	62. 8	5. 5	23	122. 5	10. 7	83	182. 3	15. 9	43	242. 1	21. 2
4	4. 0	0. 3	64	63. 8	5. 6	24	123. 5	10. 8	84	183. 3	16. 0	44	243. 1	21. 3
5	5. 0	0. 4	65	64. 8	5. 7	25	124. 5	10. 9	85	184. 3	16. 1	45	244. 1	21. 4
6	6. 0	0. 5	66	65. 7	5. 8	26	125. 5	11. 0	86	185. 3	16. 2	46	245. 1	21. 4
7	7. 0	0. 6	67	66. 7	5. 8	27	126. 5	11. 1	87	186. 3	16. 3	47	246. 1	21. 5
8	8. 0	0. 7	68	67. 7	5. 9	28	127. 5	11. 2	88	187. 3	16. 4	48	247. 1	21. 6
9	9. 0	0. 8	69	68. 7	6. 0	29	128. 5	11. 2	89	188. 3	16. 5	49	248. 1	21. 7
10	10. 0	0. 9	70	69. 7	6. 1	30	129. 5	11. 3	90	189. 3	16. 6	50	249. 0	21. 8
11	11. 0	1. 0	71	70. 7	6. 2	131	130. 5	11. 4	191	190. 3	16. 6	251	250. 0	21. 9
12	12. 0	1. 0	72	71. 7	6. 3	32	131. 5	11. 5	92	191. 3	16. 7	52	251. 0	22. 0
13	13. 0	1. 1	73	72. 7	6. 4	33	132. 5	11. 6	93	192. 3	16. 8	53	252. 0	22. 1
14	13. 9	1. 2	74	73. 7	6. 4	34	133. 5	11. 7	94	193. 3	16. 9	54	253. 0	22. 1
15	14. 9	1. 3	75	74. 7	6. 5	35	134. 5	11. 8	95	194. 3	17. 0	55	254. 0	22. 2
16	15. 9	1. 4	76	75. 7	6. 6	36	135. 5	11. 9	96	195. 3	17. 1	56	255. 0	22. 3
17	16. 9	1. 5	77	76. 7	6. 7	37	136. 5	11. 9	97	196. 3	17. 2	57	256. 0	22. 4
18	17. 9	1. 6	78	77. 7	6. 8	38	137. 5	12. 0	98	197. 2	17. 3	58	257. 0	22. 5
16	18. 9	1. 7	79	78. 7	6. 9	39	138. 5	12. 1	99	198. 2	17. 3	59	258. 0	22. 6
20	19. 9	1. 7	80	79. 7	7. 0	40	139. 5	12. 2	200	199. 2	17. 4	60	259. 0	22. 7
21	20. 9	1. 8	81	80. 7	7. 1	141	140. 5	12. 3	201	200. 2	17. 5	261	260. 0	22. 7
22	21. 9	1. 9	82	81. 7	7. 1	42	141. 5	12. 4	02	201. 2	17. 6	62	261. 0	22. 8
23	22. 9	2. 0	83	82. 7	7. 2	43	142. 5	12. 5	03	202. 2	17. 7	63	262. 0	22. 9
24	23. 9	2. 1	84	83. 7	7. 3	44	143. 5	12. 6	04	203. 2	17. 8	64	263. 0	23. 0
25	24. 9	2. 2	85	84. 7	7. 4	45	144. 4	12. 6	05	204. 2	17. 9	65	264. 0	23. 1
26	25. 9	2. 3	86	85. 7	7. 5	46	145. 4	12. 7	06	205. 2	18. 0	66	265. 0	23. 2
27	26. 9	2. 4	87	86. 7	7. 6	47	146. 4	12. 8	07	206. 2	18. 0	67	266. 0	23. 3
28	27. 9	2. 4	88	87. 7	7. 7	48	147. 4	12. 9	08	207. 2	18. 1	68	267. 0	23. 4
29	28. 9	2. 5	89	88. 7	7. 8	49	148. 4	13. 0	09	208. 2	18. 2	69	268. 0	23. 4
30	29. 9	2. 6	90	89. 7	7. 8	50	149. 4	13. 1	10	209. 2	18. 3	70	269. 0	23. 5
31	30. 9	2. 7	91	90. 7	7. 9	151	150. 4	13. 2	211	210. 2	18. 4	271	270. 0	23. 6
32	31. 9	2. 8	92	91. 6	8. 0	52	151. 4	13. 2	12	211. 2	18. 5	72	271. 0	23. 7
33	32. 9	2. 9	93	92. 6	8. 1	53	152. 4	13. 3	13	212. 2	18. 6	73	272. 0	23. 8
34	33. 9	3. 0	94	93. 6	8. 2	54	153. 4	13. 4	14	213. 2	18. 7	74	273. 0	23. 9
35	34. 9	3. 1	95	94. 6	8. 3	55	154. 4	13. 5	15	214. 2	18. 7	75	274. 0	24. 0
36	35. 9	3. 1	96	95. 6	8. 4	56	155. 4	13. 6	16	215. 2	18. 8	76	274. 9	24. 1
37	36. 9	3. 2	97	96. 6	8. 5	57	156. 4	13. 7	17	216. 2	18. 9	77	275. 9	24. 1
38	37. 9	3. 3	98	97. 6	8. 5	58	157. 4	13. 8	18	217. 2	19. 0	78	276. 9	24. 2
39	38. 9	3. 4	99	98. 6	8. 6	59	158. 4	13. 9	19	218. 2	19. 1	79	277. 9	24. 3
40	39. 8	3. 5	100	99. 6	8. 7	60	159. 4	13. 9	20	219. 2	19. 2	80	278. 9	24. 4
41	40. 8	3. 6	101	100. 6	8. 8	161	160. 4	14. 0	221	220. 2	19. 3	281	279. 9	24. 5
42	41. 8	3. 7	02	101. 6	8. 9	62	161. 4	14. 1	22	221. 2	19. 3	82	280. 9	24. 6
43	42. 8	3. 7	03	102. 6	9. 0	63	162. 4	14. 2	23	222. 2	19. 4	83	281. 9	24. 7
44	43. 8	3. 8	04	103. 6	9. 1	64	163. 4	14. 3	24	223. 1	19. 5	84	282. 9	24. 8
45	44. 8	3. 9	05	104. 6	9. 2	65	164. 4	14. 4	25	224. 1	19. 6	85	283. 9	24. 8
46	45. 8	4. 0	06	105. 6	9. 2	66	165. 4	14. 5	26	225. 1	19. 7	86	284. 9	24. 9
47	46. 8	4. 1	07	106. 6	9. 3	67	166. 4	14. 6	27	226. 1	19. 8	87	285. 9	25. 0
48	47. 8	4. 2	08	107. 6	9. 4	68	167. 4	14. 6	28	227. 1	19. 9	88	286. 9	25. 1
49	48. 8	4. 3	09	108. 6	9. 5	69	168. 4	14. 7	29	228. 1	20. 0	89	287. 9	25. 2
50	49. 8	4. 4	10	109. 6	9. 6	70	169. 4	14. 8	30	229. 1	20. 0	90	288. 9	25. 3
51	50. 8	4. 4	111	110. 6	9. 7	171	170. 3	14. 9	231	230. 1	20. 1	291	289. 9	25. 4
52	51. 8	4. 5	12	111. 6	9. 8	72	171. 3	15. 0	32	231. 1	20. 2	92	290. 9	25. 4
53	52. 8	4. 6	13	112. 6	9. 8	73	172. 3	15. 1	33	232. 1	20. 3	93	291. 9	25. 5
54	53. 8	4. 7	14	113. 6	9. 9	74	173. 3	15. 2	34	233. 1	20. 4	94	292. 9	25. 6
55	54. 8	4. 8	15	114. 6	10. 0	75	174. 3	15. 3	35	234. 1	20. 5	95	293. 9	25. 7
56	55. 8	4. 9	16	115. 6	10. 1	76	175. 3	15. 3	36	235. 1	20. 6	96	294. 9	25. 8
57	56. 8	5. 0	17	116. 6	10. 2	77	176. 3	15. 4	37	236. 1	20. 7	97	295. 9	25. 9
58	57. 8	5. 1	18	117. 6	10. 3	78	177. 3	15. 5	38	237. 1	20. 7	98	296. 9	26. 0
59	58. 8	5. 1	19	118. 5	10. 4	79	178. 3	15. 6	39	238. 1	20. 8	99	297. 9	26. 1
60	59. 8	5. 2	20	119. 5	10. 5	80	179. 3	15. 7	40	239. 1	20. 9	300	298. 9	26. 1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

85° (95°, 265°, 275°).

	Dist.	Lat.	Dep.
In **Plane Sailing.**			
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff Long.* into *Dep.* In **Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 5° (175°, 185°, 355°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	299.9	26.2	361	359.6	31.5	421	419.4	36.7	481	479.2	41.9	541	538.9	47.2
02	300.9	26.3	62	360.6	31.6	22	420.4	36.8	82	480.2	42.0	42	539.9	47.2
03	301.8	26.4	63	361.6	31.6	23	421.4	36.9	83	481.2	42.1	43	540.9	47.3
04	302.8	26.5	64	362.6	31.7	24	422.4	37.0	84	482.2	42.2	44	541.9	47.4
05	303.8	26.6	65	363.6	31.8	25	423.4	37.1	85	483.2	42.3	45	542.9	47.5
06	304.8	26.7	66	364.6	31.9	26	424.4	37.1	86	484.2	42.4	46	543.9	47.6
07	305.8	26.8	67	365.6	32.0	27	425.4	37.2	87	485.1	42.4	47	544.9	47.7
08	306.8	26.8	68	366.6	32.1	28	426.4	37.3	88	486.1	42.5	48	545.9	47.8
09	307.8	26.9	69	367.6	32.2	29	427.4	37.4	89	487.1	42.6	49	546.9	47.8
10	308.8	27.0	70	368.6	32.2	30	428.4	37.5	90	488.1	42.7	50	547.9	47.9
311	309.8	27.1	371	369.6	32.3	431	429.4	37.6	491	489.1	42.8	551	548.9	48.0
12	310.8	27.2	72	370.6	32.4	32	430.4	37.7	92	490.1	42.9	52	549.9	48.1
13	311.8	27.3	73	371.6	32.5	33	431.4	37.7	93	491.1	43.0	53	550.9	48.2
14	312.8	27.4	74	372.6	32.6	34	432.3	37.8	94	492.1	43.1	54	551.9	48.3
15	313.8	27.5	75	373.6	32.7	35	433.3	37.9	95	493.1	43.1	55	552.9	48.4
16	314.8	27.5	76	374.6	32.8	36	434.3	38.0	96	494.1	43.2	56	553.9	48.5
17	315.8	27.6	77	375.6	32.9	37	435.3	38.1	97	495.1	43.3	57	554.9	48.5
18	316.8	27.7	78	376.6	33.0	38	436.3	38.2	98	496.1	43.4	58	555.9	48.6
19	317.8	27.8	79	377.6	33.0	39	437.3	38.3	99	497.1	43.5	59	556.9	48.7
20	318.8	27.9	80	378.6	33.1	40	438.3	38.3	500	498.1	43.6	60	557.9	48.8
321	319.8	28.0	381	379.6	33.2	441	439.3	38.4	501	499.1	43.7	561	558.9	48.9
22	320.8	28.1	82	380.5	33.3	42	440.3	38.5	02	500.1	43.8	62	559.9	49.0
23	321.8	28.2	83	381.5	33.4	43	441.3	38.6	03	501.1	43.8	63	560.9	49.1
24	322.8	28.2	84	382.5	33.5	44	442.3	38.7	04	502.1	43.9	64	561.9	49.2
25	323.8	28.3	85	383.5	33.6	45	443.3	38.8	05	503.1	44.0	65	562.9	49.3
26	324.8	28.4	86	384.5	33.6	46	444.3	38.9	06	504.1	44.1	66	563.8	49.3
27	325.8	28.5	87	385.5	33.7	47	445.3	39.0	07	505.1	44.2	67	564.8	49.4
28	326.8	28.6	88	386.5	33.8	48	446.3	39.0	08	506.1	44.3	68	565.8	49.5
29	327.7	28.7	89	387.5	33.9	49	447.3	39.1	09	507.1	44.4	69	566.8	49.6
30	328.7	28.8	90	388.5	34.0	50	448.3	39.2	10	508.1	44.4	70	567.8	49.7
331	329.7	28.8	391	389.5	34.1	451	449.3	39.3	511	509.1	44.5	571	568.8	49.8
32	330.7	28.9	92	390.5	34.2	52	450.3	39.4	12	510.1	44.6	72	569.8	49.9
33	331.7	29.0	93	391.5	34.3	53	451.3	39.5	13	511.0	44.7	73	570.8	49.9
34	332.7	29.1	94	392.5	34.3	54	452.3	39.6	14	512.0	44.8	74	571.8	50.0
35	333.7	29.2	95	393.5	34.4	55	453.3	39.7	15	513.0	44.9	75	572.8	50.1
36	334.7	29.3	96	394.5	34.5	56	454.3	39.7	16	514.0	45.0	76	573.8	50.2
37	335.7	29.4	97	395.5	34.6	57	455.3	39.8	17	515.0	45.1	77	574.8	50.3
38	336.7	29.5	98	396.5	34.7	58	456.3	39.9	18	516.0	45.1	78	575.8	50.4
39	337.7	29.6	99	397.5	34.8	59	457.3	40.0	19	517.0	45.2	79	576.8	50.5
40	338.7	29.6	400	398.5	34.9	60	458.2	40.1	20	518.0	45.3	80	577.8	50.6
341	339.7	29.7	401	399.5	34.9	461	459.2	40.2	521	519.0	45.4	581	578.8	50.6
42	340.7	29.8	02	400.5	35.0	62	460.2	40.3	22	520.0	45.5	82	579.8	50.7
43	341.7	29.9	03	401.5	35.1	63	461.2	40.4	23	521.0	45.6	83	580.8	50.8
44	342.7	30.0	04	402.5	35.2	64	462.2	40.4	24	522.0	45.7	84	581.8	50.9
45	343.7	30.1	05	403.5	35.3	65	463.2	40.5	25	523.0	45.8	85	582.8	51.0
46	344.7	30.2	06	404.5	35.4	66	464.2	40.6	26	524.0	45.8	86	583.8	51.1
47	345.7	30.2	07	405.5	35.5	67	465.2	40.7	27	525.0	45.9	87	584.8	51.2
48	346.7	30.3	08	406.4	35.6	68	466.2	40.8	28	526.0	46.0	88	585.8	51.2
49	347.7	30.4	09	407.4	35.6	69	467.2	40.9	29	527.0	46.1	89	586.8	51.3
50	348.7	30.5	10	408.4	35.7	70	468.2	41.0	30	528.0	46.2	90	587.8	51.4
351	349.7	30.6	411	409.4	35.8	471	469.2	41.1	531	529.0	46.3	591	588.8	51.5
52	350.7	30.7	12	410.4	35.9	72	470.2	41.1	32	530.0	46.4	92	589.7	51.6
53	351.7	30.8	13	411.4	36.0	73	471.2	41.2	33	531.0	46.5	93	590.7	51.7
54	352.7	30.9	14	412.4	36.1	74	472.2	41.3	34	532.0	46.5	94	591.7	51.8
55	353.6	30.9	15	413.4	36.2	75	473.2	41.4	35	533.0	46.6	95	592.7	51.9
56	354.6	31.0	16	414.4	36.3	76	474.2	41.5	36	534.0	46.7	96	593.7	51.9
57	355.6	31.1	17	415.4	36.3	77	475.2	41.6	37	535.0	46.8	97	594.7	52.0
58	356.6	31.2	18	416.4	36.4	78	476.2	41.7	38	536.0	46.9	98	595.7	52.1
59	357.6	31.3	19	417.4	36.5	79	477.2	41.7	39	536.9	47.0	99	596.7	52.2
60	358.6	31.4	20	418.4	36.6	80	478.2	41.8	40	537.9	47.1	600	597.7	52.3
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

85° (95°, 265°, 275°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

TABLE 3.

Difference of Latitude and Departure for 6° (174°, 186°, 354°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.1	61	60.7	6.4	121	120.3	12.6	181	180.0	18.9	241	239.7	25.2
2	2.0	0.2	62	61.7	6.5	22	121.3	12.8	82	181.0	19.0	42	240.7	25.3
3	3.0	0.3	63	62.7	6.6	23	122.3	12.9	83	182.0	19.1	43	241.7	25.4
4	4.0	0.4	64	63.6	6.7	24	123.3	13.0	84	183.0	19.2	44	242.7	25.5
5	5.0	0.5	65	64.6	6.8	25	124.3	13.1	85	184.0	19.3	45	243.7	25.6
6	6.0	0.6	66	65.6	6.9	26	125.3	13.2	86	185.0	19.4	46	244.7	25.7
7	7.0	0.7	67	66.6	7.0	27	126.3	13.3	87	186.0	19.5	47	245.6	25.8
8	8.0	0.8	68	67.6	7.1	28	127.3	13.4	88	187.0	19.7	48	246.6	25.9
9	9.0	0.9	69	68.6	7.2	29	128.3	13.5	89	188.0	19.8	49	247.6	26.0
10	9.9	1.0	70	69.6	7.3	30	129.3	13.6	90	189.0	19.9	50	248.6	26.1
11	10.9	1.1	71	70.6	7.4	131	130.3	13.7	191	190.0	20.0	251	249.6	26.2
12	11.9	1.3	72	71.6	7.5	32	131.3	13.8	92	190.9	20.1	52	250.6	26.3
13	12.9	1.4	73	72.6	7.6	33	132.3	13.9	93	191.9	20.2	53	251.6	26.4
14	13.9	1.5	74	73.6	7.7	34	133.3	14.0	94	192.9	20.3	54	252.6	26.6
15	14.9	1.6	75	74.6	7.8	35	134.4	14.1	95	193.9	20.4	55	253.6	26.7
16	15.9	1.7	76	75.6	7.9	36	135.3	14.2	96	194.9	20.5	56	254.6	26.8
17	16.9	1.8	77	76.6	8.0	37	136.2	14.3	97	195.9	20.6	57	255.6	26.9
18	17.9	1.9	78	77.6	8.2	38	137.2	14.4	98	196.9	20.7	58	256.6	27.0
19	18.9	2.0	79	78.6	8.3	39	138.2	14.5	99	197.9	20.8	59	257.6	27.1
20	19.9	2.1	80	79.6	8.4	40	139.2	14.6	200	198.9	20.9	60	258.6	27.2
21	20.9	2.2	81	80.6	8.5	141	140.2	14.7	201	199.9	21.0	261	259.6	27.3
22	21.9	2.3	82	81.6	8.6	42	141.2	14.8	02	200.9	21.1	62	260.6	27.4
23	22.9	2.4	83	82.5	8.7	43	142.2	14.9	03	201.9	21.2	63	261.6	27.5
24	23.9	2.5	84	83.5	8.8	44	143.2	15.1	04	202.9	21.3	64	262.6	27.6
25	24.9	2.6	85	84.5	8.9	45	144.2	15.2	05	203.9	21.4	65	263.5	27.7
26	25.9	2.7	86	85.5	9.0	46	145.2	15.3	06	204.9	21.5	66	264.5	27.8
27	26.9	2.8	87	86.5	9.1	47	146.2	15.4	07	205.9	21.6	67	265.5	27.9
28	27.8	2.9	88	87.5	9.2	48	147.2	15.5	08	206.9	21.7	68	266.5	28.0
29	28.8	3.0	89	88.5	9.3	49	148.2	15.6	09	207.9	21.8	69	267.5	28.1
30	29.8	3.1	90	89.5	9.4	50	149.2	15.7	10	208.8	22.0	70	268.5	28.2
31	30.8	3.2	91	90.5	9.5	151	150.2	15.8	211	209.8	22.1	271	269.5	28.3
32	31.8	3.3	92	91.5	9.6	52	151.2	15.9	12	210.8	22.2	72	270.5	28.4
33	32.8	3.4	93	92.5	9.7	53	152.2	16.0	13	211.8	22.3	73	271.5	28.5
34	33.8	3.6	94	93.5	9.8	54	153.2	16.1	14	212.8	22.4	74	272.5	28.6
35	34.8	3.7	95	94.5	9.9	55	154.2	16.2	15	213.8	22.5	75	273.5	28.7
36	35.8	3.8	96	95.5	10.0	56	155.1	16.3	16	214.8	22.6	76	274.5	28.8
37	36.8	3.9	97	96.5	10.1	57	156.1	16.4	17	215.8	22.7	77	275.5	29.0
38	37.8	4.0	98	97.5	10.2	58	157.1	16.5	18	216.8	22.8	78	276.5	29.1
39	38.8	4.1	99	98.5	10.3	59	158.1	16.6	19	217.8	22.9	79	277.5	29.2
40	39.8	4.2	100	99.5	10.5	60	159.1	16.7	20	218.8	23.0	80	278.5	29.3
41	40.8	4.3	101	100.4	10.6	161	160.1	16.8	221	219.8	23.1	281	279.5	29.4
42	41.8	4.4	02	101.4	10.7	62	161.1	16.9	22	220.8	23.2	82	280.5	29.5
43	42.8	4.5	03	102.4	10.8	63	162.1	17.0	23	221.8	23.3	83	281.4	29.6
44	43.8	4.6	04	103.4	10.9	64	163.1	17.1	24	222.8	23.4	84	282.4	29.7
45	44.8	4.7	05	104.4	11.0	65	164.1	17.2	25	223.8	23.5	85	283.4	29.8
46	45.7	4.8	06	105.4	11.1	66	165.1	17.4	26	224.8	23.6	86	284.4	29.9
47	46.7	4.9	07	106.4	11.2	67	166.1	17.5	27	225.8	23.7	87	285.4	30.0
48	47.7	5.0	08	107.4	11.3	68	167.1	17.6	28	226.8	23.8	88	286.4	30.1
49	48.7	5.1	09	108.4	11.4	69	168.1	17.7	29	227.7	23.9	89	287.4	30.2
50	49.7	5.2	10	109.4	11.5	70	169.1	17.8	30	228.7	24.0	90	288.4	30.3
51	50.7	5.3	111	110.4	11.6	171	170.1	17.9	231	229.7	24.1	291	289.4	30.4
52	51.7	5.4	12	111.4	11.7	72	171.1	18.0	32	230.7	24.3	92	290.4	30.5
53	52.7	5.5	13	112.4	11.8	73	172.1	18.1	33	231.7	24.4	93	291.4	30.6
54	53.7	5.6	14	113.4	11.9	74	173.0	18.2	34	232.7	24.5	94	292.4	30.7
55	54.7	5.7	15	114.4	12.0	75	174.0	18.3	35	233.7	24.6	95	293.4	30.8
56	55.7	5.9	16	115.4	12.1	76	175.0	18.4	36	234.7	24.7	96	294.4	30.9
57	56.7	6.0	17	116.4	12.2	77	176.0	18.5	37	235.7	24.8	97	295.4	31.0
58	57.7	6.1	18	117.4	12.3	78	177.0	18.6	38	236.7	24.9	98	296.4	31.1
59	58.7	6.2	19	118.3	12.4	79	178.0	18.7	39	237.7	25.0	99	297.4	31.3
60	59.7	6.3	20	119.3	12.5	80	179.0	18.8	40	238.7	25.1	300	298.4	31.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

84°, (96°, 264°, 276°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 6° (174°, 186°, 354°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	299.3	31.5	361	359.0	37.7	421	418.7	44.0	481	478.4	50.3	541	538.0	56.5
02	300.3	31.6	62	360.0	37.8	22	419.7	44.1	82	479.4	50.4	42	539.0	56.7
03	301.3	31.7	63	361.0	37.9	23	420.7	44.2	83	480.4	50.5	43	540.0	56.8
04	302.3	31.8	64	362.0	38.0	24	421.7	44.3	84	481.3	50.6	44	541.0	56.9
05	303.3	31.9	65	363.0	38.2	25	422.7	44.4	85	482.3	50.7	45	542.0	57.0
06	304.3	32.0	66	364.0	38.3	26	423.7	44.5	86	483.3	50.8	46	543.0	57.1
07	305.3	32.1	67	365.0	38.4	27	424.7	44.6	87	484.3	50.9	47	544.0	57.2
08	306.3	32.2	68	366.0	38.5	28	425.7	44.7	88	485.3	51.0	48	545.0	57.3
09	307.3	32.3	69	367.0	38.6	29	426.6	44.8	89	486.3	51.1	49	546.0	57.4
10	308.3	32.4	70	368.0	38.7	30	427.6	44.9	90	487.3	51.2	50	547.0	57.5
311	309.3	32.5	371	369.0	38.8	431	428.6	45.1	491	488.3	51.3	551	548.0	57.6
12	310.3	32.6	72	370.0	38.9	32	429.6	45.2	92	489.3	51.4	52	549.0	57.7
13	311.3	32.7	73	371.0	39.0	33	430.6	45.3	93	490.3	51.5	53	550.0	57.8
14	312.3	32.8	74	372.0	39.1	34	431.6	45.4	94	491.3	51.6	54	551.0	57.9
15	313.3	32.9	75	372.9	39.2	35	432.6	45.5	95	492.3	51.7	55	552.0	58.0
16	314.3	33.0	76	373.9	39.3	36	433.6	45.6	96	493.3	51.8	56	553.0	58.1
17	315.3	33.1	77	374.9	39.4	37	434.6	45.7	97	494.3	52.0	57	553.9	58.2
18	316.3	33.2	78	375.9	39.5	38	435.6	45.8	98	495.3	52.1	58	554.9	58.3
19	317.3	33.3	79	376.9	39.6	39	436.6	45.9	99	496.3	52.2	59	555.9	58.4
20	318.2	33.4	80	377.9	39.7	40	437.6	46.0	500	497.3	52.3	60	556.9	58.5
321	319.2	33.6	381	378.9	39.8	441	438.6	46.1	501	498.3	52.4	561	557.9	58.6
22	320.2	33.7	82	379.9	39.9	42	439.6	46.2	02	499.3	52.5	62	558.9	58.7
23	321.2	33.8	83	380.9	40.0	43	440.6	46.3	03	500.2	52.6	63	559.9	58.8
24	322.2	33.9	84	381.9	40.1	44	441.6	46.4	04	501.2	52.7	64	560.9	59.0
25	323.2	34.0	85	382.9	40.2	45	442.6	46.5	05	502.2	52.8	65	561.9	59.1
26	324.2	34.1	86	383.9	40.3	46	443.6	46.6	06	503.2	52.9	66	562.9	59.2
27	325.2	34.2	87	384.9	40.5	47	444.6	46.7	07	504.2	53.0	67	563.9	59.3
28	326.2	34.3	88	385.9	40.6	48	445.5	46.8	08	505.2	53.1	68	564.9	59.4
29	327.2	34.4	89	386.9	40.7	49	446.5	46.9	09	506.2	53.2	69	565.9	59.5
30	328.2	34.5	90	387.9	40.8	50	447.5	47.0	10	507.2	53.3	70	566.9	59.6
331	329.2	34.6	391	388.9	40.9	451	448.5	47.1	511	508.2	53.4	571	567.9	59.7
32	330.2	34.7	92	389.9	41.0	52	449.5	47.2	12	509.2	53.5	72	568.9	59.8
33	331.2	34.8	93	390.8	41.1	53	450.5	47.4	13	510.2	53.6	73	569.9	59.9
34	332.2	34.9	94	391.8	41.2	54	451.5	47.5	14	511.2	53.7	74	570.9	60.0
35	333.2	35.0	95	392.8	41.3	55	452.5	47.6	15	512.2	53.8	75	571.9	60.1
36	334.2	35.1	96	393.8	41.4	56	453.5	47.7	16	513.2	53.9	76	572.8	60.2
37	335.2	35.2	97	394.8	41.5	57	454.5	47.8	17	514.2	54.0	77	573.8	60.3
38	336.1	35.3	98	395.8	41.6	58	455.5	47.9	18	515.2	54.1	78	574.8	60.4
39	337.1	35.4	99	396.8	41.7	59	456.5	48.0	19	516.2	54.3	79	575.8	60.5
40	338.1	35.5	400	397.8	41.8	60	457.5	48.1	20	517.2	54.4	80	576.8	60.6
341	339.1	35.6	401	398.8	41.9	461	458.5	48.2	521	518.1	54.5	581	577.8	60.7
42	340.1	35.7	02	399.8	42.0	62	459.5	48.3	22	519.1	54.6	82	578.8	60.8
43	341.1	35.9	03	400.8	42.1	63	460.5	48.4	23	520.1	54.7	83	579.8	60.9
44	342.1	36.0	04	401.8	42.2	64	461.5	48.5	24	521.1	54.8	84	580.8	61.0
45	343.1	36.1	05	402.8	42.3	65	462.5	48.6	25	522.1	54.9	85	581.8	61.1
46	344.1	36.2	06	403.8	42.4	66	463.4	48.7	26	523.1	55.0	86	582.8	61.3
47	345.1	36.3	07	404.8	42.5	67	464.4	48.8	27	524.1	55.1	87	583.8	61.4
48	346.1	36.4	08	405.8	42.6	68	465.4	48.9	28	525.1	55.2	88	584.8	61.5
49	347.1	36.5	09	406.8	42.8	69	466.4	49.0	29	526.1	55.3	89	585.8	61.6
50	348.1	36.6	10	407.8	42.9	70	467.4	49.1	30	527.1	55.4	90	586.8	61.7
351	349.1	36.7	411	408.7	43.0	471	468.4	49.2	531	528.1	55.5	591	587.8	61.8
52	350.1	36.8	12	409.7	43.1	72	469.4	49.3	32	529.1	55.6	92	588.8	61.9
53	351.1	36.9	13	410.7	43.2	73	470.4	49.4	33	530.1	55.7	93	589.8	62.0
54	352.1	37.0	14	411.7	43.3	74	471.4	49.5	34	531.1	55.8	94	590.7	62.1
55	353.1	37.1	15	412.7	43.4	75	472.4	49.7	35	532.1	55.9	95	591.7	62.2
56	354.0	37.2	16	413.7	43.5	76	473.4	49.8	36	533.1	56.0	96	592.7	62.3
57	355.0	37.3	17	414.7	43.6	77	474.4	49.9	37	534.1	56.1	97	593.7	62.4
58	356.0	37.4	18	415.7	43.7	78	475.4	50.0	38	535.1	56.2	98	594.7	62.5
59	357.0	37.5	19	416.7	43.8	79	476.4	50.1	39	536.0	56.3	99	595.7	62.6
60	358.0	37.6	20	417.7	43.9	80	477.4	50.2	40	537.0	56.4	600	596.7	62.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

84° (96°, 264°, 276°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 7° (173°, 187°, 353°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.1	61	60.5	7.4	121	120.1	14.7	181	179.7	22.1	241	239.2	29.4
2	2.0	0.2	62	61.5	7.6	22	121.1	14.9	82	180.6	22.2	42	240.2	29.5
3	3.0	0.4	63	62.5	7.7	23	122.1	15.0	83	181.6	22.3	43	241.2	29.6
4	4.0	0.5	64	63.5	7.8	24	123.1	15.1	84	182.6	22.4	44	242.2	29.7
5	5.0	0.6	65	64.5	7.9	25	124.1	15.2	85	183.6	22.5	45	243.2	29.9
6	6.0	0.7	66	65.5	8.0	26	125.1	15.4	86	184.6	22.7	46	244.2	30.0
7	6.9	0.9	67	66.5	8.2	27	126.1	15.5	87	185.6	22.8	47	245.2	30.1
8	7.9	1.0	68	67.5	8.3	28	127.0	15.6	88	186.6	22.9	48	246.2	30.2
9	8.9	1.1	69	68.5	8.4	29	128.0	15.7	89	187.6	23.0	49	247.1	30.3
10	9.9	1.2	70	69.5	8.5	30	129.0	15.8	90	188.6	23.2	50	248.1	30.5
11	10.9	1.3	71	70.5	8.7	131	130.0	16.0	191	189.6	23.3	251	249.1	30.6
12	11.9	1.5	72	71.5	8.8	32	131.0	16.1	92	190.6	23.4	52	250.1	30.7
13	12.9	1.6	73	72.5	8.9	33	132.0	16.2	93	191.6	23.5	53	251.1	30.8
14	13.9	1.7	74	73.4	9.0	34	133.0	16.3	94	192.6	23.6	54	252.1	31.0
15	14.9	1.8	75	74.4	9.1	35	134.0	16.5	95	193.5	23.8	55	253.1	31.1
16	15.9	1.9	76	75.4	9.3	36	135.0	16.6	96	194.5	23.9	56	254.1	31.2
17	16.9	2.1	77	76.4	9.4	37	136.0	16.7	97	195.5	24.0	57	255.1	31.3
18	17.9	2.2	78	77.4	9.5	38	137.0	16.8	98	196.5	24.1	58	256.1	31.4
19	18.9	2.3	79	78.4	9.6	39	138.0	16.9	99	197.5	24.3	59	257.1	31.6
20	19.9	2.4	80	79.4	9.7	40	139.0	17.1	200	198.5	24.4	60	258.1	31.7
21	20.8	2.6	81	80.4	9.9	141	139.9	17.2	201	199.5	24.5	261	259.1	31.8
22	21.8	2.7	82	81.4	10.0	42	140.9	17.3	02	200.5	24.6	62	260.0	31.9
23	22.8	2.8	83	82.4	10.1	43	141.9	17.4	03	201.5	24.7	63	261.0	32.1
24	23.8	2.9	84	83.4	10.2	44	142.9	17.5	04	202.5	24.9	64	262.0	32.2
25	24.8	3.0	85	84.4	10.4	45	143.9	17.7	05	203.5	25.0	65	263.0	32.3
26	25.8	3.2	86	85.4	10.5	46	144.9	17.8	06	204.5	25.1	66	264.0	32.4
27	26.8	3.3	87	86.4	10.6	47	145.9	17.9	07	205.5	25.2	67	265.0	32.5
28	27.8	3.4	88	87.3	10.7	48	146.9	18.0	08	206.4	25.3	68	266.0	32.7
29	28.8	3.5	89	88.3	10.8	49	147.9	18.2	09	207.4	25.5	69	267.0	32.8
30	29.8	3.7	90	89.3	11.0	50	148.9	18.3	10	208.4	25.6	70	268.0	32.9
31	30.8	3.8	91	90.3	11.1	151	149.9	18.4	211	209.4	25.7	271	269.0	33.0
32	31.8	3.9	92	91.3	11.2	52	150.9	18.5	12	210.4	25.8	72	270.0	33.1
33	32.8	4.0	93	92.3	11.3	53	151.9	18.6	13	211.4	26.0	73	271.0	33.3
34	33.7	4.1	94	93.3	11.5	54	152.9	18.8	14	212.4	26.1	74	272.0	33.4
35	34.7	4.3	95	94.3	11.6	55	153.8	18.9	15	213.4	26.2	75	273.0	33.5
36	35.7	4.4	96	95.3	11.7	56	154.8	19.0	16	214.4	26.3	76	273.9	33.6
37	36.7	4.5	97	96.3	11.8	57	155.8	19.1	17	215.4	26.4	77	274.9	33.8
38	37.7	4.6	98	97.3	11.9	58	156.8	19.3	18	216.4	26.6	78	275.9	33.9
39	38.7	4.8	99	98.3	12.1	59	157.8	19.4	19	217.4	26.7	79	276.9	34.0
40	39.7	4.9	100	99.3	12.2	60	158.8	19.5	20	218.4	26.8	80	277.9	34.1
41	40.7	5.0	101	100.2	12.3	161	159.8	19.6	221	219.4	26.9	281	278.9	34.2
42	41.7	5.1	02	101.2	12.4	62	160.8	19.7	22	220.3	27.1	82	279.9	34.4
43	42.7	5.2	03	102.2	12.6	63	161.8	19.9	23	221.3	27.2	83	280.9	34.5
44	43.7	5.4	04	103.2	12.7	64	162.8	20.0	24	222.3	27.3	84	281.9	34.6
45	44.7	5.5	05	104.2	12.8	65	163.8	20.1	25	223.3	27.4	85	282.9	34.7
46	45.7	5.6	06	105.2	12.9	66	164.8	20.2	26	224.3	27.5	86	283.9	34.9
47	46.6	5.7	07	106.2	13.0	67	165.8	20.4	27	225.3	27.7	87	284.9	35.0
48	47.6	5.8	08	107.2	13.2	68	166.7	20.5	28	226.3	27.8	88	285.9	35.1
49	48.6	6.0	09	108.2	13.3	69	167.7	20.6	29	227.3	27.9	89	286.8	35.2
50	49.6	6.1	10	109.2	13.4	70	168.7	20.7	30	228.3	28.0	90	287.8	35.3
51	50.6	6.2	111	110.2	13.5	171	169.7	20.8	231	229.3	28.2	291	288.8	35.5
52	51.6	6.3	12	111.2	13.6	72	170.7	21.0	32	230.3	28.3	92	289.8	35.6
53	52.6	6.5	13	112.2	13.8	73	171.7	21.1	33	231.3	28.4	93	290.8	35.7
54	53.6	6.6	14	113.2	13.9	74	172.7	21.2	34	232.3	28.5	94	291.8	35.8
55	54.6	6.7	15	114.1	14.0	75	173.7	21.3	35	233.2	28.6	95	292.8	36.0
56	55.6	6.8	16	115.1	14.1	76	174.7	21.4	36	234.2	28.8	96	293.8	36.1
57	56.6	6.9	17	116.1	14.3	77	175.7	21.6	37	235.2	28.9	97	294.8	36.2
58	57.6	7.1	18	117.1	14.4	78	176.7	21.7	38	236.2	29.0	98	295.8	36.3
59	58.6	7.2	19	118.1	14.5	79	177.7	21.8	39	237.2	29.1	99	296.8	36.4
60	59.6	7.3	20	119.1	14.6	80	178.7	21.9	40	238.2	29.2	300	297.8	36.6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

83° (97°, 263°, 277°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side. Adj.	N×Sin. Side Opp.

Difference of Latitude and Departure for 7° (173°, 187°, 353°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	298. 7	36. 7	361	358. 3	44. 0	421	417. 9	51. 3	481	477. 4	58. 6	541	537. 0	65. 9
02	299. 7	36. 8	62	359. 3	44. 1	22	418. 9	51. 4	82	478. 4	58. 7	42	538. 0	66. 1
03	300. 7	36. 9	63	360. 3	44. 2	23	419. 8	51. 6	83	479. 4	58. 9	43	539. 0	66. 2
04	301. 7	37. 0	64	361. 3	44. 4	24	420. 8	51. 7	84	480. 4	59. 0	44	539. 9	66. 3
05	302. 7	37. 2	65	362. 3	44. 5	25	421. 8	51. 8	85	481. 4	59. 1	45	540. 9	66. 4
06	303. 7	37. 3	66	363. 3	44. 6	26	422. 8	51. 9	86	482. 4	59. 2	46	541. 9	66. 5
07	304. 7	37. 4	67	364. 3	44. 7	27	423. 8	52. 0	87	483. 4	59. 4	47	542. 9	66. 7
08	305. 7	37. 5	68	365. 3	44. 8	28	424. 8	52. 2	88	484. 4	59. 5	48	543. 9	66. 8
09	306. 7	37. 7	69	366. 2	45. 0	29	425. 8	52. 3	89	485. 4	59. 6	49	544. 9	66. 9
10	307. 7	37. 8	70	367. 2	45. 1	30	426. 8	52. 4	90	486. 3	59. 7	50	545. 9	67. 0
311	308. 7	37. 9	371	368. 2	45. 2	431	427. 8	52. 5	491	487. 3	59. 8	551	546. 9	67. 1
12	309. 7	38. 0	72	369. 2	45. 3	32	428. 8	52. 6	92	488. 3	60. 0	52	547. 9	67. 3
13	310. 7	38. 1	73	370. 2	45. 5	33	429. 8	52. 8	93	489. 3	60. 1	53	548. 9	67. 4
14	311. 7	38. 3	74	371. 2	45. 6	34	430. 8	52. 9	94	490. 3	60. 2	54	549. 9	67. 5
15	312. 7	38. 4	75	372. 2	45. 7	35	431. 8	53. 0	95	491. 3	60. 3	55	550. 9	67. 6
16	313. 6	38. 5	76	373. 2	45. 8	36	432. 8	53. 1	96	492. 3	60. 4	56	551. 9	67. 8
17	314. 6	38. 6	77	374. 2	45. 9	37	433. 7	53. 3	97	493. 3	60. 6	57	552. 8	67. 9
18	315. 6	38. 8	78	375. 2	46. 1	38	434. 7	53. 4	98	494. 3	60. 7	58	553. 8	68. 0
19	316. 6	38. 9	79	376. 2	46. 2	39	435. 7	53. 5	99	495. 3	60. 8	59	554. 8	68. 1
20	317. 6	39. 0	80	377. 2	46. 3	40	436. 7	53. 6	500	496. 3	60. 9	60	555. 8	68. 2
321	318. 6	39. 1	381	378. 2	46. 4	441	437. 7	53. 7	501	497. 3	61. 1	561	556. 8	68. 4
22	319. 6	39. 2	82	379. 2	46. 6	42	438. 7	53. 9	02	498. 3	61. 2	62	557. 8	68. 5
23	320. 6	39. 4	83	380. 1	46. 7	43	439. 7	54. 0	03	499. 3	61. 3	63	558. 8	68. 6
24	321. 6	39. 5	84	381. 1	46. 8	44	440. 7	54. 1	04	500. 2	61. 4	64	559. 8	68. 7
25	322. 6	39. 6	85	382. 1	46. 9	45	441. 7	54. 2	05	501. 2	61. 5	65	560. 8	68. 9
26	323. 6	39. 7	86	383. 1	47. 0	46	442. 7	54. 4	06	502. 2	61. 7	66	561. 8	69. 0
27	324. 6	39. 8	87	384. 1	47. 2	47	443. 7	54. 5	07	503. 2	61. 8	67	562. 8	69. 1
28	325. 6	40. 0	88	385. 1	47. 3	48	444. 7	54. 6	08	504. 2	61. 9	68	563. 8	69. 2
29	326. 5	40. 1	89	386. 1	47. 4	49	445. 7	54. 7	09	505. 2	62. 0	69	564. 8	69. 3
30	327. 5	40. 2	90	387. 1	47. 5	50	446. 6	54. 8	10	506. 2	62. 2	70	565. 8	69. 5
331	328. 5	40. 3	391	388. 1	47. 7	451	447. 6	55. 0	511	507. 2	62. 3	571	566. 7	69. 6
32	329. 5	40. 5	92	389. 1	47. 8	52	448. 6	55. 1	12	508. 2	62. 4	72	567. 7	69. 7
33	330. 5	40. 6	93	390. 1	47. 9	53	449. 6	55. 2	13	509. 2	62. 5	73	568. 7	69. 8
34	331. 5	40. 7	94	391. 1	48. 0	54	450. 6	55. 3	14	510. 2	62. 6	74	569. 7	70. 0
35	332. 5	40. 8	95	392. 1	48. 1	55	451. 6	55. 5	15	511. 2	62. 8	75	570. 7	70. 1
36	333. 5	40. 9	96	393. 0	48. 3	56	452. 6	55. 6	16	512. 2	62. 9	76	571. 7	70. 2
37	334. 5	41. 1	97	394. 0	48. 4	57	453. 6	55. 7	17	513. 1	63. 0	77	572. 7	70. 3
38	335. 5	41. 2	98	395. 0	48. 5	58	454. 6	55. 8	18	514. 1	63. 1	78	573. 7	70. 4
39	336. 5	41. 3	99	396. 0	48. 6	59	455. 6	55. 9	19	515. 1	63. 3	79	574. 7	70. 6
40	337. 5	41. 4	400	397. 0	48. 7	60	456. 6	56. 1	20	516. 1	63. 4	80	575. 7	70. 7
341	338. 5	41. 6	401	398. 0	48. 9	461	457. 6	56. 2	521	517. 1	63. 5	581	576. 7	70. 8
42	339. 5	41. 7	02	399. 0	49. 0	62	458. 6	56. 3	22	518. 1	63. 6	82	577. 7	70. 9
43	340. 4	41. 8	03	400. 0	49. 1	63	459. 5	56. 4	23	519. 1	63. 7	83	578. 7	71. 0
44	341. 4	41. 9	04	401. 0	49. 2	64	460. 5	56. 5	24	520. 1	63. 9	84	579. 6	71. 2
45	342. 4	42. 0	05	402. 0	49. 4	65	461. 5	56. 7	25	521. 1	64. 0	85	580. 6	71. 3
46	343. 4	42. 2	06	403. 0	49. 5	66	462. 5	56. 8	26	522. 1	64. 1	86	581. 6	71. 4
47	344. 4	42. 3	07	404. 0	49. 6	67	463. 5	56. 9	27	523. 1	64. 2	87	582. 6	71. 5
48	345. 4	42. 4	08	405. 0	49. 7	68	464. 5	57. 0	28	524. 1	64. 3	88	583. 6	71. 7
49	346. 4	42. 5	09	406. 0	49. 8	69	465. 5	57. 2	29	525. 1	64. 5	89	584. 6	71. 8
50	347. 4	42. 7	10	406. 9	50. 0	70	466. 5	57. 3	30	526. 0	64. 6	90	585. 6	71. 9
351	348. 4	42. 8	411	407. 9	50. 1	471	467. 5	57. 4	531	527. 0	64. 7	591	586. 6	72. 0
52	349. 4	42. 9	12	408. 9	50. 2	72	468. 5	57. 5	32	528. 0	64. 8	92	587. 6	72. 1
53	350. 4	43. 0	13	409. 9	50. 3	73	469. 5	57. 6	33	529. 0	65. 0	93	588. 6	72. 3
54	351. 4	43. 1	14	410. 9	50. 5	74	470. 5	57. 8	34	530. 0	65. 1	94	589. 6	72. 4
55	352. 4	43. 3	15	411. 9	50. 6	75	471. 5	57. 9	35	531. 0	65. 2	95	590. 6	72. 5
56	353. 3	43. 4	16	412. 9	50. 7	76	472. 5	58. 0	36	532. 0	65. 3	96	591. 6	72. 6
57	354. 3	43. 5	17	413. 9	50. 8	77	473. 4	58. 1	37	533. 0	65. 4	97	592. 6	72. 8
58	355. 3	43. 6	18	414. 9	50. 9	78	474. 4	58. 3	38	534. 0	65. 6	98	593. 5	72. 9
59	356. 3	43. 7	19	415. 9	51. 1	79	475. 4	58. 4	39	535. 0	65. 7	99	594. 5	73. 0
60	357. 3	43. 9	20	416. 9	51. 2	80	476. 4	58. 5	40	536. 0	65. 8	600	595. 5	73. 1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

83° (97°, 263°, 277°).

In Plane Sailing.	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 8° (172°, 188°, 352°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.1	61	60.4	8.5	121	119.8	16.8	181	179.2	25.2	241	238.7	33.5
2	2.0	0.3	62	61.4	8.6	22	120.8	17.0	82	180.2	25.3	42	239.6	33.7
3	3.0	0.4	63	62.4	8.8	23	121.8	17.1	83	181.2	25.5	43	240.6	33.8
4	4.0	0.6	64	63.4	8.9	24	122.8	17.3	84	182.2	25.6	44	241.6	34.0
5	5.0	0.7	65	64.4	9.0	25	123.8	17.4	85	183.2	25.7	45	242.6	34.1
6	5.9	0.8	66	65.4	9.2	26	124.8	17.5	86	184.2	25.9	46	243.6	34.2
7	6.9	1.0	67	66.3	9.3	27	125.8	17.7	87	185.2	26.0	47	244.6	34.4
8	7.9	1.1	68	67.3	9.5	28	126.8	17.8	88	186.2	26.2	48	245.6	34.5
9	8.9	1.3	69	68.3	9.6	29	127.7	18.0	89	187.2	26.3	49	246.6	34.7
10	9.9	1.4	70	69.3	9.7	30	128.7	18.1	90	188.2	26.4	50	247.6	34.8
11	10.9	1.5	71	70.3	9.9	131	129.7	18.2	191	189.1	26.6	251	248.6	34.9
12	11.9	1.7	72	71.3	10.0	32	130.7	18.4	92	190.1	26.7	52	249.5	35.1
13	12.9	1.8	73	72.3	10.2	33	131.7	18.5	93	191.1	26.9	53	250.5	35.2
14	13.9	1.9	74	73.3	10.3	34	132.7	18.6	94	192.1	27.0	54	251.5	35.3
15	14.9	2.1	75	74.3	10.4	35	133.7	18.8	95	193.1	27.1	55	252.5	35.5
16	15.8	2.2	76	75.3	10.6	36	134.7	18.9	96	194.1	27.3	56	253.5	35.6
17	16.8	2.4	77	76.3	10.7	37	135.7	19.1	97	195.1	27.4	57	254.5	35.8
18	17.8	2.5	78	77.2	10.9	38	136.7	19.2	98	196.1	27.6	58	255.5	35.9
19	18.8	2.6	79	78.2	11.0	39	137.7	19.3	99	197.1	27.7	59	256.5	36.0
20	19.8	2.8	80	79.2	11.1	40	138.6	19.5	200	198.1	27.8	60	257.5	36.2
21	20.8	2.9	81	80.2	11.3	141	139.6	19.6	201	199.0	28.0	261	258.5	36.3
22	21.8	3.1	82	81.2	11.4	42	140.6	19.8	02	200.0	28.1	62	259.5	36.5
23	22.8	3.2	83	82.2	11.6	43	141.6	19.9	03	201.0	28.3	63	260.4	36.6
24	23.8	3.3	84	83.2	11.7	44	142.6	20.0	04	202.0	28.4	64	261.4	36.7
25	24.8	3.5	85	84.2	11.8	45	143.6	20.2	05	203.0	28.5	65	262.4	36.9
26	25.7	3.6	86	85.2	12.0	46	144.6	20.3	06	204.0	28.7	66	263.4	37.0
27	26.7	3.8	87	86.2	12.1	47	145.6	20.5	07	205.0	28.8	67	264.4	37.2
28	27.7	3.9	88	87.1	12.2	48	146.6	20.6	08	206.0	28.9	68	265.4	37.3
29	28.7	4.0	89	88.1	12.4	49	147.5	20.7	09	207.0	29.1	69	266.4	37.4
30	29.7	4.2	90	89.1	12.5	50	148.5	20.9	10	208.0	29.2	70	267.4	37.6
31	30.7	4.3	91	90.1	12.7	151	149.5	21.0	211	208.9	29.4	271	268.4	37.7
32	31.7	4.5	92	91.1	12.8	52	150.5	21.2	12	209.9	29.5	72	269.4	37.9
33	32.7	4.6	93	92.1	12.9	53	151.5	21.3	13	210.9	29.6	73	270.3	38.0
34	33.7	4.7	94	93.1	13.1	54	152.5	21.4	14	211.9	29.8	74	271.3	38.1
35	34.7	4.9	95	94.1	13.2	55	153.5	21.6	15	212.9	29.9	75	272.3	38.3
36	35.6	5.0	96	95.1	13.4	56	154.5	21.7	16	213.9	30.1	76	273.3	38.4
37	36.6	5.1	97	96.1	13.5	57	155.5	21.9	17	214.9	30.2	77	274.3	38.6
38	37.6	5.3	98	97.0	13.6	58	156.5	22.0	18	215.9	30.3	78	275.3	38.7
39	38.6	5.4	99	98.0	13.8	59	157.5	22.1	19	216.9	30.5	79	276.3	38.8
40	39.6	5.6	100	99.0	13.9	60	158.4	22.3	20	217.9	30.6	80	277.3	39.0
41	40.6	5.7	101	100.0	14.1	161	159.4	22.4	221	218.8	30.8	281	278.3	39.1
42	41.6	5.8	02	101.0	14.2	62	160.4	22.5	22	219.8	30.9	82	279.3	39.2
43	42.6	6.0	03	102.0	14.3	63	161.4	22.7	23	220.8	31.0	83	280.2	39.4
44	43.6	6.1	04	103.0	14.5	64	162.4	22.8	24	221.8	31.2	84	281.2	39.5
45	44.6	6.3	05	104.0	14.6	65	163.4	23.0	25	222.8	31.3	85	282.2	39.7
46	45.6	6.4	06	105.0	14.8	66	164.4	23.1	26	223.8	31.5	86	283.2	39.8
47	46.5	6.5	07	106.0	14.9	67	165.4	23.2	27	224.8	31.6	87	284.2	39.9
48	47.5	6.7	08	106.9	15.0	68	166.4	23.4	28	225.8	31.7	88	285.2	40.1
49	48.5	6.8	09	107.9	15.2	69	167.4	23.5	29	226.8	31.9	89	286.2	40.2
50	49.5	7.0	10	108.9	15.3	70	168.3	23.7	30	227.8	32.0	90	287.2	40.4
51	50.5	7.1	111	109.9	15.4	171	169.3	23.8	231	228.8	32.1	291	288.2	40.5
52	51.5	7.2	12	110.9	15.6	72	170.3	23.9	32	229.7	32.3	92	289.2	40.6
53	52.5	7.4	13	111.9	15.7	73	171.3	24.1	33	230.7	32.4	93	290.1	40.8
54	53.5	7.5	14	112.9	15.9	74	172.3	24.2	34	231.7	32.6	94	291.1	40.9
55	54.5	7.7	15	113.9	16.0	75	173.3	24.4	35	232.7	32.7	95	292.1	41.1
56	55.5	7.8	16	114.9	16.1	76	174.3	24.5	36	233.7	32.8	96	293.1	41.2
57	56.4	7.9	17	115.9	16.3	77	175.3	24.6	37	234.7	33.0	97	294.1	41.3
58	57.4	8.1	18	116.9	16.4	78	176.3	24.8	38	235.7	33.1	98	295.1	41.5
59	58.4	8.2	19	117.8	16.6	79	177.3	24.9	39	236.7	33.3	99	296.1	41.6
60	59.4	8.4	20	118.8	16.7	80	178.2	25.1	40	237.7	33.4	300	297.1	41.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

82° (98°, 262°, 278°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 8° (172°, 188°, 352°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	298.1	41.9	361	357.5	50.2	421	416.9	58.6	481	476.3	66.9	541	535.7	75.3
02	299.1	42.0	62	358.5	50.4	22	417.9	58.7	82	477.3	67.1	42	536.7	75.4
03	300.1	42.2	63	359.5	50.5	23	418.9	58.9	83	478.3	67.2	43	537.7	75.6
04	301.0	42.3	64	360.5	50.7	24	419.9	59.0	84	479.3	67.4	44	538.7	75.7
05	302.0	42.4	65	361.4	50.8	25	420.9	59.1	85	480.3	67.5	45	539.7	75.8
06	303.0	42.6	66	362.4	50.9	26	421.9	59.3	86	481.3	67.6	46	540.7	76.0
07	304.0	42.7	67	363.4	51.1	27	422.8	59.4	87	482.3	67.8	47	541.7	76.1
08	305.0	42.9	68	364.4	51.2	28	423.8	59.6	88	483.3	67.9	48	542.7	76.3
09	306.0	43.0	69	365.4	51.4	29	424.8	59.7	89	484.2	68.1	49	543.7	76.4
10	307.0	43.1	70	366.4	51.5	30	425.8	59.8	90	485.2	68.2	50	544.6	76.5
311	308.0	43.3	371	367.4	51.6	431	426.8	60.0	491	486.2	68.3	551	545.6	76.7
12	309.0	43.4	72	368.4	51.8	32	427.8	60.1	92	487.2	68.5	52	546.6	76.8
13	310.0	43.6	73	369.4	51.9	33	428.8	60.3	93	488.2	68.6	53	547.6	77.0
14	310.9	43.7	74	370.4	52.1	34	429.8	60.4	94	489.2	68.8	54	548.6	77.1
15	311.9	43.8	75	371.4	52.2	35	430.8	60.5	95	490.2	68.9	55	549.6	77.2
16	312.9	44.0	76	372.3	52.3	36	431.8	60.7	96	491.2	69.0	56	550.6	77.4
17	313.9	44.1	77	373.3	52.5	37	432.7	60.8	97	492.2	69.2	57	551.6	77.5
18	314.9	44.3	78	374.3	52.6	38	433.7	61.0	98	493.2	69.3	58	552.6	77.7
19	315.9	44.4	79	375.3	52.7	39	434.7	61.1	99	494.1	69.6	59	553.6	77.8
20	316.9	44.5	80	376.3	52.9	40	435.7	61.2	500	495.1	69.6	60	554.6	77.9
321	317.9	44.7	381	377.3	53.0	441	436.7	61.4	501	496.1	69.7	561	555.5	78.1
22	318.9	44.8	82	378.3	53.2	42	437.7	61.5	02	497.1	69.9	62	556.5	78.2
23	319.9	45.0	83	379.3	53.3	43	438.7	61.7	03	498.1	70.0	63	557.5	78.4
24	320.8	45.1	84	380.3	53.4	44	439.7	61.8	04	499.1	70.2	64	558.5	78.5
25	321.8	45.2	85	381.3	53.6	45	440.7	61.9	05	500.1	70.3	65	559.5	78.6
26	322.8	45.4	86	382.2	53.7	46	441.7	62.1	06	501.1	70.4	66	560.5	78.8
27	323.8	45.5	87	383.2	53.9	47	442.6	62.2	07	502.1	70.6	67	561.5	78.9
28	324.8	45.6	88	384.2	54.0	48	443.6	62.3	08	503.1	70.7	68	562.5	79.1
29	325.8	45.8	89	385.2	54.1	49	444.6	62.5	09	504.0	70.8	69	563.5	79.2
30	326.8	45.9	90	386.2	54.3	50	445.6	62.6	10	505.0	71.0	70	564.5	79.3
331	327.8	46.1	391	387.2	54.4	451	446.6	62.8	511	506.0	71.1	571	565.4	79.5
32	328.8	46.2	92	388.2	54.6	52	447.6	62.9	12	507.0	71.3	72	566.4	79.6
33	329.8	46.3	93	389.1	54.7	53	448.6	63.0	13	508.0	71.4	73	567.4	79.7
34	330.7	46.5	94	390.1	54.8	54	449.6	63.2	14	509.0	71.5	74	568.4	79.9
35	331.7	46.6	95	391.1	55.0	55	450.6	63.3	15	510.0	71.7	75	569.4	80.0
36	332.7	46.8	96	392.1	55.1	56	451.6	63.5	16	511.0	71.8	76	570.4	80.2
37	333.7	46.9	97	393.1	55.3	57	452.6	63.6	17	512.0	72.0	77	571.4	80.3
38	334.7	47.0	98	394.1	55.4	58	453.5	63.7	18	513.0	72.1	78	572.4	80.4
39	335.7	47.2	99	395.1	55.5	59	454.5	63.9	19	513.9	72.2	79	573.4	80.6
40	336.7	47.3	400	396.1	55.7	60	455.5	64.0	20	514.9	72.4	80	574.4	80.7
341	337.7	47.5	401	397.1	55.8	461	456.5	64.2	521	515.9	72.5	581	575.3	80.9
42	338.7	47.6	02	398.1	55.9	62	457.5	64.3	22	516.9	72.6	82	576.3	81.0
43	339.7	47.7	03	399.1	56.1	63	458.5	64.4	23	517.9	72.8	83	577.3	81.1
44	340.7	47.9	04	400.1	56.2	64	459.5	64.6	24	518.9	72.9	84	578.3	81.3
45	341.6	48.0	05	401.1	56.4	65	460.5	64.7	25	519.9	73.1	85	579.3	81.4
46	342.6	48.2	06	402.0	56.5	66	461.5	64.9	26	520.9	73.2	86	580.3	81.6
47	343.6	48.3	07	403.0	56.6	67	462.5	65.0	27	521.9	73.3	87	581.3	81.7
48	344.6	48.4	08	404.0	56.8	68	463.4	65.1	28	522.9	73.5	88	582.3	81.8
49	345.6	48.6	09	405.0	56.9	69	464.4	65.3	29	523.9	73.6	89	583.3	82.0
50	346.6	48.7	10	406.0	57.1	70	465.4	65.4	30	524.8	73.8	90	584.3	82.1
351	347.6	48.8	411	407.0	57.2	471	466.4	65.6	531	525.8	73.9	591	585.2	82.3
52	348.6	49.0	12	408.0	57.3	72	467.4	65.7	32	526.8	74.0	92	586.2	82.4
53	349.6	49.1	13	409.0	57.5	73	468.4	65.8	33	527.8	74.2	93	587.2	82.5
54	350.6	49.3	14	410.0	57.6	74	469.4	66.0	34	528.8	74.3	94	588.2	82.7
55	351.5	49.4	15	411.0	57.8	75	470.4	66.1	35	529.8	74.5	95	589.2	82.8
56	352.5	49.5	16	411.9	57.9	76	471.4	66.2	36	530.8	74.6	96	590.2	82.9
57	353.5	49.7	17	412.9	58.0	77	472.4	66.4	37	531.8	74.7	97	591.2	83.1
58	354.5	49.8	18	413.9	58.2	78	473.3	66.5	38	532.8	74.9	98	592.2	83.2
59	355.5	50.0	19	414.9	58.3	79	474.3	66.7	39	533.8	75.0	99	593.2	83.4
60	356.5	50.1	20	415.9	58.5	80	475.3	66.8	40	534.7	75.2	600	594.2	83.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

82° (98°, 262°, 278°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 9° (171°, 189°, 351°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.2	61	60.2	9.5	121	119.5	18.9	181	178.8	28.3	241	238.0	37.7
2	2.0	0.3	62	61.2	9.7	22	120.5	19.1	82	179.8	28.5	42	239.0	37.9
3	3.0	0.5	63	62.2	9.9	23	121.5	19.2	83	180.7	28.6	43	240.0	38.0
4	4.0	0.6	64	63.2	10.0	24	122.5	19.4	84	181.7	28.8	44	241.0	38.2
5	4.9	0.8	65	64.2	10.2	25	123.5	19.6	85	182.7	28.9	45	242.0	38.3
6	5.9	0.9	66	65.2	10.3	26	124.4	19.7	86	183.7	29.1	46	243.0	38.5
7	6.9	1.1	67	66.2	10.5	27	125.4	19.9	87	184.7	29.3	47	244.0	38.6
8	7.9	1.3	68	67.2	10.6	28	126.4	20.0	88	185.7	29.4	48	244.9	38.8
9	8.9	1.4	69	68.2	10.8	29	127.4	20.2	89	186.7	29.6	49	245.9	39.0
10	9.9	1.6	70	69.1	11.0	30	128.4	20.3	90	187.7	29.7	50	246.9	39.1
11	10.9	1.7	71	70.1	11.1	131	129.4	20.5	191	188.6	29.9	251	247.9	39.3
12	11.9	1.9	72	71.1	11.3	32	130.4	20.6	92	189.6	30.0	52	248.9	39.4
13	12.8	2.0	73	72.1	11.4	33	131.4	20.8	93	190.6	30.2	53	249.9	39.6
14	13.8	2.2	74	73.1	11.6	34	132.4	21.0	94	191.6	30.3	54	250.9	39.7
15	14.8	2.3	75	74.1	11.7	35	133.3	21.1	95	192.6	30.5	55	251.9	39.9
16	15.8	2.5	76	75.1	11.9	36	134.3	21.3	96	193.6	30.7	56	252.8	40.0
17	16.8	2.7	77	76.1	12.0	37	135.3	21.4	97	194.6	30.8	57	253.8	40.2
18	17.8	2.8	78	77.0	12.2	38	136.3	21.6	98	195.6	31.0	58	254.8	40.4
19	18.8	3.0	79	78.0	12.4	39	137.3	21.7	99	196.5	31.1	59	255.8	40.5
20	19.8	3.1	80	79.0	12.5	40	138.3	21.9	200	197.5	31.3	60	256.8	40.7
21	20.7	3.3	81	80.0	12.7	141	139.3	22.1	201	198.5	31.4	261	257.8	40.8
22	21.7	3.4	82	81.0	12.8	42	140.3	22.2	02	199.5	31.6	62	258.8	41.0
23	22.7	3.6	83	82.0	13.0	43	141.2	22.4	03	200.5	31.8	63	259.8	41.1
24	23.7	3.8	84	83.0	13.1	44	142.2	22.5	04	201.5	31.9	64	260.7	41.3
25	24.7	3.9	85	84.0	13.3	45	143.2	22.7	05	202.5	32.1	65	261.7	41.5
26	25.7	4.1	86	84.9	13.5	46	144.2	22.8	06	203.5	32.2	66	262.7	41.6
27	26.7	4.2	87	85.9	13.6	47	145.2	23.0	07	204.5	32.4	67	263.7	41.8
28	27.7	4.4	88	86.9	13.8	48	146.2	23.2	08	205.4	32.5	68	264.7	41.9
29	28.6	4.5	89	87.9	13.9	49	147.2	23.3	09	206.4	32.7	69	265.7	42.1
30	29.6	4.7	90	88.9	14.1	50	148.2	23.5	10	207.4	32.9	70	266.7	42.2
31	30.6	4.8	91	89.9	14.2	151	149.1	23.6	211	208.4	33.0	271	267.7	42.4
32	31.6	5.0	92	90.9	14.4	52	150.1	23.8	12	209.4	33.2	72	268.7	42.6
33	32.6	5.2	93	91.9	14.5	53	151.1	23.9	13	210.4	33.3	73	269.6	42.7
34	33.6	5.3	94	92.8	14.7	54	152.1	24.1	14	211.4	33.5	74	270.6	42.9
35	34.6	5.5	95	93.8	14.9	55	153.1	24.2	15	212.4	33.6	75	271.6	43.0
36	35.6	5.6	96	94.8	15.0	56	154.1	24.4	16	213.3	33.8	76	272.6	43.2
37	36.5	5.8	97	95.8	15.2	57	155.1	24.6	17	214.3	33.9	77	273.6	43.3
38	37.5	5.9	98	96.8	15.3	58	156.1	24.7	18	215.3	34.1	78	274.6	43.5
39	38.5	6.1	99	97.8	15.5	59	157.0	24.9	19	216.3	34.3	79	275.6	43.6
40	39.5	6.3	100	98.8	15.6	60	158.0	25.0	20	217.3	34.4	80	276.6	43.8
41	40.5	6.4	101	99.8	15.8	161	159.0	25.2	221	218.3	34.6	281	277.5	44.0
42	41.5	6.6	02	100.7	16.0	62	160.0	25.3	22	219.3	34.7	82	278.5	44.1
43	42.5	6.7	03	101.7	16.1	63	161.0	25.5	23	220.3	34.9	83	279.5	44.3
44	43.5	6.9	04	102.7	16.3	64	162.0	25.7	24	221.2	35.0	84	280.5	44.4
45	44.4	7.0	05	103.7	16.4	65	163.0	25.8	25	222.2	35.2	85	281.5	44.6
46	45.4	7.2	06	104.7	16.6	66	164.0	26.0	26	223.2	35.4	86	282.5	44.7
47	46.4	7.4	07	105.7	16.7	67	164.9	26.1	27	224.2	35.5	87	283.5	44.9
48	47.4	7.5	08	106.7	16.9	68	165.9	26.3	28	225.2	35.7	88	284.5	45.1
49	48.4	7.7	09	107.7	17.1	69	166.9	26.4	29	226.2	35.8	89	285.4	45.2
50	49.4	7.8	10	108.6	17.2	70	167.9	26.6	30	227.2	36.0	90	286.4	45.4
51	50.4	8.0	111	109.6	17.4	171	168.9	26.8	231	228.2	36.1	291	287.4	45.5
52	51.4	8.1	12	110.6	17.5	72	169.9	26.9	32	229.1	36.3	92	288.4	45.7
53	52.3	8.3	13	111.6	17.7	73	170.9	27.1	33	230.1	36.4	93	289.4	45.8
54	53.3	8.4	14	112.6	17.8	74	171.9	27.2	34	231.1	36.6	94	290.4	46.0
55	54.3	8.6	15	113.6	18.0	75	172.8	27.4	35	232.1	36.8	95	291.4	46.1
56	55.3	8.8	16	114.6	18.1	76	173.8	27.5	36	233.1	36.9	96	292.4	46.3
57	56.3	8.9	17	115.6	18.3	77	174.8	27.7	37	234.1	37.1	97	293.3	46.5
58	57.3	9.1	18	116.5	18.5	78	175.8	27.8	38	235.1	37.2	98	294.3	46.6
59	58.3	9.2	19	117.5	18.6	79	176.8	28.0	39	236.1	37.4	99	295.3	46.8
60	59.3	9.4	20	118.5	18.8	80	177.8	28.2	40	237.0	37.5	300	296.3	46.9
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

81° (99°, 261°, 279°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side. Adj.	N×Sin. Side Opp.

TABLE 3.

Difference of Latitude and Departure for 9° (171°, 189°, 351°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	297.3	47.1	361	356.6	56.5	421	415.8	65.9	481	475.1	75.2	541	534.3	84.6
02	298.3	47.2	62	357.5	56.6	22	416.8	66.0	82	476.1	75.4	42	535.3	84.8
03	299.3	47.4	63	358.5	56.8	23	417.8	66.2	83	477.1	75.6	43	536.3	84.9
04	300.3	47.6	64	359.5	56.9	24	418.8	66.3	84	478.0	75.7	44	537.3	85.1
05	301.2	47.7	65	360.5	57.1	25	419.8	66.5	85	479.0	75.9	45	538.3	85.3
06	302.2	47.9	66	361.5	57.3	26	420.8	66.6	86	480.0	76.0	46	539.3	85.4
07	303.2	48.0	67	362.5	57.4	27	421.7	66.8	87	481.0	76.2	47	540.3	85.6
08	304.2	48.2	68	363.5	57.6	28	422.7	67.0	88	482.0	76.3	48	541.3	85.7
09	305.2	48.3	69	364.5	57.7	29	423.7	67.1	89	483.0	76.5	49	542.2	85.9
10	306.2	48.5	70	365.4	57.9	30	424.7	67.3	90	484.0	76.7	50	543.2	86.0
311	307.2	48.7	371	366.4	58.0	431	425.7	67.4	491	485.0	76.8	551	544.2	86.2
12	308.2	48.8	72	367.4	58.2	32	426.7	67.6	92	485.9	77.0	52	545.2	86.4
13	309.1	49.0	73	368.4	58.4	33	427.7	67.7	93	486.9	77.1	53	546.2	86.5
14	310.1	49.1	74	369.4	58.5	34	428.7	67.9	94	487.9	77.3	54	547.2	86.7
15	311.1	49.3	75	370.4	58.7	35	429.6	68.0	95	488.9	77.4	55	548.2	86.8
16	312.1	49.4	76	371.4	58.8	36	430.6	68.2	96	489.9	77.6	56	549.2	87.0
17	313.1	49.6	77	372.4	59.0	37	431.6	68.4	97	490.9	77.7	57	550.1	87.1
18	314.1	49.7	78	373.3	59.1	38	432.6	68.5	98	491.9	77.9	58	551.1	87.3
19	315.1	49.9	79	374.3	59.3	39	433.6	68.7	99	492.9	78.1	59	552.1	87.4
20	316.1	50.1	80	375.3	59.4	40	434.6	68.8	500	493.8	78.2	60	553.1	87.6
321	317.0	50.2	381	376.3	59.6	441	435.6	69.0	501	494.8	78.4	561	554.1	87.8
22	318.0	50.4	82	377.3	59.8	42	436.6	69.1	02	495.8	78.5	62	555.1	87.9
23	319.0	50.5	83	378.3	59.9	43	437.5	69.3	03	496.8	78.7	63	556.1	88.1
24	320.0	50.7	84	379.3	60.1	44	438.5	69.5	04	497.8	78.8	64	557.1	88.2
25	321.0	50.8	85	380.3	60.2	45	439.5	69.6	05	498.8	79.0	65	558.0	88.4
26	322.0	51.0	86	381.2	60.4	46	440.5	69.8	06	499.8	79.2	66	559.0	88.5
27	323.0	51.2	87	382.2	60.5	47	441.5	69.9	07	500.8	79.3	67	560.0	88.7
28	324.0	51.3	88	383.2	60.7	48	442.5	70.1	08	501.7	79.5	68	561.0	88.9
29	324.9	51.5	89	384.2	60.9	49	443.5	70.2	09	502.7	79.6	69	562.0	89.0
30	325.9	51.6	90	385.2	61.0	50	444.5	70.4	10	503.7	79.8	70	563.0	89.2
331	326.9	51.8	391	386.2	61.2	451	445.4	70.6	511	504.7	79.9	571	564.0	89.3
32	327.9	51.9	92	387.2	61.3	52	446.4	70.7	12	505.7	80.1	72	565.0	89.5
33	328.9	52.1	93	388.2	61.5	53	447.4	70.9	13	506.7	80.3	73	565.9	89.6
34	329.9	52.2	94	389.1	61.6	54	448.4	71.0	14	507.7	80.4	74	566.9	89.8
35	330.9	52.4	95	390.1	61.8	55	449.4	71.2	15	508.7	80.6	75	567.9	89.9
36	331.9	52.6	96	391.1	61.9	56	450.4	71.3	16	509.6	80.7	76	568.9	90.1
37	332.9	52.7	97	392.1	62.1	57	451.4	71.5	17	510.6	80.9	77	569.9	90.3
38	333.8	52.9	98	393.1	62.3	58	452.4	71.6	18	511.6	81.0	78	570.9	90.4
39	334.8	53.0	99	394.1	62.4	59	453.3	71.8	19	512.6	81.2	79	571.9	90.6
40	335.8	53.2	400	395.1	62.6	60	454.3	72.0	20	513.6	81.3	80	572.9	90.7
341	336.8	53.3	401	396.1	62.7	461	455.3	72.1	521	514.6	81.5	581	573.8	90.9
42	337.8	53.5	02	397.1	62.9	62	456.3	72.3	22	515.6	81.7	82	574.8	91.0
43	338.8	53.7	03	398.0	63.0	63	457.3	72.4	23	516.6	81.8	83	575.8	91.2
44	339.8	53.8	04	399.0	63.2	64	458.3	72.6	24	517.5	82.0	84	576.8	91.4
45	340.8	54.0	05	400.0	63.4	65	459.3	72.7	25	518.5	82.1	85	577.8	91.5
46	341.7	54.1	06	401.0	63.5	66	460.3	72.9	26	519.5	82.3	86	578.8	91.7
47	342.7	54.3	07	402.0	63.7	67	461.3	73.1	27	520.5	82.4	87	579.8	91.8
48	343.7	54.4	08	403.0	63.8	68	462.2	73.2	28	521.5	82.6	88	580.8	92.0
49	344.7	54.6	09	404.0	64.0	69	463.2	73.4	29	522.5	82.8	89	581.7	92.1
50	345.7	54.8	10	405.0	64.1	70	464.2	73.5	30	523.5	82.9	90	582.7	92.3
351	346.7	54.9	411	405.9	64.3	471	465.2	73.7	531	524.5	83.1	591	583.7	92.5
52	347.7	55.1	12	406.9	64.5	72	466.2	73.8	32	525.5	83.2	92	584.7	92.6
53	348.7	55.2	13	407.9	64.6	73	467.2	74.0	33	526.4	83.4	93	585.7	92.8
54	349.6	55.4	14	408.9	64.8	74	468.2	74.1	34	527.4	83.5	94	586.7	92.9
55	350.6	55.5	15	409.9	64.9	75	469.2	74.3	35	528.4	83.7	95	587.7	93.1
56	351.6	55.7	16	410.9	65.1	76	470.1	74.5	36	529.4	83.8	96	588.7	93.2
57	352.6	55.8	17	411.9	65.2	77	471.1	74.6	37	530.4	84.0	97	589.6	93.4
58	353.6	56.0	18	412.9	65.4	78	472.1	74.8	38	531.4	84.2	98	590.6	93.5
59	354.6	56.2	19	413.8	65.5	79	473.1	74.9	39	532.4	84.3	99	591.6	93.7
60	355.6	56.3	20	414.8	65.7	80	474.1	75.1	40	533.4	84.5	600	592.6	93.9
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

81° (99°, 261°, 279°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

TABLE 3.

Difference of Latitude and Departure for 10° (170°, 190°, 350°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.2	61	60.1	10.6	121	119.2	21.0	181	178.3	31.4	241	237.3	41.8
2	2.0	0.3	62	61.1	10.8	22	120.1	21.2	82	179.2	31.6	42	238.3	42.0
3	3.0	0.5	63	62.0	10.9	23	121.1	21.4	83	180.2	31.8	43	239.3	42.2
4	3.9	0.7	64	63.0	11.1	24	122.1	21.5	84	181.2	32.0	44	240.3	42.4
5	4.9	0.9	65	64.0	11.3	25	123.1	21.7	85	182.2	32.1	45	241.3	42.5
6	5.9	1.0	66	65.0	11.5	26	124.1	21.9	86	183.2	32.3	46	242.3	42.7
7	6.9	1.2	67	66.0	11.6	27	125.1	22.1	87	184.2	32.5	47	243.2	42.9
8	7.9	1.4	68	67.0	11.8	28	126.1	22.2	88	185.1	32.6	48	244.2	43.1
9	8.9	1.6	69	68.0	12.0	29	127.0	22.4	89	186.1	32.8	49	245.2	43.2
10	9.8	1.7	70	68.9	12.2	30	128.0	22.6	90	187.1	33.0	50	246.2	43.4
11	10.8	1.9	71	69.9	12.3	131	129.0	22.7	191	188.1	33.2	251	247.2	43.6
12	11 8	2.1	72	70.9	12.5	32	130.0	22.9	92	189.1	33.3	52	248.2	43.8
13	12.8	2.3	73	71.9	12.7	33	131.0	23.1	93	190.1	33.5	53	249.2	43.9
14	13.8	2.4	74	72.9	12.8	34	132.0	23.3	94	191.1	33.7	54	250.1	44.1
15	14.8	2.6	75	73.9	13.0	35	132.9	23.4	95	192.0	33.9	55	251.1	44.3
16	15.8	2.8	76	74.8	13.2	36	133.9	23.6	96	193.0	34.0	56	252.1	44.5
17	16.7	3.0	77	75.8	13.4	37	134.9	23.8	97	194.0	34.2	57	253.1	44.6
18	17.7	3.1	78	76.8	13.5	38	135.9	24.0	98	195.0	34.4	58	254.1	44.8
19	18.7	3.3	79	77.8	13.7	39	136.9	24.1	99	196.0	34.6	59	255.1	45.0
20	19.7	3.5	80	78.8	13.9	40	137.9	24.3	200	197.0	34.7	60	256.1	45.1
21	20.7	3.6	81	79.8	14.1	141	138.9	24.5	201	197.9	34.9	261	257.0	45.3
22	21.7	3.8	82	80.8	14.2	42	139.8	24.7	02	198.9	35.1	62	258.0	45.5
23	22.7	4.0	83	81.7	14.4	43	140.8	24.8	03	199.9	35.3	63	259.0	45.7
24	23.6	4.2	84	82.7	14.6	44	141.8	25.0	04	200.9	35.4	64	260.0	45.8
25	24.6	4.3	85	83.7	14.8	45	142.8	25.2	05	201.9	35.6	65	261.0	46.0
26	25.6	4.5	86	84.7	14.9	46	143.8	25.4	06	202.9	35.8	66	262.0	46.2
27	26.6	4.7	87	85.7	15.1	47	144.8	25.5	07	203.9	35.9	67	262.9	46.4
28	27.6	4.9	88	86.7	15.3	48	145.8	25.7	08	204.8	36.1	68	263.9	46.5
29	28.6	5.0	89	87.6	15.5	49	146.7	25.9	09	205.8	36.3	69	264.9	46.7
30	29.5	5.2	90	88.6	15.6	50	147.7	26.0	10	206.8	36.5	70	265.9	46.9
31	30.5	5.4	91	89.6	15.8	151	148.7	26.2	211	207.8	36.6	271	266.9	47.1
32	31.5	5.6	92	90.6	16.0	52	149.7	26.4	12	208.8	36.8	72	267.9	47.2
33	32.5	5.7	93	91.6	16.1	53	150.7	26.6	13	209.8	37.0	73	268.9	47.4
34	33.5	5.9	94	92.6	16.3	54	151.7	26.7	14	210.7	37.2	74	269.8	47.6
35	34.5	6.1	95	93.6	16.5	55	152.6	26.9	15	211.7	37.3	75	270.8	47.8
36	35.5	6.3	96	94.5	16.7	56	153.6	27.1	16	212.7	37.5	76	271.8	47.9
37	36.4	6.4	97	95.5	16.8	57	154.6	27.3	17	213.7	37.7	77	272.8	48.1
38	37.4	6.6	98	96.5	17.0	58	155.6	27.4	18	214.7	37.9	78	273.8	48.3
39	38.4	6.8	99	97.5	17.2	59	156.6	27.6	19	215.7	38.0	79	274.8	48.4
40	39.4	6.9	100	98.5	17.4	60	157.6	27.8	20	216.7	38.2	80	275.7	48.6
41	40.4	7.1	101	99.5	17.5	161	158.6	28.0	221	217.6	38.4	281	276.7	48.8
42	41.4	7.3	02	100.5	17.7	62	159.5	28.1	22	218.6	38.5	82	277.7	49.0
43	42.3	7.5	03	101.4	17.9	63	160.5	28.3	23	219.6	38.7	83	278.7	49.1
44	43.3	7.6	04	102.4	18.1	64	161.5	28.5	24	220.6	38.9	84	279.7	49.3
45	44.3	7.8	05	103.4	18.2	65	162.5	28.7	25	221.6	39.1	85	280.7	49.5
46	45.3	8.0	06	104.4	18.4	66	163.5	28.8	26	222.6	39.2	86	281.7	49.7
47	46.3	8.2	07	105.4	18.6	67	164.5	29.0	27	223.6	39.4	87	282.6	49.8
48	47.3	8.3	08	106.4	18.8	68	165.4	29.2	28	224.5	39.6	88	283.6	50.0
49	48.3	8.5	09	107.3	18.9	69	166.4	29.3	29	225.5	39.8	89	284.6	50.2
50	49.2	8.7	10	108.3	19.1	70	167.4	29.5	30	226.5	39.9	90	285.6	50.4
51	50.2	8.9	111	109.3	19.3	171	168.4	29.7	231	227.5	40.1	291	286.6	50.5
52	51.2	9.0	12	110.3	19.4	72	169.4	29.9	32	228.5	40.3	92	287.6	50.7
53	52.2	9.2	13	111.3	19.6	73	170.4	30.0	33	229.5	40.5	93	288.5	50.9
54	53.2	9.4	14	112.3	19.8	74	171.4	30.2	34	230.4	40.6	94	289.5	51.1
55	54.2	9.6	15	113.3	20.0	75	172.3	30.4	35	231.4	40.8	95	290.5	51.2
56	55.1	9.7	16	114.2	20.1	76	173.3	30.6	36	232.4	41.0	96	291.5	51.4
57	56.1	9.9	17	115.2	20.3	77	174.3	30.7	37	233.4	41.2	97	292.5	51.6
58	57.1	10.1	18	116.2	20.5	78	175.3	30.9	38	234.4	41.3	98	293.5	51.7
59	58.1	10.2	19	117.2	20.7	79	176.3	31.1	39	235.4	41.5	99	294.5	51.9
60	59.1	10.4	20	118.2	20.8	80	177.3	31.3	40	236.4	41.7	300	295.4	52.1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

80° (100°, 260°, 280°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		m	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 10° (170°, 190°, 350°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	296.4	52.3	361	355.5	62.7	421	414.6	73.1	481	473.7	83.5	541	532.8	93.9
02	297.4	52.4	62	356.5	62.9	22	415.6	73.3	82	474.7	83.7	42	533.8	94.1
03	298.4	52.6	63	357.5	63.0	23	416.6	73.5	83	475.7	83.9	43	534.8	94.3
04	299.4	52.8	64	358.5	63.2	24	417.6	73.6	84	476.6	84.0	44	535.7	94.5
05	300.4	53.0	65	359.5	63.4	25	418.5	73.8	85	477.6	84.2	45	536.7	94.6
06	301.4	53.1	66	360.4	63.6	26	419.5	74.0	86	478.6	84.4	46	537.7	94.8
07	302.3	53.3	67	361.4	63.7	27	420.5	74.1	87	479.6	84.6	47	538.7	95.0
08	303.3	53.5	68	362.4	63.9	28	421.5	74.3	88	480.6	84.7	48	539.7	95.2
09	304.3	53.7	69	363.4	64.1	29	422.5	74.5	89	481.6	84.9	49	540.7	95.3
10	305.3	53.8	70	364.4	64.2	30	423.5	74.7	90	482.6	85.1	50	541.6	95.5
311	306.3	54.0	371	365.4	64.4	431	424.5	74.8	491	483.5	85.3	551	542.6	95.7
12	307.3	54.2	72	366.4	64.6	32	425.4	75.0	92	484.5	85.4	52	543.6	95.9
13	308.2	54.4	73	367.3	64.8	33	426.4	75.2	93	485.5	85.6	53	544.6	96.0
14	309.2	54.5	74	368.3	64.9	34	427.4	75.4	94	486.5	85.8	54	545.6	96.2
15	310.2	54.7	75	369.3	65.1	35	428.4	75.5	95	487.5	86.0	55	546.6	96.4
16	311.2	54.9	76	370.3	65.3	36	429.4	75.7	96	488.5	86.1	56	547.6	96.5
17	312.2	55.0	77	371.3	65.5	37	430.4	75.9	97	489.4	86.3	57	548.5	96.7
18	313.2	55.2	78	372.3	65.6	38	431.3	76.1	98	490.4	86.5	58	549.5	96.9
19	314.2	55.4	79	373.2	65.8	39	432.3	76.2	99	491.4	86.7	59	550.5	97.1
20	315.1	55.6	80	374.2	66.0	40	433.3	76.4	500	492.4	86.8	60	551.5	97.2
321	316.1	55.7	381	375.2	66.2	441	434.3	76.6	501	493.4	87.0	561	552.5	97.4
22	317.1	55.9	82	376.2	66.3	42	435.3	76.8	02	494.4	87.2	62	553.5	97.6
23	318.1	56.1	83	377.2	66.5	43	436.3	76.9	03	495.4	87.3	63	554.4	97.8
24	319.1	56.3	84	378.2	66.7	44	437.3	77.1	04	496.3	87.5	64	555.4	97.9
25	320.1	56.4	85	379.2	66.9	45	438.2	77.3	05	497.3	87.7	65	556.4	98.1
26	321.0	56.6	86	380.1	67.0	46	439.2	77.4	06	498.3	87.9	66	557.4	98.3
27	322.0	56.8	87	381.1	67.2	47	440.2	77.6	07	499.3	88.0	67	558.4	98.5
28	323.0	57.0	88	382.1	67.4	48	441.2	77.8	08	500.3	88.2	68	559.4	98.6
29	324.0	57.1	89	383.1	67.5	49	442.2	78.0	09	501.3	88.4	69	560.4	98.8
30	325.0	57.3	90	384.1	67.7	50	443.2	78.1	10	502.3	88.6	70	561.3	99.0
331	326.0	57.5	391	385.1	67.9	451	444.1	78.3	511	503.2	88.7	571	562.3	99.2
32	327.0	57.7	92	386.0	68.1	52	445.1	78.5	12	504.2	88.9	72	563.3	99.3
33	327.9	57.8	93	387.0	68.2	53	446.1	78.7	13	505.2	89.1	73	564.3	99.5
34	328.9	58.0	94	388.0	68.4	54	447.1	78.8	14	506.2	89.3	74	565.3	99.7
35	329.9	58.2	95	389.0	68.6	55	448.1	79.0	15	507.2	89.4	75	566.3	99.8
36	330.9	58.3	96	390.0	68.8	56	449.1	79.2	16	508.2	89.6	76	567.2	100.0
37	331.9	58.5	97	391.0	68.9	57	450.1	79.4	17	509.1	89.8	77	568.2	100.2
38	332.9	58.7	98	392.0	69.1	58	451.0	79.5	18	510.1	89.9	78	569.2	100.4
39	333.9	58.9	99	392.9	69.3	59	452.0	79.7	19	511.1	90.1	79	570.2	100.5
40	334.8	59.0	400	393.9	69.5	60	453.0	79.9	20	512.1	90.3	80	571.2	100.7
341	335.8	59.2	401	394.9	69.6	461	454.0	80.1	521	513.1	90.5	581	572.2	100.9
42	336.8	59.4	02	395.9	69.8	62	455.0	80.2	22	514.1	90.6	82	573.2	101.1
43	337.8	59.6	03	396.9	70.0	63	456.0	80.4	23	515.1	90.8	83	574.1	101.2
44	338.8	59.7	04	397.9	70.2	64	457.0	80.6	24	516.0	91.0	84	575.1	101.4
45	339.8	59.9	05	398.9	70.3	65	457.9	80.7	25	517.0	91.2	85	576.1	101.6
46	340.7	60.1	06	399.8	70.5	66	458.9	80.9	26	518.0	91.3	86	577.1	101.8
47	341.7	60.3	07	400.8	70.7	67	459.9	81.1	27	519.0	91.5	87	578.1	101.9
48	342.7	60.4	08	401.8	70.8	68	460.9	81.3	28	520.0	91.7	88	579.1	102.1
49	343.7	60.6	09	402.8	71.0	69	461.9	81.4	29	521.0	91.9	89	580.1	102.3
50	344.7	60.8	10	403.8	71.2	70	462.9	81.6	30	521.9	92.0	90	581.0	102.5
351	345.7	61.0	411	404.8	71.4	471	463.8	81.8	531	522.9	92.2	591	582.0	102.6
52	346.7	61.1	12	405.7	71.5	72	464.8	82.0	32	523.9	92.4	92	583.0	102.8
53	347.6	61.3	13	406.7	71.7	73	465.8	82.1	33	524.9	92.6	93	584.0	103.0
54	348.6	61.5	14	407.7	71.9	74	466.8	82.3	34	525.9	92.7	94	585.0	103.1
55	349.6	61.6	15	408.7	72.1	75	467.8	82.5	35	526.9	92.9	95	586.0	103.3
56	350.6	61.8	16	409.7	72.2	76	468.8	82.7	36	527.9	93.1	96	586.9	103.5
57	351.6	62.0	17	410.7	72.4	77	469.8	82.8	37	528.8	93.2	97	587.9	103.7
58	352.6	62.2	18	411.6	72.6	78	470.7	83.0	38	529.8	93.4	98	588.9	103.8
59	353.5	62.3	19	412.6	72.8	79	471.7	83.2	39	530.8	93.6	99	589.9	104.0
60	354.5	62.5	20	413.6	72.9	80	472.7	83.4	40	531.8	93.8	600	590.9	104.2
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

80° (100°, 260°, 280°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 11° (169°, 191°, 349°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.2	61	59.9	11.6	121	118.8	23.1	181	177.7	34.5	241	236.6	46.0
2	2.0	0.4	62	60.9	11.8	22	119.8	23.3	82	178.7	34.7	42	237.6	46.2
3	2 9	0.6	63	61.8	12.0	23	120.7	23.5	83	179.6	34.9	43	238.5	46.4
4	3.9	0.8	64	62.8	12.2	24	121.7	23.7	84	180.6	35.1	44	239.5	46.6
5	4.9	1.0	65	63.8	12.4	25	122.7	23.9	85	181.6	35.3	45	240.5	46.7
6	5.9	1.1	66	64.8	12.6	26	123.7	24.0	86	182.6	35.5	46	241.5	46.9
7	6.9	1.3	67	65.8	12.8	27	124.7	24.2	87	183.6	35.7	47	242.5	47.1
8	7.9	1.5	68	66.8	13.0	28	125.6	24.4	88	184.5	35.9	48	243.4	47.3
9	8.8	1.7	69	67.7	13.2	29	126.6	24.6	89	185.5	36.1	49	244.4	47.5
10	9.8	1.9	70	68.7	13.4	30	127.6	24.8	90	186.5	36.3	50	245.4	47.7
11	10.8	2.1	71	69.7	13.5	131	128.6	25.0	191	187.5	36.4	251	246.4	47.9
12	11.8	2.3	72	70.7	13.7	32	129.6	25.2	92	188.5	36.6	52	247.4	48.1
13	12.8	2.5	73	71.7	13.9	33	130.6	25.4	93	189.5	36.8	53	248.4	48.3
14	13.7	2.7	74	72.6	14.1	34	131.5	25.6	94	190.4	37.0	54	249.3	48.5
15	14.7	2.9	75	73.6	14.3	35	132.5	25.8	95	191.4	37.2	55	250.3	48.7
16	15.7	3.1	76	74.6	14.5	36	133.5	26.0	96	192.4	37.4	56	251.3	48.8
17	16.7	3.2	77	75.6	14.7	37	134.5	26.1	97	193.4	37.6	57	252.3	49.0
18	17.7	3.4	78	76.6	14.9	38	135.5	26.3	98	194.4	37.8	58	253.3	49.2
19	18.7	3.6	79	77.5	15.1	39	136.4	26.5	99	195.3	38.0	59	254.2	49.4
20	19.6	3.8	80	78.5	15.3	40	137.4	26.7	200	196.3	38.2	60	255.2	49.6
21	20.6	4.0	81	79.5	15.5	141	138.4	26.9	201	197.3	38.4	261	256.2	49.8
22	21.6	4.2	82	80.5	15.6	42	139.4	27.1	02	198.3	38.5	62	257.2	50.0
23	22.6	4.4	83	81.5	15.8	43	140.4	27.3	03	199.3	38.7	63	258.2	50.2
24	23.6	4.6	84	82.5	16.0	44	141 4	27.5	04	200.3	38.9	64	259.1	50.4
25	24.5	4.8	85	83.4	16.2	45	142.3	27.7	05	201.2	39.1	65	260.1	50.6
26	25.5	5.0	86	84.4	16.4	46	143.3	27.9	06	202.2	39.3	66	261.1	50.8
27	26.5	5.2	87	85.4	16.6	47	144.3	28.0	07	203.2	39.5	67	262.1	50.9
28	27.5	5.3	88	86.4	16.8	48	145.3	28.2	08	204.2	39.7	68	263.1	51.1
29	28.5	5.5	89	87.4	17.0	49	146.3	28.4	09	205.2	39.9	69	264.1	51.3
30	29.4	5.7	90	88.3	17.2	50	147.2	28.6	10	206.1	40.1	70	265.0	51.5
31	30.4	5.9	91	89.3	17.4	151	148.2	28.8	211	207.1	40.3	271	266.0	51.7
32	31.4	6.1	92	90.3	17.6	52	149.2	29.0	12	208.1	40.5	72	267.0	51.9
33	32.4	6.3	93	91.3	17.7	53	150.2	29.2	13	209.1	40.6	73	268.0	52.1
34	33.4	6.5	94	92.3	17.9	54	151.2	29.4	14	210.1	40.8	74	269.0	52.3
35	34.4	6.7	95	93.3	18.1	55	152.2	29.6	15	211.0	41.0	75	269.9	52.5
36	35.3	6.9	96	94.2	18.3	56	153.1	29.8	16	212.0	41.2	76	270.9	52.7
37	36.3	7.1	97	95.2	18.5	57	154.1	30.0	17	213.0	41.4	77	271.9	52.9
38	37.3	7.3	98	96.2	18.7	58	155.1	30.1	18	214.0	41.6	78	272.9	53.0
39	38.3	7.4	99	97.2	18.9	59	156.1	30.3	19	215.0	41.8	79	273.9	53.2
40	39.3	7.6	100	98.2	19.1	60	157.1	30.5	20	216.0	42.0	80	274.9	53.4
41	40.2	7.8	101	99.1	19.3	161	158.0	30.7	221	216.9	42.2	281	275.8	53.6
42	41.2	8.0	02	100.1	19.5	62	159.0	30.9	22	217.9	42.4	82	276.8	53.8
43	42.2	8.2	03	101.1	19.7	63	160.0	31.1	23	218.9	42.6	83	277.8	54.0
44	43.2	8.4	04	102.1	19.8	64	161.0	31.3	24	219.9	42.7	84	278.8	54.2
45	44.2	8.6	05	103.1	20.0	65	162.0	31.5	25	220.9	42.9	85	279.8	54.4
46	45.2	8.8	06	104.1	20.2	66	163.0	31.7	26	221.8	43.1	86	280.7	54.6
47	46.1	9.0	07	105.0	20.4	67	163.9	31.9	27	222.8	43.3	87	281.7	54.8
48	47.1	9.2	08	106.0	20.6	68	164.9	32.1	28	223.8	43.5	88	282.7	55.0
49	48.1	9.3	09	107.0	20.8	69	165.9	32.2	29	224.8	43.7	89	283.7	55.1
50	49.1	9.5	10	108.0	21.0	70	166.9	32.4	30	225.8	43.9	90	284.7	55.3
51	50.1	9.7	111	109.0	21.2	171	167.9	32.6	231	226.8	44.1	291	285.7	55.5
52	51.0	9.9	12	109.9	21.4	72	168.8	32.8	32	227.7	44.3	92	286.6	55.7
53	52.0	10.1	13	110.9	21.6	73	169.8	33.0	33	228.7	44.5	93	287.6	55.9
54	53.0	10.3	14	111.9	21.8	74	170.8	33.2	34	229.7	44.6	94	288.6	56.1
55	54.0	10.5	15	112.9	21.9	75	171.8	33.4	35	230.7	44.8	95	289.6	56.3
56	55.0	10.7	16	113.9	22.1	76	172.8	33.6	36	231.7	45.0	96	290.6	56.5
57	56.0	10.9	17	114.9	22.3	77	173.7	33.8	37	232.6	45.2	97	291.5	56.7
58	56.9	11.1	18	115.8	22.5	78	174.7	34.0	38	233.6	45.4	98	292.5	56.9
59	57.9	11.3	19	116.8	22.7	79	175.7	34.2	39	234.6	45.6	99	293.5	57.1
60	58.9	11.4	20	117.8	22.9	80	176.7	34.3	40	235.6	45.8	300	294.5	57.2
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

79° (101°, 259°, 281°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 11° (169°, 191°, 349°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	295.5	57.4	361	354.4	68.9	421	413.3	80.3	481	472.2	91.8	541	531.1	103.2
02	296.5	57.6	62	355.3	69.1	22	414.2	80.5	82	473.1	92.0	42	532.0	103.4
03	297.4	57.8	63	356.3	69.3	23	415.2	80.7	83	474.1	92.2	43	533.0	103.6
04	298.4	58.0	64	357.3	69.5	24	416.2	80.9	84	475.1	92.4	44	534.0	103.8
05	299.4	58.2	65	358.3	69.6	25	417.2	81.1	85	476.1	92.5	45	535.0	104.0
06	300.4	58.4	66	359.3	69.8	26	418.2	81.3	86	477.1	92.7	46	536.0	104.2
07	301.4	58.6	67	360.3	70.0	27	419.2	81.5	87	478.1	92.9	47	537.0	104.4
08	302.3	58.8	68	361.2	70.2	28	420.1	81.7	88	479.0	93.1	48	537.9	104.6
09	303.3	59.0	69	362.2	70.4	29	421.1	81.9	89	480.0	93.3	49	538.9	104.8
10	304.3	59.2	70	363.2	70.6	30	422.1	82.1	90	481.0	93.5	50	539.9	104.9
311	305.3	59.3	371	364.2	70.8	431	423.0	82.2	491	482.0	93.7	551	540.9	105.1
12	306.3	59.5	72	365.2	71.0	32	424.1	82.4	92	483.0	93.9	52	541.9	105.3
13	307.2	59.7	73	366.1	71.2	33	425.0	82.6	93	483.9	94.1	53	542.8	105.5
14	308.2	59.9	74	367.1	71.4	34	426.0	82.8	94	484.9	94.3	54	543.8	105.7
15	309.2	60.1	75	368.1	71.6	35	427.0	83.0	95	485.9	94.5	55	544.8	105.9
16	310.2	60.3	76	369.1	71.7	36	428.0	83.2	96	486.9	94.6	56	545.8	106.1
17	311.2	60.5	77	370.1	71.9	37	428.9	83.4	97	487.9	94.8	57	546.8	106.3
18	312.2	60.7	78	371.1	72.1	38	430.0	83.6	98	488.9	95.0	58	547.7	106.5
19	313.1	60.9	79	372.0	72.3	39	430.9	83.8	99	489.8	95.2	59	548.7	106.7
20	314.1	61.1	80	373.0	72.5	40	431.9	84.0	500	490.8	95.4	60	549.7	106.9
321	315.1	61.2	381	374.0	72.7	441	432.9	84.1	501	491.8	95.6	561	550.7	107.0
22	316.1	61.4	82	375.0	72.9	42	433.9	84.3	02	492.8	95.8	62	551.7	107.2
23	317.1	61.6	83	376.0	73.1	43	434.9	84.5	03	493.8	96.0	63	552.7	107.4
24	318.0	61.8	84	376.9	73.3	44	435.8	84.7	04	494.7	96.2	64	553.6	107.6
25	319.0	62.0	85	377.9	73.5	45	436.8	84.9	05	495.7	96.4	65	554.6	107.8
26	320.0	62.2	86	378.9	73.7	46	437.8	85.1	06	496.7	96.5	66	555.6	108.0
27	321.0	62.4	87	379.9	73.8	47	438.8	85.3	07	497.7	96.7	67	556.6	108.2
28	322.0	62.6	88	380.8	74.0	48	439.8	85.5	08	498.7	96.9	68	557.6	108.4
29	323.0	62.8	89	381.9	74.2	49	440.8	85.7	09	499.6	97.1	69	558.5	108.6
30	323.9	63.0	90	382.8	74.4	50	441.7	85.9	10	500.6	97.3	70	559.5	108.8
331	324.9	63.2	391	383.8	74.6	451	442.7	86.1	511	501.6	97.5	571	560.5	109.0
32	325.9	63.3	92	384.8	74.8	52	443.7	86.2	12	502.6	97.7	72	561.5	109.1
33	326.9	63.5	93	385.8	75.0	53	444.7	86.4	13	503.6	97.9	73	562.5	109.3
34	327.9	63.7	94	386.8	75.2	54	445.7	86.6	14	504.6	98.1	74	563.5	109.5
35	328.8	63.9	95	387.7	75.4	55	446.6	86.8	15	505.5	98.3	75	564.4	109.7
36	329.8	64.1	96	388.7	75.6	56	447.6	87.0	16	506.5	98.5	76	565.4	109.9
37	330.8	64.3	97	389.7	75.8	57	448.6	87.2	17	507.5	98.6	77	566.4	110.1
38	331.8	64.5	98	390.7	75.9	58	449.6	87.4	18	508.5	98.8	78	567.4	110.3
39	332.7	64.7	99	391.7	76.1	59	450.6	87.6	19	509.5	99.0	79	568.4	110.5
40	333.8	64.9	400	392.7	76.3	60	451.5	87.8	20	510.4	99.2	80	569.3	110.7
341	334.7	65.1	401	393.6	76.5	461	452.5	88.0	521	511.4	99.4	581	570.3	110.9
42	335.7	65.3	02	394.6	76.7	62	453.5	88.2	22	512.4	99.6	82	571.3	111.1
43	336.7	65.4	03	395.6	76.9	63	454.5	88.3	23	513.4	99.8	83	572.3	111.2
44	337.7	65.6	04	396.6	77.1	64	455.4	88.5	24	514.4	100.0	84	573.3	111.4
45	338.7	65.8	05	397.6	77.3	65	456.5	88.7	25	515.4	100.2	85	574.3	111.6
46	339.6	66.0	06	398.5	77.5	66	457.4	88.9	26	516.3	100.4	86	575.2	111.8
47	340.6	66.2	07	399.5	77.7	67	458.4	89.1	27	517.3	100.6	87	576.2	112.1
48	341.6	66.4	08	400.5	77.9	68	459.4	89.3	28	518.3	100.7	88	577.2	112.3
49	342.6	66.6	09	401.5	78.1	69	460.4	89.5	29	519.3	100.9	89	578.2	112.4
50	343.6	66.8	10	402.5	78.2	70	461.4	89.7	30	520.3	101.1	90	579.2	112.6
351	344.6	67.0	411	403.4	78.4	471	462.3	89.9	531	521.2	101.3	591	580.1	112.8
52	345.5	67.2	12	404.4	78.6	72	463.3	90.1	32	522.2	101.5	92	581.1	113.0
53	346.5	67.4	13	405.4	78.8	73	464.3	90.3	33	523.2	101.7	93	582.1	113.2
54	347.5	67.5	14	406.4	79.0	74	465.3	90.4	34	524.2	101.9	94	583.1	113.3
55	348.5	67.7	15	407.4	79.2	75	466.3	90.6	35	525.2	102.1	95	584.1	113.5
56	349.5	67.9	16	408.4	79.4	76	467.3	90.8	36	526.2	102.3	96	585.0	113.7
57	350.4	68.1	17	409.3	79.6	77	468.2	91.0	37	527.1	102.5	97	586.0	113.9
58	351.4	68.3	18	410.3	79.8	78	469.2	91.2	38	528.1	102.7	98	587.0	114.1
59	352.4	68.5	19	411.3	79.9	79	470.2	91.4	39	529.1	102.8	99	588.0	114.3
60	353.4	68.7	20	412.3	80.1	80	471.2	91.6	40	530.1	103.0	600	589.0	114.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

79° (101°, 259°, 281°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 12° (168°, 192°, 348°).

Dist.	Lat.	Dep	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.2	61	59.7	12.7	121	118.4	25.2	181	177.0	37.6	241	235.7	50.1
2	2.0	0.4	62	60.6	12.9	22	119.3	25.4	82	178.0	37.8	42	236.7	50.3
3	2.9	0.6	63	61.6	13.1	23	120.3	25.6	83	179.0	38.0	43	237.7	50.5
4	3.9	0.8	64	62.6	13.3	24	121.3	25.8	84	180.0	38.3	44	238.7	50.7
5	4.9	1.0	65	63.6	13.5	25	122.3	26.0	85	181.0	38.5	45	239.6	50.9
6	5.9	1.2	66	64.6	13.7	26	123.2	26.2	86	181.9	38.7	46	240.6	51.1
7	6.8	1.5	67	65.5	13.9	27	124.2	26.4	87	182.9	38.9	47	241.6	51.4
8	7.8	1.7	68	66.5	14.1	28	125.2	26.6	88	183.9	39.1	48	242.6	51.6
9	8.8	1.9	69	67.5	14.3	29	126.2	26.8	89	184.9	39.3	49	243.6	51.8
10	9.8	2.1	70	68.5	14.6	30	127.2	27.0	90	185.8	39.5	50	244.5	52.0
11	10.8	2.3	71	69.4	14.8	131	128.1	27.2	191	186.8	39.7	251	245.5	52.2
12	11.7	2.5	72	70.4	15.0	32	129.1	27.4	92	187.8	39.9	52	246.5	52.4
13	12.7	2.7	73	71.4	15.2	33	130.1	27.7	93	188.8	40.1	53	247.5	52.6
14	13.7	2.9	74	72.4	15.4	34	131.1	27.9	94	189.8	40.3	54	248.4	52.8
15	14.7	3.1	75	73.4	15.6	35	132.0	28.1	95	190.7	40.5	55	249.4	53.0
16	15.7	3.3	76	74.3	15.8	36	133.0	28.3	96	191.7	40.8	56	250.4	53.2
17	16.6	3.5	77	75.3	16.0	37	134.0	28.5	97	192.7	41.0	57	251.4	53.4
18	17.6	3.7	78	76.3	16.2	38	135.0	28.7	98	193.7	41.2	58	252.4	53.6
19	18.6	4.0	79	77.3	16.4	39	136.0	28.9	99	194.7	41.4	59	253.3	53.8
20	19.6	4.2	80	78.3	16.6	40	136.9	29.1	200	195.6	41.6	60	254.3	54.1
21	20.5	4.4	81	79.2	16.8	141	137.9	29.3	201	196.6	41.8	261	255.3	54.3
22	21.5	4.6	82	80.2	17.0	42	138.9	29.5	02	197.6	42.0	62	256.3	54.5
23	22.5	4.8	83	81.2	17.3	43	139.9	29.7	03	198.6	42.2	63	257.3	54.7
24	23.5	5.0	84	82.2	17.5	44	140.9	29.9	04	199.5	42.4	64	258.2	54.9
25	24.5	5.2	85	83.1	17.7	45	141.8	30.1	05	200.5	42.6	65	259.2	55.1
26	25.4	5.4	86	84.1	17.9	46	142.8	30.4	06	201.5	42.8	66	260.2	55.3
27	26.4	5.6	87	85.1	18.1	47	143.8	30.6	07	202.5	43.0	67	261.2	55.5
28	27.4	5.8	88	86.1	18.3	48	144.8	30.8	08	203.5	43.2	68	262.1	55.7
29	28.4	6.0	89	87.1	18.5	49	145.7	31.0	09	204.4	43.5	69	263.1	55.9
30	29.3	6.2	90	88.0	18.7	50	146.7	31.2	10	205.4	43.7	70	264.1	56.1
31	30.3	6.4	91	89.0	18.9	151	147.7	31.4	211	206.4	43.9	271	265.1	56.3
32	31.3	6.7	92	90.0	19.1	52	148.7	31.6	12	207.4	44.1	72	266.1	56.6
33	32.3	6.9	93	91.0	19.3	53	149.7	31.8	13	208.3	44.3	73	267.0	56.8
34	33.3	7.1	94	91.9	19.5	54	150.6	32.0	14	209.3	44.5	74	268.0	57.0
35	34.2	7.3	95	92.9	19.8	55	151.6	32.2	15	210.3	44.7	75	269.0	57.2
36	35.2	7.5	96	93.9	20.0	56	152.6	32.4	16	211.3	44.9	76	270.0	57.4
37	36.2	7.7	97	94.9	20.2	57	153.6	32.6	17	212.3	45.1	77	270.9	57.6
38	37.2	7.9	98	95.9	20.4	58	154.5	32.9	18	213.2	45.3	78	271.9	57.8
39	38.1	8.1	99	96.8	20.6	59	155.5	33.1	19	214.2	45.5	79	272.9	58.0
40	39.1	8.3	100	97.8	20.8	60	156.5	33.3	20	215.2	45.7	80	273.9	58.2
41	40.1	8.5	101	98.8	21.0	161	157.5	33.5	221	216.2	45.9	281	274.9	58.4
42	41.1	8.7	02	99.8	21.2	62	158.5	33.7	22	217.1	46.2	82	275.8	58.6
43	42.1	8.9	03	100.7	21.4	63	159.4	33.9	23	218.1	46.4	83	276.8	58.8
44	43.0	9.1	04	101.7	21.6	64	160.4	34.1	24	219.1	46.6	84	277.8	59.0
45	44.0	9.4	05	102.7	21.8	65	161.4	34.3	25	220.1	46.8	85	278.8	59.3
46	45.0	9.6	06	103.7	22.0	66	162.4	34.5	26	221.1	47.0	86	279.8	59.5
47	46.0	9.8	07	104.7	22.2	67	163.4	34.7	27	222.0	47.2	87	280.7	59.7
48	47.0	10.0	08	105.7	22.5	68	164.3	34.9	28	223.0	47.4	88	281.7	59.9
49	47.9	10.2	09	106.6	22.7	69	165.3	35.1	29	224.0	47.6	89	282.7	60.1
50	48.9	10.4	10	107.6	22.9	70	166.3	35.3	30	225.0	47.8	90	283.7	60.3
51	49.9	10.6	111	108.6	23.1	171	167.3	35.6	231	226.0	48.0	291	284.6	60.5
52	50.9	10.3	12	109.6	23.3	72	168.2	35.8	32	226.9	48.2	92	285.6	60.7
53	51.8	11.0	13	110.5	23.5	73	169.2	36.0	33	227.9	48.4	93	286.6	60.9
54	52.8	11.2	14	111.5	23.7	74	170.2	36.2	34	228.9	48.7	94	287.6	61.1
55	53.8	11.4	15	112.5	23.9	75	171.2	36.4	35	229.9	48.9	95	288.6	61.3
56	54.8	11.6	16	113.5	24.1	76	172.2	36.6	36	230.8	49.1	96	289.5	61.5
57	55.8	11.9	17	114.4	24.3	77	173.1	36.8	37	231.8	49.3	97	290.5	61.7
58	56.7	12.1	18	115.4	24.5	78	174.1	37.0	38	232.8	49.5	98	291.5	62.0
59	57.7	12.3	19	116.4	24.7	79	175.1	37.2	39	233.8	49.7	99	292.5	62.2
60	58.7	12.5	20	117.4	24.9	80	176.1	37.4	40	234.8	49.9	300	293.4	62.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

78° (102°, 258°, 282°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 12° (168°, 192°, 348°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	294.4	62.6	361	353.1	75.0	421	411.8	87.5	481	470.5	100.0	541	529.2	112.5
02	295.4	62.8	62	354.1	75.2	22	412.8	87.7	82	471.5	100.2	42	530.2	112.7
03	296.4	63.0	63	355.1	75.4	23	413.8	87.9	83	472.4	100.4	43	531.1	112.9
04	297.4	63.2	64	356.0	75.7	24	414.7	88.1	84	473.4	100.6	44	532.1	113.1
05	298.3	63.4	65	357.0	75.9	25	415.7	88.3	85	474.4	100.8	45	533.1	113.3
06	299.3	63.6	66	358.0	76.1	26	416.7	88.6	86	475.4	101.0	46	534.1	113.5
07	300.3	63.8	67	359.0	76.3	27	417.7	88.8	87	476.4	101.3	47	535.0	113.7
08	301.3	64.0	68	360.0	76.5	28	418.6	89.0	88	477.3	101.5	48	536.0	113.9
09	302.2	64.2	69	360.9	76.7	29	419.6	89.2	89	478.3	101.7	49	537.0	114.1
10	303.2	64.5	70	361.9	76.9	30	420.6	89.4	90	479.3	101.9	50	538.0	114.4
311	304.2	64.7	371	362.9	77.1	431	421.6	89.6	491	480.3	102.1	551	539.0	114.6
12	305.2	64.9	72	363.9	77.3	32	422.6	89.8	92	481.2	102.3	52	539.9	114.8
13	306.2	65.1	73	364.8	77.6	33	423.5	90.0	93	482.2	102.5	53	540.9	115.0
14	307.1	65.3	74	365.8	77.8	34	424.5	90.2	94	483.2	102.7	54	541.9	115.2
15	308.1	65.5	75	366.8	78.0	35	425.5	90.4	95	484.2	102.9	55	542.9	115.4
16	309.1	65.7	76	367.8	78.2	36	426.5	90.6	96	485.2	103.1	56	543.9	115.6
17	310.1	65.9	77	368.8	78.4	37	427.5	90.9	97	486.1	103.3	57	544.8	115.8
18	311.1	66.1	78	369.7	78.6	38	428.4	91.1	98	487.1	103.5	58	545.8	116.0
19	312.0	66.3	79	370.7	78.8	39	429.4	91.3	99	488.1	103.7	59	546.8	116.2
20	313.0	66.5	80	371.7	79.0	40	430.4	91.5	500	489.1	104.0	60	547.8	116.4
321	314.0	66.7	381	372.7	79.2	441	431.4	91.7	501	490.1	104.2	561	548.7	116.6
22	315.0	66.9	82	373.7	79.4	42	432.3	91.9	02	491.0	104.4	62	549.7	116.8
23	315.9	67.2	83	374.6	79.6	43	433.3	92.1	03	492.0	104.6	63	550.7	117.1
24	316.9	67.4	84	375.6	79.8	44	434.3	92.3	04	493.0	104.8	64	551.7	117.3
25	317.9	67.6	85	376.6	80.0	45	435.3	92.5	05	494.0	105.0	65	552.7	117.5
26	318.9	67.8	86	377.6	80.3	46	436.3	92.7	06	494.9	105.2	66	553.6	117.7
27	319.9	68.0	87	378.5	80.5	47	437.2	92.9	07	495.9	105.4	67	554.6	117.9
28	320.8	68.2	88	379.5	80.7	48	438.2	93.1	08	496.9	105.6	68	555.6	118.1
29	321.8	68.4	89	380.5	80.9	49	439.2	93.4	09	497.9	105.8	69	556.6	118.3
30	322.8	68.6	90	381.5	81.1	50	440.2	93.6	10	498.9	106.0	70	557.5	118.5
331	323.8	68.8	391	382.5	81.3	451	441.1	93.8	511	499.8	106.2	571	558.5	118.7
32	324.7	69.0	92	383.4	81.5	52	442.1	94.0	12	500.8	106.5	72	559.5	118.9
33	325.7	69.2	93	384.4	81.7	53	443.1	94.2	13	501.8	106.7	73	560.5	119.1
34	326.7	69.4	94	385.4	81.9	54	444.1	94.4	14	502.8	106.9	74	561.5	119.3
35	327.7	69.7	95	386.4	82.1	55	445.1	94.6	15	503.7	107.1	75	562.4	119.5
36	328.7	69.9	96	387.3	82.3	56	446.0	94.8	16	504.7	107.3	76	563.4	119.8
37	329.6	70.1	97	388.3	82.5	57	447.0	95.0	17	505.7	107.5	77	564.4	120.0
38	330.6	70.3	98	389.3	82.7	58	448.0	95.2	18	506.7	107.7	78	565.4	120.2
39	331.6	70.5	99	390.3	83.0	59	449.0	95.4	19	507.7	107.9	79	566.3	120.4
40	332.6	70.7	400	391.3	83.2	60	449.9	95.6	20	508.7	108.1	80	567.3	120.6
341	333.5	70.9	401	392.2	83.4	461	450.9	95.8	521	509.6	108.3	581	568.3	120.8
42	334.5	71.1	02	393.2	83.6	62	451.9	96.1	22	510.6	108.5	82	569.3	121.0
43	335.5	71.3	03	394.2	83.8	63	452.9	96.3	23	511.6	108.7	83	570.3	121.2
44	336.5	71.5	04	395.2	84.0	64	453.9	96.5	24	512.5	108.9	84	571.2	121.4
45	337.5	71.7	05	396.2	84.2	65	454.8	96.7	25	513.5	109.2	85	572.2	121.6
46	338.4	71.9	06	397.1	84.4	66	455.8	96.9	26	514.5	109.4	86	573.2	121.8
47	339.4	72.1	07	398.1	84.6	67	456.8	97.1	27	515.5	109.6	87	574.2	122.0
48	340.4	72.4	08	399.1	84.8	68	457.8	97.3	28	516.5	109.8	88	575.2	122.3
49	341.4	72.6	09	400.1	85.0	69	458.8	97.5	29	517.4	110.0	89	576.1	122.5
50	342.4	72.8	10	401.0	85.2	70	459.7	97.7	30	518.4	110.2	90	577.1	122.7
351	343.3	73.0	411	402.0	85.5	471	460.7	97.9	531	519.4	110.4	591	578.1	122.9
52	344.3	73.2	12	403.0	85.7	72	461.7	98.1	32	520.4	110.6	92	579.1	123.1
53	345.3	73.4	13	404.0	85.9	73	462.7	98.3	33	521.4	110.8	93	580.0	123.3
54	346.3	73.6	14	405.0	86.1	74	463.6	98.6	34	522.3	111.0	94	581.0	123.5
55	347.2	73.8	15	405.9	86.3	75	464.6	98.8	35	523.3	111.2	95	582.0	123.7
56	348.2	74.0	16	406.9	86.5	76	465.6	99.0	36	524.3	111.4	96	583.0	123.9
57	349.2	74.2	17	407.9	86.7	77	466.6	99.2	37	525.3	111.6	97	584.0	124.1
58	350.2	74.4	18	408.9	86.9	78	467.6	99.4	38	526.2	111.9	98	584.9	124.3
59	351.2	74.6	19	409.8	87.1	79	468.5	99.6	39	527.2	112.1	99	585.9	124.5
60	352.1	74.8	20	410.8	87.3	80	469.5	99.8	40	528.2	112.3	600	586.9	124.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

78° (102°, 258°, 282°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 13° (167°, 193°, 347°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.2	61	59.4	13.7	121	117.9	27.2	181	176.4	40.7	241	234.8	54.2
2	1.9	0.4	62	60.4	13.9	22	118.9	27.4	82	177.3	40.9	42	235.8	54.4
3	2.9	0.7	63	61.4	14.2	23	119.8	27.7	83	178.3	41.2	43	236.8	54.7
4	3.9	0.9	64	62.4	14.4	24	120.8	27.9	84	179.3	41.4	44	237.7	54.9
5	4.9	1.1	65	63.3	14.6	25	121.8	28.1	85	180.3	41.6	45	238.7	55.1
6	5.8	1.3	66	64.3	14.8	26	122.8	28.3	86	181.2	41.8	46	239.7	55.3
7	6.8	1.6	67	65.3	15.1	27	123.7	28.6	87	182.2	42.1	47	240.7	55.6
8	7.8	1.8	68	66.3	15.3	28	124.7	28.8	88	183.2	42.3	48	241.6	55.8
9	8.8	2.0	69	67.2	15.5	29	125.7	29.0	89	184.2	42.5	49	242.6	56.0
10	9.7	2.2	70	68.2	15.7	30	126.7	29.2	90	185.1	42.7	50	243.6	56.2
11	10.7	2.5	71	69.2	16.0	131	127.6	29.5	191	186.1	43.0	251	244.6	56.5
12	11.7	2.7	72	70.2	16.2	32	128.6	29.7	92	187.1	43.2	52	245.5	56.7
13	12.7	2.9	73	71.1	16.4	33	129.6	29.9	93	188.1	43.4	53	246.5	56.9
14	13.6	3.1	74	72.1	16.6	34	130.6	30.1	94	189.0	43.6	54	247.5	57.1
15	14.6	3.4	75	73.1	16.9	35	131.5	30.4	95	190.0	43.9	55	248.5	57.4
16	15.6	3.6	76	74.1	17.1	36	132.5	30.6	96	191.0	44.1	56	249.4	57.6
17	16.6	3.8	77	75.0	17.3	37	133.5	30.8	97	192.0	44.3	57	250.4	57.8
18	17.5	4.0	78	76.0	17.5	38	134.5	31.0	98	192.9	44.5	58	251.4	58.0
19	18.5	4.3	79	77.0	17.8	39	135.4	31.3	99	193.9	44.8	59	252.4	58.3
20	19.5	4.5	80	77.9	18.0	40	136.4	31.5	200	194.9	45.0	60	253.3	58.5
21	20.5	4.7	81	78.9	18.2	141	137.4	31.7	201	195.8	45.2	261	254.3	58.7
22	21.4	4.9	82	79.9	18.4	42	138.4	31.9	02	196.8	45.4	62	255.3	58.9
23	22.4	5.2	83	80.9	18.7	43	139.3	32.2	03	197.8	45.7	63	256.3	59.2
24	23.4	5.4	84	81.8	18.9	44	140.3	32.4	04	198.8	45.9	64	257.2	59.4
25	24.4	5.6	85	82.8	19.1	45	141.3	32.6	05	199.7	46.1	65	258.2	59.6
26	25.3	5.8	86	83.8	19.3	46	142.3	32.8	06	200.7	46.3	66	259.2	59.8
27	26.3	6.1	87	84.8	19.6	47	143.2	33.1	07	201.7	46.6	67	260.2	60.1
28	27.3	6.3	88	85.7	19.8	48	144.2	33.3	08	202.7	46.8	68	261.1	60.3
29	28.3	6.5	89	86.7	20.0	49	145.2	33.5	09	203.6	47.0	69	262.1	60.5
30	29.2	6.7	90	87.7	20.2	50	146.2	33.7	10	204.6	47.2	70	263.1	60.7
31	30.2	7.0	91	88.7	20.5	151	147.1	34.0	211	205.6	47.5	271	264.1	61.0
32	31.2	7.2	92	89.6	20.7	52	148.1	34.2	12	206.6	47.7	72	265.0	61.2
33	32.2	7.4	93	90.6	20.9	53	149.1	34.4	13	207.5	47.9	73	266.0	61.4
34	33.1	7.6	94	91.6	21.1	54	150.1	34.6	14	208.5	48.1	74	267.0	61.6
35	34.1	7.9	95	92.6	21.4	55	151.0	34.9	15	209.5	48.4	75	268.0	61.9
36	35.1	8.1	96	93.5	21.6	56	152.0	35.1	16	210.5	48.6	76	268.9	62.1
37	36.1	8.3	97	94.5	21.8	57	153.0	35.3	17	211.4	48.8	77	269.9	62.3
38	37.0	8.5	98	95.5	22.0	58	154.0	35.5	18	212.4	49.0	78	270.9	62.5
39	38.0	8.8	99	96.5	22.3	59	154.9	35.8	19	213.4	49.3	79	271.8	62.8
40	39.0	9.0	100	97.4	22.5	60	155.9	36.0	20	214.4	49.5	80	272.8	63.0
41	39.9	9.2	101	98.4	22.7	161	156.9	36.2	221	215.3	49.7	281	273.8	63.2
42	40.9	9.4	02	99.4	22.9	62	157.8	36.4	22	216.3	49.9	82	274.8	63.4
43	41.9	9.7	03	100.4	23.2	63	158.8	36.7	23	217.3	50.2	83	275.7	63.7
44	42.9	9.9	04	101.3	23.4	64	159.8	36.9	24	218.3	50.4	84	276.7	63.9
45	43.8	10.1	05	102.3	23.6	65	160.8	37.1	25	219.2	50.6	85	277.7	64.1
46	44.8	10.3	06	103.3	23.8	66	161.7	37.3	26	220.2	50.8	86	278.7	64.3
47	45.8	10.6	07	104.3	24.1	67	162.7	37.6	27	221.2	51.1	87	279.6	64.6
48	46.8	10.8	08	105.2	24.3	68	163.7	37.8	28	222.2	51.3	88	280.6	64.8
49	47.7	11.0	09	106.2	24.5	69	164.7	38.0	29	223.1	51.5	89	281.6	65.0
50	48.7	11.2	10	107.2	24.7	70	165.6	38.2	30	224.1	51.7	90	282.6	65.2
51	49.7	11.5	111	108.2	25.0	171	166.6	38.5	231	225.1	52.0	291	283.5	65.5
52	50.7	11.7	12	109.1	25.2	72	167.6	38.7	32	226.1	52.2	92	284.5	65.7
53	51.6	11.9	13	110.1	25.4	73	168.6	38.9	33	227.0	52.4	93	285.5	65.9
54	52.6	12.1	14	111.1	25.6	74	169.5	39.1	34	228.0	52.6	94	286.5	66.1
55	53.6	12.4	15	112.1	25.9	75	170.5	39.4	35	229.0	52.9	95	287.4	66.4
56	54.6	12.6	16	113.0	26.1	76	171.5	39.6	36	230.0	53.1	96	288.4	66.6
57	55.5	12.8	17	114.0	26.3	77	172.5	39.8	37	230.9	53.3	97	289.4	66.8
58	56.5	13.0	18	115.0	26.5	78	173.4	40.0	38	231.9	53.5	98	290.4	67.0
59	57.5	13.3	19	116.0	26.8	79	174.4	40.3	39	232.9	53.8	99	291.3	67.3
60	58.5	13.5	20	116.9	27.0	80	175.4	40.5	40	233.8	54.0	300	292.3	67.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

77° (103°, 257°, 283°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

Difference of Latitude and Departure for 13° (167°, 193°, 347°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	293.3	67.7	361	351.7	81.2	421	410.2	94.7	481	468.7	108.2	541	527.1	121.7
02	294.3	67.9	62	352.7	81.4	22	411.2	94.9	82	469.6	108.4	42	528.1	121.9
03	295.2	68.2	63	353.7	81.7	23	412.2	95.2	83	470.6	108.7	43	529.1	122.1
04	296.2	68.4	64	354.7	81.9	24	413.1	95.4	84	471.6	108.9	44	530.1	122.4
05	297.2	68.6	65	355.6	82.1	25	414.1	95.6	85	472.6	109.1	45	531.0	122.6
06	298.2	68.8	66	356.6	82.3	26	415.1	95.8	86	473.5	109.3	46	532.0	122.8
07	299.1	69.1	67	357.6	82.6	27	416.1	96.1	87	474.5	109.6	47	533.0	123.0
08	300.1	69.3	68	358.6	82.8	28	417.0	96.3	88	475.5	109.8	48	534.0	123.3
09	301.1	69.5	69	359.5	83.0	29	418.0	96.5	89	476.5	110.0	49	534.9	123.5
10	302.1	69.7	70	360.5	83.2	30	419.0	96.7	90	477.4	110.2	50	535.9	123.7
311	303.0	70.0	371	361.5	83.5	431	420.0	97.0	491	478.4	110.5	551	536.9	123.9
12	304.0	70.2	72	362.5	83.7	32	420.9	97.2	92	479.4	110.7	52	537.9	124.2
13	305.0	70.4	73	363.4	83.9	33	421.9	97.4	93	480.4	110.9	53	538.8	124.4
14	306.0	70.6	74	364.4	84.1	34	422.9	97.6	94	481.3	111.1	54	539.8	124.6
15	306.9	70.9	75	365.4	84.4	35	423.9	97.9	95	482.3	111.4	55	540.8	124.8
16	307.9	71.1	76	366.4	84.6	36	424.8	98.1	96	483.3	111.6	56	541.7	125.1
17	308.9	71.3	77	367.3	84.8	37	425.8	98.3	97	484.3	111.8	57	542.7	125.3
18	309.8	71.5	78	368.3	85.0	38	426.8	98.5	98	485.2	112.0	58	543.7	125.5
19	310.8	71.8	79	369.3	85.3	39	427.7	98.8	99	486.2	112.3	59	544.7	125.7
20	311.8	72.0	80	370.3	85.5	40	428.7	99.0	500	487.2	112.5	60	545.6	126.0
321	312.8	72.2	381	371.2	85.7	441	429.7	99.2	501	488.2	112.7	561	546.6	126.2
22	313.7	72.4	82	372.2	85.9	42	430.7	99.4	02	489.1	112.9	62	547.6	126.4
23	314.7	72.7	83	373.2	86.2	43	431.6	99.7	03	490.1	113.2	63	548.6	126.6
24	315.7	72.9	84	374.2	86.4	44	432.6	99.9	04	491.1	113.4	64	549.5	126.9
25	316.7	73.1	85	375.1	86.6	45	433.6	100.1	05	492.1	113.6	65	550.5	127.1
26	317.6	73.3	86	376.1	86.8	46	434.6	100.3	06	493.0	113.8	66	551.5	127.3
27	318.6	73.6	87	377.1	87.1	47	435.5	100.6	07	494.0	114.1	67	552.5	127.5
28	319.6	73.8	88	378.1	87.3	48	436.5	100.8	08	495.0	114.3	68	553.4	127.8
29	320.6	74.0	89	379.0	87.5	49	437.5	101.0	09	496.0	114.5	69	554.4	128.0
30	321.5	74.2	90	380.0	87.7	50	438.5	101.2	10	496.9	114.7	70	555.4	128.2
331	322.5	74.5	391	381.0	88.0	451	439.4	101.5	511	497.9	115.0	571	556.4	128.4
32	323.5	74.7	92	382.0	88.2	52	440.4	101.7	12	498.9	115.2	72	557.3	128.7
33	324.5	74.9	93	382.9	88.4	53	441.4	101.9	13	499.9	115.4	73	558.3	128.9
34	325.4	75.1	94	383.9	88.6	54	442.4	102.1	14	500.8	115.6	74	559.3	129.1
35	326.4	75.4	95	384.9	88.9	55	443.3	102.4	15	501.8	115.8	75	560.3	129.3
36	327.4	75.6	96	385.9	89.1	56	444.3	102.6	16	502.8	116.1	76	561.2	129.6
37	328.4	75.8	97	386.8	89.3	57	445.3	102.8	17	503.7	116.3	77	562.2	129.8
38	329.3	76.0	98	387.8	89.5	58	446.3	103.0	18	504.7	116.5	78	563.2	130.0
39	330.3	76.3	99	388.8	89.8	59	447.2	103.3	19	505.7	116.7	79	564.2	130.2
40	331.3	76.5	400	389.7	90.0	60	448.2	103.5	20	506.7	117.0	80	565.1	130.5
341	332.3	76.7	401	390.7	90.2	461	449.2	103.7	521	507.6	117.2	581	566.1	130.7
42	333.2	76.9	02	391.7	90.4	62	450.2	103.9	22	508.6	117.5	82	567.1	130.9
43	334.2	77.2	03	392.7	90.7	63	451.1	104.2	23	509.6	117.6	83	568.1	131.1
44	335.2	77.4	04	393.6	90.9	64	452.1	104.4	24	510.6	117.9	84	569.0	131.4
45	336.2	77.6	05	394.6	91.1	65	453.1	104.6	25	511.5	118.1	85	570.0	131.6
46	337.1	77.8	06	395.6	91.3	66	454.1	104.8	26	512.5	118.3	86	571.0	131.8
47	338.1	78.1	07	396.6	91.6	67	455.0	105.1	27	513.5	118.5	87	572.0	132.0
48	339.1	78.3	08	397.5	91.8	68	456.0	105.3	28	514.5	118.8	88	572.9	132.3
49	340.1	78.5	09	398.5	92.0	69	457.0	105.5	29	515.4	119.0	89	573.9	132.5
50	341.0	78.7	10	399.5	92.2	70	458.0	105.7	30	516.4	119.2	90	574.9	132.7
351	342.0	79.0	411	400.5	92.5	471	458.9	106.0	531	517.4	119.4	591	575.9	132.9
52	343.0	79.2	12	401.4	92.7	72	459.9	106.2	32	518.4	119.7	92	576.8	133.2
53	344.0	79.4	13	402.4	92.9	73	460.9	106.4	33	519.3	119.9	93	577.8	133.4
54	344.9	79.6	14	403.4	93.1	74	461.9	106.6	34	520.3	120.1	94	578.8	133.6
55	345.9	79.9	15	404.4	93.4	75	462.8	106.9	35	521.3	120.3	95	579.8	133.8
56	346.9	80.1	16	405.3	93.6	76	463.8	107.1	36	522.3	120.6	96	580.7	134.1
57	347.9	80.3	17	406.3	93.8	77	464.8	107.3	37	523.2	120.8	97	581.7	134.3
58	348.8	80.5	18	407.3	94.0	78	465.7	107.5	38	524.2	121.0	98	582.7	134.5
59	349.8	80.8	19	408.3	94.3	79	466.7	107.8	39	525.2	121.2	99	583.6	134.7
60	350.8	81.0	20	409.2	94.5	80	467.7	108.0	40	526.2	121.5	600	584.6	135.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

77° (103°, 257°, 283°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 14° (166°, 194°, 346°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.2	61	59.2	14.8	121	117.4	29.3	181	175.6	43.8	241	233.8	58.3
2	1.9	0.5	62	60.2	15.0	22	118.4	29.5	82	176.6	44.0	42	234.8	58.5
3	2.9	0.7	63	61.1	15.2	23	119.3	29.8	83	177.6	44.3	43	235.8	58.8
4	3.9	1.0	64	62.1	15.5	24	120.3	30.0	84	178.5	44.5	44	236.8	59.0
5	4.9	1.2	65	63.1	15.7	25	121.3	30.2	85	179.5	44.8	45	237.7	59.3
6	5.8	1.5	66	64.0	16.0	26	122.3	30.5	86	180.5	45.0	46	238.7	59.5
7	6.8	1.7	67	65.0	16.2	27	123.2	30.7	87	181.4	45.2	47	239.7	59 8
8	7.8	1.9	68	66.0	16.5	28	124.2	31.0	88	182.4	45.5	48	240.6	60.0
9	8.7	2.2	69	67.0	16.7	29	125.2	31.2	89	183.4	45.7	49	241.6	60.2
10	9.7	2.4	70	67.9	16.9	30	126.1	31.4	90	184.4	46.0	50	242.6	60.5
11	10.7	2.7	71	68.9	17.2	131	127.1	31.7	191	185.3	46.2	251	243.5	60.7
12	11.6	2.9	72	69.9	17.4	32	128.1	31.9	92	186.3	46.4	52	244.5	61.0
13	12.6	3.1	73	70.8	17.7	33	129.0	32.2	93	187.3	46.7	53	245.5	61.2
14	13.6	3.4	74	71.8	17.9	34	130.0	32.4	94	188.2	46.9	54	246.5	61.4
15	14.6	3.6	75	72.8	18.1	35	131.0	32.7	95	189.2	47.2	55	247.4	61.7
16	15.5	3.9	76	73.7	18.4	36	132.0	32.9	96	190.2	47.4	56	248.4	61.9
17	16.5	4.1	77	74.7	18.6	37	132.9	33.1	97	191.1	47.7	57	249.4	62.2
18	17.5	4.4	78	75.7	18.9	38	133.9	33.4	98	192.1	47.9	58	250.3	62.4
19	18.4	4.6	79	76.7	19.1	39	134.9	33.6	99	193.1	48.1	59	251.3	62.7
20	19.4	4.8	80	77.6	19.4	40	135.8	33.9	200	194.1	48.4	60	252.3	62.9
21	20.4	5.1	81	78.6	19.6	141	136.8	34.1	201	195.0	48.6	261	253.2	63.1
22	21.3	5.3	82	79.6	19.8	42	137.8	34.4	02	196.0	48.9	62	254.2	63.4
23	22.3	5.6	83	80.5	20.1	43	138.8	34.6	03	197.0	49.1	63	255.2	63.6
24	23.3	5.8	84	81.5	20.3	44	139.7	34.8	04	197.9	49.4	64	256.2	63.9
25	24.3	6.0	85	82.5	20.6	45	140.7	35.1	05	198.9	49.6	65	257.1	64.1
26	25.2	6.3	86	83.4	20.8	46	141.7	35.3	06	199.9	49.8	66	258.1	64.4
27	26.2	6.5	87	84.4	21.0	47	142.6	35.6	07	200.9	50.1	67	259.1	64.6
28	27.2	6.8	88	85.4	21.3	48	143.6	35.8	08	201.8	50.3	68	260.0	64.8
29	28.1	7.0	89	86.4	21.5	49	144.6	36.0	09	202.8	50.6	69	261.0	65.1
30	29.1	7.3	90	87.3	21.8	50	145.5	36.3	10	203.8	50.8	70	262.0	65.3
31	30.1	7.5	91	88.3	22.0	151	146.5	36.5	211	204.7	51.0	271	263.0	65.6
32	31.0	7.7	92	89.3	22.3	52	147.5	36.8	12	205.7	51.3	72	263.9	65.8
33	32.0	8.0	93	90.2	22.5	53	148.5	37.0	13	206.7	51.5	73	264.9	66.0
34	33.0	8.2	94	91.2	22.7	54	149.4	37.3	14	207.6	51.8	74	265.9	66.3
35	34.0	8.5	95	92.2	23.0	55	150.4	37.5	15	208.6	52.0	75	266.8	66.5
36	34.9	8.7	96	93.1	23.2	56	151.4	37.7	16	209.6	52.3	76	267.8	66.8
37	35.9	9.0	97	94.1	23.5	57	152.3	38.0	17	210.6	52.5	77	268.8	67.0
38	36.9	9.2	98	95.1	23.7	58	153.3	38.2	18	211.5	52.7	78	269.7	67.3
39	37.8	9.4	99	96.1	24.0	59	154.3	38.5	19	212.5	53.0	79	270.7	67.5
40	38.8	9.7	100	97.0	24.2	60	155.2	38.7	20	213.5	53.2	80	271.7	67.7
41	39.8	9.9	101	98.0	24.4	161	156.2	38.9	221	214.4	53.5	281	272.7	68.0
42	40.8	10.2	02	99.0	24.7	62	157.2	39.2	22	215.4	53.7	82	273.6	68.2
43	41.7	10.4	03	99.9	24.9	63	158.2	39.4	23	216.4	53.9	83	274.6	68.5
44	42.7	10.6	04	100.9	25.2	64	159.1	39.7	24	217.3	54.2	84	275.6	68.7
45	43.7	10.9	05	101.9	25.4	65	160.1	39.9	25	218.3	54.4	85	276.5	68.9
46	44.6	11.1	06	102.9	25.6	66	161.1	40.2	26	219.3	54.7	86	277.5	69.2
47	45.6	11.4	07	103.8	25.9	67	162.0	40.4	27	220.3	54.9	87	278.5	69.4
48	46.6	11.6	08	104.8	26.1	68	163.0	40.6	28	221.2	55.2	88	279.4	69.7
49	47.5	11.9	09	105.8	26.4	69	164.0	40.9	29	222.2	55.4	89	280.4	69.9
50	48.5	12.1	10	106.7	26.6	70	165.0	41.1	30	223.2	55.6	90	281.4	70.2
51	49.5	12.3	111	107.7	26.9	171	165.9	41.4	231	224.1	55.9	291	282.4	70.4
52	50.5	12.6	12	108.7	27.1	72	166.9	41.6	32	225.1	56.1	92	283.3	70.6
53	51.4	12.8	13	109.6	27.3	73	167.9	41.9	33	226.1	56.4	93	284.3	70.9
54	52.4	13.1	14	110.6	27.6	74	168.8	42.1	34	227.0	56.6	94	285.3	71.1
55	53.4	13.3	15	111.6	27.8	75	169.8	42.3	35	228.0	56.9	95	286.2	71.4
56	54.3	13.5	16	112.6	28.1	76	170.8	42.6	36	229.0	57.1	96	287.2	71.6
57	55.3	13.8	17	113.5	28.3	77	171.7	42.8	37	230.0	57.3	97	288.2	71.9
58	56.3	14.0	18	114.5	28.5	78	172.7	43.1	38	230.9	57.6	98	289.1	72.1
59	57.2	14.3	19	115.5	28.8	79	173.7	43.3	39	231.9	57.8	99	290.1	72.3
60	58.2	14.5	20	116.4	29.0	80	174.7	43.5	40	232.9	58.1	300	291.1	72.6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

76° (104°, 256°, 284°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 14° (166°, 194°, 346°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	292.1	72.8	361	350.3	87.3	421	408.5	101.8	481	466.7	116.4	541	524.9	130.9
02	293.0	73.1	62	351.2	87.6	22	409.5	102.1	82	467.7	116.6	42	525.9	131.1
03	294.0	73.3	63	352.2	87.8	23	410.4	102.3	83	468.7	116.8	43	526.9	131.4
04	295.0	73.5	64	353.2	88.1	24	411.4	102.6	84	469.6	117.1	44	527.8	131.6
05	295.9	73.8	65	354.2	88.3	25	412.4	102.8	85	470.6	117.3	45	528.8	131.8
06	296.9	74.0	66	355.1	88.5	26	413.3	103.1	86	471.6	117.6	46	529.8	132.1
07	297.9	74.3	67	356.1	88.8	27	414.3	103.3	87	472.5	117.8	47	530.8	132.3
08	298.9	74.5	68	357.1	89.0	28	415.3	103.5	88	473.5	118.1	48	531.7	132.6
09	299.8	74.8	69	358.0	89.3	29	416.3	103.8	89	474.5	118.3	49	532.7	132.8
10	300.8	75.0	70	359.0	89.5	30	417.2	104.0	90	475.4	118.5	50	533.7	133.1
311	301.8	75.2	371	360.0	89.8	431	418.2	104.3	491	476.4	118.8	551	534.6	133.3
12	302.7	75.5	72	361.0	90.0	32	419.2	104.5	92	477.4	119.0	52	535.6	133.5
13	303.7	75.7	73	361.9	90.2	33	420.1	104.8	93	478.4	119.3	53	536.6	133.8
14	304.6	76.0	74	362.9	90.5	34	421.1	105.0	94	479.3	119.5	54	537.5	134.0
15	305.6	76.2	75	363.9	90.7	35	422.0	105.2	95	480.3	119.8	55	538.5	134.3
16	306.6	76.4	76	364.8	91.0	36	423.0	105.5	96	481.3	120.0	56	539.5	134.5
17	307.6	76.7	77	365.8	91.2	37	424.0	105.7	97	482.2	120.2	57	540.5	134.8
18	308.6	76.9	78	366.8	91.4	38	425.0	106.0	98	483.2	120.5	58	541.4	135.0
19	309.5	77.2	79	367.7	91.7	39	426.0	106.2	99	484.2	120.7	59	542.4	135.2
20	310.5	77.4	80	368.7	91.9	40	426.9	106.4	500	485.1	121.0	60	543.4	135.5
321	311.5	77.7	381	369.7	92.2	441	427.9	106.7	501	486.1	121.2	561	544.3	135.7
22	312.4	77.9	82	370.7	92.4	42	428.9	106.9	02	487.1	121.4	62	545.3	136.0
23	313.4	78.1	83	371.6	92.7	43	429.8	107.2	03	488.1	121.7	63	546.3	136.2
24	314.4	78.4	84	372.6	92.9	44	430.8	107.4	04	489.0	121.9	64	547.2	136.4
25	315.3	78.6	85	373.6	93.1	45	431.8	107.7	05	490.0	122.2	65	548.2	136.7
26	316.3	78.9	86	374.5	93.4	46	432.8	107.9	06	491.0	122.4	66	549.2	136.9
27	317.3	79.1	87	375.5	93.6	47	433.7	108.1	07	491.9	122.7	67	550.2	137.2
28	318.3	79.4	88	376.4	93.9	48	434.7	108.4	08	492.9	122.9	68	551.1	137.4
29	319.2	79.6	89	377.4	94.1	49	435.7	108.6	09	493.9	123.1	69	552.1	137.7
30	320.2	79.8	90	378.4	94.3	50	436.6	108.9	10	494.9	123.4	70	553.1	137.9
331	321.2	80.1	391	379.4	94.6	451	437.6	109.1	511	495.8	123.6	571	554.0	138.1
32	322.1	80.3	92	380.4	94.8	52	438.6	109.3	12	496.8	123.9	72	555.0	138.4
33	323.1	80.6	93	381.3	95.1	53	439.5	109.6	13	497.8	124.1	73	556.0	138.6
34	324.1	80.8	94	382.3	95.3	54	440.5	109.8	14	498.7	124.3	74	556.9	138.9
35	325.0	81.0	95	383.3	95.6	55	441.5	110.1	15	499.7	124.6	75	557.9	139.1
36	326.0	81.3	96	384.2	95.8	56	442.5	110.3	16	500.7	124.8	76	558.9	139.3
37	327.0	81.5	97	385.2	96.0	57	443.4	110.6	17	501.6	125.1	77	559.9	139.6
38	328.0	81.8	98	386.2	96.3	58	444.4	110.8	18	502.6	125.3	78	560.8	139.8
39	328.9	82.0	99	387.1	96.5	59	445.4	111.0	19	503.6	125.6	79	561.8	140.1
40	329.9	82.3	400	388.1	96.8	60	446.3	111.3	20	504.6	125.8	80	562.8	140.3
341	330.8	82.5	401	389.1	97.0	461	447.3	111.5	521	505.5	126.0	581	563.7	140.6
42	331.8	82.7	02	390.1	97.3	62	448.3	111.8	22	506.5	126.3	82	564.7	140.8
43	332.8	83.0	03	391.0	97.5	63	449.2	112.0	23	507.5	126.5	83	565.7	141.0
44	333.8	83.2	04	392.0	97.7	64	450.2	112.3	24	508.4	126.8	84	566.7	141.3
45	334.8	83.5	05	393.0	98.0	65	451.2	112.5	25	509.4	127.0	85	567.6	141.5
46	335.7	83.7	06	393.9	98.2	66	452.2	112.7	26	510.4	127.3	86	568.6	141.8
47	336.7	83.9	07	394.9	98.5	67	453.1	113.0	27	511.3	127.5	87	569.6	142.0
48	337.7	84.2	08	395.9	98.7	68	454.1	113.2	28	512.3	127.7	88	570.5	142.3
49	338.6	84.4	09	396.9	98.9	69	455.1	113.5	29	513.3	128.0	89	571.5	142.5
50	339.6	84.7	10	397.8	99.2	70	456.0	113.7	30	514.3	128.2	90	572.5	142.7
351	340.6	84.9	411	398.8	99.4	471	457.0	113.9	531	515.2	128.5	591	573.4	143.0
52	341.5	85.2	12	399.8	99.7	72	458.0	114.2	32	516.2	128.7	92	574.4	143.2
53	342.5	85.4	13	400.7	99.9	73	458.9	114.4	33	517.2	128.9	93	575.4	143.5
54	343.5	85.6	14	401.7	100.2	74	459.9	114.7	34	518.1	129.2	94	576.4	143.7
55	344.5	85.9	15	402.7	100.4	75	460.9	114.9	35	519.1	129.4	95	577.3	143.9
56	345.4	86.1	16	403.6	100.6	76	461.9	115.2	36	520.1	129.7	96	578.3	144.2
57	346.4	86.4	17	404.6	100.9	77	462.8	115.4	37	521.0	129.9	97	579.3	144.4
58	347.4	86.6	18	405.6	101.1	78	463.8	115.6	38	522.0	130.2	98	580.2	144.7
59	348.3	86.8	19	406.6	101.4	79	464.8	115.9	39	523.0	130.4	99	581.2	144.9
60	349.3	87.1	20	407.5	101.6	80	465.7	116.1	40	524.0	130.6	600	582.2	145.2
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

76° (104°, 256°, 284°).

In Plane Sailing.	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 15° (165°, 195°, 345°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.3	61	58.9	15.8	121	116.9	31.3	181	174.8	46.8	241	232.8	62.4
2	1.9	0.5	62	59.9	16.0	22	117.8	31.6	82	175.8	47.1	42	233.8	62.6
3	2.9	0.8	63	60.9	16.3	23	118.8	31.8	83	176.8	47.4	43	234.7	62.9
4	3.9	1.0	64	61.8	16.6	24	119.8	32.1	84	177.7	47.6	44	235.7	63.2
5	4.8	1.3	65	62.8	16.8	25	120.7	32.4	85	178.7	47.9	45	236.7	63.4
6	5.8	1.6	66	63.8	17.1	26	121.7	32.6	86	179.7	48.1	46	237.6	63.7
7	6.8	1.8	67	64.7	17.3	27	122.7	32.9	87	180.6	48.4	47	238.6	63.9
8	7.7	2.1	68	65.7	17.6	28	123.6	33.1	88	181.6	48.7	48	239.5	64.2
9	8.7	2.3	69	66.6	17.9	29	124.6	33.4	89	182.6	48.9	49	240.5	64.4
10	9.7	2.6	70	67.6	18.1	30	125.6	33.6	90	183.5	49.2	50	241.5	64.7
11	10.6	2.8	71	68.6	18.4	131	126.5	33.9	191	184.5	49.4	251	242.4	65.0
12	11.6	3.1	72	69.5	18.6	32	127.5	34.2	92	185.5	49.7	52	243.4	65.2
13	12.6	3.4	73	70.5	18.9	33	128.5	34.4	93	186.4	50.0	53	244.4	65.5
14	13.5	3.6	74	71.5	19.2	34	129.4	34.7	94	187.4	50.2	54	245.3	65.7
15	14.5	3.9	75	72.4	19.4	35	130.4	34.9	95	188.4	50.5	55	246.3	66.0
16	15.5	4.1	76	73.4	19.7	36	131.4	35.2	96	189.3	50.7	56	247.3	66.3
17	16.4	4.4	77	74.4	19.9	37	132.3	35.5	97	190.3	51.0	57	248.2	66.5
18	17.4	4.7	78	75.3	20.2	38	133.3	35.7	98	191.3	51.2	58	249.2	66.8
19	18.4	4.9	79	76.3	20.4	39	134.3	36.0	99	192.2	51.5	59	250.2	67.0
20	19.3	5.2	80	77.3	20.7	40	135.2	36.2	200	193.2	51.8	60	251.1	67.3
21	20.3	5.4	81	78.2	21.0	141	136.2	36.5	201	194.2	52.0	261	252.1	67.6
22	21.3	5.7	82	79.2	21.2	42	137.2	36.8	02	195.1	52.3	62	253.1	67.8
23	22.2	6.0	83	80.2	21.5	43	138.1	37.0	03	196.1	52.5	63	254.0	68.1
24	23.2	6.2	84	81.1	21.7	44	139.1	37.3	04	197.0	52.8	64	255.0	68.3
25	24.1	6.5	85	82.1	22.0	45	140.1	37.5	05	198.0	53.1	65	256.0	68.6
26	25.1	6.7	86	83.1	22.3	46	141.0	37.8	06	199.0	53.3	66	256.9	68.8
27	26.1	7.0	87	84.0	22.5	47	142.0	38.0	07	199.9	53.6	67	257.9	69.1
28	27.0	7.2	88	85.0	22.8	48	143.0	38.3	08	200.9	53.8	68	258.9	69.4
29	28.0	7.5	89	86.0	23.0	49	143.9	38.6	09	201.9	54.1	69	259.8	69.6
30	29.0	7.8	90	86.9	23.3	50	144.9	38.8	10	202.8	54.4	70	260.8	69.9
31	29.9	8.0	91	87.9	23.6	151	145.9	39.1	211	203.8	54.6	271	261.8	70.1
32	30.9	8.3	92	88.9	23.8	52	146.8	39.3	12	204.8	54.9	72	262.7	70.4
33	31.9	8.5	93	89.8	24.1	53	147.8	39.6	13	205.7	55.1	73	263.7	70.7
34	32.8	8.8	94	90.8	24.3	54	148.8	39.9	14	206.7	55.4	74	264.7	70.9
35	33.8	9.1	95	91.8	24.6	55	149.7	40.1	15	207.7	55.6	75	265.6	71.2
36	34.8	9.3	96	92.7	24.8	56	150.7	40.4	16	208.6	55.9	76	266.6	71.4
37	35.7	9.6	97	93.7	25.1	57	151.7	40.6	17	209.6	56.2	77	267.6	71.7
38	36.7	9.8	98	94.7	25.4	58	152.6	40.9	18	210.6	56.4	78	268.5	72.0
39	37.7	10.1	99	95.6	25.6	59	153.6	41.2	19	211.5	56.7	79	269.5	72.2
40	38.6	10.4	100	96.6	25.9	60	154.5	41.4	20	212.5	56.9	80	270.5	72.5
41	39.6	10.6	101	97.6	26.1	161	155.5	41.7	221	213.5	57.2	281	271.4	72.7
42	40.6	10.9	02	98.5	26.4	62	156.5	41.9	22	214.4	57.5	82	272.4	73.0
43	41.5	11.1	03	99.5	26.7	63	157.4	42.2	23	215.4	57.7	83	273.4	73.2
44	42.5	11.4	04	100.5	26.9	64	158.4	42.4	24	216.4	58.0	84	274.3	73.5
45	43.5	11.6	05	101.4	27.2	65	159.4	42.7	25	217.3	58.2	85	275.3	73.8
46	44.4	11.9	06	102 4	27.4	66	160.3	43.0	26	218.3	58.5	86	276.3	74.0
47	45.4	12.2	07	103.4	27.7	67	161.3	43.2	27	219.3	58.8	87	277.2	74.3
48	46.4	12.4	08	104.3	28.0	68	162.3	43.5	28	220.2	59.0	88	278.2	74.5
49	47.3	12.7	09	105.3	28.2	69	163.2	43.7	29	221.2	59.3	89	279.2	74.8
50	48.3	12.9	10	106.3	28.5	70	164.2	44.0	30	222.2	59.5	90	280.1	75.1
51	49.3	13.2	111	107.2	28.7	171	165.2	44.3	231	223.1	59.8	291	281.1	75.3
52	50.2	13.5	12	108.2	29.0	72	166.1	44.5	32	224.1	60.0	92	282.1	75.6
53	51.2	13.7	13	109.1	29.2	73	167.1	44.8	33	225.1	60.3	93	283.0	75.8
54	52.2	14.0	14	110.1	29.5	74	168.1	45.0	34	226.0	60.6	94	284.0	76.1
55	53.1	14.2	15	111.1	29.8	75	169.0	45.3	35	227.0	60.8	95	284.9	76.4
56	54.1	14.5	16	112.0	30.0	76	170.0	45.6	36	228.0	61.1	96	285.9	76.6
57	55.1	14.8	17	113.0	30.3	77	171.0	45.8	37	228.9	61.3	97	286.9	76.9
58	56.0	15.0	18	114.0	30.5	78	171.9	46.1	38	229.9	61.6	98	287.8	77.1
59	57.0	15.3	19	114.9	30.8	79	172.9	46.3	39	230.9	61.9	99	288.8	77.4
60	58.0	15.5	20	115.9	31.1	80	173.9	46.6	40	231.8	62.1	300	289.8	77.6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

75° (105°, 255°, 285°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		m	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 15° (165°, 195°, 345°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	290.7	77.9	361	348.7	93.4	421	406.7	109.0	481	464.6	124.5	541	522.6	140.0
02	291.7	78.2	62	349.7	93.7	22	407.6	109.2	82	465.6	124.8	42	523.5	140.3
03	292.7	78.4	63	350.6	94.0	23	408.6	109.5	83	466.5	125.0	43	524.5	140.5
04	293.6	78.7	64	351.6	94.2	24	409.6	109.7	84	467.5	125.3	44	525.5	140.8
05	294.6	78.9	65	352.6	94.5	25	410.5	110.0	85	468.5	125.5	45	526.4	141.1
06	295.6	79.2	66	353.5	94.7	26	411.5	110.3	86	469.4	125.8	46	527.4	141.3
07	296.5	79.5	67	354.5	95.0	27	412.4	110.5	87	470.4	126.0	47	528.4	141.6
08	297.5	79.7	68	355.5	95.2	28	413.4	110.8	88	471.4	126.3	48	529.3	141.8
09	298.5	80.0	69	356.4	95.5	29	414.4	111.0	89	472.3	126.6	49	530.3	142.1
10	299.4	80.2	70	357.4	95.8	30	415.3	111.3	90	473.3	126.8	50	531.3	142.4
311	300.4	80.5	371	358.4	96.0	431	416.3	111.6	491	474.3	127.1	551	532.2	142.6
12	301.4	80.8	72	359.3	96.3	32	417.3	111.8	92	475.2	127.3	52	533.2	142.9
13	302.3	81.0	73	360.3	96.5	33	418.2	112.1	93	476.2	127.6	53	534.2	143.1
14	303.3	81.3	74	361.3	96.8	34	419.2	112.3	94	477.2	127.9	54	535.1	143.4
15	304.3	81.5	75	362.2	97.1	35	420.2	112.6	95	478.1	128.1	55	536.1	143.6
16	305.2	81.8	76	363.2	97.3	36	421.1	112.8	96	479.1	128.4	56	537.1	143.9
17	306.2	82.0	77	364.2	97.6	37	422.1	113.1	97	480.1	128.6	57	538.0	144.2
18	307.2	82.3	78	365.1	97.8	38	423.1	113.4	98	481.0	128.9	58	539.0	144.4
19	308.1	82.6	79	366.1	98.1	39	424.0	113.6	99	482.0	129.2	59	540.0	144.7
20	309.1	82.8	80	367.1	98.4	40	425.0	113.9	500	483.0	129.4	60	540.9	144.9
321	310.1	83.1	381	368.0	98.6	441	426.0	114.1	501	483.9	129.7	561	541.9	145.2
22	311.0	83.3	82	369.0	98.9	42	426.9	114.4	02	484.9	129.9	62	542.9	145.5
23	312.0	83.6	83	369.9	99.1	43	427.9	114.7	03	485.9	130.2	63	543.8	145.7
24	313.0	83.9	84	370.9	99.4	44	428.9	114.9	04	486.8	130.4	64	544.8	146.0
25	313.9	84.1	85	371.9	99.6	45	429.8	115.2	05	487.8	130.7	65	545.7	146.2
26	314.9	84.4	86	372.8	99.9	46	430.8	115.4	06	488.8	131.0	66	546.7	146.5
27	315.9	84.6	87	373.8	100.2	47	431.8	115.7	07	489.7	131.2	67	547.7	146.8
28	316.8	84.9	88	374.8	100.4	48	432.7	116.0	08	490.7	131.5	68	548.6	147.0
29	317.8	85.2	89	375.7	100.7	49	433.7	116.2	09	491.7	131.7	69	549.6	147.3
30	318.8	85.4	90	376.7	100.9	50	434.7	116.5	10	492.6	132.0	70	550.6	147.5
331	319.7	85.7	391	377.7	101.2	451	435.6	116.7	511	493.6	132.3	571	551.5	147.8
32	320.7	85.9	92	378.6	101.5	52	436.6	117.0	12	494.6	132.5	72	552.5	148.0
33	321.7	86.2	93	379.6	101.7	53	437.6	117.2	13	495.5	132.8	73	553.5	148.3
34	322.6	86.4	94	330.6	102.0	54	438.5	117.5	14	496.5	133.0	74	554.4	148.6
35	323.6	86.7	95	381.5	102.2	55	439.5	117.8	15	497.5	133.3	75	555.4	148.8
36	324.6	87.0	96	382.5	102.5	56	440.5	118.0	16	498.4	133.6	76	556.4	149.1
37	325.5	87.2	97	383.5	102.8	57	441.4	118.3	17	499.4	133.8	77	557.3	149.3
38	326.5	87.5	98	384.4	103.0	58	442.4	118.5	18	500.3	134.1	78	558.3	149.6
39	327.4	87.7	99	385.4	103.3	59	443.4	118.8	19	501.3	134.3	79	559.3	149.8
40	328.4	88.0	400	386.4	103.5	60	444.3	119.1	20	502.3	134.6	80	560.2	150.1
341	329.4	88.3	401	387.3	103.8	461	445.3	119.3	521	503.2	134.8	581	561.2	150.4
42	330.3	88.5	02	388.3	104.0	62	446.3	119.6	22	504.2	135.1	82	562.2	150.6
43	331.3	88.8	03	389.3	104.3	63	447.2	119.8	23	505.2	135.4	83	563.1	150.9
44	332.3	89.0	04	390.2	104.6	64	448.2	120.1	24	506.1	135.6	84	564.1	151.2
45	333.2	89.3	05	391.2	104.8	65	449.2	120.4	25	507.1	135.9	85	565.1	151.4
46	334.2	89.6	06	392.2	105.1	66	450.1	120.6	26	508.1	136.1	86	566.0	151.6
47	335.2	89.8	07	393.1	105.3	67	451.1	120.9	27	509.0	136.4	87	567.0	151.9
48	336.1	90.1	08	394.1	105.6	68	452.1	121.1	28	510.0	136.7	88	568.0	152.2
49	337.1	90.3	09	395.1	105.9	69	453.0	121.4	29	511.0	136.9	89	568.9	152.4
50	338.1	90.6	10	396.0	106.1	70	454.0	121.6	30	511.9	137.2	90	569.9	152.7
351	339.0	90.8	411	397.0	106.4	471	455.0	121.9	531	512.9	137.4	591	570.9	153.0
52	341.0	91.1	12	398.0	106.6	72	455.9	122.2	32	513.9	137.7	92	571.8	153.2
53	341.0	91.4	13	398.9	106.9	73	456.9	122.4	33	514.8	138.0	93	572.8	153.5
54	341.9	91.6	14	399.9	107.2	74	457.8	122.7	34	515.8	138.2	94	573.8	153.7
55	342.9	91.9	15	400.9	107.4	75	458.8	122.9	35	516.8	138.5	95	574.7	154.0
56	343.9	92.1	16	401.8	107.7	76	459.8	123.2	36	517.7	138.7	96	575.7	154.3
57	344.8	92.4	17	402.8	107.9	77	460.7	123.5	37	518.7	139.0	97	576.7	154.5
58	345.8	92.7	18	403.8	108.2	78	461.7	123.7	38	519.7	139.2	98	577.6	154.8
59	346.8	92.9	19	404.7	108.4	79	462.7	124.0	39	520.6	139.5	99	578.6	155.0
60	347.7	93.2	20	405.7	108.7	80	463.6	124.2	40	521.6	139.8	600	579.6	155.3
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

75° (105°, 255°, 285°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 16° (164°, 196°, 344°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.3	61	58.6	16.8	121	116.3	33.4	181	174.0	49.9	241	231.7	66.4
2	1.9	0.6	62	59.6	17.1	22	117.3	33.6	82	174.9	50.2	42	232.6	66.7
3	2.9	0.8	63	60.6	17.4	23	118.2	33.9	83	175.9	50.4	43	233.6	67.0
4	3.8	1.1	64	61.5	17.6	24	119.2	34.2	84	176.9	50.7	44	234.5	67.3
5	4.8	1.4	65	62.5	17.9	25	120.2	34.5	85	177.8	51.0	45	235.5	67.5
6	5.8	1.7	66	63.4	18.2	26	121.1	34.7	86	178.8	51.3	46	236.5	67.8
7	6.7	1.9	67	64.4	18.5	27	122.1	35.0	87	179.8	51.5	47	237.4	68.1
8	7.7	2.2	68	65.4	18.7	28	123.0	35.3	88	180.7	51.8	48	238.4	68.4
9	8.7	2.5	69	66.3	19.0	29	124.0	35.6	89	181.7	52.1	49	239.4	68.6
10	9.6	2.8	70	67.3	19.3	30	125.0	35.8	90	182.6	52.4	50	240.3	68.9
11	10.6	3.0	71	68.2	19.6	131	125.9	36.1	191	183.6	52.6	251	241.3	69.2
12	11.5	3.3	72	69.2	19.8	32	126.9	36.4	92	184.6	52.9	52	242.2	69.5
13	12.5	3.6	73	70.2	20.1	33	127.8	36.7	93	185.5	53.2	53	243.2	69.7
14	13.5	3.9	74	71.1	20.4	34	128.8	36.9	94	186.5	53.5	54	244.2	70.0
15	14.4	4.1	75	72.1	20.7	35	129.8	37.2	95	187.4	53.7	55	245.1	70.3
16	15.4	4.4	76	73.1	20.9	36	130.7	37.5	96	188.4	54.0	56	246.1	70.6
17	16.3	4.7	77	74.0	21.2	37	131.7	37.8	97	189.4	54.3	57	247.0	70.8
18	17.3	5.0	78	75.0	21.5	38	132.7	38.0	98	190.3	54.6	58	248.0	71.1
19	18.3	5.2	79	75.9	21.8	39	133.6	38.3	99	191.3	54.9	59	249.0	71.4
20	19.2	5.5	80	76.9	22.1	40	134.6	38.6	200	192.3	55.1	60	249.9	71.7
21	20.2	5.8	81	77.9	22.3	141	135.5	38.9	201	193.2	55.4	261	250.9	71.9
22	21.1	6.1	82	78.8	22.6	42	136.5	39.1	02	194.2	55.7	62	251.9	72.2
23	22.1	6.3	83	79.8	22.9	43	137.5	39.4	03	195.1	56.0	63	252.8	72.5
24	23.1	6.6	84	80.7	23.2	44	138.4	39.7	04	196.1	56.2	64	253.8	72.8
25	24.0	6.9	85	81.7	23.4	45	139.4	40.0	05	197.1	56.5	65	254.7	73.0
26	25.0	7.2	86	82.7	23.7	46	140.3	40.2	06	198.0	56.8	66	255.7	73.3
27	26.0	7.4	87	83.6	24.0	47	141.3	40.5	07	199.0	57.1	67	256.7	73.6
28	26.9	7.7	88	84.6	24.3	48	142.3	40.8	08	199.9	57.3	68	257.6	73.9
29	27.9	8.0	89	85.6	24.5	49	143.2	41.1	09	200.9	57.6	69	258.6	74.1
30	28.8	8.3	90	86.5	24.8	50	144.2	41.3	10	201.9	57.9	70	259.5	74.4
31	29.8	8.5	91	87.5	25.1	151	145.2	41.6	211	202.8	58.2	271	260.5	74.7
32	30.8	8.8	92	88.4	25.4	52	146.1	41.9	12	203.8	58.4	72	261.5	75.0
33	31.7	9.1	93	89.4	25.6	53	147.1	42.2	13	204.7	58.7	73	262.4	75.2
34	32.7	9.4	94	90.4	25.9	54	148.0	42.4	14	205.7	59.0	74	263.4	75.5
35	33.6	9.6	95	91.3	26.2	55	149.0	42.7	15	206.7	59.3	75	264.3	75.8
36	34.6	9.9	96	92.3	26.5	56	150.0	43.0	16	207.6	59.5	76	265.3	76.1
37	35.6	10.2	97	93.2	26.7	57	150.9	43.3	17	208.6	59.8	77	266.3	76.4
38	36.5	10.5	98	94.2	27.0	58	151.9	43.6	18	209.6	60.1	78	267.2	76.6
39	37.5	10.7	99	95.2	27.3	59	152.8	43.8	19	210.5	60.4	79	268.2	76.9
40	38.5	11.0	100	96.1	27.6	60	153.8	44.1	20	211.5	60.6	80	269.2	77.2
41	39.4	11.3	101	97.1	27.8	161	154.8	44.4	221	212.4	60.9	281	270.1	77.5
42	40.4	11.6	02	98.0	28.1	62	155.7	44.7	22	213.4	61.2	82	271.1	77.7
43	41.3	11.9	03	99.0	28.4	63	156.7	44.9	23	214.4	61.5	83	272.0	78.0
44	42.3	12.1	04	100.0	28.7	64	157.6	45.2	24	215.3	61.7	84	273.0	78.3
45	43.3	12.4	05	100.9	28.9	65	158.6	45.5	25	216.3	62.0	85	274.0	78.6
46	44.2	12.7	06	101.9	29.2	66	159.6	45.8	26	217.2	62.3	86	274.9	78.8
47	45.2	13.0	07	102.9	29.5	67	160.5	46.0	27	218.2	62.6	87	275.9	79.1
48	46.1	13.2	08	103.8	29.8	68	161.5	46.3	28	219.2	62.8	88	276.8	79.4
49	47.1	13.5	09	104.8	30.0	69	162.5	46.6	29	220.1	63.1	89	277.8	79.7
50	48.1	13.8	10	105.7	30.3	70	163.4	46.9	30	221.1	63.4	90	278.8	79.9
51	49.0	14.1	111	106.7	30.6	171	164.4	47.1	231	222.1	63.7	291	279.7	80.2
52	50.0	14.3	12	107.7	30.9	72	165.3	47.4	32	223.0	63.9	92	280.7	80.5
53	50.9	14.6	13	108.6	31.1	73	166.3	47.7	33	224.0	64.2	93	281.6	80.8
54	51.9	14.9	14	109.6	31.4	74	167.3	48.0	34	224.9	64.5	94	282.6	81.0
55	52.9	15.2	15	110.5	31.7	75	168.2	48.2	35	225.9	64.8	95	283.6	81.3
56	53.8	15.4	16	111.5	32.0	76	169.2	48.5	36	226.9	65.1	96	284.5	81.6
57	54.8	15.7	17	112.5	32.2	77	170.1	48.8	37	227.8	65.3	97	285.5	81.9
58	55.8	16.0	18	113.4	32.5	78	171.1	49.1	38	228.8	65.6	98	286.5	82.1
59	56.7	16.3	19	114.4	32.8	79	172.1	49.3	39	229.7	65.9	99	287.4	82.4
60	57.7	16.5	20	115.4	33.1	80	173.0	49.6	40	230.7	66.2	300	288.4	82.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

74° (106°, 254°, 286°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side. Adj.	N×Sin. / Side Opp.

Difference of Latitude and Departure for 16° (164°, 196°, 344°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	289.3	83.0	361	347.0	99.5	421	404.7	116.0	481	462.4	132.6	541	520.0	149.1
02	290.3	83.2	62	348.0	99.8	22	405.7	116.3	82	463.3	132.9	42	521.0	149.4
03	291.3	83.5	63	348.9	100.1	23	406.6	116.6	83	464.3	133.1	43	522.0	149.7
04	292.2	83.8	64	349.9	100.3	24	407.6	116.9	84	465.3	133.4	44	522.9	149.9
05	293.2	84.1	65	350.9	100.6	25	408.5	117.1	85	466.2	133.7	45	523.9	150.2
06	294.1	84.3	66	351.8	100.9	26	409.5	117.4	86	467.2	134.0	46	524.8	150.5
07	295.1	84.6	67	352.8	101.2	27	410.5	117.7	87	468.1	134.2	47	525.8	150.8
08	296.1	84.9	68	353.7	101.4	28	411.4	118.0	88	469.1	134.5	48	526.8	151.0
09	297.0	85.2	69	354.7	101.7	29	412.4	118.2	89	470.1	134.8	49	527.7	151.3
10	298.0	85.4	70	355.7	102.0	30	413.3	118.5	90	471.0	135.1	50	528.7	151.6
311	299.0	85.7	371	356.6	102.3	431	414.3	118.8	491	472.0	135.3	551	529.7	151.9
12	299.9	86.0	72	357.6	102.5	32	415.3	119.1	92	472.9	135.6	52	530.6	152.2
13	300.9	86.3	73	358.6	102.8	33	416.2	119.4	93	473.9	135.9	53	531.6	152.4
14	301.8	86.6	74	359.5	103.1	34	417.2	119.6	94	474.9	136.2	54	532.5	152.7
15	302.8	86.8	75	360.5	103.4	35	418.1	119.9	95	475.8	136.4	55	533.5	153.0
16	303.8	87.1	76	361.4	103.6	36	419.1	120.2	96	476.8	136.7	56	534.5	153.3
17	304.7	87.4	77	362.4	103.9	37	420.1	120.5	97	477.7	137.0	57	535.4	153.5
18	305.7	87.7	78	363.4	104.2	38	421.0	120.7	98	478.7	137.3	58	536.4	153.8
19	306.6	87.9	79	364.3	104.5	39	422.0	121.0	99	479.7	137.5	59	537.3	154.1
20	307.6	88.2	80	365.3	104.7	40	423.0	121.3	500	480.6	137.8	60	538.3	154.4
321	308.6	88.5	381	366.2	105.0	441	423.9	121.6	501	481.6	138.1	561	539.3	154.6
22	309.5	88.8	82	367.2	105.3	42	424.9	121.8	02	482.6	138.4	62	540.2	154.9
23	310.5	89.0	83	368.2	105.6	43	425.8	122.1	03	483.5	138.6	63	541.2	155.2
24	311.4	89.3	84	369.1	105.8	44	426.8	122.4	04	484.5	138.9	64	542.2	155.5
25	312.4	89.6	85	370.1	106.1	45	427.8	122.7	05	485.4	139.2	65	543.1	155.7
26	313.4	89.9	86	371.0	106.4	46	428.7	122.9	06	486.4	139.5	66	544.1	156.0
27	314.3	90.1	87	372.0	106.7	47	429.7	123.2	07	487.4	139.7	67	545.0	156.3
28	315.3	90.4	88	373.0	106.9	48	430.6	123.5	08	488.3	140.0	68	546.0	156.6
29	316.3	90.7	89	373.9	107.2	49	431.6	123.8	09	489.3	140.3	69	547.0	156.8
30	317.2	91.0	90	374.9	107.5	50	432.6	124.0	10	490.2	140.6	70	547.9	157.1
331	318.2	91.2	391	375.9	107.8	451	433.5	124.3	511	491.2	140.9	571	548.9	157.4
32	319.1	91.5	92	376.8	108.0	52	434.5	124.6	12	492.2	141.1	72	549.8	157.7
33	320.1	91.8	93	377.8	108.3	53	435.5	124.9	13	493.1	141.4	73	550.8	157.9
34	321.1	92.1	94	378.7	108.6	54	436.4	125.1	14	494.1	141.7	74	551.8	158.2
35	322.0	92.3	95	379.7	108.9	55	437.4	125.4	15	495.0	142.0	75	552.7	158.5
36	323.0	92.6	96	380.7	109.2	56	438.3	125.7	16	496.0	142.2	76	553.7	158.8
37	323.9	92.9	97	381.6	109.4	57	439.3	126.0	17	497.0	142.5	77	554.6	159.0
38	324.9	93.2	98	382.6	109.7	58	440.3	126.2	18	497.9	142.8	78	555.6	159.3
39	325.8	93.4	99	383.5	110.0	59	441.2	126.5	19	498.9	143.1	79	556.6	159.6
40	326.8	93.7	400	384.5	110.3	60	442.2	126.8	20	499.9	143.3	80	557.5	159.9
341	327.8	94.0	401	385.5	110.5	461	443.1	127.1	521	500.8	143.6	581	558.5	160.1
42	328.8	94.3	02	386.4	110.8	62	444.1	127.3	22	501.8	143.9	82	559.5	160.4
43	329.7	94.5	03	387.4	111.1	63	445.1	127.6	23	502.7	144.2	83	560.4	160.6
44	330.7	94.8	04	388.3	111.4	64	446.0	127.9	24	503.7	144.4	84	561.4	161.0
45	331.6	95.1	05	389.3	111.6	65	447.0	128.2	25	504.7	144.7	85	562.3	161.2
46	332.6	95.4	06	390.3	111.9	66	447.9	128.4	26	505.6	145.0	86	563.3	161.5
47	333.6	95.6	07	391.2	112.2	67	448.9	128.7	27	506.6	145.3	87	564.3	161.8
48	334.5	95.9	08	392.2	112.5	68	449.9	129.0	28	507.5	145.5	88	565.2	162.1
49	335.5	96.2	09	393.2	112.7	69	450.8	129.3	29	508.5	145.8	89	566.2	162.4
50	336.4	96.5	10	394.1	113.0	70	451.8	129.5	30	509.5	146.1	90	567.1	162.6
351	337.4	96.7	411	395.1	113.3	471	452.8	129.8	531	510.4	146.4	591	568.1	162.9
52	338.4	97.0	12	396.0	113.6	72	453.7	130.1	32	511.4	146.6	92	569.1	163.2
53	339.3	97.3	13	397.0	113.8	73	454.7	130.4	33	512.4	146.9	93	570.0	163.5
54	340.3	97.6	14	398.0	114.1	74	455.6	130.7	34	513.3	147.2	94	571.0	163.7
55	341.2	97.9	15	398.9	114.4	75	456.6	130.9	35	514.3	147.5	95	572.0	164.0
56	342.2	98.1	16	399.9	114.7	76	457.6	131.2	36	515.2	147.7	96	572.9	164.3
57	343.2	98.4	17	400.8	114.9	77	458.5	131.6	37	516.2	148.0	97	573.9	164.6
58	344.1	98.7	18	401.8	115.2	78	459.5	131.8	38	517.2	148.3	98	574.8	164.8
59	345.1	99.0	19	402.8	115.5	79	460.4	132.0	39	518.1	148.6	99	575.8	165.1
60	346.1	99.2	20	403.7	115.8	80	461.4	132.3	40	519.1	148.8	600	576.8	165.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

74° (106°, 254°, 286°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 17° (163°, 197°, 343°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.3	61	58.3	17.8	121	115.7	35.4	181	173.1	52.9	241	230.5	70.5
2	1.9	0.6	62	59.3	18.1	22	116.7	35.7	82	174.0	53.2	42	231.4	70.8
3	2.9	0.9	63	60.2	18.4	23	117.6	36.0	83	175.0	53.5	43	232.4	71.0
4	3.8	1.2	64	61.2	18.7	24	118.6	36.3	84	176.0	53.8	44	233.3	71.3
5	4.8	1.5	65	62.2	19.0	25	119.5	36.5	85	176.9	54.1	45	234.3	71.6
6	5.7	1.8	66	63.1	19.3	26	120.5	36.8	86	177.9	54.4	46	235.3	71.9
7	6.7	2.0	67	64.1	19.6	27	121.5	37.1	87	178.8	54.7	47	236.2	72.2
8	7.7	2.3	68	65.0	19.9	28	122.4	37.4	88	179.8	55.0	48	237.2	72.5
9	8.6	2.6	69	66.0	20.2	29	123.4	37.7	89	180.7	55.3	49	238.1	72.8
10	9.6	2.9	70	66.9	20.5	30	124.3	38.0	90	181.7	55.6	50	239.1	73.1
11	10.5	3.2	71	67.9	20.8	131	125.3	38.3	191	182.7	55.8	251	240.0	73.4
12	11.5	3.5	72	68.9	21.1	32	126.2	38.6	92	183.6	56.1	52	241.0	73.7
13	12.4	3.8	73	69.8	21.3	33	127.2	38.9	93	184.6	56.4	53	241.9	74.0
14	13.4	4.1	74	70.8	21.6	34	128.1	39.2	94	185.5	56.7	54	242.9	74.3
15	14.3	4.4	75	71.7	21.9	35	129.1	39.5	95	186.5	57.0	55	243.9	74.6
16	15.3	4.7	76	72.7	22.2	36	130.1	39.8	96	187.4	57.3	56	244.8	74.8
17	16.3	5.0	77	73.6	22.5	37	131.0	40.1	97	188.4	57.6	57	245.8	75.1
18	17.2	5.3	78	74.6	22.8	38	132.0	40.3	98	189.3	57.9	58	246.7	75.4
19	18.2	5.6	79	75.5	23.1	39	132.9	40.6	99	190.3	58.2	59	247.7	75.7
20	19.1	5.8	80	76.5	23.4	40	133.9	40.9	200	191.3	58.5	60	248.6	76.0
21	20.1	6.1	81	77.5	23.7	141	134.8	41.2	201	192.2	58.8	261	249.6	76.3
22	21.0	6.4	82	78.4	24.0	42	135.8	41.5	02	193.2	59.1	62	250.6	76.6
23	22.0	6.7	83	79.4	24.3	43	136.8	41.8	03	194.1	59.4	63	251.5	76.9
24	23.0	7.0	84	80.3	24.6	44	137.7	42.1	04	195.1	59.6	64	252.5	77.2
25	23.9	7.3	85	81.3	24.9	45	138.7	42.4	05	196.0	59.9	65	253.4	77.5
26	24.9	7.6	86	82.2	25.1	46	139.6	42.7	06	197.0	60.2	66	254.4	77.8
27	25.8	7.9	87	83.2	25.4	47	140.6	43.0	07	198.0	60.5	67	255.3	78.1
28	26.8	8.2	88	84.2	25.7	48	141.5	43.3	08	198.9	60.8	68	256.3	78.4
29	27.7	8.5	89	85.1	26.0	49	142.5	43.6	09	199.9	61.1	69	257.2	78.6
30	28.7	8.8	90	86.1	26.3	50	143.4	43.9	10	200.8	61.4	70	258.2	78.9
31	29.6	9.1	91	87.0	26.6	151	144.4	44.1	211	201.8	61.7	271	259.2	79.2
32	30.6	9.4	92	88.0	26.9	52	145.4	44.4	12	202.7	62.0	72	260.1	79.5
33	31.6	9.6	93	88.9	27.2	53	146.3	44.7	13	203.7	62.3	73	261.1	79.8
34	32.5	9.9	94	89.9	27.5	54	147.3	45.0	14	204.6	62.6	74	262.0	80.1
35	33.5	10.2	95	90.8	27.8	55	148.2	45.3	15	205.6	62.9	75	263.0	80.4
36	34.4	10.5	96	91.8	28.1	56	149.2	45.6	16	206.6	63.2	76	263.9	80.7
37	35.4	10.8	97	92.8	28.4	57	150.1	45.9	17	207.5	63.4	77	264.9	81.0
38	36.3	11.1	98	93.7	28.7	58	151.1	46.2	18	208.5	63.7	78	265.9	81.3
39	37.3	11.4	99	94.7	28.9	59	152.1	46.5	19	209.4	64.0	79	266.8	81.6
40	38.3	11.7	100	95.6	29.2	60	153.0	46.8	20	210.4	64.3	80	267.8	81.9
41	39.2	12.0	101	96.6	29.5	161	154.0	47.1	221	211.3	64.6	281	268.7	82.2
42	40.2	12.3	02	97.5	29.8	62	154.9	47.4	22	212.3	64.9	82	269.7	82.4
43	41.1	12.6	03	98.5	30.1	63	155.9	47.7	23	213.3	65.2	83	270.6	82.7
44	42.1	12.9	04	99.5	30.4	64	156.8	47.9	24	214.2	65.5	84	271.6	83.0
45	43.0	13.2	05	100.4	30.7	65	157.8	48.2	25	215.2	65.8	85	272.5	83.3
46	44.0	13.4	06	101.4	31.0	66	158.7	48.5	26	216.1	66.1	86	273.5	83.6
47	44.9	13.7	07	102.3	31.3	67	159.7	48.8	27	217.1	66.4	87	274.5	83.9
48	45.9	14.0	08	103.3	31.6	68	160.7	49.1	28	218.0	66.7	88	275.4	84.2
49	46.9	14.3	09	104.2	31.9	69	161.6	49.4	29	219.0	67.0	89	276.4	84.5
50	47.8	14.6	10	105.2	32.2	70	162.6	49.7	30	220.0	67.2	90	277.3	84.8
51	48.8	14.9	111	106.1	32.5	171	163.5	50.0	231	220.9	67.5	291	278.3	85.1
52	49.7	15.2	12	107.1	32.7	72	164.5	50.3	32	221.9	67.8	92	279.2	85.4
53	50.7	15.5	13	108.1	33.0	73	165.4	50.6	33	222.8	68.1	93	280.2	85.7
54	51.6	15.8	14	109.0	33.3	74	166.4	50.9	34	223.8	68.4	94	281.2	86.0
55	52.6	16.1	15	110.0	33.6	75	167.4	51.2	35	224.7	68.7	95	282.1	86.2
56	53.6	16.4	16	110.9	33.9	76	168.3	51.5	36	225.7	69.0	96	283.1	86.5
57	54.5	16.7	17	111.9	34.2	77	169.3	51.7	37	226.6	69.3	97	284.0	86.8
58	55.5	17.0	18	112.8	34.5	78	170.2	52.0	38	227.6	69.6	98	285.0	87.1
59	56.4	17.2	19	113.8	34.8	79	171.2	52.3	39	228.6	69.9	99	285.9	87.4
60	57.4	17.5	20	114.8	35.1	80	172.1	52.6	40	229.5	70.2	300	286.9	87.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

73° (107°, 253°, 287°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		*m*	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 17° (163°, 197°, 343°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	287.8	88.0	361	345.2	105.5	421	402.6	123.1	481	460.0	140.6	541	517.4	158.2
02	288.8	88.3	62	346.2	105.8	22	403.6	123.4	82	460.9	140.9	42	518.3	158.5
03	289.8	88.6	63	347.1	106.1	23	404.5	123.7	83	461.9	141.2	43	519.3	158.8
04	290.7	88.9	64	348.1	106.4	24	405.5	124.0	84	462.9	141.5	44	520.2	159.1
05	291.7	89.2	65	349.1	106.7	25	406.4	124.3	85	463.8	141.8	45	521.2	159.3
06	292.6	89.5	66	350.0	107.0	26	407.4	124.6	86	464.8	142.1	46	522.1	159.6
07	293.6	89.8	67	351.0	107.3	27	408.3	124.8	87	465.7	142.4	47	523.1	159.9
08	294.5	90.1	68	351.9	107.6	28	409.3	125.1	88	466.7	142.7	48	524.1	160.2
09	295.5	90.3	69	352.9	107.9	29	410.3	125.4	89	467.6	143.0	49	525.0	160.5
10	296.5	90.6	70	353.8	108.2	30	411.2	125.7	90	468.6	143.3	50	526.0	160.8
311	297.4	90.9	371	354.8	108.5	431	412.2	126.0	491	469.5	143.6	551	526.9	161.1
12	298.4	91.2	72	355.7	108.8	32	413.1	126.3	92	470.5	143.8	52	527.9	161.4
13	299.3	91.5	73	356.7	109.1	33	414.1	126.6	93	471.5	144.1	53	528.8	161.7
14	300.3	91.8	74	357.7	109.3	34	415.0	126.9	94	472.4	144.4	54	529.8	162.0
15	301.2	92.1	75	358.6	109.6	35	416.0	127.2	95	473.4	144.7	55	530.7	162.3
16	302.2	92.4	76	359.6	109.9	36	416.9	127.5	96	474.3	145.0	56	531.7	162.6
17	303.1	92.7	77	360.5	110.2	37	417.9	127.8	97	475.3	145.3	57	532.7	162.9
18	304.1	93.0	78	361.5	110.5	38	418.9	128.1	98	476.2	145.6	58	533.6	163.1
19	305.1	93.3	79	362.4	110.8	39	419.8	128.4	99	477.2	145.9	59	534.6	163.4
20	306.0	93.6	80	363.4	111.1	40	420.8	128.6	500	478.2	146.2	60	535.5	163.7
321	307.0	93.9	381	364.4	111.4	441	421.7	128.9	501	479.1	146.5	561	536.5	164.0
22	307.9	94.1	82	365.3	111.7	42	422.7	129.2	02	480.1	146.8	62	537.4	164.3
23	308.9	94.4	83	366.3	112.0	43	423.6	129.5	03	481.0	147.1	63	538.4	164.6
24	309.8	94.7	84	367.2	112.3	44	424.6	129.8	04	482.0	147.4	64	539.4	164.9
25	310.8	95.0	85	368.2	112.6	45	425.6	130.1	05	482.9	147.6	65	540.3	165.2
26	311.8	95.3	86	369.1	112.9	46	426.5	130.4	06	483.9	147.9	66	541.3	165.5
27	312.7	95.6	87	370.1	113.1	47	427.5	130.7	07	484.8	148.2	67	542.2	165.8
28	313.6	95.9	88	371.0	113.4	48	428.4	131.0	08	485.8	148.5	68	543.2	166.1
29	314.6	96.2	89	372.0	113.7	49	429.4	131.3	09	486.8	148.8	69	544.1	166.4
30	315.5	96.5	90	373.0	114.0	50	430.3	131.6	10	487.7	149.1	70	545.1	166.7
331	316.5	96.8	391	373.9	114.3	451	431.3	131.9	511	488.7	149.4	571	546.1	166.9
32	317.5	97.1	92	374.9	114.6	52	432.2	132.2	12	489.6	149.7	72	547.0	167.2
33	318.4	97.4	93	375.8	114.9	53	433.2	132.4	13	490.6	150.0	73	548.0	167.5
34	319.4	97.7	94	376.8	115.2	54	434.2	132.7	14	491.5	150.3	74	548.9	167.8
35	320.4	97.9	95	377.7	115.5	55	435.1	133.0	15	492.5	150.6	75	549.9	168.1
36	321.3	98.2	96	378.7	115.8	56	436.1	133.3	16	493.5	150.9	76	550.8	168.4
37	322.3	98.5	97	379.7	116.1	57	437.0	133.6	17	494.4	151.2	77	551.8	168.7
38	323.2	98.8	98	380.6	116.4	58	438.0	133.9	18	495.4	151.4	78	552.7	169.0
39	324.2	99.1	99	381.6	116.7	59	438.9	134.2	19	496.3	151.7	79	553.7	169.3
40	325.1	99.4	400	382.5	116.9	60	439.9	134.5	20	497.3	152.0	80	554.7	169.6
341	326.1	99.7	401	383.5	117.2	461	440.9	134.8	521	498.2	152.3	581	555.6	169.9
42	327.1	100.0	02	384.4	117.5	62	441.8	135.1	22	499.2	152.6	82	556.6	170.2
43	328.0	100.3	03	385.4	117.8	63	442.8	135.4	23	500.1	152.9	83	557.5	170.5
44	329.0	100.6	04	386.3	118.1	64	443.7	135.7	24	501.1	153.2	84	558.5	170.7
45	329.9	100.9	05	387.3	118.4	65	444.7	136.0	25	502.1	153.5	85	559.4	171.0
46	330.8	101.2	06	388.3	118.7	66	445.6	136.2	26	503.0	153.8	86	560.4	171.3
47	331.8	101.5	07	389.2	119.0	67	446.6	136.5	27	504.0	154.1	87	561.4	171.6
48	332.8	101.7	08	390.2	119.3	68	447.6	136.8	28	504.9	154.4	88	562.3	171.9
49	333.8	102.0	09	391.1	119.6	69	448.5	137.1	29	505.9	154.7	89	563.3	172.2
50	334.7	102.3	10	392.1	119.9	70	449.5	137.4	30	506.8	155.0	90	564.2	172.5
351	335.7	102.6	411	393.0	120.2	471	450.4	137.7	531	507.8	155.2	591	565.2	172.8
52	336.6	102.9	12	394.0	120.5	72	451.4	138.0	32	508.8	155.5	92	566.1	173.1
53	337.6	103.2	13	395.0	120.7	73	452.3	138.3	33	509.7	155.8	93	567.1	173.4
54	338.5	103.5	14	395.9	121.0	74	453.3	138.6	34	510.7	156.1	94	568.0	173.7
55	339.5	103.8	15	396.9	121.3	75	454.2	138.9	35	511.6	156.4	95	569.0	174.0
56	340.4	104.1	16	397.8	121.6	76	455.2	139.2	36	512.6	156.7	96	570.0	174.3
57	341.4	104.4	17	398.8	121.9	77	456.2	139.5	37	513.5	157.0	97	570.9	174.5
58	342.4	104.7	18	399.7	122.2	78	457.1	139.8	38	514.5	157.3	98	571.9	174.8
59	343.3	105.0	19	400.7	122.5	79	458.1	140.0	39	515.4	157.6	99	572.8	175.1
60	344.3	105.3	20	401.6	122.8	80	459.0	140.3	40	516.4	157.9	600	573.8	175.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

73° (107°, 253°, 287°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 18° (162°, 198°, 342°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	1.0	0.3	61	58.0	18.9	121	115.1	37.4	181	172.1	55.9	241	229.2	74.5
2	1.9	0.6	62	59.0	19.2	22	116.0	37.7	82	173.1	56.2	42	230.2	74.8
3	2.9	0.9	63	59.9	19.5	23	117.0	38.0	83	174.0	56.6	43	231.1	75.1
4	3.8	1.2	64	60.9	19.8	24	117.9	38.3	84	175.0	56.9	44	232.1	75.4
5	4.8	1.5	65	61.8	20.1	25	118.9	38.6	85	175.9	57.2	45	233.0	75.7
6	5.7	1.9	66	62.8	20.4	26	119.8	38.9	86	176.9	57.5	46	234.0	76.0
7	6.7	2.2	67	63.7	20.7	27	120.8	39.2	87	177.8	57.8	47	234.9	76.3
8	7.6	2.5	68	64.7	21.0	28	121.7	39.6	88	178.8	58.1	48	235.9	76.6
9	8.6	2.8	69	65.6	21.3	29	122.7	39.9	89	179.7	58.4	49	236.8	76.9
10	9.5	3.1	70	66.6	21.6	30	123.6	40.2	90	180.7	58.7	50	237.8	77.3
11	10.5	3.4	71	67.5	21.9	131	124.6	40.5	191	181.7	59.0	251	238.7	77.6
12	11.4	3.7	72	68.5	22.2	32	125.5	40.8	92	182.6	59.3	52	239.7	77.9
13	12.4	4.0	73	69.4	22.6	33	126.5	41.1	93	183.6	59.6	53	240.6	78.2
14	13.3	4.3	74	70.4	22.9	34	127.4	41.4	94	184.5	59.9	54	241.6	78.5
15	14.3	4.6	75	71.3	23.2	35	128.4	41.7	95	185.5	60.3	55	242.5	78.8
16	15.2	4.9	76	72.3	23.5	36	129.3	42.0	96	186.4	60.6	56	243.5	79.1
17	16.2	5.3	77	73.2	23.8	37	130.3	42.3	97	187.4	60.9	57	244.4	79.4
18	17.1	5.6	78	74.2	24.1	38	131.2	42.6	98	188.3	61.2	58	245.4	79.7
19	18.1	5.9	79	75.1	24.4	39	132.2	43.0	99	189.3	61.5	59	246.3	80.0
20	19.0	6.2	80	76.1	24.7	40	133.1	43.3	200	190.2	61.8	60	247.3	80.3
21	20.0	6.5	81	77.0	25.0	141	134.1	43.6	201	191.2	62.1	261	248.2	80.7
22	20.9	6.8	82	78.0	25.3	42	135.1	43.9	02	192.1	62.4	62	249.2	81.0
23	21.9	7.1	83	78.9	25.6	43	136.0	44.2	03	193.1	62.7	63	250.1	81.3
24	22.8	7.4	84	79.9	26.0	44	137.0	44.5	04	194.0	63.0	64	251.1	81.6
25	23.8	7.7	85	80.8	26.3	45	137.9	44.8	05	195.0	63.3	65	252.0	81.9
26	24.7	8.0	86	81.8	26.6	46	138.9	45.1	06	195.9	63.7	66	253.0	82.2
27	25.7	8.3	87	82.7	26.9	47	139.8	45.4	07	196.9	64.0	67	253.9	82.5
28	26.6	8.7	88	83.7	27.2	48	140.8	45.7	08	197.8	64.3	68	254.9	82.8
29	27.6	9.0	89	84.6	27.5	49	141.7	46.0	09	198.8	64.6	69	255.8	83.1
30	28.5	9.3	90	85.6	27.8	50	142.7	46.4	10	199.7	64.9	70	256.8	83.4
31	29.5	9.6	91	86.5	28.1	151	143.6	46.7	211	200.7	65.2	271	257.7	83.7
32	30.4	9.9	92	87.5	28.4	52	144.6	47.0	12	201.6	65.5	72	258.7	84.1
33	31.4	10.2	93	88.4	28.7	53	145.5	47.3	13	202.6	65.8	73	259.6	84.4
34	32.3	10.5	94	89.4	29.0	54	146.5	47.6	14	203.5	66.1	74	260.6	84.7
35	33.3	10.8	95	90.4	29.4	55	147.4	47.9	15	204.5	66.4	75	261.5	85.0
36	34.2	11.1	96	91.3	29.7	56	148.4	48.2	16	205.4	66.7	76	262.5	85.3
37	35.2	11.4	97	92.3	30.0	57	149.3	48.5	17	206.4	67.1	77	263.4	85.6
38	36.1	11.7	98	93.2	30.3	58	150.3	48.8	18	207.3	67.4	78	264.4	85.9
39	37.1	12.1	99	94.2	30.6	59	151.2	49.1	19	208.3	67.7	79	265.3	86.2
40	38.0	12.4	100	95.1	30.9	60	152.2	49.4	20	209.2	68.0	80	266.3	86.5
41	39.0	12.7	101	96.1	31.2	161	153.1	49.8	221	210.2	68.3	281	267.2	86.8
42	39.9	13.0	02	97.0	31.5	62	154.1	50.1	22	211.1	68.6	82	268.2	87.1
43	40.9	13.3	03	98.0	31.8	63	155.0	50.4	23	212.1	68.9	83	269.1	87.5
44	41.8	13.6	04	98.9	32.1	64	156.0	50.7	24	213.0	69.2	84	270.1	87.8
45	42.8	13.9	05	99.9	32.4	65	156.9	51.0	25	214.0	69.5	85	271.1	88.1
46	43.7	14.2	06	100.8	32.8	66	157.9	51.3	26	214.9	69.8	86	272.0	88.4
47	44.7	14.5	07	101.8	33.1	67	158.8	51.6	27	215.9	70.1	87	273.0	88.7
48	45.7	14.8	08	102.7	33.4	68	159.8	51.9	28	216.8	70.5	88	273.9	89.0
49	46.6	15.1	09	103.7	33.7	69	160.7	52.2	29	217.8	70.8	89	274.9	89.3
50	47.6	15.5	10	104.6	34.0	70	161.7	52.5	30	218.7	71.1	90	275.8	89.6
51	48.5	15.8	111	105.6	34.3	171	162.6	52.8	231	219.7	71.4	291	276.8	89.9
52	49.5	16.1	12	106.5	34.6	72	163.6	53.2	32	220.6	71.7	92	277.7	90.2
53	50.4	16.4	13	107.5	34.9	73	164.5	53.5	33	221.6	72.0	93	278.7	90.5
54	51.4	16.7	14	108.4	35.2	74	165.5	53.8	34	222.5	72.3	94	279.6	90.9
55	52.3	17.0	15	109.4	35.5	75	166.4	54.1	35	223.5	72.6	95	280.6	91.2
56	53.3	17.3	16	110.3	35.8	76	167.4	54.4	36	224.4	72.9	96	281.5	91.5
57	54.2	17.6	17	111.3	36.2	77	168.3	54.7	37	225.4	73.2	97	282.5	91.8
58	55.2	17.9	18	112.2	36.5	78	169.3	55.0	38	226.4	73.5	98	283.4	92.1
59	56.1	18.2	19	113.2	36.8	79	170.2	55.3	39	227.3	73.9	99	284.4	92.4
60	57.1	18.5	20	114.1	37.1	80	171.2	55.6	40	228.3	74.2	300	285.3	92.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

72° (108°, 252°, 288°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side. Adj.	Side Opp.

Difference of Latitude and Departure for 18° (162°, 198°, 342°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	286.3	93.0	361	343.3	111.6	421	400.4	130.1	481	457.5	148.6	541	514.5	167.2
02	287.2	93.3	62	344.3	111.9	22	401.3	130.4	82	458.4	148.9	42	515.5	167.5
03	288.2	93.6	63	345.2	112.2	23	402.3	130.7	83	459.4	149.3	43	516.4	167.8
04	289.1	93.9	64	346.2	112.5	24	403.2	131.0	84	460.3	149.6	44	517.4	168.1
05	290.1	94.3	65	347.1	112.8	25	404.2	131.3	85	461.3	149.9	45	518.3	168.4
06	291.0	94.6	66	348.1	113.1	26	405.2	131.6	86	462.2	150.2	46	519.3	168.7
07	292.0	94.9	67	349.0	113.4	27	406.1	132.0	87	463.2	150.5	47	520.2	169.0
08	292.9	95.2	68	350.0	113.7	28	407.1	132.3	88	464.1	150.8	48	521.2	169.3
09	293.9	95.5	69	350.9	114.0	29	408.0	132.6	89	465.1	151.1	49	522.1	169.7
10	294.8	95.8	70	351.9	114.3	30	409.0	132.9	90	466.0	151.4	50	523.1	170.0
311	295.8	96.1	371	352.8	114.6	431	409.9	133.2	491	467.0	151.7	551	524.0	170.3
12	296.7	96.4	72	353.8	115.0	32	410.9	133.5	92	467.9	152.0	52	525.0	170.6
13	297.7	96.7	73	354.7	115.3	33	411.8	133.8	93	468.9	152.3	53	525.9	170.9
14	298.6	97.0	74	355.7	115.6	34	412.8	134.1	94	469.8	152.7	54	526.9	171.2
15	299.6	97.3	75	356.6	115.9	35	413.7	134.4	95	470.8	153.0	55	527.8	171.5
16	300.5	97.6	76	357.6	116.2	36	414.7	134.7	96	471.7	153.3	56	528.8	171.8
17	301.5	98.0	77	358.5	116.5	37	415.6	135.0	97	472.7	153.6	57	529.7	172.1
18	302.4	98.3	78	359.5	116.8	38	416.6	135.3	98	473.6	153.9	58	530.7	172.4
19	303.4	98.6	79	360.5	117.1	39	417.5	135.7	99	474.6	154.2	59	531.6	172.7
20	304.3	98.9	80	361.4	117.4	40	418.5	136.0	500	475.5	154.5	60	532.6	173.0
321	305.3	99.2	381	362.4	117.7	441	419.4	136.3	501	476.5	154.8	561	533.5	173.4
22	306.2	99.5	82	363.3	118.0	42	420.4	136.6	02	477.4	155.1	62	534.5	173.7
23	307.2	99.8	83	364.3	118.4	43	421.3	136.9	03	478.4	155.4	63	535.4	174.0
24	308.2	100.1	84	365.2	118.7	44	422.3	137.2	04	479.3	155.7	64	536.4	174.3
25	309.1	100.4	85	366.2	119.0	45	423.2	137.5	05	480.3	156.1	65	537.3	174.6
26	310.0	100.7	86	367.1	119.3	46	424.2	137.8	06	481.2	156.4	66	538.3	174.9
27	311.0	101.0	87	368.1	119.6	47	425.1	138.1	07	482.2	156.7	67	539.2	175.2
28	311.9	101.4	88	369.0	119.9	48	426.1	138.4	08	483.1	157.0	68	540.2	175.5
29	312.9	101.7	89	370.0	120.2	49	427.0	138.7	09	484.1	157.3	69	541.2	175.8
30	313.8	102.0	90	370.9	120.5	50	428.0	139.1	10	485.0	157.6	70	542.1	176.1
331	314.8	102.3	391	371.9	120.8	451	428.9	139.4	511	486.0	157.9	571	543.1	176.4
32	315.8	102.6	92	372.8	121.1	52	429.9	139.7	12	486.9	158.2	72	544.0	176.8
33	316.7	102.9	93	373.8	121.4	53	430.8	140.0	13	487.9	158.5	73	545.0	177.1
34	317.7	103.2	94	374.7	121.8	54	431.8	140.3	14	488.8	158.8	74	545.9	177.4
35	318.6	103.5	95	375.7	122.1	55	432.7	140.6	15	489.8	159.1	75	546.9	177.7
36	319.6	103.8	96	376.6	122.4	56	433.7	140.9	16	490.7	159.5	76	547.8	178.0
37	320.5	104.1	97	377.6	122.7	57	434.6	141.2	17	491.7	159.8	77	548.8	178.3
38	321.5	104.6	98	378.5	123.0	58	435.6	141.5	18	492.6	160.1	78	549.7	178.6
39	322.4	104.8	99	379.5	123.3	59	436.5	141.8	19	493.6	160.4	79	550.7	178.9
40	323.4	105.1	400	380.4	123.6	60	437.5	142.1	20	494.5	160.7	80	551.6	179.2
341	324.3	105.4	401	381.4	123.9	461	438.4	142.5	521	495.5	161.0	581	552.6	179.5
42	325.3	105.7	02	382.3	124.2	62	439.4	142.8	22	496.5	161.3	82	553.5	179.8
43	326.2	106.0	03	383.3	124.5	63	440.3	143.1	23	497.4	161.6	83	554.5	180.2
44	327.2	106.3	04	384.2	124.8	64	441.3	143.4	24	498.4	161.9	84	555.4	180.5
45	328.1	106.6	05	385.2	125.2	65	442.2	143.7	25	499.3	162.2	85	556.4	180.8
46	329.1	106.9	06	386.1	125.5	66	443.2	144.0	26	500.3	162.5	86	557.3	181.1
47	330.0	107.2	07	387.1	125.8	67	444.1	144.3	27	501.2	162.9	87	558.3	181.4
48	331.0	107.5	08	388.0	126.1	68	445.1	144.6	28	502.2	163.2	88	559.2	181.7
49	331.9	107.8	09	389.0	126.4	69	446.0	144.9	29	503.1	163.5	89	560.2	182.0
50	332.9	108.2	10	389.9	126.7	70	447.0	145.2	30	504.1	163.8	90	561.1	182.3
351	333.8	108.5	411	390.9	127.0	471	447.9	145.5	531	505.0	164.1	591	562.1	182.6
52	334.8	108.8	12	391.8	127.3	72	448.9	145.9	32	506.0	164.4	92	563.0	182.9
53	335.7	109.1	13	392.8	127.6	73	449.8	146.2	33	506.9	164.7	93	564.0	183.2
54	336.7	109.4	14	393.7	127.9	74	450.8	146.5	34	507.9	165.0	94	564.9	183.6
55	337.6	109.7	15	394.7	128.2	75	451.8	146.8	35	508.8	165.3	95	565.9	183.9
56	338.6	110.0	16	395.6	128.6	76	452.7	147.1	36	509.8	165.6	96	566.8	184.2
57	339.5	110.3	17	396.6	128.9	77	453.7	147.4	37	510.7	165.9	97	567.8	184.5
58	340.5	110.6	18	397.5	129.2	78	454.6	147.7	38	511.7	166.3	98	568.7	184.8
59	341.4	110.9	19	398.5	129.5	79	455.6	148.0	39	512.6	166.6	99	569.7	185.1
60	342.4	111.2	20	399.4	129.8	80	456.5	148.3	40	513.6	166.9	600	570.6	185.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

72° (108°, 252°, 288°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 19° (161°, 199°, 341°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.3	61	57.7	19.9	121	114.4	39.4	181	171.1	58.9	241	227.9	78.5
2	1.9	0.7	62	58.6	20.2	22	115.4	39.7	82	172.1	59.3	42	228.8	78.8
3	2.8	1.0	63	59.6	20.5	23	116.3	40.0	83	173.0	59.6	43	229.8	79.1
4	3.8	1.3	64	60.5	20.8	24	117.2	40.4	84	174.0	59.9	44	230.7	79.4
5	4.7	1.6	65	61.5	21.2	25	118.2	40.7	85	174.9	60.2	45	231.7	79.8
6	5.7	2.0	66	62.4	21.5	26	119.1	41.0	86	175.9	60.6	46	232.6	80.1
7	6.6	2.3	67	63.3	21.8	27	120.1	41.3	87	176.8	60.9	47	233.5	80.4
8	7.6	2.6	68	64.3	22.1	28	121.0	41.7	88	177.8	61.2	48	234.5	80.7
9	8.5	2.9	69	65.2	22.5	29	122.0	42.0	89	178.7	61.5	49	235.4	81.1
10	9.5	3.3	70	66.2	22.8	30	122.9	42.3	90	179.6	61.9	50	236.4	81.4
11	10.4	3.6	71	67.1	23.1	131	123.9	42.6	191	180.6	62.2	251	237.3	81.7
12	11.3	3.9	72	68.1	23.4	32	124.8	43.0	92	181.5	62.5	52	238.3	82.0
13	12.3	4.2	73	69.0	23.8	33	125.8	43.3	93	182.5	62.8	53	239.2	82.4
14	13.2	4.6	74	70.0	24.1	34	126.7	43.6	94	183.4	63.2	54	240.2	82.7
15	14.2	4.9	75	70.9	24.4	35	127.6	44.0	95	184.4	63.5	55	241.1	83.0
16	15.1	5.2	76	71.9	24.7	36	128.6	44.3	96	185.3	63.8	56	242.1	83.3
17	16.1	5.5	77	72.8	25.1	37	129.5	44.6	97	186.3	64.1	57	243.0	83.7
18	17.0	5.9	78	73.8	25.4	38	130.5	44.9	98	187.2	64.5	58	243.9	84.0
19	18.0	6.2	79	74.7	25.7	39	131.4	45.3	99	188.2	64.8	59	244.9	84.3
20	18.9	6.5	80	75.6	26.0	40	132.4	45.6	200	189.1	65.1	60	245.8	84.6
21	19.9	6.8	81	76.6	26.4	141	133.3	45.9	201	190.0	65.4	261	246.8	85.0
22	20.8	7.2	82	77.5	26.7	42	134.3	46.2	02	191.0	65.8	62	247.7	85.3
23	21.7	7.5	83	78.5	27.0	43	135.2	46.6	03	191.9	66.1	63	248.7	85.6
24	22.7	7.8	84	79.4	27.3	44	136.2	46.9	04	192.9	66.4	64	249.6	86.0
25	23.6	8.1	85	80.4	27.7	45	137.1	47.2	05	193.8	66.7	65	250.6	86.3
26	24.6	8.5	86	81.3	28.0	46	138.0	47.5	06	194.8	67.1	66	251.5	86.6
27	25.5	8.8	87	82.3	28.3	47	139.0	47.9	07	195.7	67.4	67	252.5	86.9
28	26.5	9.1	88	83.2	28.7	48	139.9	48.2	08	196.7	67.7	68	253.4	87.3
29	27.4	9.4	89	84.2	29.0	49	140.9	48.5	09	197.6	68.0	69	254.3	87.6
30	28.4	9.8	90	85.1	29.3	50	141.8	48.8	10	198.6	68.4	70	255.3	87.9
31	29.3	10.1	91	86.0	29.6	151	142.8	49.2	211	199.5	68.7	271	256.2	88.2
32	30.3	10.4	92	87.0	30.0	52	143.7	49.5	12	200.4	69.0	72	257.2	88.6
33	31.2	10.7	93	87.9	30.3	53	144.7	49.8	13	201.4	69.3	73	258.1	88.9
34	32.1	11.1	94	88.9	30.6	54	145.6	50.1	14	202.3	69.7	74	259.1	89.2
35	33.1	11.4	95	89.8	30.9	55	146.6	50.5	15	203.3	70.0	75	260.0	89.5
36	34.0	11.7	96	90.8	31.3	56	147.5	50.8	16	204.2	70.3	76	261.0	89.9
37	35.0	12.0	97	91.7	31.6	57	148.4	51.1	17	205.2	70.6	77	261.9	90.2
38	35.9	12.4	98	92.7	31.9	58	149.4	51.4	18	206.1	71.0	78	262.9	90.5
39	36.9	12.7	99	93.6	32.2	59	150.3	51.8	19	207.1	71.3	79	263.8	90.8
40	37.8	13.0	100	94.6	32.6	60	151.3	52.1	20	208.0	71.6	80	264.7	91.2
41	38.8	13.3	101	95.5	32.9	161	152.2	52.4	221	209.0	72.0	281	265.7	91.5
42	39.7	13.7	02	96.4	33.2	62	153.2	52.7	22	209.9	72.3	82	266.6	91.8
43	40.7	14.0	03	97.4	33.5	63	154.1	53.1	23	210.9	72.6	83	267.6	92.1
44	41.6	14.3	04	98.3	33.9	64	155.1	53.4	24	211.8	72.9	84	268.5	92.5
45	42.5	14.7	05	99.3	34.2	65	156.0	53.7	25	212.7	73.3	85	269.5	92.8
46	43.5	15.0	06	100.2	34.5	66	157.0	54.0	26	213.7	73.6	86	270.4	93.1
47	44.4	15.3	07	101.2	34.8	67	157.9	54.4	27	214.6	73.9	87	271.4	93.4
48	45.4	15.6	08	102.1	35.2	68	158.8	54.7	28	215.6	74.2	88	272.3	93.8
49	46.3	16.0	09	103.1	35.5	69	159.8	55.0	29	216.5	74.6	89	273.3	94.1
50	47.3	16.3	10	104.0	35.8	70	160.7	55.3	30	217.5	74.9	90	274.2	94.4
51	48.2	16.6	111	105.0	36.1	171	161.7	55.7	231	218.4	75.2	291	275.1	94.7
52	49.2	16.9	12	105.9	36.5	72	162.6	56.0	32	219.4	75.5	92	276.1	95.1
53	50.1	17.3	13	106.8	36.8	73	163.6	56.3	33	220.3	75.9	93	277.0	95.4
54	51.1	17.6	14	107.8	37.1	74	164.5	56.6	34	221.3	76.2	94	278.0	95.7
55	52.0	17.9	15	108.7	37.4	75	165.5	57.0	35	222.2	76.5	95	278.9	96.0
56	52.9	18.2	16	109.7	37.8	76	166.4	57.3	36	223.1	76.8	96	279.9	96.4
57	53.9	18.6	17	110.6	38.1	77	167.4	57.6	37	224.1	77.2	97	280.8	96.7
58	54.8	18.9	18	111.6	38.4	78	168.3	58.0	38	225.0	77.5	98	281.8	97.0
59	55.8	19.2	19	112.5	38.7	79	169.2	58.3	39	226.0	77.8	99	282.7	97.3
60	56.7	19.5	20	113.5	39.1	80	170.2	58.6	40	226.9	78.1	300	283.7	97.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

71° (109°, 251°, 289°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		*m*	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 19° (161°, 199°, 341°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	284. 6	98. 0	361	341. 3	117. 5	421	398. 1	137. 1	481	454. 8	156. 6	541	511. 5	176. 1
02	285. 5	98. 3	62	342. 3	117. 9	22	399. 0	137. 4	82	455. 7	156. 9	42	512. 5	176. 5
03	286. 5	98. 6	63	343. 2	118. 2	23	400. 0	137. 7	83	456. 7	157. 2	43	513. 4	176. 8
04	287. 4	99. 0	64	344. 2	118. 5	24	400. 9	138. 0	84	457. 6	157. 6	44	514. 4	177. 1
05	288. 4	99. 3	65	345. 1	118. 8	25	401. 8	138. 4	85	458. 6	157. 9	45	515. 3	177. 4
06	289. 3	99. 6	66	346. 1	119. 2	26	402. 8	138. 7	86	459. 5	158. 2	46	516. 3	177. 8
07	290. 3	99. 9	67	347. 0	119 5	27	403. 7	139. 0	87	460. 5	158. 6	47	517. 2	178. 1
08	291. 2	100. 3	68	348. 0	119. 8	28	404. 7	139. 3	88	461. 4	158. 9	48	518. 1	178. 4
09	292. 2	100. 6	69	348. 9	120. 1	29	405. 6	139. 7	89	462. 4	159. 2	49	519. 1	178. 7
10	293. 1	100. 9	70	349. 8	120. 5	30	406. 6	140. 0	90	463. 3	159. 5	50	520. 0	179. 1
311	294 1	101. 3	371	350. 8	120. 8	431	407. 5	140. 3	491	464. 2	159. 9	551	521. 0	179. 4
12	295. 0	101. 6	72	351. 7	121. 1	32	408. 5	140. 6	92	465. 2	160. 2	52	521. 9	179. 7
13	295. 9	101. 9	73	352. 7	121. 4	33	409. 4	141. 0	93	466. 1	160. 5	53	522. 9	180. 0
14	296. 9	102. 2	74	353. 6	121. 8	34	410. 4	141. 3	94	467. 1	160. 8	54	523. 8	180. 4
15	297. 8	102. 6	75	354. 6	122. 1	35	411. 3	141. 6	95	468. 0	161. 2	55	524. 8	180. 7
16	298. 8	102. 9	76	355. 5	122. 4	36	412. 2	141. 9	96	469. 0	161. 5	56	525. 7	181. 0
17	299. 7	103. 2	77	356. 5	122. 7	37	413. 2	142. 3	97	469. 9	161. 8	57	526. 7	181. 3
18	300. 7	103. 5	78	357. 4	123. 1	38	414. 1	142. 6	98	470. 9	162. 1	58	527. 6	181. 7
19	301. 6	103. 8	79	358. 4	123. 4	39	415. 1	142. 9	99	471. 8	162. 5	59	528. 5	182. 0
20	302. 6	104. 2	80	359. 3	123. 7	40	416. 0	143. 3	500	472. 8	162. 8	60	529. 5	182. 3
321	303. 5	104. 5	381	360. 2	124. 0	441	417. 0	143. 6	501	473. 7	163. 1	561	530. 4	182. 6
22	304. 5	104. 8	82	361. 2	124. 4	42	417. 9	143. 9	02	474. 7	163. 4	62	531. 4	183. 0
23	305. 4	105. 2	83	362. 1	124 7	43	418. 9	144. 2	03	475. 6	163. 8	63	532. 3	183. 3
24	306. 3	105. 5	84	363. 1	125. 0	44	419. 8	144. 6	04	476. 5	164. 1	64	533. 3	183. 6
25	307. 3	105. 8	85	364. 0	125. 3	45	420. 8	144. 9	05	477. 5	164. 4	65	534. 2	183. 9
26	308. 2	106. 1	86	365. 0	125. 7	46	421. 7	145. 2	06	478. 4	164. 7	66	535. 2	184. 3
27	309. 2	106. 5	87	365. 9	126. 0	47	422. 6	145. 5	07	479. 4	165. 1	67	536. 1	184. 6
28	310. 1	106. 8	88	366. 9	126. 3	48	423. 6	145. 9	08	480. 3	165. 4	68	537. 1	184. 9
29	311. 1	107. 1	89	367. 8	126. 6	49	424. 5	146. 2	09	481. 3	165. 7	69	538. 0	185. 2
30	312. 0	107. 4	90	368. 8	127. 0	50	425. 5	146. 5	10	482. 2	166. 0	70	538. 9	185. 6
331	313. 0	107. 8	391	369. 7	127. 3	451	426. 4	146. 8	511	483. 2	166. 4	571	539. 9	185. 9
32	313. 9	108. 1	92	370. 6	127. 6	52	427. 4	147. 2	12	484. 1	166. 7	72	540. 8	186. 2
33	314. 9	108. 4	93	371. 6	127. 9	53	428. 3	147. 5	13	485. 1	167. 0	73	541. 8	186. 6
34	315. 8	108. 7	94	372. 5	128. 3	54	429. 3	147. 8	14	486. 0	167. 3	74	542. 7	186. 9
35	316. 7	109. 1	95	373. 5	128. 6	55	430. 2	148. 1	15	486. 9	167. 7	75	543. 7	187. 2
36	317. 7	109. 4	96	374. 4	128. 9	56	431. 2	148. 5	16	487. 9	168. 0	76	544. 6	187. 5
37	318. 6	109. 7	97	375. 4	129. 3	57	432. 1	148. 8	17	488. 8	168. 3	77	545. 6	187. 9
38	319. 6	110. 0	98	376. 3	129. 6	58	433. 0	149. 1	18	489. 7	168. 6	78	546. 5	188. 2
39	320. 5	110. 4	99	377. 3	129. 9	59	434. 0	149. 4	19	490. 7	169. 0	79	547. 5	188. 5
40	321. 5	110. 7	400	378. 2	130. 2	60	434. 9	149. 8	20	491. 6	169. 3	80	548. 4	188. 8
341	322. 4	111. 0	401	379. 2	130. 6	461	435. 9	150. 1	521	492. 6	169. 6	581	549. 3	189. 2
42	323. 4	111. 3	02	380. 1	130. 9	62	436. 8	150. 4	22	493. 6	169. 9	82	550. 3	189. 5
43	324. 3	111. 7	03	381. 0	131. 2	63	437. 8	150. 7	23	494. 5	170. 3	83	551. 2	189. 8
44	325. 3	112. 0	04	382. 0	131. 5	64	438. 7	151. 1	24	495. 5	170. 6	84	552. 2	190. 1
45	326. 2	112. 3	05	382. 9	131. 9	65	439. 7	151. 4	25	496. 4	170. 9	85	553. 1	190. 5
46	327. 1	112. 6	06	383. 9	132. 2	66	440. 6	151. 7	26	497. 3	171. 2	86	554. 1	190. 8
47	328. 1	113. 0	07	384. 8	132. 5	67	441. 6	152. 0	27	498. 3	171. 6	87	555. 0	191. 1
48	329. 0	113. 3	08	385. 8	132. 8	68	442. 5	152. 4	28	499. 2	171. 9	88	556. 0	191. 4
49	330. 0	113. 6	09	386. 7	133. 2	69	443. 4	152. 7	29	500. 2	172. 2	89	556. 9	191. 8
50	330. 9	113. 9	10	387. 7	133. 5	70	444. 4	153. 0	30	501. 1	172. 6	90	557. 9	192. 0
351	331. 9	114. 3	411	388. 6	133. 8	471	445. 3	153. 3	531	502. 1	172. 9	591	558. 8	192. 4
52	332. 8	114. 6	12	389. 6	134. 1	72	446. 3	153. 7	32	503. 0	173. 2	92	559. 7	192. 7
53	333. 8	114. 9	13	390. 5	134. 5	73	447. 2	154. 0	33	504. 0	173. 5	93	560. 7	193. 1
54	334. 7	115. 3	14	391. 4	134. 8	74	448. 2	154. 3	34	504. 9	173. 9	94	561. 6	193. 4
55	335. 7	115. 6	15	392. 4	135. 1	75	449. 1	154. 6	35	505. 9	174. 2	95	562. 6	193. 7
56	336. 6	115. 9	16	393. 3	135. 4	76	450. 1	155. 0	36	506. 8	174. 5	96	563. 5	194. 0
57	337. 6	116. 2	17	394. 3	135. 8	77	451. 0	155. 3	37	507. 7	174. 8	97	564. 5	194. 4
58	338. 5	116. 6	18	395. 2	136. 1	78	452. 0	155. 6	38	508. 7	175. 2	98	565. 4	194. 7
59	339. 4	116. 9	19	396. 2	136. 4	79	452. 9	155. 9	39	509. 6	175. 5	99	566. 4	195. 0
60	340. 4	117. 2	20	397. 1	136. 7	80	453. 8	156. 3	40	510. 6	175. 8	600	567. 3	195. 3
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

71° (109°, 251°, 289°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 20° (160°, 200°, 340°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.3	61	57.3	20.9	121	113.7	41.4	181	170.1	61.9	241	226.5	82.4
2	1.9	0.7	62	58.3	21.2	22	114.6	41.7	82	171.0	62.2	42	227.4	82.8
3	2.8	1.0	63	59.2	21.5	23	115.6	42.1	83	172.0	62.6	43	228.3	83.1
4	3.8	1.4	64	60.1	21.9	24	116.5	42.4	84	172.9	62.9	44	229.3	83.5
5	4.7	1.7	65	61.1	22.2	25	117.5	42.8	85	173.8	63.3	45	230.2	83.8
6	5.6	2.1	66	62.0	22.6	26	118.4	43.1	86	174.8	63.6	46	231.2	84.1
7	6.6	2.4	67	63.0	22.9	27	119.3	43.4	87	175.7	64.0	47	232.1	84.5
8	7.5	2.7	68	63.9	23.3	28	120.3	43.8	88	176.7	64.3	48	233.0	84.8
9	8.5	3.1	69	64.8	23.6	29	121.2	44.1	89	177.6	64.6	49	234.0	85.2
10	9.4	3.4	70	65.8	23.9	30	122.2	44.5	90	178.5	65.0	50	234.9	85.5
11	10.3	3.8	71	66.7	24.3	131	123.1	44.8	191	179.5	65.3	251	235.9	85.8
12	11.3	4.1	72	67.7	24.6	32	124.0	45.1	92	180.4	65.7	52	236.8	86.2
13	12.2	4.4	73	68.6	25.0	33	125.0	45.5	93	181.4	66.0	53	237.7	86.5
14	13.2	4.8	74	69.5	25.3	34	125.9	45.8	94	182.3	66.4	54	238.7	86.9
15	14.1	5.1	75	70.5	25.7	35	126.9	46.2	95	183.2	66.7	55	239.6	87.2
16	15.0	5.5	76	71.4	26.0	36	127.8	46.5	96	184.2	67.0	56	240.6	87.6
17	16.0	5.8	77	72.4	26.3	37	128.7	46.9	97	185.1	67.4	57	241.5	87.9
18	16.9	6.2	78	73.3	26.7	38	129.7	47.2	98	186.1	67.7	58	242.4	88.2
19	17.9	6.5	79	74.2	27.0	39	130.6	47.5	99	187.0	68.1	59	243.4	88.6
20	18.8	6.8	80	75.2	27.4	40	131.6	47.9	200	187.9	68.4	60	244.3	88.9
21	19.7	7.2	81	76.1	27.7	141	132.5	48.2	201	188.9	68.7	261	245.3	89.3
22	20.7	7.5	82	77.1	28.0	42	133.4	48.6	02	189.8	69.1	62	246.2	89.6
23	21.6	7.9	83	78.0	28.4	43	134.4	48.9	03	190.8	69.4	63	247.1	90.0
24	22.6	8.2	84	78.9	28.7	44	135.3	49.3	04	191.7	69.8	64	248.1	90.3
25	23.5	8.6	85	79.9	29.1	45	136.3	49.6	05	192.6	70.1	65	249.0	90.6
26	24.4	8.9	86	80.8	29.4	46	137.2	49.9	06	193.6	70.5	66	250.0	91.0
27	25.4	9.2	87	81.8	29.8	47	138.1	50.3	07	194.5	70.8	67	250.9	91.3
28	26.3	9.6	88	82.7	30.1	48	139.1	50.6	08	195.5	71.1	68	251.8	91.7
29	27.3	9.9	89	83.6	30.4	49	140.0	51.0	09	196.4	71.5	69	252.8	92.0
30	28.2	10.3	90	84.6	30.8	50	140.9	51.3	10	197.3	71.8	70	253.7	92.3
31	29.1	10.6	91	85.5	31.1	151	141.9	51.6	211	198.3	72.2	271	254.7	92.7
32	30.1	10.9	92	86.5	31.5	52	142.8	52.0	12	199.2	72.5	72	255.6	93.0
33	31.0	11.3	93	87.4	31.8	53	143.8	52.3	13	200.2	72.9	73	256.5	93.4
34	31.9	11.6	94	88.3	32.1	54	144.7	52.7	14	201.1	73.2	74	257.5	93.7
35	32.9	12.0	95	89.3	32.5	55	145.7	53.0	15	202.0	73.5	75	258.4	94.1
36	33.8	12.3	96	90.2	32.8	56	146.6	53.4	16	203.0	73.9	76	259.4	94.4
37	34.8	12.7	97	91.2	33.2	57	147.5	53.7	17	203.9	74.2	77	260.3	94.7
38	35.7	13.0	98	92.1	33.5	58	148.5	54.0	18	204.9	74.6	78	261.2	95.1
39	36.6	13.3	99	93.0	33.9	59	149.4	54.4	19	205.8	74.9	79	262.2	95.4
40	37.6	13.7	100	94.0	34.2	60	150.4	54.7	20	206.7	75.2	80	263.1	95.8
41	38.5	14.0	101	94.9	34.5	161	151.3	55.1	221	207.7	75.6	281	264.1	96.1
42	39.5	14.4	02	95.8	34.9	62	152.2	55.4	22	208.6	75.9	82	265.0	96.4
43	40.4	14.7	03	96.8	35.2	63	153.2	55.7	23	209.6	76.3	83	265.9	96.8
44	41.3	15.0	04	97.7	35.6	64	154.1	56.1	24	210.5	76.6	84	266.9	97.1
45	42.3	15.4	05	98.7	35.9	65	155.0	56.4	25	211.4	77.0	85	267.8	97.5
46	43.2	15.7	06	99.6	36.3	66	156.0	56.8	26	212.4	77.3	86	268.8	97.8
47	44.2	16.1	07	100.5	36.6	67	156.9	57.1	27	213.3	77.6	87	269.7	98.2
48	45.1	16.4	08	101.5	36.9	68	157.9	57.5	28	214.2	78.0	88	270.6	98.5
49	46.0	16.8	09	102.4	37.3	69	158.8	57.8	29	215.2	78.3	89	271.6	98.8
50	47.0	17.1	10	103.4	37.6	70	159.7	58.1	30	216.1	78.7	90	272.5	99.2
51	47.9	17.4	111	104.3	38.0	171	160.7	58.5	231	217.1	79.0	291	273.5	99.5
52	48.9	17.8	12	105.2	38.3	72	161.6	58.8	32	218.0	79.3	92	274.4	99.9
53	49.8	18.1	13	106.2	38.6	73	162.6	59.2	33	218.9	79.7	93	275.3	100.2
54	50.7	18.5	14	107.1	39.0	74	163.5	59.5	34	219.9	80.0	94	276.3	100.6
55	51.7	18.8	15	108.1	39.3	75	164.4	59.9	35	220.8	80.4	95	277.2	100.9
56	52.6	19.2	16	109.0	39.7	76	165.4	60.2	36	221.8	80.7	96	278.1	101.2
57	53.6	19.5	17	109.9	40.0	77	166.3	60.5	37	222.7	81.1	97	279.1	101.6
58	54.5	19.8	18	110.9	40.4	78	167.3	60.9	38	223.6	81.4	98	280.0	101.9
59	55.4	20.2	19	111.8	40.7	79	168.2	61.2	39	224.6	81.7	99	281.0	102.3
60	56.4	20.5	20	112.8	41.0	80	169.1	61.6	40	225.5	82.1	300	281.9	102.6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

70° (110°, 250°, 290°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

Difference of Latitude and Departure for 20° (160°, 200°, 340°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	282.8	102.9	361	339.2	123.5	421	395.6	144.0	481	452.0	164.5	541	508.4	185.0
02	283.8	103.3	62	340.2	123.8	22	396.6	144.3	82	452.9	164.9	42	509.3	185.4
03	284.7	103.6	63	341.1	124.2	23	397.5	144.7	83	453.9	165.2	43	510.3	185.7
04	285.7	104.0	64	342.0	124.5	24	398.4	145.0	84	454.8	165.5	44	511.2	186.1
05	286.6	104.3	65	343.0	124.8	25	399.4	145.4	85	455.8	165.9	45	512.1	186.4
06	287.5	104.7	66	343.9	125.2	26	400.3	145.7	86	456.7	166.2	46	513.1	186.7
07	288.5	105.0	67	344.9	125.5	27	401.3	146.1	87	457.6	166.6	47	514.0	187.1
08	289.4	105.3	68	345.8	125.9	28	402.2	146.4	88	458.6	166.9	48	515.0	187.4
09	290.4	105.7	69	346.7	126.2	29	403.1	146.7	89	459.5	167.3	49	515.9	187.8
10	291.3	106.0	70	347.7	126.5	30	404.1	147.1	90	460.4	167.6	50	516.8	188.1
311	292.2	106.4	371	348.6	126.9	431	405.0	147.4	491	461.4	167.9	551	517.8	188.5
12	293.2	106.7	72	349.6	127.2	32	406.0	147.8	92	462.3	168.3	52	518.7	188.8
13	294.1	107.1	73	350.5	127.6	33	406.9	148.1	93	463.3	168.6	53	519.7	189.1
14	295.1	107.4	74	351.4	127.9	34	407.8	148.4	94	464.2	169.0	54	520.6	189.5
15	296.0	107.7	75	352.4	128.3	35	408.8	148.8	95	465.1	169.3	55	521.5	189.8
16	296.9	108.1	76	353.3	128.6	36	409.7	149.1	96	466.1	169.6	56	522.5	190.2
17	297.9	108.4	77	354.3	128.9	37	410.6	149.5	97	467.0	170.0	57	523.4	190.5
18	298.8	108.8	78	355.2	129.3	38	411.6	149.8	98	468.0	170.3	58	524.3	190.8
19	299.8	109.1	79	356.1	129.6	39	412.5	150.2	99	468.9	170.7	59	525.3	191.2
20	300.7	109.4	80	357.1	130.0	40	413.5	150.5	500	469.8	171.0	60	526.2	191.5
321	301.6	109.8	381	358.0	130.3	441	414.4	150.8	501	470.8	171.4	561	527.2	191.9
22	302.6	110.1	82	359.0	130.7	42	415.3	151.2	02	471.7	171.7	62	528.1	192.2
23	303.5	110.5	83	359.9	131.0	43	416.3	151.5	03	472.7	172.0	63	529.0	192.6
24	304.5	110.8	84	360.8	131.3	44	417.2	151.9	04	473.6	172.4	64	530.0	192.9
25	305.4	111.2	85	361.8	131.7	45	418.2	152.2	05	474.5	172.7	65	530.9	193.2
26	306.3	111.5	86	362.7	132.0	46	419.1	152.5	06	475.5	173.1	66	531.9	193.6
27	307.3	111.8	87	363.7	132.4	47	420.0	152.9	07	476.4	173.4	67	532.8	193.9
28	308.2	112.2	88	364.6	132.7	48	421.0	153.2	08	477.4	173.7	68	533.7	194.3
29	309.2	112.5	89	365.5	133.1	49	421.9	153.6	09	478.3	174.1	69	534.7	194.6
30	310.1	112.9	90	366.5	133.4	50	422.9	153.9	10	479.2	174.4	70	535.6	195.0
331	311.0	113.2	391	367.4	133.7	451	423.8	154.3	511	480.2	174.8	571	536.6	195.3
32	312.0	113.6	92	368.4	134.1	52	424.7	154.6	12	481.1	175.1	72	537.5	195.6
33	312.9	113.9	93	369.3	134.4	53	425.7	154.9	13	482.1	175.5	73	538.4	196.0
34	313.9	114.2	94	370.2	134.8	54	426.6	155.3	14	483.0	175.8	74	539.4	196.3
35	314.8	114.6	95	371.2	135.1	55	427.6	155.6	15	483.9	176.1	75	540.3	196.7
36	315.7	114.9	96	372.1	135.4	56	428.5	156.0	16	484.9	176.5	76	541.3	197.0
37	316.7	115.3	97	373.1	135.8	57	429.4	156.3	17	485.8	176.8	77	542.2	197.3
38	317.6	115.6	98	374.0	136.1	58	430.4	156.6	18	486.8	177.2	78	543.1	197.7
39	318.6	115.9	99	374.9	136.5	59	431.3	157.0	19	487.7	177.5	79	544.1	198.0
40	319.5	116.3	400	375.9	136.8	60	432.3	157.3	20	488.6	177.9	80	545.0	198.4
341	320.4	116.6	401	376.8	137.2	461	433.2	157.7	521	489.6	178.2	581	546.0	198.7
42	321.4	117.0	02	377.8	137.5	62	434.1	158.0	22	490.5	178.5	82	546.9	199.1
43	322.3	117.3	03	378.7	137.8	63	435.1	158.4	23	491.5	178.9	83	547.8	199.4
44	323.3	117.7	04	379.6	138.2	64	436.0	158.7	24	492.4	179.2	84	548.8	199.7
45	324.2	118.0	05	380.6	138.5	65	437.0	159.0	25	493.3	179.6	85	549.7	200.1
46	325.1	118.3	06	381.5	138.9	66	437.9	159.4	26	494.3	179.9	86	550.7	200.4
47	326.1	118.7	07	382.5	139.2	67	438.8	159.7	27	495.2	180.2	87	551.6	200.8
48	327.0	119.0	08	383.4	139.6	68	439.8	160.1	28	496.2	180.6	88	552.5	201.2
49	328.0	119.4	09	384.3	139.9	69	440.7	160.4	29	497.1	180.9	89	553.5	201.4
50	328.9	119.7	10	385.3	140.2	70	441.7	160.7	30	498.0	181.3	90	554.4	201.8
351	329.8	120.0	411	386.2	140.6	471	442.6	161.1	531	499.0	181.6	591	555.4	202.1
52	330.8	120.4	12	387.2	140.9	72	443.5	161.4	32	499.9	182.0	92	556.3	202.5
53	331.7	120.7	13	388.1	141.3	73	444.5	161.8	33	500.9	182.3	93	557.2	202.8
54	332.7	121.1	14	389.0	141.6	74	445.4	162.1	34	501.8	182.6	94	558.2	203.2
55	333.6	121.4	15	390.0	141.9	75	446.4	162.5	35	502.7	183.0	95	559.1	203.5
56	334.5	121.8	16	390.9	142.3	76	447.3	162.8	36	503.7	183.3	96	560.1	203.8
57	335.5	122.1	17	391.9	142.6	77	448.2	163.1	37	504.6	183.7	97	561.0	204.2
58	336.4	122.4	18	392.8	143.0	78	449.2	163.5	38	505.6	184.0	98	561.9	204.5
59	337.4	122.8	19	393.7	143.3	79	450.1	163.8	39	506.5	184.3	99	562.9	204.9
60	338.3	123.1	20	394.7	143.7	80	451.1	164.2	40	507.4	184.7	600	563.8	205.2
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

70° (110°, 250°, 290°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 21° (159°, 201°, 339°).

Dist	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.4	61	56.9	21.9	121	113.0	43.4	181	169.0	64.9	241	225.0	86.4
2	1.9	0.7	62	57.9	22.2	22	113.9	43.7	82	169.9	65.2	42	225.9	86.7
3	2.8	1.1	63	58.8	22.6	23	114.8	44.1	83	170.8	65.6	43	226.9	87.1
4	3.7	1.4	64	59.7	22.9	24	115.8	44.4	84	171.8	65.9	44	227.8	87.4
5	4.7	1.8	65	60.7	23.3	25	116.7	44.8	85	172.7	66.3	45	228.7	87.8
6	5.6	2.2	66	61.6	23.7	26	117.6	45.2	86	173.6	66.7	46	229.7	88.2
7	6.5	2.5	67	62.5	24.0	27	118.6	45.5	87	174.6	67.0	47	230.6	88.5
8	7.5	2.9	68	63.5	24.4	28	119.5	45.9	88	175.5	67.4	48	231.5	88.9
9	8.4	3.2	69	64.4	24.7	29	120.4	46.2	89	176.4	67.7	49	232.5	89.2
10	9.3	3.6	70	65.4	25.1	30	121.4	46.6	90	177.4	68.1	50	233.4	89.6
11	10.3	3.9	71	66.3	25.4	131	122.3	46.9	191	178.3	68.4	251	234.3	90.0
12	11.2	4.3	72	67.2	25.8	32	123.2	47.3	92	179.2	68.8	52	235.3	90.3
13	12.1	4.7	73	68.2	26.2	33	124.2	47.7	93	180.2	69.2	53	236.2	90.7
14	13.1	5.0	74	69.1	26.5	34	125.1	48.0	94	181.1	69.5	54	237.1	91.0
15	14.0	5.4	75	70.0	26.9	35	126.0	48.4	95	182.0	69.9	55	238.1	91.4
16	14.9	5.7	76	71.0	27.2	36	127.0	48.7	96	183.0	70.2	56	239.0	91.7
17	15.9	6.1	77	71.9	27.6	37	127.9	49.1	97	183.9	70.6	57	239.9	92.1
18	16.8	6.5	78	72.8	28.0	38	128.8	49.5	98	184.8	71.0	58	240.9	92.5
19	17.7	6.8	79	73.8	28.3	39	129.8	49.8	99	185.8	71.3	59	241.8	92.8
20	18.7	7.2	80	74.7	28.7	40	130.7	50.2	200	186.7	71.7	60	242.7	93.2
21	19.6	7.5	81	75.6	29.0	141	131.6	50.5	201	187.6	72.0	261	243.7	93.5
22	20.5	7.9	82	76.6	29.4	42	132.6	50.9	02	188.6	72.4	62	244.6	93.9
23	21.5	8.2	83	77.5	29.7	43	133.5	51.2	03	189.5	72.7	63	245.5	94.3
24	22.4	8.6	84	78.4	30.1	44	134.4	51.6	04	190.5	73.1	64	246.5	94.6
25	23.3	9.0	85	79.4	30.5	45	135.4	52.0	05	191.4	73.5	65	247.4	95.0
26	24.3	9.3	86	80.3	30.8	46	136.3	52.3	06	192.3	73.8	66	248.3	95.3
27	25.2	9.7	87	81.2	31.2	47	137.2	52.7	07	193.3	74.2	67	249.3	95.7
28	26.1	10.0	88	82.2	31.5	48	138.2	53.0	08	194.2	74.5	68	250.2	96.0
29	27.1	10.4	89	83.1	31.9	49	139.1	53.4	09	195.1	74.9	69	251.1	96.4
30	28.0	10.8	90	84.0	32.3	50	140.0	53.8	10	196.1	75.3	70	252.1	96.8
31	28.9	11.1	91	85.0	32.6	151	141.0	54.1	211	197.0	75.6	271	253.0	97.1
32	29.9	11.5	92	85.9	33.0	52	141.9	54.5	12	197.9	76.0	72	253.9	97.5
33	30.8	11.8	93	86.8	33.3	53	142.8	54.8	13	198.9	76.3	73	254.9	97.8
34	31.7	12.2	94	87.8	33.7	54	143.8	55.2	14	199.8	76.7	74	255.8	98.2
35	32.7	12.5	95	88.7	34.0	55	144.7	55.5	15	200.7	77.0	75	256.7	98.6
36	33.6	12.9	96	89.6	34.4	56	145.6	55.9	16	201.7	77.4	76	257.7	98.9
37	34.5	13.3	97	90.6	34.8	57	146.6	56.3	17	202.6	77.8	77	258.6	99.3
38	35.5	13.6	98	91.5	35.1	58	147.5	56.6	18	203.5	78.1	78	259.5	99.6
39	36.4	14.0	99	92.4	35.5	59	148.4	57.0	19	204.5	78.5	79	260.5	100.0
40	37.3	14.3	100	93.4	35.8	60	149.4	57.3	20	205.4	78.8	80	261.4	100.3
41	38.3	14.7	101	94.3	36.2	161	150.3	57.7	221	206.3	79.2	281	262.3	100.7
42	39.2	15.1	02	95.2	36.6	62	151.2	58.1	22	207.3	79.6	82	263.3	101.1
43	40.1	15.4	03	96.2	36.9	63	152.2	58.4	23	208.2	79.9	83	264.2	101.4
44	41.1	15.8	04	97.1	37.3	64	153.1	58.8	24	209.1	80.3	84	265.1	101.8
45	42.0	16.1	05	98.0	37.6	65	154.0	59.1	25	210.1	80.6	85	266.1	102.1
46	42.9	16.5	06	99.0	38.0	66	155.0	59.5	26	211.0	81.0	86	267.0	102.5
47	43.9	16.8	07	99.9	38.3	67	155.9	59.8	27	211.9	81.3	87	267.9	102.9
48	44.8	17.2	08	100.8	38.7	68	156.8	60.2	28	212.9	81.7	88	268.9	103.2
49	45.7	17.6	09	101.8	39.1	69	157.8	60.6	29	213.8	82.1	89	269.8	103.6
50	46.7	17.9	10	102.7	39.4	70	158.7	60.9	30	214.7	82.4	90	270.7	103.9
51	47.6	18.3	111	103.6	39.8	171	159.6	61.3	231	215.7	82.8	291	271.7	104.3
52	48.5	18.6	12	104.6	40.1	72	160.6	61.6	32	216.6	83.1	92	272.6	104.6
53	49.5	19.0	13	105.5	40.5	73	161.5	62.0	33	217.5	83.5	93	273.5	105.0
54	50.4	19.4	14	106.4	40.9	74	162.4	62.4	34	218.5	83.9	94	274.5	105.4
55	51.3	19.7	15	107.4	41.2	75	163.4	62.7	35	219.4	84.2	95	275.4	105.7
56	52.3	20.1	16	108.3	41.6	76	164.3	63.1	36	220.3	84.6	96	276.3	106.1
57	53.2	20.4	17	109.2	41.9	77	165.2	63.4	37	221.3	84.9	97	277.3	106.4
58	54.1	20.8	18	110.2	42.3	78	166.2	63.8	38	222.2	85.3	98	278.2	106.8
59	55.1	21.1	19	111.1	42.6	79	167.1	64.1	39	223.1	85.6	99	279.1	107.2
60	56.0	21.5	20	112.0	43.0	80	168.0	64.5	40	224.1	86.0	300	280.1	107.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

69° (111°, 249°, 291°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 21° (159°, 201°, 339°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	281.0	107.9	361	337.0	129.4	421	393.0	150.9	481	449.1	172.4	541	505.1	193.9
02	281.9	108.2	62	338.0	129.7	22	394.0	151.2	82	450.0	172.7	42	506.0	194.2
03	282.9	108.6	63	338.9	130.1	23	394.9	151.6	83	450.9	173.1	43	506.9	194.6
04	283.8	108.9	64	339.8	130.4	24	395.8	151.9	84	451.9	173.5	44	507.9	195.0
05	284.7	109.3	65	340.8	130.8	25	396.8	152.3	85	452.8	173.8	45	508.8	195.3
06	285.7	109.7	66	341.7	131.2	26	397.7	152.7	86	453.7	174.2	46	509.7	195.7
07	286.6	110.0	67	342.6	131.5	27	398.6	153.0	87	454.7	174.5	47	510.7	196.0
08	287.5	110.4	68	343.6	131.9	28	399.6	153.4	88	455.6	174.9	48	511.6	196.4
09	288.5	110.7	69	344.5	132.2	29	400.5	153.7	89	456.5	175.2	49	512.5	196.7
10	289.4	111.1	70	345.4	132.6	30	401.4	154.1	90	457.5	175.6	50	513.5	197.1
311	290.3	111.5	371	346.4	133.0	431	402.4	154.5	491	458.4	176.0	551	514.4	197.5
12	291.3	111.8	72	347.3	133.3	32	403.3	154.8	92	459.3	176.3	52	515.3	197.8
13	292.2	112.2	73	348.2	133.7	33	404.2	155.2	93	460.5	176.7	53	516.3	198.2
14	293.1	112.5	74	349.1	134.0	34	405.2	155.5	94	461.2	177.0	54	517.2	198.5
15	294.1	112.9	75	350.1	134.4	35	406.1	155.9	95	462.1	177.4	55	518.1	198.9
16	295.0	113.2	76	351.0	134.7	36	407.0	156.2	96	463.1	177.8	56	519.1	199.3
17	295.9	113.6	77	352.0	135.1	37	408.0	156.6	97	464.0	178.1	57	520.0	199.6
18	296.9	114.0	78	352.9	135.5	38	408.9	157.0	98	464.9	178.5	58	520.9	200.0
19	297.8	114.3	79	353.8	135.8	39	409.8	157.3	99	465.9	178.8	59	521.9	200.3
20	298.7	114.7	80	354.8	136.2	40	410.8	157.7	500	466.8	179.2	60	522.8	200.7
321	299.7	115.0	381	355.7	136.5	441	411.7	158.0	501	467.7	179.5	561	523.7	201.0
22	300.6	115.4	82	356.6	136.9	42	412.6	158.4	02	468.7	179.9	62	524.7	201.4
23	301.5	115.8	83	357.6	137.3	43	413.6	158.8	03	469.6	180.3	63	525.6	201.8
24	302.5	116.1	84	358.5	137.6	44	414.5	159.1	04	470.5	180.6	64	526.5	202.1
25	303.4	116.5	85	359.4	138.0	45	415.4	159.5	05	471.5	181.0	65	527.5	202.5
26	304.3	116.8	86	360.4	138.3	46	416.4	159.8	06	472.4	181.3	66	528.4	202.8
27	305.3	117.2	87	361.3	138.7	47	417.3	160.2	07	473.3	181.7	67	529.3	203.2
28	306.2	117.5	88	362.2	139.0	48	418.2	160.5	08	474.3	182.1	68	530.3	203.6
29	307.1	117.9	89	363.2	139.4	49	419.2	160.9	09	475.2	182.4	69	531.2	203.9
30	308.1	118.3	90	364.1	139.8	50	420.1	161.3	10	476.1	182.8	70	532.1	204.3
331	309.0	118.6	391	365.0	140.1	451	421.0	161.6	511	477.1	183.1	571	533.1	204.6
32	309.9	119.0	92	365.9	140.5	52	422.0	162.0	12	478.0	183.5	72	534.0	205.0
33	310.9	119.3	93	366.9	140.8	53	422.9	162.3	13	478.9	183.8	73	534.9	205.3
34	311.8	119.7	94	367.8	141.2	54	423.8	162.7	14	479.9	184.2	74	535.9	205.7
35	312.7	120.1	95	368.8	141.6	55	424.8	163.1	15	480.8	184.6	75	536.8	206.1
36	313.7	120.4	96	369.7	141.9	56	425.7	163.4	16	481.7	184.9	76	537.7	206.4
37	314.6	120.8	97	370.6	142.3	57	426.6	163.8	17	482.7	185.3	77	538.7	206.8
38	315.6	121.1	98	371.6	142.6	58	427.6	164.1	18	483.6	185.6	78	539.6	207.1
39	316.5	121.5	99	372.5	143.0	59	428.5	164.5	19	484.5	186.0	79	540.5	207.5
40	317.4	121.8	400	373.4	143.3	60	429.4	164.8	20	485.5	186.4	80	541.5	207.9
341	318.4	122.2	401	374.4	143.7	461	430.4	165.2	521	486.4	186.7	581	542.4	208.2
42	319.3	122.6	02	375.3	144.1	62	431.3	165.6	22	487.3	187.1	82	543.3	208.6
43	320.2	122.9	03	376.2	144.4	63	432.2	165.9	23	488.3	187.4	83	544.3	208.9
44	321.2	123.2	04	377.1	144.8	64	433.2	166.3	24	489.2	187.8	84	545.2	209.3
45	322.1	123.6	05	378.1	145.1	65	434.1	166.6	25	490.1	188.1	85	546.1	209.6
46	323.0	124.0	06	379.0	145.5	66	435.0	167.0	26	491.1	188.5	86	547.1	210.0
47	324.0	124.4	07	379.9	145.9	67	436.0	167.4	27	492.0	188.9	87	548.0	210.4
48	324.9	124.7	08	380.9	146.2	68	436.9	167.7	28	492.9	189.2	88	548.9	210.7
49	325.8	125.1	09	381.8	146.6	69	437.8	168.1	29	493.9	189.6	89	549.9	211.1
50	326.8	125.4	10	382.8	146.9	70	438.8	168.4	30	494.8	189.9	90	550.8	211.4
351	327.7	125.8	411	383.7	147.3	471	439.7	168.8	531	495.7	190.3	591	551.7	211.8
52	328.6	126.1	12	384.6	147.6	72	440.6	169.1	32	496.7	190.7	92	552.7	212.2
53	329.6	126.5	13	385.6	148.0	73	441.6	169.5	33	497.6	191.0	93	553.6	212.5
54	330.5	126.9	14	386.5	148.4	74	442.5	169.9	34	498.5	191.4	94	554.5	212.9
55	331.4	127.2	15	387.4	148.7	75	443.5	170.2	35	499.5	191.7	95	555.5	213.2
56	332.4	127.6	16	388.4	149.1	76	444.4	170.6	36	500.4	192.1	96	556.4	213.6
57	333.3	127.9	17	389.3	149.4	77	445.3	170.9	37	501.3	192.4	97	557.3	213.9
58	334.2	128.3	18	390.2	149.8	78	446.3	171.3	38	502.3	192.8	98	558.2	214.3
59	335.2	128.7	19	391.2	150.2	79	447.2	171.7	39	503.2	193.2	99	559.2	214.7
60	336.1	129.0	20	392.1	150.5	80	448.1	172.0	40	504.1	193.5	600	560.1	215.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

69° (111°, 249°, 291°).

In Plane Sailing.	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 22° (158°, 202, 338°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.4	61	56.6	22.9	121	112.2	45.3	181	167.8	67.8	241	223.5	90.3
2	1.9	0.7	62	57.5	23.2	22	113.1	45.7	82	168.7	68.2	42	224.4	90.7
3	2.8	1.1	63	58.4	23.6	23	114.0	46.1	83	169.7	68.6	43	225.3	91.0
4	3.7	1.5	64	59.3	24.0	24	115.0	46.5	84	170.6	68.9	44	226.2	91.4
5	4.6	1.9	65	60.3	24.3	25	115.9	46.8	85	171.5	69.3	45	227.2	91.8
6	5.6	2.2	66	61.2	24.7	26	116.8	47.2	86	172.5	69.7	46	228.1	92.2
7	6.5	2.6	67	62.1	25.1	27	117.8	47.6	87	173.4	70.1	47	229.0	92.5
8	7.4	3.0	68	63.0	25.5	28	118.7	47.9	88	174.3	70.4	48	229.9	92.9
9	8.3	3.4	69	64.0	25.8	29	119.6	48.3	89	175.2	70.8	49	230.9	93.3
10	9.3	3.7	70	64.9	26.2	30	120.5	48.7	90	176.2	71.2	50	231.8	93.7
11	10.2	4.1	71	65.8	26.6	131	121.5	49.1	191	177.1	71.5	251	232.7	94.0
12	11.1	4.5	72	66.8	27.0	32	122.4	49.4	92	178.0	71.9	52	233.7	94.4
13	12.1	4.9	73	67.7	27.3	33	123.3	49.8	93	178.9	72.3	53	234.6	94.8
14	13.0	5.2	74	68.6	27.7	34	124.2	50.2	94	179.9	72.7	54	235.5	95.2
15	13.9	5.6	75	69.5	28.1	35	125.2	50.6	95	180.8	73.0	55	236.4	95.5
16	14.8	6.0	76	70.5	28.5	36	126.1	50.9	96	181.7	73.4	56	237.4	95.9
17	15.8	6.4	77	71.4	28.8	37	127.0	51.3	97	182.7	73.8	57	238.3	96.3
18	16.7	6.7	78	72.3	29.2	38	128.0	51.7	98	183.6	74.2	58	239.2	96.6
19	17.6	7.1	79	73.2	29.6	39	128.9	52.1	99	184.5	74.5	59	240.1	97.0
20	18.5	7.5	80	74.2	30.0	40	129.8	52.4	200	185.4	74.9	60	241.1	97.4
21	19.5	7.9	81	75.1	30.3	141	130.7	52.8	201	186.4	75.3	261	242.0	97.8
22	20.4	8.2	82	76.0	30.7	42	131.7	53.2	02	187.3	75.7	62	242.9	98.1
23	21.3	8.6	83	77.0	31.1	43	132.6	53.6	03	188.2	76.0	63	243.8	98.5
24	22.3	9.0	84	77.9	31.5	44	133.5	53.9	04	189.1	76.4	64	244.8	98.9
25	23.2	9.4	85	78.8	31.8	45	134.4	54.3	05	190.1	76.8	65	245.7	99.3
26	24.1	9.7	86	79.7	32.2	46	135.4	54.7	06	191.0	77.2	66	246.6	99.6
27	25.0	10.1	87	80.7	32.6	47	136.3	55.1	07	191.9	77.5	67	247.6	100.0
28	26.0	10.5	88	81.6	33.0	48	137.2	55.4	08	192.9	77.9	68	248.5	100.4
29	26.9	10.9	89	82.5	33.3	49	138.2	55.8	09	193.8	78.3	69	249.4	100.8
30	27.8	11.2	90	83.4	33.7	50	139.1	56.2	10	194.7	78.7	70	250.3	101.1
31	28.7	11.6	91	84.4	34.1	151	140.0	56.6	211	195.6	79.0	271	251.3	101.5
32	29.7	12.0	92	85.3	34.5	52	140.9	56.9	12	196.6	79.4	72	252.2	101.9
33	30.6	12.4	93	86.2	34.8	53	141.9	57.3	13	197.5	79.8	73	253.1	102.3
34	31.5	12.7	94	87.2	35.2	54	142.8	57.7	14	198.4	80.2	74	254.0	102.6
35	32.5	13.1	95	88.1	35.6	55	143.7	58.1	15	199.3	80.5	75	255.0	103.0
36	33.4	13.5	96	89.0	36.0	56	144.6	58.4	16	200.3	80.9	76	255.9	103.4
37	34.3	13.9	97	89.9	36.3	57	145.6	58.8	17	201.2	81.3	77	256.8	103.8
38	35.2	14.2	98	90.9	36.7	58	146.5	59.2	18	202.1	81.7	78	257.8	104.1
39	36.2	14.6	99	91.8	37.1	59	147.4	59.6	19	203.1	82.0	79	258.7	104.5
40	37.1	15.0	100	92.7	37.5	60	148.3	59.9	20	204.0	82.4	80	259.6	104.9
41	38.0	15.4	101	93.6	37.8	161	149.3	60.3	221	204.9	82.8	281	260.5	105.3
42	38.9	15.7	02	94.6	38.2	62	150.2	60.7	22	205.8	83.2	82	261.5	105.6
43	39.9	16.1	03	95.5	38.6	63	151.1	61.1	23	206.8	83.5	83	262.4	106.0
44	40.8	16.5	04	96.4	39.0	64	152.1	61.4	24	207.7	83.9	84	263.3	106.4
45	41.7	16.9	05	97.4	39.3	65	153.0	61.8	25	208.6	84.3	85	264.2	106.8
46	42.7	17.2	06	98.3	39.7	66	153.9	62.2	26	209.5	84.7	86	265.2	107.1
47	43.6	17.6	07	99.2	40.1	67	154.8	62.6	27	210.5	85.0	87	266.1	107.5
48	44.5	18.0	08	100.1	40.5	68	155.8	62.9	28	211.4	85.4	88	267.0	107.9
49	45.4	18.4	09	101.1	40.8	69	156.7	63.3	29	212.3	85.8	89	268.0	108.3
50	46.4	18.7	10	102.0	41.2	70	157.6	63.7	30	213.3	86.2	90	268.9	108.6
51	47.3	19.1	111	102.9	41.6	171	158.5	64.1	231	214.2	86.5	291	269.8	109.0
52	48.2	19.5	12	103.8	42.0	72	159.5	64.4	32	215.1	86.9	92	270.7	109.4
53	49.1	19.9	13	104.8	42.3	73	160.4	64.8	33	216.0	87.3	93	271.7	109.8
54	50.1	20.2	14	105.7	42.7	74	161.3	65.2	34	217.0	87.7	94	272.6	110.1
55	51.0	20.6	15	106.6	43.1	75	162.3	65.6	35	217.9	88.0	95	273.5	110.5
56	51.9	21.0	16	107.6	43.5	76	163.2	65.9	36	218.8	88.4	96	274.4	110.9
57	52.8	21.4	17	108.5	43.8	77	164.1	66.3	37	219.7	88.8	97	275.4	111.3
58	53.8	21.7	18	109.4	44.2	78	165.0	66.7	38	220.7	89.2	98	276.3	111.6
59	54.7	22.1	19	110.3	44.6	79	166.0	67.1	39	221.6	89.5	99	277.2	112.0
60	55.6	22.5	20	111.3	45.0	80	166.9	67.4	40	222.5	89.9	300	278.2	112.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

68° (112°, 248°, 292°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 22° (158°, 202°, 338°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	279.8	112.8	361	334.7	135.2	421	390.3	157.7	481	446.0	180.2	541	501.6	202.7
02	280.0	113.1	62	335.6	135.6	22	391.3	158.1	82	446.9	180.6	42	502.5	203.0
03	280.9	113.5	63	336.6	136.0	23	392.2	158.5	83	447.8	180.9	43	503.5	203.4
04	281.9	113.9	64	337.5	136.4	24	393.1	158.8	84	448.8	181.3	44	504.4	203.8
05	282.8	114.3	65	338.4	136.7	25	394.1	159.2	85	449.7	181.7	45	505.3	204.2
06	283.7	114.6	66	339.3	137.1	26	395.0	159.6	86	450.6	182.1	46	506.2	204.5
07	284.6	115.0	67	340.3	137.5	27	395.9	160.0	87	451.5	182.4	47	507.2	204.9
08	285.6	115.4	68	341.2	137.9	28	396.8	160.3	88	452.5	182.8	48	508.1	205.3
09	286.5	115.8	69	342.1	138.2	29	397.8	160.7	89	453.4	183.2	49	509.0	205.7
10	287.4	116.1	70	343.1	138.6	30	398.7	161.1	90	454.3	183.6	50	510.0	206.0
311	288.4	116.5	371	344.0	139.0	431	399.6	161.5	491	455.2	184.0	551	510.9	206.4
12	289.3	116.9	72	344.9	139.4	32	400.5	161.8	92	456.2	184.3	52	511.8	206.8
13	290.2	117.3	73	345.8	139.7	33	401.5	162.2	93	457.1	184.7	53	512.7	207.2
14	291.1	117.6	74	346.8	140.1	34	402.4	162.6	94	458.0	185.1	54	513.7	207.5
15	292.1	118.0	75	347.7	140.5	35	403.3	163.0	95	459.0	185.4	55	514.6	207.9
16	293.0	118.4	76	348.6	140.9	36	404.3	163.3	96	459.9	185.8	56	515.5	208.3
17	293.9	118.8	77	349.5	141.2	37	405.2	163.7	97	460.8	186.2	57	516.4	208.7
18	294.8	119.1	78	350.5	141.6	38	406.1	164.1	98	461.7	186.6	58	517.4	209.0
19	295.8	119.5	79	351.4	142.0	39	407.0	164.5	99	462.7	186.9	59	518.3	209.4
20	296.7	119.9	80	352.3	142.4	40	408.0	164.8	500	463.6	187.3	60	519.2	209.8
321	297.6	120.2	381	353.3	142.7	441	408.9	165.2	501	464.5	187.7	561	520.2	210.2
22	298.6	120.6	82	354.2	143.1	42	409.8	165.6	02	465.4	188.1	62	521.1	210.5
23	299.5	121.0	83	355.1	143.5	43	410.7	166.0	03	466.4	188.4	63	522.0	210.9
24	300.4	121.4	84	356.0	143.8	44	411.7	166.3	04	467.3	188.8	64	522.9	211.3
25	301.3	121.7	85	357.0	144.2	45	412.6	166.7	05	468.2	189.2	65	523.9	211.7
26	302.3	122.1	86	357.9	144.6	46	413.5	167.1	06	469.2	189.6	66	524.8	212.0
27	303.2	122.5	87	358.8	145.0	47	414.5	167.4	07	470.1	189.9	67	525.7	212.4
28	304.1	122.9	88	359.7	145.3	48	415.4	167.8	08	471.0	190.3	68	526.6	212.8
29	305.0	123.2	89	360.7	145.7	49	416.3	168.2	09	471.9	190.7	69	527.6	213.2
30	306.0	123.6	90	361.6	146.1	50	417.2	168.6	10	472.9	191.0	70	528.5	213.5
331	306.9	124.0	391	362.5	146.5	451	418.2	168.9	511	473.8	191.4	571	529.4	213.9
32	307.8	124.4	92	363.5	146.8	52	419.1	169.3	12	474.7	191.8	72	530.3	214.3
33	308.8	124.7	93	364.4	147.2	53	420.0	169.7	13	475.6	192.2	73	531.3	214.6
34	309.7	125.1	94	365.3	147.6	54	420.9	170.1	14	476.6	192.5	74	532.2	215.0
35	310.6	125.5	95	366.2	148.0	55	421.9	170.4	15	477.5	192.9	75	533.1	215.4
36	311.5	125.9	96	367.2	148.3	56	422.8	170.8	16	478.4	193.3	76	534.1	215.8
37	312.5	126.2	97	368.1	148.7	57	423.7	171.2	17	479.4	193.7	77	535.0	216.1
38	313.4	126.6	98	369.0	149.1	58	424.7	171.6	18	480.3	194.0	78	535.9	216.5
39	314.3	127.0	99	369.9	149.5	59	425.6	171.9	19	481.2	194.4	79	536.8	216.9
40	315.2	127.4	400	370.9	149.8	60	426.5	172.3	20	482.1	194.8	80	537.8	217.3
341	316.2	127.7	401	371.8	150.2	461	427.4	172.7	521	483.1	195.2	581	538.7	217.6
42	317.1	128.1	02	372.7	150.6	62	428.4	173.1	22	484.0	195.5	82	539.6	218.0
43	318.0	128.5	03	373.7	151.0	63	429.3	173.4	23	484.9	195.9	83	540.5	218.4
44	319.0	128.9	04	374.6	151.3	64	430.2	173.8	24	485.8	196.3	84	541.5	218.8
45	319.9	129.2	05	375.5	151.7	65	431.1	174.2	25	486.8	196.7	85	542.4	219.1
46	320.8	129.6	06	376.4	152.1	66	432.1	174.6	26	487.7	197.0	86	543.3	219.5
47	321.7	130.0	07	377.4	152.5	67	433.0	174.9	27	488.6	197.4	87	544.3	219.9
48	322.7	130.4	08	378.3	152.8	68	433.9	175.3	28	489.6	197.8	88	545.2	220.3
49	323.6	130.7	09	379.2	153.2	69	434.8	175.7	29	490.5	198.2	89	546.1	220.6
50	324.5	131.1	10	380.1	153.6	70	435.8	176.1	30	491.4	198.5	90	547.0	221.0
351	325.4	131.5	411	381.1	154.0	471	436.7	176.4	531	492.3	198.9	591	548.0	221.4
52	326.4	131.9	12	382.0	154.3	72	437.6	176.8	32	493.3	199.3	92	548.9	221.8
53	327.3	132.2	13	382.9	154.7	73	438.6	177.2	33	494.2	199.7	93	549.8	222.1
54	328.2	132.6	14	383.9	155.1	74	439.5	177.6	34	495.1	200.0	94	550.7	222.5
55	329.2	133.0	15	384.8	155.5	75	440.4	177.9	35	496.0	200.4	95	551.7	222.9
56	330.1	133.4	16	385.7	155.8	76	441.3	178.3	36	497.0	200.8	96	552.6	223.3
57	331.0	133.7	17	386.6	156.2	77	442.3	178.7	37	497.9	201.2	97	553.5	223.6
58	332.0	134.1	18	387.6	156.6	78	443.2	179.1	38	498.8	201.5	98	554.5	224.0
59	332.9	134.5	19	388.5	157.0	79	444.1	179.4	39	499.8	201.9	99	555.4	224.4
60	333.8	134.9	20	389.4	157.3	80	445.0	179.8	40	500.7	202.3	600	556.3	224.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

68° (112°, 248°, 292°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 23° (157°, 203°, 337°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.4	61	56.2	23.8	121	111.4	47.3	181	166.6	70.7	241	221.8	94.2
2	1.8	0.8	62	57.1	24.2	22	112.3	47.7	82	167.5	71.1	42	222.8	94.6
3	2.8	1.2	63	58.0	24.6	23	113.2	48.1	83	168.5	71.5	43	223.7	94.9
4	3.7	1.6	64	58.9	25.0	24	114.1	48.5	84	169.4	71.9	44	224.6	95.3
5	4.6	2.0	65	59.8	25.4	25	115.1	48.8	85	170.3	72.3	45	225.5	95.7
6	5.5	2.3	66	60.8	25.8	26	116.0	49.2	86	171.2	72.7	46	226.4	96.1
7	6.4	2.7	67	61.7	26.2	27	116.9	49.6	87	172.1	73.1	47	227.4	96.5
8	7.4	3.1	68	62.6	26.6	28	117.8	50.0	88	173.1	73.5	48	228.3	96.9
9	8.3	3.5	69	63.5	27.0	29	118.7	50.4	89	174.0	73.8	49	229.2	97.3
10	9.2	3.9	70	64.4	27.4	30	119.7	50.8	90	174.9	74.2	50	230.1	97.7
11	10.1	4.3	71	65.4	27.7	131	120.6	51.2	191	175.8	74.6	251	231.0	98.1
12	11.0	4.7	72	66.3	28.1	32	121.5	51.6	92	176.7	75.0	52	232.0	98.5
13	12.0	5.1	73	67.2	28.5	33	122.4	52.0	93	177.7	75.4	53	232.9	98.9
14	12.9	5.5	74	68.1	28.9	34	123.3	52.4	94	178.6	75.8	54	233.8	99.2
15	13.8	5.9	75	69.0	29.3	35	124.3	52.7	95	179.5	76.2	55	234.7	99.6
16	14.7	6.3	76	70.0	29.7	36	125.2	53.1	96	180.4	76.6	56	235.6	100.0
17	15.6	6.6	77	70.9	30.1	37	126.1	53.5	97	181.3	77.0	57	236.6	100.4
18	16.6	7.0	78	71.8	30.5	38	127.0	53.9	98	182.3	77.4	58	237.5	100.8
19	17.5	7.4	79	72.7	30.9	39	128.0	54.3	99	183.2	77.8	59	238.4	101.2
20	18.4	7.8	80	73.6	31.3	40	128.9	54.7	200	184.1	78.1	60	239.3	101.6
21	19.3	8.2	81	74.6	31.6	141	129.8	55.1	201	185.0	78.5	261	240.3	102.0
22	20.3	8.6	82	75.5	32.0	42	130.7	55.5	02	185.9	78.9	62	241.2	102.4
23	21.2	9.0	83	76.4	32.4	43	131.6	55.9	03	186.9	79.3	63	242.1	102.8
24	22.1	9.4	84	77.3	32.8	44	132.6	56.3	04	187.8	79.7	64	243.0	103.2
25	23.0	9.8	85	78.2	33.2	45	133.5	56.7	05	188.7	80.1	65	243.9	103.5
26	23.9	10.2	86	79.2	33.6	46	134.4	57.0	06	189.6	80.5	66	244.9	103.9
27	24.9	10.5	87	80.1	34.0	47	135.3	57.4	07	190.5	80.9	67	245.8	104.3
28	25.8	10.9	88	81.0	34.4	48	136.2	57.8	08	191.5	81.3	68	246.7	104.7
29	26.7	11.3	89	81.9	34.8	49	137.2	58.2	09	192.4	81.7	69	247.6	105.1
30	27.6	11.7	90	82.8	35.2	50	138.1	58.6	10	193.3	82.1	70	248.5	105.5
31	28.5	12.1	91	83.8	35.6	151	139.0	59.0	211	194.2	82.4	271	249.5	105.9
32	29.5	12.5	92	84.7	35.9	52	139.9	59.4	12	195.1	82.8	72	250.4	106.3
33	30.4	12.9	93	85.6	36.3	53	140.8	59.8	13	196.1	83.2	73	251.3	106.7
34	31.3	13.3	94	86.5	36.7	54	141.8	60.2	14	197.0	83.6	74	252.2	107.1
35	32.2	13.7	95	87.4	37.1	55	142.7	60.6	15	197.9	84.0	75	253.1	107.5
36	33.1	14.1	96	88.4	37.5	56	143.6	61.0	16	198.8	84.4	76	254.1	107.8
37	34.1	14.5	97	89.3	37.9	57	144.5	61.3	17	199.7	84.8	77	255.0	108.2
38	35.0	14.8	98	90.2	38.3	58	145.4	61.7	18	200.7	85.2	78	255.9	108.6
39	35.9	15.2	99	91.1	38.7	59	146.4	62.1	19	201.6	85.6	79	256.8	109.0
40	36.8	15.6	100	92.1	39.1	60	147.3	62.5	20	202.5	86.0	80	257.7	109.4
41	37.7	16.0	101	93.0	39.5	161	148.2	62.9	221	203.4	86.4	281	258.7	109.8
42	38.7	16.4	02	93.9	39.9	62	149.1	63.3	22	204.4	86.7	82	259.6	110.2
43	39.6	16.8	03	94.8	40.2	63	150.0	63.7	23	205.3	87.1	83	260.5	110.6
44	40.5	17.2	04	95.7	40.6	64	151.0	64.1	24	206.2	87.5	84	261.4	111.0
45	41.4	17.6	05	96.7	41.0	65	151.9	64.5	25	207.1	87.9	85	262.3	111.4
46	42.3	18.0	06	97.6	41.4	66	152.8	64.9	26	208.0	88.3	86	263.3	111.7
47	43.3	18.4	07	98.5	41.8	67	153.7	65.3	27	209.0	88.7	87	264.2	112.1
48	44.2	18.8	08	99.4	42.2	68	154.6	65.6	28	209.9	89.1	88	265.1	112.5
49	45.1	19.1	09	100.3	42.6	69	155.6	66.0	29	210.8	89.5	89	266.0	112.9
50	46.0	19.5	10	101.3	43.0	70	156.5	66.4	30	211.7	89.9	90	266.9	113.3
51	46.9	19.9	111	102.2	43.4	171	157.4	66.8	231	212.6	90.3	291	267.9	113.7
52	47.9	20.3	12	103.1	43.8	72	158.3	67.2	32	213.6	90.6	92	268.8	114.1
53	48.8	20.7	13	104.0	44.2	73	159.2	67.6	33	214.5	91.0	93	269.7	114.5
54	49.7	21.1	14	104.9	44.5	74	160.2	68.0	34	215.4	91.4	94	270.6	114.9
55	50.6	21.5	15	105.9	44.9	75	161.1	68.4	35	216.3	91.8	95	271.5	115.3
56	51.5	21.9	16	106.8	45.3	76	162.0	68.8	36	217.2	92.2	96	272.5	115.7
57	52.5	22.3	17	107.7	45.7	77	162.9	69.2	37	218.2	92.6	97	273.4	116.0
58	53.4	22.7	18	108.6	46.1	78	163.8	69.6	38	219.1	93.0	98	274.3	116.4
59	54.3	23.1	19	109.5	46.5	79	164.8	69.9	39	220.0	93.4	99	275.2	116.8
60	55.2	23.4	20	110.5	46.9	80	165.7	70.3	40	220.9	93.8	300	276.2	117.2
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

67° (113°, 247°, 293°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		m	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

Difference of Latitude and Departure for 23° (157°, 203°, 337°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	277.1	117.6	361	332.3	141.1	421	387.5	164.5	481	442.8	187.9	541	498.0	211.4
02	278.0	118.0	62	333.2	141.4	22	388.5	164.9	82	443.7	188.3	42	498.9	211.8
03	278.9	118.4	63	334.1	141.8	23	389.4	165.3	83	444.6	188.7	43	499.8	212.2
04	279.8	118.8	64	335.1	142.2	24	390.3	165.7	84	445.5	189.1	44	500.8	212.6
05	280.8	119.2	65	336.0	142.6	25	391.2	166.1	85	446.4	189.5	45	501.7	212.9
06	281.7	119.6	66	336.9	143.0	26	392.1	166.5	86	447.4	189.9	46	502.6	213.3
07	282.6	120.0	67	337.8	143.4	27	393.1	166.8	87	448.3	190.3	47	503.5	213.7
08	283.5	120.3	68	338.7	143.8	28	394.0	167.2	88	449.2	190.7	48	504.4	214.1
09	284.4	120.7	69	339.7	144.2	29	394.9	167.6	89	450.1	191.1	49	505.4	214.5
10	285.4	121.1	70	340.6	144.6	30	395.8	168.0	90	451.0	191.5	50	506.3	214.9
311	286.3	121.5	371	341.5	145.0	431	396.7	168.4	491	452.0	191.8	551	507.2	215.3
12	287.2	121.9	72	342.4	145.4	32	397.7	168.8	92	452.9	192.2	52	508.1	215.7
13	288.1	122.3	73	343.3	145.7	33	398.6	169.2	93	453.8	192.6	53	509.0	216.1
14	289.0	122.7	74	344.3	146.1	34	399.5	169.6	94	454.7	193.0	54	510.0	216.5
15	290.0	123.1	75	345.2	146.5	35	400.4	170.0	95	455.6	193.4	55	510.9	216.9
16	290.9	123.5	76	346.1	146.9	36	401.3	170.4	96	456.6	193.8	56	511.8	217.2
17	291.8	123.9	77	347.0	147.3	37	402.3	170.7	97	457.5	194.2	57	512.7	217.6
18	292.7	124.3	78	348.0	147.7	38	403.2	171.1	98	458.4	194.6	58	513.6	218.0
19	293.6	124.6	79	348.9	148.1	39	404.1	171.5	99	459.3	195.0	59	514.6	218.4
20	294.6	125.0	80	349.8	148.5	40	405.0	171.9	500	460.3	195.4	60	515.5	218.8
321	295.5	125.4	381	350.7	148.9	441	405.9	172.3	501	461.2	195.8	561	516.4	219.2
22	296.4	125.8	82	351.6	149.3	42	406.9	172.7	02	462.1	196.1	62	517.3	219.6
23	297.3	126.2	83	352.6	149.7	43	407.8	173.1	03	463.0	196.5	63	518.2	220.0
24	298.2	126.6	84	353.5	150.0	44	408.7	173.5	04	463.9	196.9	64	519.2	220.4
25	299.2	127.0	85	354.4	150.4	45	409.6	173.9	05	464.9	197.3	65	520.1	220.8
26	300.1	127.4	86	355.3	150.8	46	410.5	174.3	06	465.8	197.7	66	521.0	221.2
27	301.0	127.8	87	356.2	151.2	47	411.5	174.7	07	466.7	198.1	67	521.9	221.5
28	301.9	128.2	88	357.2	151.6	48	412.4	175.0	08	467.6	198.5	68	522.8	221.9
29	302.8	128.6	89	358.1	152.0	49	413.3	175.4	09	468.5	198.9	69	523.8	222.3
30	303.8	128.9	90	359.0	152.4	50	414.2	175.8	10	469.5	199.3	70	524.7	222.7
331	304.7	129.3	391	359.9	152.8	451	415.1	176.2	511	470.4	199.7	571	525.6	223.1
32	305.6	129.7	92	360.8	153.2	52	416.1	176.6	12	471.3	200.1	72	526.5	223.5
33	306.5	130.1	93	361.8	153.6	53	417.0	177.0	13	472.2	200.4	73	527.4	223.9
34	307.4	130.5	94	362.7	153.9	54	417.9	177.4	14	473.1	200.8	74	528.4	224.3
35	308.4	130.9	95	363.6	154.3	55	418.8	177.8	15	474.1	201.2	75	529.3	224.7
36	309.3	131.3	96	364.5	154.7	56	419.8	178.2	16	475.0	201.6	76	530.2	225.1
37	310.2	131.7	97	365.4	155.1	57	420.7	178.6	17	475.9	202.0	77	531.1	225.5
38	311.1	132.1	98	366.4	155.5	58	421.6	179.0	18	476.8	202.4	78	532.1	225.8
39	312.1	132.5	99	367.3	155.9	59	422.5	179.3	19	477.7	202.8	79	533.0	226.2
40	313.0	132.8	400	368.2	156.3	60	423.4	179.7	20	478.7	203.2	80	533.9	226.6
341	313.9	133.2	401	369.1	156.7	461	424.4	180.1	521	479.6	203.6	581	534.8	227.0
42	314.8	133.6	02	370.0	157.1	62	425.3	180.5	22	480.5	204.0	82	535.7	227.4
43	315.7	134.0	03	371.0	157.5	63	426.2	180.9	23	481.4	204.4	83	536.7	227.8
44	316.7	134.4	04	371.9	157.9	64	427.1	181.3	24	482.3	204.7	84	537.6	228.2
45	317.6	134.8	05	372.8	158.2	65	428.0	181.7	25	483.3	205.1	85	538.5	228.6
46	318.5	135.2	06	373.7	158.6	66	429.0	182.1	26	484.2	205.5	86	539.4	229.0
47	319.4	135.6	07	374.6	159.0	67	429.9	182.5	27	485.1	205.9	87	540.3	229.4
48	320.3	136.0	08	375.6	159.4	68	430.8	182.9	28	486.0	206.3	88	541.3	229.7
49	321.3	136.4	09	376.5	159.8	69	431.7	183.3	29	486.9	206.7	89	542.2	230.1
50	322.2	136.8	10	377.4	160.2	70	432.6	183.6	30	487.9	207.1	90	543.1	230.5
351	323.1	137.1	411	378.3	160.6	471	433.6	184.0	531	488.8	207.5	591	544.0	230.9
52	324.0	137.5	12	379.2	161.0	72	434.5	184.4	32	489.7	207.9	92	544.9	231.3
53	324.9	137.9	13	380.2	161.4	73	435.4	184.8	33	490.6	208.3	93	545.9	231.7
54	325.9	138.3	14	381.1	161.8	74	436.3	185.2	34	491.5	208.7	94	546.8	232.1
55	326.8	138.7	15	382.0	162.2	75	437.2	185.6	35	492.5	209.0	95	547.7	232.5
56	327.7	139.1	16	382.9	162.5	76	438.2	186.0	36	493.4	209.4	96	548.6	232.9
57	328.6	139.5	17	383.9	162.9	77	439.1	186.4	37	494.3	209.8	97	549.5	233.3
58	329.5	139.9	18	384.8	163.3	78	440.0	186.8	38	495.2	210.2	98	550.5	233.7
59	330.5	140.3	19	385.7	163.7	79	440.9	187.2	39	496.2	210.6	99	551.4	234.0
60	331.4	140.7	20	386.6	164.1	80	441.8	187.6	40	497.1	211.0	600	552.3	234.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

67° (113°, 247°, 293°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 24° (156°, 204°, 336°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.4	61	55.7	24.8	121	110.5	49.2	181	165.4	73.6	241	220.2	98.0
2	1.8	0.8	62	56.6	25.2	22	111.5	49.6	82	166.3	74.0	42	221.1	98.4
3	2.7	1.2	63	57.6	25.6	23	112.4	50.0	83	167.2	74.4	43	222.0	98.8
4	3.7	1.6	64	58.5	26.0	24	113.3	50.4	84	168.1	74.8	44	222.9	99.2
5	4.6	2.0	65	59.4	26.4	25	114.2	50.8	85	169.0	75.2	45	223.8	99.7
6	5.5	2.4	66	60.3	26.8	26	115.1	51.2	86	169.9	75.7	46	224.7	100.1
7	6.4	2.8	67	61.2	27.3	27	116.0	51.7	87	170.8	76.1	47	225.6	100.5
8	7.3	3.3	68	62.1	27.7	28	116.9	52.1	88	171.7	76.5	48	226.6	100.9
9	8.2	3.7	69	63.0	28.1	29	117.8	52.5	89	172.7	76.9	49	227.5	101.3
10	9.1	4.1	70	63.9	28.5	30	118.8	52.9	90	173.6	77.3	50	228.4	101.7
11	10.0	4.5	71	64.9	28.9	131	119.7	53.3	191	174.5	77.7	251	229.3	102.1
12	11.0	4.9	72	65.8	29.3	32	120.6	53.7	92	175.4	78.1	52	230.2	102.5
13	11.9	5.3	73	66.7	29.7	33	121.5	54.1	93	176.3	78.5	53	231.1	102.9
14	12.8	5.7	74	67.6	30.1	34	122.4	54.5	94	177.2	78.9	54	232.0	103.3
15	13.7	6.1	75	68.5	30.5	35	123.3	54.9	95	178.1	79.3	55	233.0	103.7
16	14.6	6.5	76	69.4	30.9	36	124.2	55.3	96	179.1	79.7	56	233.9	104.1
17	15.5	6.9	77	70.3	31.3	37	125.2	55.7	97	180.0	80.1	57	234.8	104.5
18	16.4	7.3	78	71.3	31.7	38	126.1	56.1	98	180.9	80.5	58	235.7	104.9
19	17.4	7.7	79	72.2	32.1	39	127.0	56.5	99	181.8	80.9	59	236.6	105.3
20	18.3	8.1	80	73.1	32.5	40	127.9	56.9	200	182.7	81.3	60	237.5	105.8
21	19.2	8.5	81	74.0	32.9	141	128.8	57.3	201	183.6	81.8	261	238.4	106.2
22	20.1	8.9	82	74.9	33.4	42	129.7	57.8	02	184.5	82.2	62	239.3	106.6
23	21.0	9.4	83	75.8	33.8	43	130.6	58.2	03	185.4	82.6	63	240.3	107.0
24	21.9	9.8	84	76.7	34.2	44	131.6	58.6	04	186.4	83.0	64	241.2	107.4
25	22.8	10.2	85	77.7	34.6	45	132.5	59.0	05	187.3	83.4	65	242.1	107.8
26	23.8	10.6	86	78.6	35.0	46	133.4	59.4	06	188.2	83.8	66	243.0	108.2
27	24.7	11.0	87	79.5	35.4	47	134.3	59.8	07	189.1	84.2	67	243.9	108.6
28	25.6	11.4	88	80.4	35.8	48	135.2	60.2	08	190.0	84.6	68	244.8	109.0
29	26.5	11.8	89	81.3	36.2	49	136.1	60.6	09	190.9	85.0	69	245.7	109.4
30	27.4	12.2	90	82.2	36.6	50	137.0	61.0	10	191.8	85.4	70	246.7	109.8
31	28.3	12.6	91	83.1	37.0	151	137.9	61.4	211	192.8	85.8	271	247.6	110.2
32	29.2	13.0	92	84.0	37.4	52	138.9	61.8	12	193.7	86.2	72	248.5	110.6
33	30.1	13.4	93	85.0	37.8	53	139.8	62.2	13	194.6	86.6	73	249.4	111.0
34	31.1	13.8	94	85.9	38.2	54	140.7	62.6	14	195.5	87.0	74	250.3	111.4
35	32.0	14.2	95	86.8	38.6	55	141.6	63.0	15	196.4	87.4	75	251.2	111.9
36	32.9	14.6	96	87.7	39.0	56	142.5	63.5	16	197.3	87.9	76	252.1	112.3
37	33.8	15.0	97	88.6	39.5	57	143.4	63.9	17	198.2	88.3	77	253.1	112.7
38	34.7	15.5	98	89.5	39.9	58	144.3	64.3	18	199.2	88.7	78	254.0	113.1
39	35.6	15.9	99	90.4	40.3	59	145.3	64.7	19	200.1	89.1	79	254.9	113.5
40	36.5	16.3	100	91.4	40.7	60	146.2	65.1	20	201.0	89.5	80	255.8	113.9
41	37.5	16.7	101	92.3	41.1	161	147.1	65.5	221	201.9	89.9	281	256.7	114.3
42	38.4	17.1	02	93.2	41.5	62	148.0	65.9	22	202.8	90.3	82	257.6	114.7
43	39.3	17.5	03	94.1	41.9	63	148.9	66.3	23	203.7	90.7	83	258.5	115.1
44	40.2	17.9	04	95.0	42.3	64	149.8	66.7	24	204.6	91.1	84	259.4	115.5
45	41.1	18.3	05	95.9	42.7	65	150.7	67.1	25	205.5	91.5	85	260.4	115.9
46	42.0	18.7	06	96.8	43.1	66	151.6	67.5	26	206.5	91.9	86	261.3	116.3
47	42.9	19.1	07	97.7	43.5	67	152.6	67.9	27	207.4	92.3	87	262.2	116.7
48	43.9	19.5	08	98.7	43.9	68	153.5	68.3	28	208.3	92.7	88	263.1	117.1
49	44.8	19.9	09	99.6	44.3	69	154.4	68.7	29	209.2	93.1	89	264.0	117.5
50	45.7	20.3	10	100.5	44.7	70	155.3	69.1	30	210.1	93.5	90	264.9	118.0
51	46.6	20.7	111	101.4	45.1	171	156.2	69.6	231	211.0	94.0	291	265.8	118.4
52	47.5	21.2	12	102.3	45.6	72	157.1	70.0	32	211.9	94.4	92	266.8	118.8
53	48.4	21.6	13	103.2	46.0	73	158.0	70.4	33	212.9	94.8	93	267.7	119.2
54	49.3	22.0	14	104.1	46.4	74	159.0	70.8	34	213.8	95.2	94	268.6	119.6
55	50.2	22.4	15	105.1	46.8	75	159.9	71.2	35	214.7	95.6	95	269.5	120.0
56	51.2	22.8	16	106.0	47.2	76	160.8	71.6	36	215.6	96.0	96	270.4	120.4
57	52.1	23.2	17	106.9	47.6	77	161.7	72.0	37	216.5	96.4	97	271.3	120.8
58	53.0	23.6	18	107.8	48.0	78	162.6	72.4	38	217.4	96.8	98	272.2	121.2
59	53.9	24.0	19	108.7	48.4	79	163.5	72.8	39	218.3	97.2	99	273.2	121.6
60	54.8	24.4	20	109.6	48.8	80	164.4	73.2	40	219.3	97.6	300	274.1	122.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

66° (114°, 246°, 294°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side. Adj.	N×Sin. Side Opp.

Difference of Latitude and Departure for 24° (156°, 204°, 336°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	275.0	122.4	361	329.8	146.8	421	384.6	171.2	481	439.4	195.6	541	494.2	220.0
02	275.9	122.8	62	330.7	147.2	22	385.5	171.6	82	440.3	196.0	42	495.1	220.5
03	276.8	123.2	63	331.6	147.6	23	386.4	172.0	83	441.2	196.5	43	496.1	220.9
04	277.7	123.6	64	332.5	148.1	24	387.3	172.5	84	442.2	196.9	44	497.0	221.3
05	278.6	124.1	65	333.4	148.5	25	388.3	172.9	85	443.1	197.3	45	497.9	221.7
06	279.5	124.5	66	334.4	148.9	26	389.2	173.3	86	444.0	197.7	46	498.8	222.1
07	280.5	124.9	67	335.3	149.3	27	390.1	173.7	87	444.9	198.1	47	499.7	222.5
08	281.4	125.3	68	336.2	149.7	28	391.0	174.1	88	445.8	198.5	48	500.6	222.9
09	282.3	125.7	69	337.1	150.1	29	391.9	174.5	89	446.7	198.9	49	501.5	223.3
10	283.2	126.1	70	338.0	150.5	30	392.8	174.9	90	447.6	199.3	50	502.5	223.7
311	284.1	126.5	371	338.9	150.9	431	393.7	175.3	491	448.6	199.7	551	503.4	224.1
12	285.0	126.9	72	339.8	151.3	32	394.7	175.7	92	449.5	200.1	52	504.3	224.5
13	285.9	127.3	73	340.7	151.7	33	395.6	176.1	93	450.4	200.5	53	505.2	224.9
14	286.9	127.7	74	341.7	152.1	34	396.5	176.5	94	451.3	200.9	54	506.1	225.3
15	287.8	128.1	75	342.6	152.5	35	397.4	176.9	95	452.2	201.3	55	507.0	225.7
16	288.7	128.5	76	343.5	152.9	36	398.3	177.3	96	453.1	201.7	56	507.9	226.1
17	289.6	128.9	77	344.4	153.3	37	399.2	177.7	97	454.0	202.1	57	508.8	226.6
18	290.5	129.3	78	345.3	153.7	38	400.1	178.2	98	454.9	202.6	58	509.8	227.0
19	291.4	129.7	79	346.2	154.2	39	401.0	178.6	99	455.9	203.0	59	510.7	227.4
20	292.3	130.2	80	347.1	154.6	40	402.0	179.0	500	456.8	203.4	60	511.6	227.8
321	293.2	130.6	381	348.1	155.0	441	402.9	179.4	501	457.7	203.8	561	512.5	228.2
22	294.2	131.0	82	349.0	155.4	42	403.8	179.8	02	458.6	204.2	62	513.4	228.6
23	295.1	131.4	83	349.9	155.8	43	404.7	180.2	03	459.5	204.6	63	514.3	229.0
24	296.0	131.8	84	350.8	156.2	44	405.6	180.6	04	460.4	205.0	64	515.2	229.4
25	296.9	132.2	85	351.7	156.6	45	406.5	181.0	05	461.3	205.4	65	516.2	229.8
26	297.8	132.6	86	352.6	157.0	46	407.4	181.4	06	442.3	205.8	66	517.1	230.2
27	298.7	133.0	87	353.5	157.4	47	408.4	181.8	07	463.2	206.2	67	518.0	230.6
28	299.6	133.4	88	354.5	157.8	48	409.3	182.2	08	464.1	206.6	68	518.9	231.0
29	300.6	133.8	89	355.4	158.2	49	410.2	182.6	09	465.0	207.0	69	519.8	231.4
30	301.5	134.2	90	356.3	158.6	50	411.1	183.0	10	465.9	207.4	70	520.7	231.8
331	302.4	134.6	391	357.2	159.0	451	412.0	183.4	511	466.8	207.8	571	521.6	232.2
32	303.3	135.0	92	358.1	159.4	52	412.9	183.8	12	467.7	208.2	72	522.5	232.7
33	304.2	135.4	93	359.0	159.8	53	413.8	184.3	13	468.6	208.7	73	523.5	233.1
34	305.1	135.9	94	359.9	160.3	54	414.7	184.7	14	469.6	209.1	74	524.4	233.5
35	306.0	136.3	95	360.9	160.7	55	415.7	185.1	15	470.5	209.5	75	525.3	233.9
36	307.0	136.7	96	361.8	161.1	56	416.6	185.5	16	471.4	209.9	76	526.2	234.3
37	307.9	137.1	97	362.7	161.5	57	417.5	185.9	17	472.3	210.3	77	527.1	234.7
38	308.8	137.5	98	363.6	161.9	58	418.4	186.3	18	473.2	210.7	78	528.0	235.1
39	309.7	137.9	99	364.5	162.3	59	419.3	186.7	19	474.1	211.1	79	528.9	235.5
40	310.6	138.3	400	365.4	162.7	60	420.2	187.1	20	475.0	211.5	80	529.9	235.9
341	311.5	138.7	401	366.3	163.1	461	421.1	187.5	521	476.0	211.9	581	530.8	236.3
42	312.4	139.1	02	367.2	163.5	62	422.1	187.9	22	476.9	212.3	82	531.7	236.7
43	313.3	139.5	03	368.2	163.9	63	423.0	188.3	23	477.8	212.7	83	532.6	237.1
44	314.3	139.9	04	369.1	164.3	64	423.9	188.7	24	478.7	213.1	84	533.5	237.5
45	315.2	140.3	05	370.0	164.7	65	424.8	189.1	25	479.6	213.5	85	534.4	237.9
46	316.1	140.7	06	370.9	165.1	66	425.7	189.5	26	480.5	213.9	86	535.3	238.3
47	317.0	141.1	07	371.8	165.5	67	426.6	189.9	27	481.4	214.4	87	536.3	238.8
48	317.9	141.5	08	372.7	165.9	68	427.5	190.4	28	482.4	214.8	88	537.2	239.2
49	318.8	142.0	09	373.6	166.4	69	428.5	190.8	29	483.3	215.2	89	538.1	239.6
50	319.7	142.4	10	374.6	166.8	70	429.4	191.2	30	484.2	215.6	90	539.0	240.0
351	320.7	142.8	411	375.5	167.2	471	430.3	191.6	531	485.1	216.0	591	539.9	240.4
52	321.6	143.2	12	376.4	167.6	72	431.2	192.0	32	486.0	216.4	92	540.8	240.8
53	322.5	143.6	13	377.3	168.0	73	432.1	192.4	33	486.9	216.8	93	541.7	241.2
54	323.4	144.0	14	378.2	168.4	74	433.0	192.8	34	487.8	217.2	94	542.6	241.6
55	324.3	144.4	15	379.1	168.8	75	433.9	193.2	35	488.7	217.6	95	543.6	242.0
56	325.2	144.8	16	380.0	169.2	76	434.8	193.6	36	489.7	218.0	96	544.5	242.4
57	326.1	145.2	17	380.9	169.6	77	435.8	194.0	37	490.6	218.4	97	545.4	242.8
58	327.0	145.6	18	381.9	170.0	78	436.7	194.4	38	491.5	218.8	98	546.3	243.2
59	328.0	146.0	19	382.8	170.4	79	437.6	194.8	39	492.4	219.2	99	547.2	243.6
60	328.9	146.4	20	383.7	170.8	80	438.5	195.2	40	493.3	219.6	600	548.1	244.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

66° (114°, 246°, 294°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

TABLE 3.

Difference of Latitude and Departure for 25° (155°, 205°, 335°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.4	61	55.3	25.8	121	109.7	51.1	181	164.0	76.5	241	218.4	101.9
2	1.8	0.8	62	56.2	26.2	22	110.6	51.6	82	164.9	76.9	42	219.3	102.3
3	2.7	1.3	63	57.1	26.6	23	111.5	52.0	83	165.9	77.3	43	220.2	102.7
4	3.6	1.7	64	58.0	27.0	24	112.4	52.4	84	166.8	77.8	44	221.1	103.1
5	4.5	2.1	65	58.9	27.5	25	113.3	52.8	85	167.7	78.2	45	222.0	103.5
6	5.4	2.5	66	59.8	27.9	26	114.2	53.2	86	168.6	78.6	46	223.0	104.0
7	6.3	3.0	67	60.7	28.3	27	115.1	53.7	87	169.5	79.0	47	223.9	104.4
8	7.3	3.4	68	61.6	28.7	28	116.0	54.1	88	170.4	79.5	48	224.8	104.8
9	8.2	3.8	69	62.5	29.2	29	116.9	54.5	89	171.3	79.9	49	225.7	105.2
10	9.1	4.2	70	63.4	29.6	30	117.8	54.9	90	172.2	80.3	50	226.6	105.7
11	10.0	4.6	71	64.3	30.0	131	118.7	55.4	191	173.1	80.7	251	227.5	106.1
12	10.9	5.1	72	65.3	30.4	32	119.6	55.8	92	174.0	81.1	52	228.4	106.5
13	11.8	5.5	73	66.2	30.9	33	120.5	56.2	93	174.9	81.6	53	229.3	106.9
14	12.7	5.9	74	67.1	31.3	34	121.4	56.6	94	175.8	82.0	54	230.2	107.3
15	13.6	6.3	75	68.0	31.7	35	122.4	57.1	95	176.7	82.4	55	231.1	107.8
16	14.5	6.8	76	68.9	32.1	36	123.3	57.5	96	177.6	82.8	56	232.0	108.2
17	15.4	7.2	77	69.8	32.5	37	124.2	57.9	97	178.5	83.3	57	232.9	108.6
18	16.3	7.6	78	70.7	33.0	38	125.1	58.3	98	179.4	83.7	58	233.8	109.0
19	17.2	8.0	79	71.6	33.4	39	126.0	58.7	99	180.4	84.1	59	234.7	109.5
20	18.1	8.5	80	72.5	33.8	40	126.9	59.2	200	181.3	84.5	60	235.6	109.9
21	19.0	8.9	81	73.4	34.2	141	127.8	59.6	201	182.2	84.9	261	236.5	110.3
22	19.9	9.3	82	74.3	34.7	42	128.7	60.0	02	183.1	85.4	62	237.5	110.7
23	20.8	9.7	83	75.2	35.1	43	129.6	60.4	03	184.0	85.8	63	238.4	111.1
24	21.8	10.1	84	76.1	35.5	44	130.5	60.9	04	184.9	86.2	64	239.3	111.6
25	22.7	10.6	85	77.0	35.9	45	131.4	61.3	05	185.8	86.6	65	240.2	112.0
26	23.6	11.0	86	77.9	36.3	46	132.3	61.7	06	186.7	87.1	66	241.1	112.4
27	24.5	11.4	87	78.8	36.8	47	133.2	62.1	07	187.6	87.5	67	242.0	112.8
28	25.4	11.8	88	79.8	37.2	48	134.1	62.5	08	188.5	87.9	68	242.9	113.3
29	26.3	12.3	89	80.7	37.6	49	135.0	63.0	09	189.4	88.3	69	243.8	113.7
30	27.2	12.7	90	81.6	38.0	50	135.9	63.4	10	190.3	88.7	70	244.7	114.1
31	28.1	13.1	91	82.5	38.5	151	136.9	63.8	211	191.2	89.2	271	245.6	114.5
32	29.0	13.5	92	83.4	38.9	52	137.8	64.2	12	192.1	89.6	72	246.5	115.0
33	29.9	13.9	93	84.3	39.3	53	138.7	64.7	13	193.0	90.0	73	247.4	115.4
34	30.8	14.4	94	85.2	39.7	54	139.6	65.1	14	193.9	90.4	74	248.3	115.8
35	31.7	14.8	95	86.1	40.1	55	140.5	65.5	15	194.9	90.9	75	249.2	116.2
36	32.6	15.2	96	87.0	40.6	56	141.4	65.9	16	195.8	91.3	76	250.1	116.6
37	33.5	15.6	97	87.9	41.0	57	142.3	66.4	17	196.7	91.7	77	251.0	117.1
38	34.4	16.1	98	88.8	41.4	58	143.2	66.8	18	197.6	92.1	78	252.0	117.5
39	35.3	16.5	99	89.7	41.8	59	144.1	67.2	19	198.5	92.6	79	252.9	117.9
40	36.3	16.9	100	90.6	42.3	60	145.0	67.6	20	199.4	93.0	80	253.8	118.3
41	37.2	17.3	101	91.5	42.7	161	145.9	68.0	221	200.3	93.4	281	254.7	118.8
42	38.1	17.7	02	92.4	43.1	62	146.8	68.5	22	201.2	93.8	82	255.6	119.2
43	39.0	18.2	03	93.3	43.5	63	147.7	68.9	23	202.1	94.2	83	256.5	119.6
44	39.9	18.6	04	94.3	44.0	64	148.6	69.3	24	203.0	94.7	84	257.4	120.0
45	40.8	19.0	05	95.2	44.4	65	149.5	69.7	25	203.9	95.1	85	258.3	120.4
46	41.7	19.4	06	96.1	44.8	66	150.4	70.2	26	204.8	95.5	86	259.2	120.9
47	42.6	19.9	07	97.0	45.2	67	151.4	70.6	27	205.7	95.9	87	260.1	121.3
48	43.5	20.3	08	97.9	45.6	68	152.3	71.0	28	206.6	96.4	88	261.0	121.7
49	44.4	20.7	09	98.8	46.1	69	153.2	71.4	29	207.5	96.8	89	261.9	122.1
50	45.3	21.1	10	99.7	46.5	70	154.1	71.8	30	208.5	97.2	90	262.8	122.6
51	46.2	21.6	111	100.6	46.9	171	155.0	72.3	231	209.4	97.6	291	263.7	123.0
52	47.1	22.0	12	101.5	47.3	72	155.9	72.7	32	210.3	98.0	92	264.6	123.4
53	48.0	22.4	13	102.4	47.8	73	156.8	73.1	33	211.2	98.5	93	265.5	123.8
54	48.9	22.8	14	103.3	48.2	74	157.7	73.5	34	212.1	98.9	94	266.5	124.2
55	49.8	23.2	15	104.2	48.6	75	158.6	74.0	35	213.0	99.3	95	267.4	124.7
56	50.8	23.7	16	105.1	49.0	76	159.5	74.4	36	213.9	99.7	96	268.3	125.1
57	51.7	24.1	17	106.0	49.4	77	160.4	74.8	37	214.8	100.2	97	269.2	125.5
58	52.6	24.5	18	106.9	49.9	78	161.3	75.2	38	215.7	100.6	98	270.1	125.9
59	53.5	24.9	19	107.9	50.3	79	162.2	75.6	39	216.6	101.0	99	271.0	126.4
60	54.4	25.4	20	108.8	50.7	80	163.1	76.1	40	217.5	101.4	300	271.9	126.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

65° (115°, 245°, 295°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		m	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 25° (155°, 205°, 335°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	272.8	127.2	361	327.2	152.6	421	381.6	177.9	481	435.9	203.3	541	490.3	228.6
02	273.7	127.6	62	328.0	153.0	22	382.5	178.3	82	436.8	203.7	42	491.2	229.1
03	274.6	128.1	63	329.0	153.4	23	383.4	178.8	83	437.7	204.1	43	492.1	229.5
04	275.5	128.5	64	329.9	153.8	24	384.3	179.2	84	438.7	204.5	44	493.0	229.9
05	276.4	128.9	65	330.8	154.3	25	385.2	179.6	85	439.6	204.9	45	493.9	230.3
06	277.3	129.3	66	331.7	154.7	26	386.1	180.0	86	440.5	205.4	46	494.8	230.7
07	278.2	129.7	67	332.6	155.1	27	387.0	180.5	87	441.4	205.8	47	495.8	231.2
08	279.1	130.2	68	333.5	155.5	28	387.9	180.9	88	442.3	206.2	48	496.7	231.6
09	280.0	130.6	69	334.4	155.9	29	388.8	181.3	89	443.2	206.6	49	497.6	232.0
10	281.0	131.0	70	335.3	156.4	30	389.7	181.7	90	444.1	207.1	50	498.5	232.4
311	281.9	131.4	371	336.2	156.8	431	390.6	182.1	491	445.0	207.5	551	499.4	232.9
12	282.8	131.9	72	337.1	157.2	32	391.5	182.6	92	445.9	207.9	52	500.3	233.3
13	283.7	132.3	73	338.1	157.6	33	392.4	183.0	93	446.8	208.4	53	501.2	233.7
14	284.6	132.7	74	339.0	158.1	34	393.3	183.4	94	447.7	208.8	54	502.1	234.1
15	285.5	133.1	75	339.9	158.5	35	394.2	183.8	95	448.6	209.2	55	503.0	234.6
16	286.4	133.5	76	340.8	158.9	36	395.2	184.3	96	449.5	209.6	56	503.9	235.0
17	287.3	134.0	77	341.7	159.3	37	396.1	184.7	97	450.4	210.0	57	504.8	235.4
18	288.2	134.4	78	342.5	159.7	38	397.0	185.1	98	451.3	210.4	58	505.7	235.8
19	289.1	134.8	79	343.5	160.2	39	397.9	185.5	99	452.2	210.9	59	506.6	236.2
20	290.0	135.2	80	344.4	160.6	40	398.8	186.0	500	453.2	211.3	60	507.5	236.7
321	290.9	135.7	381	345.3	161.0	441	399.6	186.3	501	454.1	211.7	561	508.4	237.1
22	291.8	136.1	82	346.2	161.4	42	400.6	186.8	02	455.0	212.2	62	509.3	237.5
23	292.7	136.5	83	347.1	161.9	43	401.5	187.2	03	455.9	212.6	63	510.3	237.9
24	293.6	136.9	84	348.0	162.3	44	402.4	187.6	04	456.8	213.0	64	511.2	238.4
25	294.6	137.4	85	348.9	162.7	45	403.3	188.1	05	457.7	213.4	65	512.1	238.8
26	295.5	137.8	86	349.8	163.1	46	404.2	188.5	06	458.6	213.8	66	513.0	239.2
27	296.4	138.2	87	350.7	163.6	47	405.1	188.9	07	459.5	214.3	67	513.9	239.6
28	297.3	138.6	88	351.6	164.0	48	406.0	189.3	08	460.4	214.7	68	514.8	240.0
29	298.2	139.0	89	352.6	164.4	49	406.9	189.8	09	461.3	215.1	69	515.7	240.5
30	299.1	139.5	90	353.5	164.8	50	407.8	190.2	10	462.2	215.5	70	516.6	240.9
331	300.0	139.9	391	354.4	165.2	451	408.7	190.6	511	463.1	216.0	571	517.5	241.3
32	300.9	140.3	92	355.3	165.7	52	409.7	191.0	12	464.0	216.4	72	518.4	241.7
33	301.8	140.7	93	356.2	166.1	53	410.6	191.4	13	464.9	216.8	73	519.3	242.2
34	302.7	141.2	94	357.1	166.5	54	411.5	191.7	14	465.8	217.2	74	520.2	242.6
35	303.6	141.6	95	358.0	166.9	55	412.4	192.3	15	466.7	217.6	75	521.1	243.0
36	304.5	142.0	96	358.9	167.4	56	413.3	192.7	16	467.7	218.1	76	522.0	243.4
37	305.4	142.4	97	359.8	167.8	57	414.1	193.1	17	468.6	218.5	77	522.9	243.9
38	306.3	142.8	98	360.7	168.2	58	415.1	193.6	18	469.5	218.9	78	523.8	244.3
39	307.2	143.3	99	361.6	168.6	59	416.0	194.0	19	470.4	219.3	79	524.8	244.7
40	308.1	143.7	400	362.5	169.0	60	416.9	194.4	20	471.8	219.8	80	525.7	245.1
341	309.1	144.1	401	363.4	169.5	461	417.8	194.8	521	472.2	220.2	581	526.6	245.5
42	310.0	144.5	02	364.3	169.9	62	418.7	195.2	22	473.1	220.6	82	527.5	246.0
43	310.9	145.0	03	365.2	170.3	63	419.6	195.7	23	474.0	221.0	83	528.4	246.4
44	311.8	145.4	04	366.1	170.7	64	420.5	196.1	24	474.9	221.5	84	529.3	246.8
45	312.7	145.8	05	367.1	171.2	65	421.4	196.5	25	475.8	221.9	85	530.2	247.2
46	313.6	146.2	06	368.0	171.6	66	422.3	196.9	26	476.7	222.3	86	531.1	247.7
47	314.5	146.6	07	368.9	172.0	67	423.2	197.4	27	477.6	222.7	87	532.0	248.1
48	315.4	147.1	08	369.8	172.4	68	424.2	197.8	28	478.5	223.1	88	532.9	248.5
49	316.3	147.5	09	370.7	172.9	69	425.1	198.2	29	479.4	223.6	89	533.8	248.9
50	317.2	147.9	10	371.6	173.3	70	426.0	198.6	30	480.3	224.0	90	534.7	249.3
351	318.1	148.3	411	372.5	173.7	471	426.9	199.1	531	481.2	224.4	591	535.6	249.8
52	319.0	148.8	12	373.4	174.1	72	427.8	199.5	32	482.1	224.8	92	536.5	250.2
53	319.9	149.2	13	374.3	174.5	73	428.7	199.9	33	483.1	225.3	92	537.4	250.6
54	320.8	149.6	14	375.2	175.0	74	429.6	200.3	34	482.0	225.7	94	538.3	251.0
55	321.7	150.0	15	376.1	175.4	75	430.5	200.7	35	484.9	226.1	95	539.3	251.5
56	322.6	150.5	16	377.0	175.8	76	431.4	201.2	36	485.8	226.5	96	540.2	251.9
57	323.6	150.9	17	377.9	176.2	77	432.3	201.6	37	486.7	226.9	97	541.1	252.3
58	324.5	151.3	18	378.8	176.7	78	433.2	202.0	38	487.6	227.4	98	542.0	252.7
59	325.4	151.7	19	379.7	177.1	79	434.1	202.4	39	488.5	227.8	99	542.9	253.1
60	326.3	152.1	20	380.6	177.5	80	435.0	202.9	40	489.4	228.2	600	543.8	253.6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

65° (115°, 245°, 295°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 26° (154°, 206°, 334°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.4	61	54.8	26.7	121	108.8	53.0	181	162.7	79.3	241	216.6	105.6
2	1.8	0.9	62	55.7	27.2	22	109.7	53.5	82	163.6	79.8	42	217.5	106.1
3	2.7	1.3	63	56.6	27.6	23	110.6	53.9	83	164.5	80.2	43	218.4	106.5
4	3.6	1.8	64	57.5	28.1	24	111.5	54.4	84	165.4	80.7	44	219.3	107.0
5	4.5	2.2	65	58.4	28.5	25	112.3	54.8	85	166.3	81.1	45	220.2	107.4
6	5.4	2.6	66	59.3	28.9	26	113.2	55.2	86	167.2	81.5	46	221.1	107.8
7	6.3	3.1	67	60.2	29.4	27	114.1	55.7	87	168.1	82.0	47	222.0	108.3
8	7.2	3.5	68	61.1	29.8	28	115.0	56.1	88	169.0	82.4	48	222.9	108.7
9	8.1	3.9	69	62.0	30.2	29	115.9	56.5	89	169.9	82.9	49	223.8	109.2
10	9.0	4.4	70	62.9	30.7	30	116.8	57.0	90	170.8	83.3	50	224.7	109.6
11	9.9	4.8	71	63.8	31.1	131	117.7	57.4	191	171.7	83.7	251	225.6	110.0
12	10.8	5.3	72	64.7	31.6	32	118.6	57.9	92	172.6	84.2	52	226.5	110.5
13	11.7	5.7	73	65.6	32.0	33	119.5	58.3	93	173.5	84.6	53	227.4	110.9
14	12.6	6.1	74	66.5	32.4	34	120.4	58.7	94	174.4	85.0	54	228.3	111.3
15	13.5	6.6	75	67.4	32.9	35	121.3	59.2	95	175.3	85.5	55	229.2	111.8
16	14.4	7.0	76	68.3	33.3	36	122.2	59.6	96	176.2	85.9	56	230.1	112.2
17	15.3	7.5	77	69.2	33.8	37	123.1	60.1	97	177.1	86.4	57	231.0	112.7
18	16.2	7.9	78	70.1	34.2	38	124.0	60.5	98	178.0	86.8	58	231.9	113.1
19	17.1	8.3	79	71.0	34.6	39	124.9	60.9	99	178.9	87.2	59	232.8	113.5
20	18.0	8.8	80	71.9	35.1	40	125.8	61.4	200	179.8	87.7	60	233.7	114.0
21	18.9	9.2	81	72.8	35.5	141	126.7	61.8	201	180.7	88.1	261	234.6	114.4
22	19.8	9.6	82	73.7	35.9	42	127.6	62.2	02	181.6	88.6	62	235.5	114.9
23	20.7	10.1	83	74.6	36.4	43	128.5	62.7	03	182.5	89.0	63	236.4	115.3
24	21.6	10.5	84	75.5	36.8	44	129.4	63.1	04	183.4	89.4	64	237.3	115.7
25	22.5	11.0	85	76.4	37.3	45	130.3	63.6	05	184.3	89.9	65	238.2	116.2
26	23.4	11.4	86	77.3	37.7	46	131.2	64.0	06	185.2	90.3	66	239.1	116.6
27	24.3	11.8	87	78.2	38.1	47	132.1	64.4	07	186.1	90.7	67	240.0	117.0
28	25.2	12.3	88	79.1	38.6	48	133.0	64.9	08	186.9	91.2	68	240.9	117.5
29	26.1	12.7	89	80.0	39.0	49	133.9	65.3	09	187.8	91.6	69	241.8	117.9
30	27.0	13.2	90	80.9	39.5	50	134.8	65.8	10	188.7	92.1	70	242.7	118.4
31	27.9	13.6	91	81.8	39.9	151	135.7	66.2	211	189.6	92.5	271	243.6	118.8
32	28.8	14.0	92	82.7	40.3	52	136.6	66.6	12	190.5	92.9	72	244.5	119.2
33	29.7	14.5	93	83.6	40.8	53	137.5	67.1	13	191.4	93.4	73	245.4	119.7
34	30.6	14.9	94	84.5	41.2	54	138.4	67.5	14	192.3	93.8	74	246.3	120.1
35	31.5	15.3	95	85.4	41.6	55	139.3	67.9	15	193.2	94.2	75	247.2	120.6
36	32.4	15.8	96	86.3	42.1	56	140.2	68.4	16	194.1	94.7	76	248.1	121.0
37	33.3	16.2	97	87.2	42.5	57	141.1	68.8	17	195.0	95.1	77	249.0	121.4
38	34.2	16.7	98	88.1	43.0	58	142.0	69.3	18	195.9	95.6	78	249.9	121.9
39	35.1	17.1	99	89.0	43.4	59	142.9	69.7	19	196.8	96.0	79	250.8	122.3
40	36.0	17.5	100	89.9	43.8	60	143.8	70.1	20	197.7	96.4	80	251.7	122.7
41	36.9	18.0	101	90.8	44.3	161	144.7	70.6	221	198.6	96.9	281	252.6	123.2
42	37.7	18.4	02	91.7	44.7	62	145.6	71.0	22	199.5	97.3	82	253.5	123.6
43	38.6	18.8	03	92.6	45.2	63	146.5	71.5	23	200.4	97.8	83	254.4	124.1
44	39.5	19.3	04	93.5	45.6	64	147.4	71.9	24	201.3	98.2	84	255.3	124.5
45	40.4	19.7	05	94.4	46.0	65	148.3	72.3	25	202.2	98.6	85	256.2	124.9
46	41.3	20.2	06	95.3	46.5	66	149.2	72.8	26	203.1	99.1	86	257.1	125.4
47	42.2	20.6	07	96.2	46.9	67	150.1	73.2	27	204.0	99.5	87	258.0	125.8
48	43.1	21.0	08	97.1	47.3	68	151.0	73.6	28	204.9	99.9	88	258.9	126.3
49	44.0	21.5	09	98.0	47.8	69	151.9	74.1	29	205.8	100.4	89	259.8	126.7
50	44.9	21.9	10	98.9	48.2	70	152.8	74.5	30	206.7	100.8	90	260.7	127.1
51	45.8	22.4	111	99.8	48.7	171	153.7	75.0	231	207.6	101.3	291	261.5	127.6
52	46.7	22.8	12	100.7	49.1	72	154.6	75.4	32	208.5	101.7	92	262.4	128.0
53	47.6	23.2	13	101.6	49.5	73	155.5	75.8	33	209.4	102.1	93	263.3	128.4
54	48.5	23.7	14	102.5	50.0	74	156.4	76.3	34	210.3	102.6	94	264.2	128.9
55	49.4	24.1	15	103.4	50.4	75	157.3	76.7	35	211.2	103.0	95	265.1	129.3
56	50.3	24.5	16	104.3	50.9	76	158.2	77.2	36	212.1	103.5	96	266.0	129.8
57	51.2	25.0	17	105.2	51.3	77	159.1	77.6	37	213.0	103.9	97	266.9	130.2
58	52.1	25.4	18	106.1	51.7	78	160.0	78.0	38	213.9	104.3	98	267.8	130.6
59	53.0	25.9	19	107.0	52.2	79	160.9	78.5	39	214.8	104.8	99	268.7	131.1
60	53.9	26.3	20	107.9	52.6	80	161.8	78.9	40	215.7	105.2	300	269.6	131.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

64° (116°, 244°, 296°).

In Plane Sailing.	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side. Adj.	Side Opp.

Difference of Latitude and Departure for 26° (154°, 206°, 334°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	270.5	131.9	361	324.5	158.3	421	378.4	184.6	481	432.3	210.9	541	486.2	237.2
02	271.4	132.4	62	325.4	158.7	22	379.3	185.0	82	433.2	211.3	42	487.1	237.6
03	272.3	132.8	63	326.3	159.1	23	380.2	185.4	83	434.1	211.7	43	488.0	238.0
04	273.2	133.3	64	327.2	159.6	24	381.1	185.9	84	435.0	212.2	44	488.9	238.5
05	274.1	133.7	65	328.1	160.0	25	382.0	186.3	85	435.9	212.6	45	489.8	238.9
06	275.0	134.1	66	329.0	160.4	26	382.9	186.7	86	436.8	213.0	46	490.7	239.4
07	275.9	134.6	67	329.9	160.9	27	383.8	187.2	87	437.7	213.5	47	491.6	239.8
08	276.8	135.0	68	330.8	161.3	28	384.7	187.6	88	438.6	213.9	48	492.5	240.2
09	277.7	135.5	69	331.7	161.8	29	385.6	188.1	89	439.5	214.4	49	493.4	240.7
10	278.6	135.9	70	332.6	162.2	30	386.5	188.5	90	440.4	214.8	50	494.3	241.1
311	279.5	136.3	371	333.5	162.6	431	387.4	188.9	491	441.3	215.2	551	495.2	241.5
12	280.4	136.8	72	334.4	163.1	32	388.3	189.4	92	442.2	215.7	52	496.1	242.0
13	281.3	137.2	73	335.3	163.5	33	389.2	189.8	93	443.1	216.1	53	497.0	242.4
14	282.2	137.6	74	336.1	164.0	34	390.1	190.3	94	444.0	216.6	54	497.9	242.9
15	283.1	138.1	75	337.0	164.4	35	391.0	190.7	95	444.9	217.0	55	498.8	243.3
16	284.0	138.5	76	337.9	164.8	36	391.9	191.1	96	445.8	217.4	56	499.7	243.7
17	284.9	139.0	77	338.8	165.3	37	392.8	191.6	97	446.7	217.9	57	500.6	244.2
18	285.8	139.4	78	339.7	165.7	38	393.7	192.0	98	447.6	218.3	58	501.5	244.6
19	286.7	139.8	79	340.6	166.1	39	394.6	192.4	99	448.5	218.7	59	502.4	245.0
20	287.6	140.3	80	341.5	166.6	40	395.5	192.9	500	449.4	219.2	60	503.3	245.5
321	288.5	140.7	381	342.4	167.0	441	396.4	193.3	501	450.3	219.6	561	504.2	245.9
22	289.4	141.2	82	343.3	167.5	42	397.3	193.8	02	451.2	220.1	62	505.1	246.4
23	290.3	141.6	83	344.2	167.9	43	398.2	194.2	03	452.1	220.5	63	506.0	246.8
24	291.2	142.0	84	345.1	168.3	44	399.1	194.6	04	453.0	220.9	64	506.9	247.2
25	292.1	142.5	85	346.0	168.8	45	400.0	195.1	05	453.9	221.4	65	507.8	247.7
26	293.0	142.9	86	346.9	169.2	46	400.9	195.5	06	454.8	221.8	66	508.7	248.1
27	293.9	143.3	87	347.8	169.6	47	401.8	196.0	07	455.7	222.3	67	509.6	248.6
28	294.8	143.8	88	348.7	170.1	48	402.7	196.4	08	456.6	222.7	68	510.5	249.0
29	295.7	144.2	89	349.6	170.5	49	403.6	196.8	09	457.5	223.1	69	511.4	249.4
30	296.6	144.7	90	350.5	171.0	50	404.5	197.3	10	458.4	223.6	70	512.3	249.9
331	297.5	145.1	391	351.4	171.4	451	405.4	197.7	511	459.3	224.0	571	513.2	250.3
32	298.4	145.5	92	352.3	171.8	52	406.3	198.1	12	460.2	224.4	72	514.1	250.7
33	299.3	146.0	93	353.2	172.3	53	407.2	198.6	13	461.1	224.9	73	515.0	251.2
34	300.2	146.4	94	354.1	172.7	54	408.1	199.0	14	462.0	225.3	74	515.9	251.6
35	301.1	146.9	95	355.0	173.2	55	409.0	199.5	15	462.9	225.8	75	516.8	252.1
36	302.0	147.3	96	355.9	173.6	56	409.9	199.9	16	463.8	226.2	76	517.7	252.5
37	302.9	147.7	97	356.8	174.0	57	410.7	200.3	17	464.7	226.6	77	518.6	252.9
38	303.8	148.2	98	357.7	174.5	58	411.6	200.8	18	465.6	227.1	78	519.5	253.4
39	304.7	148.6	99	358.6	174.9	59	412.5	201.2	19	466.5	227.5	79	520.4	253.8
40	305.6	149.0	400	359.5	175.3	60	413.6	201.7	20	467.4	228.0	80	521.3	254.3
341	306.5	149.5	401	360.4	175.8	461	414.3	202.1	521	468.3	228.4	581	522.2	254.7
42	307.4	149.9	02	361.3	176.2	62	415.2	202.5	22	469.2	228.8	82	523.1	255.1
43	308.3	150.4	03	362.2	176.7	63	416.1	203.0	23	470.1	229.3	83	524.0	255.6
44	309.2	150.8	04	363.1	177.1	64	417.0	203.4	24	471.0	229.7	84	524.9	256.0
45	310.1	151.2	05	364.0	177.5	65	417.9	203.8	25	471.9	230.1	85	525.8	256.4
46	311.0	151.7	06	364.9	178.0	66	418.8	204.3	26	472.8	230.6	86	526.7	256.9
47	311.9	152.1	07	365.8	178.4	67	419.7	204.7	27	473.7	231.0	87	527.6	257.3
48	312.8	152.6	08	366.7	178.9	68	420.6	205.2	28	474.6	231.5	88	528.5	257.8
49	313.7	153.0	09	367.6	179.3	69	421.5	205.6	29	475.5	231.9	89	529.4	258.2
50	314.6	153.4	10	368.5	179.7	70	422.4	206.0	30	476.4	232.3	90	530.3	258.6
351	315.5	153.9	411	369.4	180.2	471	423.3	206.5	531	477.3	232.8	591	531.2	259.1
52	316.4	154.3	12	370.3	180.6	72	424.2	206.9	32	478.2	233.2	92	532.1	259.5
53	317.3	154.7	13	371.2	181.0	73	425.1	207.3	33	479.1	233.7	93	533.0	260.0
54	318.2	155.2	14	372.1	181.5	74	426.0	207.8	34	480.0	234.1	94	533.9	260.4
55	319.1	155.6	15	373.0	181.9	75	426.9	208.2	35	480.9	234.5	95	534.8	260.8
56	320.0	156.1	16	373.9	182.4	76	427.8	208.7	36	481.8	235.0	96	535.7	261.3
57	320.9	156.5	17	374.8	182.8	77	428.7	209.1	37	482.7	235.4	97	536.6	261.7
58	321.8	156.9	18	375.7	183.2	78	429.6	209.5	38	483.6	235.8	98	537.5	262.1
59	322.7	157.4	19	376.6	183.7	79	430.5	210.0	39	484.4	236.3	99	538.4	262.6
60	323.6	157.8	20	377.5	184.1	80	431.4	210.4	40	485.3	236.7	600	539.3	263.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

64° (116°, 244°, 296°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

TABLE 3.

Difference of Latitude and Departure for 27° (153°, 207°, 333°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.5	61	54.4	27.7	121	107.8	54.9	181	161.3	82.2	241	214.7	109.4
2	1.8	0.9	62	55.2	28.1	22	108.7	55.4	82	162.2	82.6	42	215.6	109.9
3	2.7	1.4	63	56.1	28.6	23	109.6	55.8	83	163.1	83.1	43	216.5	110.3
4	3.6	1.8	64	57.0	29.1	24	110.5	56.3	84	163.9	83.5	44	217.4	110.8
5	4.5	2.3	65	57.9	29.5	25	111.4	56.7	85	164.8	84.0	45	218.3	111.2
6	5.3	2.7	66	58.8	30.0	26	112.3	57.2	86	165.7	84.4	46	219.2	111.7
7	6.2	3.2	67	59.7	30.4	27	113.2	57.7	87	166.6	84.9	47	220.1	112.1
8	7.1	3.6	68	60.6	30.9	28	114.0	58.1	88	167.5	85.4	48	221.0	112.6
9	8.0	4.1	69	61.5	31.3	29	114.9	58.6	89	168.4	85.8	49	221.9	113.0
10	8.9	4.5	70	62.4	31.8	30	115.8	59.0	90	169.3	86.3	50	222.8	113.5
11	9.8	5.0	71	63.3	32.2	131	116.7	59.5	191	170.2	86.7	251	223.6	114.0
12	10.7	5.4	72	64.2	32.7	32	117.6	59.9	92	171.1	87.2	52	224.5	114.4
13	11.6	5.9	73	65.0	33.1	33	118.5	60.4	93	172.0	87.6	53	225.4	114.9
14	12.5	6.4	74	65.9	33.6	34	119.4	60.8	94	172.9	88.1	54	226.3	115.3
15	13.4	6.8	75	66.8	34.0	35	120.3	61.3	95	173.7	88.5	55	227.2	115.8
16	14.3	7.3	76	67.7	34.5	36	121.2	61.7	96	174.6	89.0	56	228.1	116.2
17	15.1	7.7	77	68.6	35.0	37	122.1	62.2	97	175.5	89.4	57	229.0	116.7
18	16.0	8.2	78	69.5	35.4	38	123.0	62.7	98	176.4	89.9	58	229.9	117.1
19	16.9	8.6	79	70.4	35.9	39	123.8	63.1	99	177.3	90.3	59	230.8	117.6
20	17.8	9.1	80	71.3	36.3	40	124.7	63.6	200	178.2	90.8	60	231.7	118.0
21	18.7	9.5	81	72.2	36.8	141	125.6	64.0	201	179.1	91.3	261	232.6	118.5
22	19.6	10.0	82	73.1	37.2	42	126.5	64.5	02	180.0	91.7	62	233.4	118.9
23	20.5	10.4	83	74.0	37.7	43	127.4	64.9	03	180.9	92.2	63	234.3	119.4
24	21.4	10.9	84	74.8	38.1	44	128.3	65.4	04	181.8	92.6	64	235.2	119.9
25	22.3	11.3	85	75.7	38.6	45	129.2	65.8	05	182.7	93.1	65	236.1	120.3
26	23.2	11.8	86	76.6	39.0	46	130.1	66.3	06	183.5	93.5	66	237.0	120.8
27	24.1	12.3	87	77.5	39.5	47	131.0	66.7	07	184.4	94.0	67	237.9	121.2
28	24.9	12.7	88	78.4	40.0	48	131.9	67.2	08	185.3	94.4	68	238.8	121.7
29	25.8	13.2	89	79.3	40.4	49	132.8	67.6	09	186.2	94.9	69	239.7	122.1
30	26.7	13.6	90	80.2	40.9	50	133.7	68.1	10	187.1	95.3	70	240.6	122.6
31	27.6	14.1	91	81.1	41.3	151	134.5	68.6	211	188.0	95.8	271	241.5	123.0
32	28.5	14.5	92	82.0	41.8	52	135.4	69.0	12	188.9	96.2	72	242.4	123.5
33	29.4	15.0	93	82.9	42.2	53	136.3	69.5	13	189.8	96.7	73	243.2	123.9
34	30.3	15.4	94	83.8	42.7	54	137.2	69.9	14	190.7	97.2	74	244.1	124.4
35	31.2	15.9	95	84.6	43.1	55	138.1	70.4	15	191.6	97.6	75	245.0	124.8
36	32.1	16.3	96	85.5	43.6	56	139.0	70.8	16	192.5	98.1	76	245.9	125.3
37	33.0	16.8	97	86.4	44.0	57	139.9	71.3	17	193.3	98.5	77	246.8	125.8
38	33.9	17.3	98	87.3	44.5	58	140.8	71.7	18	194.2	99.0	78	247.7	126.2
39	34.7	17.7	99	88.2	44.9	59	141.7	72.2	19	195.1	99.4	79	248.6	126.7
40	35.6	18.2	100	89.1	45.4	60	142.6	72.6	20	196.0	99.9	80	249.5	127.1
41	36.5	18.6	101	90.0	45.9	161	143.5	73.1	221	196.9	100.3	281	250.4	127.6
42	37.4	19.1	02	90.9	46.3	62	144.3	73.5	22	197.8	100.8	82	251.3	128.0
43	38.3	19.5	03	91.8	46.8	63	145.2	74.0	23	198.7	101.2	83	252.2	128.5
44	39.2	20.0	04	92.7	47.2	64	146.1	74.5	24	199.6	101.7	84	253.0	128.9
45	40.1	20.4	05	93.6	47.7	65	147.0	74.9	25	200.5	102.1	85	253.9	129.4
46	41.0	20.9	06	94.4	48.1	66	147.9	75.4	26	201.4	102.6	86	254.8	129.8
47	41.9	21.3	07	95.3	48.6	67	148.8	75.8	27	202.3	103.1	87	255.7	130.3
48	42.8	21.8	08	96.2	49.0	68	149.7	76.3	28	203.1	103.5	88	256.6	130.7
49	43.7	22.2	09	97.1	49.5	69	150.6	76.7	29	204.0	104.0	89	257.5	131.2
50	44.6	22.7	10	98.0	49.9	70	151.5	77.2	30	204.9	104.4	90	258.4	131.7
51	45.4	23.2	111	98.9	50.4	171	152.4	77.6	231	205.8	104.9	291	259.3	132.1
52	46.3	23.6	12	99.8	50.8	72	153.3	78.1	32	206.7	105.3	92	260.2	132.6
53	47.2	24.1	13	100.7	51.3	73	154.1	78.5	33	207.6	105.8	93	261.1	133.0
54	48.1	24.5	14	101.6	51.8	74	155.0	79.0	34	208.5	106.2	94	262.0	133.5
55	49.0	25.0	15	102.5	52.2	75	155.9	79.4	35	209.4	106.7	95	262.8	133.9
56	49.9	25.4	16	103.4	52.7	76	156.8	79.9	36	210.3	107.1	96	263.7	134.4
57	50.8	25.9	17	104.2	53.1	77	157.7	80.4	37	211.2	107.6	97	264.6	134.8
58	51.7	26.3	18	105.1	53.6	78	158.6	80.8	38	212.1	108.0	98	265.5	135.3
59	52.6	26.8	19	106.0	54.0	79	159.5	81.3	39	213.0	108.5	99	266.4	135.7
60	53.5	27.2	20	106.9	54.5	80	160.4	81.7	40	213.8	109.0	300	267.3	136.2
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

63° (117°, 243°, 297°).

	Dist.	Lat.	Dep.
In Plane Sailing.			
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

Difference of Latitude and Departure for 27° (153°, 207°, 333°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	268.2	136.7	361	321.7	163.9	421	375.1	191.1	481	428.6	218.4	541	482.0	245.6
02	269.1	137.1	62	322.5	164.3	22	376.0	191.6	82	429.5	218.8	42	482.9	246.1
03	270.0	137.6	63	323.4	164.8	23	376.9	192.0	83	430.4	219.3	43	483.8	246.5
04	270.9	138.0	64	324.3	165.3	24	377.8	192.5	84	431.2	219.7	44	484.7	247.0
05	271.8	138.5	65	325.2	165.7	25	378.7	192.9	85	432.1	220.2	45	485.6	247.4
06	272.6	138.9	66	326.1	166.2	26	379.6	193.4	86	433.0	220.6	46	486.5	247.9
07	273.5	139.4	67	327.0	166.6	27	380.5	193.9	87	433.9	221.1	47	487.4	248.3
08	274.4	139.8	68	327.9	167.1	28	381.4	194.3	88	434.8	221.5	48	488.3	248.8
09	275.3	140.3	69	328.8	167.5	29	382.2	194.8	89	435.7	222.0	49	489.2	249.2
10	276.2	140.7	70	329.7	168.0	30	383.1	195.2	90	436.6	222.5	50	490.1	249.7
311	277.1	141.2	371	330.6	168.4	431	384.0	195.7	491	437.5	222.9	551	490.9	250.1
12	278.0	141.6	72	331.5	168.9	32	384.9	196.1	92	438.4	223.4	52	491.8	250.6
13	278.9	142.1	73	332.3	169.3	33	385.8	196.6	93	439.3	223.8	53	492.7	251.1
14	279.8	142.6	74	333.2	169.8	34	386.7	197.0	94	440.2	224.3	54	493.6	251.5
15	280.7	143.0	75	334.1	170.2	35	387.6	197.5	95	441.0	224.7	55	494.5	252.0
16	281.6	143.5	76	335.0	170.7	36	388.5	197.9	96	441.9	225.2	56	495.4	252.4
17	282.4	143.9	77	335.9	171.2	37	389.4	198.4	97	442.8	225.6	57	496.3	252.9
18	283.3	144.4	78	336.8	171.6	38	390.3	198.8	98	443.7	226.1	58	497.2	253.3
19	284.2	144.8	79	337.7	172.1	39	391.2	199.3	99	444.6	226.5	59	498.1	253.8
20	285.1	145.3	80	338.6	172.5	40	392.0	199.8	500	445.5	227.0	60	499.0	254.2
321	286.0	145.7	381	339.5	173.0	441	392.9	200.2	501	446.4	227.4	561	499.9	254.7
22	286.9	146.2	82	340.4	173.4	42	393.8	200.7	02	447.3	227.9	62	500.7	255.1
23	287.8	146.6	83	341.3	173.9	43	394.7	201.1	03	448.2	228.4	63	501.6	255.6
24	288.7	147.1	84	342.1	174.3	44	395.6	201.6	04	449.0	228.8	64	502.5	256.1
25	289.6	147.5	85	343.0	174.8	45	396.5	202.0	05	450.0	229.3	65	503.4	256.5
26	290.5	148.0	86	343.9	175.2	46	397.4	202.5	06	450.8	229.7	66	504.3	257.0
27	291.4	148.5	87	344.8	175.7	47	398.3	202.9	07	451.7	230.2	67	505.2	257.4
28	292.3	148.9	88	345.7	176.1	48	399.2	203.4	08	452.6	230.6	68	506.1	257.9
29	293.1	149.4	89	346.6	176.6	49	400.1	203.8	09	453.5	231.1	69	507.0	258.3
30	294.0	149.8	90	347.5	177.1	50	401.0	204.3	10	454.4	231.5	70	507.9	258.8
331	294.9	150.3	391	348.4	177.5	451	401.8	204.7	511	455.3	232.0	571	508.8	259.2
32	295.8	150.7	92	349.3	178.0	52	402.7	205.2	12	456.2	232.4	72	509.6	259.7
33	296.7	151.2	93	350.2	178.4	53	403.6	205.7	13	457.1	232.9	73	510.5	260.1
34	297.6	151.6	94	351.1	178.9	54	404.5	206.1	14	458.0	233.4	74	511.4	260.6
35	298.5	152.1	95	351.9	179.3	55	405.4	206.6	15	458.9	233.8	75	512.3	261.0
36	299.4	152.5	96	352.8	179.8	56	406.3	207.0	16	459.8	234.3	76	513.2	261.5
37	300.3	153.0	97	353.7	180.2	57	407.2	207.5	17	460.7	234.7	77	514.1	262.0
38	301.2	153.4	98	354.6	180.7	58	408.1	207.9	18	461.5	235.2	78	515.0	262.4
39	302.1	153.9	99	355.5	181.1	59	409.0	208.4	19	462.4	235.6	79	515.9	262.9
40	302.9	154.4	400	356.4	181.6	60	409.9	208.8	20	463.3	236.1	80	516.8	263.4
341	303.8	154.8	401	357.3	182.1	461	410.8	209.3	521	464.2	236.5	581	517.7	263.8
42	304.7	155.3	02	358.2	182.5	62	411.6	209.7	22	465.1	237.0	82	518.6	264.2
43	305.6	155.7	03	359.1	183.0	63	412.5	210.2	23	466.0	237.4	83	519.5	264.7
44	306.5	156.2	04	360.0	183.4	64	413.4	210.7	24	466.9	237.9	84	520.3	265.1
45	307.4	156.6	05	360.9	183.9	65	414.3	211.1	25	467.8	238.3	85	521.2	265.6
46	308.3	157.1	06	361.8	184.3	66	415.2	211.6	26	468.7	238.8	86	522.1	266.0
47	309.2	157.5	07	362.6	184.8	67	416.1	212.0	27	469.6	239.3	87	523.0	266.5
48	310.1	158.0	08	363.5	185.2	68	417.0	212.5	28	470.5	239.7	88	523.9	266.9
49	311.0	158.4	09	364.4	185.7	69	417.9	212.9	29	471.3	240.2	89	524.8	267.4
50	311.9	158.9	10	365.3	186.1	70	418.8	213.4	30	472.2	240.6	90	525.7	267.9
351	312.7	159.4	411	366.2	186.6	471	419.7	213.8	531	473.1	241.1	591	526.6	268.3
52	313.6	159.8	12	367.1	187.0	72	420.6	214.3	32	474.0	241.5	92	527.5	268.8
53	314.5	160.3	13	368.0	187.5	73	421.4	214.7	33	474.9	242.0	93	528.4	269.2
54	315.4	160.7	14	368.9	188.0	74	422.3	215.2	34	475.8	242.4	94	529.3	269.7
55	316.3	161.2	15	369.8	188.4	75	423.2	215.6	35	476.7	242.9	95	530.1	270.1
56	317.2	161.6	16	370.7	188.9	76	424.1	216.1	36	477.6	243.3	96	531.0	270.6
57	318.1	162.1	17	371.5	189.3	77	425.0	216.6	37	478.5	243.8	97	531.9	271.0
58	319.0	162.5	18	372.4	189.8	78	425.9	217.0	38	479.4	244.2	98	532.8	271.5
59	319.9	163.0	19	373.3	190.2	79	426.8	217.5	39	480.3	244.7	99	533.7	271.9
60	320.8	163.4	20	374.2	190.7	80	427.7	217.9	40	481.1	245.2	600	534.6	272.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

63° (117°, 243°, 297°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 28° (152°, 208°, 332°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.5	61	53.9	28.6	121	106.8	56.8	181	159.8	85.0	241	212.8	113.1
2	1.8	0.9	62	54.7	29.1	22	107.7	57.3	82	160.7	85.4	42	213.7	113.6
3	2.6	1.4	63	55.6	29.6	23	108.6	57.7	83	161.6	85.9	43	214.6	114.1
4	3.5	1.9	64	56.5	30.0	24	109.5	58.2	84	162.5	86.4	44	215.4	114.6
5	4.4	2.3	65	57.4	30.5	25	110.4	58.7	85	163.3	86.9	45	216.3	115.0
6	5.3	2.8	66	58.3	31.0	26	111.3	59.2	86	164.2	87.3	46	217.2	115.5
7	6.2	3.3	67	59.2	31.5	27	112.1	59.6	87	165.1	87.8	47	218.1	116.0
8	7.1	3.8	68	60.0	31.9	28	113.0	60.1	88	166.0	88.3	48	219.0	116.4
9	7.9	4.2	69	60.9	32.4	29	113.9	60.6	89	166.9	88.7	49	219.9	116.9
10	8.8	4.7	70	61.8	32.9	30	114.8	61.0	90	167.8	89.2	50	220.7	117.4
11	9.7	5.2	71	62.7	33.3	131	115.7	61.5	191	168.6	89.7	251	221.6	117.8
12	10.6	5.6	72	63.6	33.8	32	116.5	62.0	92	169.5	90.1	52	222.5	118.3
13	11.5	6.1	73	64.5	34.3	33	117.4	62.4	93	170.4	90.6	53	223.4	118.8
14	12.4	6.6	74	65.3	34.7	34	118.3	62.9	94	171.3	91.1	54	224.3	119.2
15	13.2	7.0	75	66.2	35.2	35	119.2	63.4	95	172.2	91.5	55	225.2	119.7
16	14.1	7.5	76	67.1	35.7	36	120.1	63.8	96	173.1	92.0	56	226.0	120.2
17	15.0	8.0	77	68.0	36.1	37	121.0	64.3	97	173.9	92.5	57	226.9	120.7
18	15.9	8.5	78	68.9	36.6	38	121.8	64.8	98	174.8	93.0	58	227.8	121.1
19	16.8	8.9	79	69.8	37.1	39	122.7	65.3	99	175.7	93.4	59	228.7	121.6
20	17.7	9.4	80	70.6	37.6	40	123.6	65.7	200	176.6	93.9	60	229.6	122.1
21	18.5	9.9	81	71.5	38.0	141	124.5	66.2	201	177.5	94.4	261	230.4	122.5
22	19.4	10.3	82	72.4	38.5	42	125.4	66.7	02	178.4	94.8	62	231.3	123.0
23	20.3	10.8	83	73.3	39.0	43	126.3	67.1	03	179.2	95.3	63	232.2	123.5
24	21.2	11.3	84	74.2	39.4	44	127.1	67.6	04	180.1	95.8	64	233.1	123.9
25	22.1	11.7	85	75.1	39.9	45	128.0	68.1	05	181.0	96.2	65	234.0	124.4
26	23.0	12.2	86	75.9	40.4	46	128.9	68.5	06	181.9	96.7	66	234.9	124.9
27	23.8	12.7	87	76.8	40.8	47	129.8	69.0	07	182.8	97.2	67	235.7	125.3
28	24.7	13.1	88	77.7	41.3	48	130.7	69.5	08	183.7	97.7	68	236.6	125.8
29	25.6	13.6	89	78.6	41.8	49	131.6	70.0	09	184.5	98.1	69	237.5	126.3
30	26.5	14.1	90	79.5	42.3	50	132.4	70.4	10	185.4	98.6	70	238.4	126.8
31	27.4	14.6	91	80.3	42.7	151	133.3	70.9	211	186.3	99.1	271	239.3	127.2
32	28.3	15.0	92	81.2	43.2	52	134.2	71.4	12	187.2	99.5	72	240.2	127.7
33	29.1	15.5	93	82.1	43.7	53	135.1	71.8	13	188.1	100.0	73	241.0	128.2
34	30.0	16.0	94	83.0	44.1	54	136.0	72.3	14	189.0	100.5	74	241.9	128.6
35	30.9	16.4	95	83.9	44.6	55	136.9	72.8	15	189.8	100.9	75	242.8	129.1
36	31.8	16.9	96	84.8	45.1	56	137.7	73.2	16	190.7	101.4	76	243.7	129.6
37	32.7	17.4	97	85.6	45.5	57	138.6	73.7	17	191.6	101.9	77	244.6	130.0
38	33.6	17.8	98	86.5	46.0	58	139.5	74.2	18	192.5	102.3	78	245.5	130.5
39	34.4	18.3	99	87.4	46.5	59	140.4	74.6	19	193.4	102.8	79	246.3	131.0
40	35.3	18.8	100	88.3	46.9	60	141.3	75.1	20	194.2	103.3	80	247.2	131.5
41	36.2	19.2	101	89.2	47.4	161	142.2	75.6	221	195.1	103.8	281	248.1	131.9
42	37.1	19.7	02	90.1	47.9	62	143.0	76.1	22	196.0	104.2	82	249.0	132.4
43	38.0	20.2	03	90.9	48.4	63	143.9	76.5	23	196.9	104.7	83	249.9	132.9
44	38.8	20.7	04	91.8	48.8	64	144.8	77.0	24	197.8	105.2	84	250.8	133.3
45	39.7	21.1	05	92.7	49.3	65	145.7	77.5	25	198.7	105.6	85	251.6	133.8
46	40.6	21.6	06	93.6	49.8	66	146.6	77.9	26	199.5	106.1	86	252.5	134.3
47	41.5	22.1	07	94.5	50.2	67	147.5	78.4	27	200.4	106.6	87	253.4	134.7
48	42.4	22.5	08	95.4	50.7	68	148.3	78.9	28	201.3	107.0	88	254.3	135.2
49	43.3	23.0	09	96.2	51.2	69	149.2	79.3	29	202.2	107.5	89	255.2	135.7
50	44.1	23.5	10	97.1	51.6	70	150.1	79.8	30	203.1	108.0	90	256.1	136.1
51	45.0	23.9	111	98.0	52.1	171	151.0	80.3	231	204.0	108.4	291	256.9	136.6
52	45.9	24.4	12	98.9	52.6	72	151.9	80.7	32	204.8	108.9	92	257.8	137.1
53	46.8	24.9	13	99.8	53.1	73	152.7	81.2	33	205.7	109.4	93	258.7	137.6
54	47.7	25.4	14	100.7	53.5	74	153.6	81.7	34	206.6	109.9	94	259.6	138.0
55	48.6	25.8	15	101.5	54.0	75	154.5	82.2	35	207.5	110.3	95	260.5	138.5
56	49.4	26.3	16	102.4	54.5	76	155.4	82.6	36	208.4	110.8	96	261.4	139.0
57	50.3	26.8	17	103.3	54.9	77	156.3	83.1	37	209.3	111.3	97	262.2	139.4
58	51.2	27.2	18	104.2	55.4	78	157.2	83.6	38	210.1	111.7	98	263.1	139.9
59	52.1	27.7	19	105.1	55.9	79	158.0	84.0	39	211.0	112.2	99	264.0	140.4
60	53.0	28.2	20	106.0	56.3	80	158.9	84.5	40	211.9	112.7	300	264.9	140.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

62° (118°, 242°, 298°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side. Adj.	N×Sin. / Side Opp.

Difference of Latitude and Departure for 28° (152°, 208°, 332°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	265.8	141.3	361	318.7	169.5	421	371.7	197.6	481	424.7	225.8	541	477.7	254.0
02	266.7	141.8	62	319.6	169.9	22	372.6	198.1	82	425.6	226.3	42	478.6	254.5
03	267.5	142.2	63	320.5	170.4	23	373.5	198.6	83	426.5	226.8	43	479.4	254.9
04	268.4	142.7	64	321.4	170.9	24	374.4	199.1	84	427.3	227.2	44	480.3	255.4
05	269.3	143.2	65	322.3	171.4	25	375.3	199.5	85	428.2	227.7	45	481.2	255.9
06	270.2	143.7	66	323.2	171.8	26	376.1	200.0	86	429.1	228.2	46	482.1	256.3
07	271.1	144.1	67	324.0	172.3	27	377.0	200.5	87	430.0	228.6	47	483.0	256.8
08	271.9	144.6	68	324.9	172.8	28	377.9	200.9	88	430.9	229.1	48	483.9	257.3
09	272.8	145.1	69	325.8	173.2	29	378.8	201.4	89	431.8	229.6	49	484.7	257.7
10	273.7	145.5	70	326.7	173.7	30	379.7	201.9	90	432.6	230.0	50	485.6	258.2
311	274.6	146.0	371	327.6	174.2	431	380.6	202.3	491	433.5	230.5	551	486.5	258.7
12	275.5	146.5	72	328.5	174.6	32	381.4	202.8	92	434.4	231.0	52	487.4	259.1
13	276.4	146.9	73	329.3	175.1	33	382.3	203.3	93	435.3	231.4	53	488.3	259.6
14	277.2	147.4	74	330.2	175.6	34	383.2	203.8	94	436.2	231.9	54	489.2	260.1
15	278.1	147.9	75	331.1	176.1	35	384.1	204.2	95	437.1	232.4	55	490.0	260.6
16	279.0	148.4	76	332.0	176.5	36	385.0	204.7	96	437.9	232.9	56	490.9	261.0
17	279.9	148.8	77	332.9	177.0	37	385.8	205.2	97	438.8	233.3	57	491.8	261.5
18	280.8	149.3	78	333.8	177.5	38	386.7	205.6	98	439.7	233.8	58	492.7	262.0
19	281.7	149.8	79	334.6	177.9	39	387.6	206.1	99	440.6	234.3	59	493.6	262.4
20	282.5	150.2	80	335.5	178.4	40	388.5	206.6	500	441.5	234.7	60	494.5	262.9
321	283.4	150.7	381	336.4	178.9	441	389.4	207.0	501	442.4	235.2	561	495.3	263.4
22	284.3	151.2	82	337.3	179.3	42	390.3	207.5	02	443.2	235.7	62	496.2	263.8
23	285.2	151.6	83	338.2	179.8	43	391.1	208.0	03	444.1	236.1	63	497.1	264.3
24	286.1	152.1	84	339.1	180.3	44	392.0	208.4	04	445.0	236.6	64	498.0	264.8
25	287.0	152.6	85	339.9	180.7	45	392.9	208.9	05	445.9	237.1	65	498.9	265.3
26	287.8	153.0	86	340.8	181.2	46	393.8	209.4	06	446.8	237.6	66	499.7	265.7
27	288.7	153.5	87	341.7	181.7	47	394.7	209.9	07	447.7	238.0	67	500.6	266.2
28	289.6	154.0	88	342.6	182.2	48	395.6	210.3	08	448.5	238.5	68	501.5	266.7
29	290.5	154.5	89	343.5	182.6	49	396.4	210.8	09	449.4	239.0	69	502.4	267.1
30	291.4	154.9	90	344.3	183.1	50	397.3	211.3	10	450.3	239.4	70	503.3	267.6
331	292.3	155.4	391	345.2	183.6	451	398.2	211.7	511	451.2	239.9	571	504.2	268.1
32	293.1	155.9	92	346.1	184.0	52	399.1	212.2	12	452.1	240.4	72	505.0	268.5
33	294.0	156.3	93	347.0	184.5	53	400.0	212.7	13	453.0	240.8	73	505.9	269.0
34	294.9	156.8	94	347.9	185.0	54	400.9	213.1	14	453.8	241.3	74	506.8	269.5
35	295.8	157.3	95	348.8	185.4	55	401.7	213.6	15	454.7	241.8	75	507.7	269.9
36	296.7	157.7	96	349.6	185.9	56	402.6	214.1	16	455.6	242.2	76	508.6	270.4
37	297.6	158.2	97	350.5	186.4	57	403.5	214.5	17	456.5	242.7	77	509.5	270.9
38	298.4	158.7	98	351.4	186.8	58	404.4	215.0	18	457.4	243.2	78	510.3	271.4
39	299.3	159.2	99	352.3	187.3	59	405.3	215.5	19	458.2	243.7	79	511.2	271.8
40	300.2	159.6	400	353.2	187.8	60	406.2	216.0	20	459.1	244.1	80	512.1	272.3
341	301.1	160.1	401	354.1	188.3	461	407.0	216.4	521	460.0	244.6	581	513.0	272.8
42	302.0	160.6	02	354.9	188.7	62	407.9	216.9	22	460.9	245.1	82	513.9	273.2
43	302.9	161.0	03	355.8	189.2	63	408.8	217.4	23	461.8	245.5	83	514.8	273.7
44	303.7	161.5	04	356.7	189.7	64	409.7	217.8	24	462.7	246.0	84	515.6	274.2
45	304.6	162.0	05	357.6	190.1	65	410.6	218.3	25	463.5	246.5	85	516.5	274.6
46	305.5	162.4	06	358.5	190.6	66	411.5	218.8	26	464.4	246.9	86	517.4	275.1
47	306.4	162.9	07	359.4	191.1	67	412.3	219.2	27	465.3	247.4	87	518.3	275.4
48	307.3	163.4	08	360.2	191.5	68	413.2	219.7	28	466.2	247.9	88	519.2	276.0
49	308.1	163.8	09	361.1	192.0	69	414.1	220.2	29	467.1	248.4	89	520.1	276.5
50	309.0	164.3	10	362.0	192.5	70	415.0	220.7	30	468.0	248.8	90	520.9	277.0
351	309.9	164.8	411	362.9	193.0	471	415.9	221.1	531	468.8	249.3	591	521.8	277.5
52	310.8	165.3	12	363.8	193.4	72	416.8	221.6	32	469.7	249.8	92	522.7	277.9
53	311.7	165.7	13	364.7	193.9	73	417.6	222.1	33	470.7	250.2	93	523.6	278.4
54	312.6	166.2	14	365.5	194.4	74	418.5	222.5	34	471.5	250.7	94	524.5	278.9
55	313.4	166.7	15	366.4	194.8	75	419.4	223.0	35	472.4	251.2	95	525.4	279.3
56	314.3	167.1	16	367.3	195.3	76	420.3	223.5	36	473.3	251.6	96	526.2	279.8
57	315.2	167.6	17	368.2	195.8	77	421.2	223.9	37	474.1	252.1	97	527.1	280.3
58	316.1	168.1	18	369.1	196.2	78	422.0	224.4	38	475.0	252.6	98	528.0	280.7
59	317.0	168.5	19	370.0	196.7	79	422.9	224.9	39	475.9	253.0	99	528.9	281.2
60	317.9	169.0	20	370.8	197.2	80	423.8	225.3	40	476.8	253.5	600	529.8	281.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

62° (118°, 242°, 298°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

TABLE 3.

Difference of Latitude and Departure for 29° (151°, 209°, 331°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.5	61	53.4	29.6	121	105.8	58.7	181	158.3	87.8	241	210.8	116.8
2	1.7	1.0	62	54.2	30.1	22	106.7	59.1	82	159.2	88.2	42	211.7	117.3
3	2.6	1.5	63	55.1	30.5	23	107.6	59.6	83	160.1	88.7	43	212.5	117.8
4	3.5	1.9	64	56.0	31.0	24	108.5	60.1	84	160.9	89.2	44	213.4	118.3
5	4.4	2.4	65	56.9	31.5	25	109.3	60.6	85	161.8	89.7	45	214.3	118.8
6	5.2	2.9	66	57.7	32.0	26	110.2	61.1	86	162.7	90.2	46	215.2	119.3
7	6.1	3.4	67	58.6	32.5	27	111.1	61.6	87	163.6	90.7	47	216.0	119.7
8	7.0	3.9	68	59.5	33.0	28	112.0	62.1	88	164.4	91.1	48	216.9	120.2
9	7.9	4.4	69	60.3	33.5	29	112.8	62.5	89	165.3	91.6	49	217.8	120.7
10	8.7	4.8	70	61.2	33.9	30	113.7	63.0	90	166.2	92.1	50	218.7	121.2
11	9.6	5.3	71	62.1	34.4	131	114.6	63.5	191	167.1	92.6	251	219.5	121.7
12	10.5	5.8	72	63.0	34.9	32	115.4	64.0	92	167.9	93.1	52	220.4	122.2
13	11.4	6.3	73	63.8	35.4	33	116.3	64.5	93	168.8	93.6	53	221.3	122.7
14	12.2	6.8	74	64.7	35.9	34	117.2	65.0	94	169.7	94.1	54	222.2	123.1
15	13.1	7.3	75	65.6	36.4	35	118.1	65.4	95	170.6	94.5	55	223.0	123.6
16	14.0	7.8	76	66.5	36.8	36	118.9	65.9	96	171.4	95.0	56	223.9	124.1
17	14.9	8.2	77	67.3	37.3	37	119.8	66.4	97	172.3	95.5	57	224.8	124.6
18	15.7	8.7	78	68.2	37.8	38	120.7	66.9	98	173.2	96.0	58	225.7	125.1
19	16.6	9.2	79	69.1	38.3	39	121.6	67.4	99	174.0	96.5	59	226.5	125.6
20	17.5	9.7	80	70.0	38.8	40	122.4	67.9	200	174.9	97.0	60	227.4	126.1
21	18.4	10.2	81	70.8	39.3	141	123.3	68.4	201	175.8	97.4	261	228.3	126.5
22	19.2	10.7	82	71.7	39.8	42	124.2	68.8	02	176.7	97.9	62	229.2	127.0
23	20.1	11.2	83	72.6	40.2	43	125.1	69.3	03	177.5	98.4	63	230.0	127.5
24	21.0	11.6	84	73.5	40.7	44	125.9	69.8	04	178.4	98.9	64	230.9	128.0
25	21.9	12.1	85	74.3	41.2	45	126.8	70.3	05	179.3	99.4	65	231.8	128.5
26	22.7	12.6	86	75.2	41.7	46	127.7	70.8	06	180.2	99.9	66	232.6	129.0
27	23.6	13.1	87	76.1	42.2	47	128.6	71.3	07	181.0	100.4	67	233.5	129.4
28	24.5	13.6	88	77.0	42.7	48	129.4	71.8	08	181.9	100.8	68	234.4	129.9
29	25.4	14.1	89	77.8	43.1	49	130.3	72.2	09	182.8	101.3	69	235.3	130.4
30	26.2	14.5	90	78.7	43.6	50	131.2	72.7	10	183.7	101.8	70	236.1	130.9
31	27.1	15.0	91	79.6	44.1	151	132.1	73.2	211	184.5	102.3	271	237.0	131.4
32	28.0	15.5	92	80.5	44.6	52	132.9	73.7	12	185.4	102.8	72	237.9	131.9
33	28.9	16.0	93	81.3	45.1	53	133.8	74.2	13	186.3	103.3	73	238.8	132.4
34	29.7	16.5	94	82.2	45.6	54	134.7	74.7	14	187.2	103.7	74	239.6	132.8
35	30.6	17.0	95	83.1	46.1	55	135.6	75.1	15	188.0	104.2	75	240.5	133.3
36	31.5	17.5	96	84.0	46.5	56	136.4	75.6	16	188.9	104.7	76	241.4	133.8
37	32.4	17.9	97	84.8	47.0	57	137.3	76.1	17	189.8	105.2	77	242.3	134.3
38	33.2	18.4	98	85.7	47.5	58	138.2	76.6	18	190.7	105.7	78	243.1	134.8
39	34.1	18.9	99	86.6	48.0	59	139.1	77.1	19	191.5	106.2	79	244.0	135.3
40	35.0	19.4	100	87.5	48.5	60	139.9	77.6	20	192.4	106.7	80	244.9	135.7
41	35.9	19.9	101	88.3	49.0	161	140.8	78.1	221	193.3	107.1	281	245.8	136.2
42	36.7	20.4	02	89.2	49.5	62	141.7	78.5	22	194.2	107.6	82	246.6	136.7
43	37.6	20.8	03	90.1	49.9	63	142.6	79.0	23	195.0	108.1	83	247.5	137.2
44	38.5	21.3	04	91.0	50.4	64	143.4	79.5	24	195.9	108.6	84	248.4	137.7
45	39.4	21.8	05	91.8	50.9	65	144.3	80.0	25	196.8	109.1	85	249.3	138.2
46	40.2	22.3	06	92.7	51.4	66	145.2	80.5	26	197.7	109.6	86	250.1	138.7
47	41.1	22.8	07	93.6	51.9	67	146.1	81.0	27	198.5	110.1	87	251.0	139.1
48	42.0	23.3	08	94.5	52.4	68	146.9	81.4	28	199.4	110.5	88	251.9	139.6
49	42.9	23.8	09	95.3	52.8	69	147.8	81.9	29	200.3	111.0	89	252.8	140.1
50	43.7	24.2	10	96.2	53.3	70	148.7	82.4	30	201.2	111.5	90	253.6	140.6
51	44.6	24.7	111	97.1	53.8	171	149.6	82.9	231	202.0	112.0	291	254.5	141.1
52	45.5	25.2	12	98.0	54.3	72	150.4	83.4	32	202.9	112.5	92	255.4	141.6
53	46.4	25.7	13	98.8	54.8	73	151.3	83.9	33	203.8	113.0	93	256.3	142.0
54	47.2	26.2	14	99.7	55.3	74	152.2	84.4	34	204.7	113.4	94	257.1	142.5
55	48.1	26.7	15	100.6	55.8	75	153.1	84.8	35	205.5	113.9	95	258.0	143.0
56	49.0	27.1	16	101.5	56.2	76	153.9	85.3	36	206.4	114.4	96	258.9	143.5
57	49.9	27.6	17	102.3	56.7	77	154.8	85.8	37	207.3	114.9	97	259.8	144.0
58	50.7	28.1	18	103.2	57.2	78	155.7	86.3	38	208.2	115.4	98	260.6	144.5
59	51.6	28.6	19	104.1	57.7	79	156.6	86.8	39	209.0	115.9	99	261.5	145.0
60	52.5	29.1	20	105.0	58.2	80	157.4	87.3	40	209.9	116.4	300	262.4	145.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

61° (119°, 241°, 299°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

Difference of Latitude and Departure for 29° (151°, 209°, 331°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	263.3	145.9	361	315.7	175.0	421	368.2	204.1	481	420.7	233.2	541	473.2	262.3
02	264.1	146.4	62	316.6	175.5	22	369.1	204.6	82	421.6	233.7	42	474.0	262.8
03	265.0	146.9	63	317.5	176.0	23	370.0	205.1	83	422.4	234.2	43	474.9	263.3
04	265.9	147.4	64	318.4	176.5	24	370.8	205.6	84	423.3	234.6	44	475.8	263.7
05	266.8	147.9	65	319.2	177.0	25	371.7	206.0	85	424.2	235.1	45	476.7	264.2
06	267.6	148.4	66	320.1	177.4	26	372.6	206.5	86	425.1	235.6	46	477.5	264.7
07	268.5	148.8	67	321.0	177.9	27	373.5	207.0	87	425.9	236.1	47	478.4	265.2
08	269.4	149.3	68	321.9	178.4	28	374.3	207.5	88	426.8	236.6	48	479.3	265.7
09	270.3	149.8	69	322.7	178.9	29	375.2	208.0	89	427.7	237.1	49	480.2	266.2
10	271.1	150.3	70	323.6	179.4	30	376.1	208.5	90	428.6	237.6	50	481.0	266.6
311	272.0	150.8	371	324.5	179.9	431	377.0	209.0	491	429.4	238.0	551	481.9	267.1
12	272.9	151.3	72	325.4	180.3	32	377.8	209.4	92	430.3	238.5	52	482.8	267.6
13	273.8	151.7	73	326.2	180.8	33	378.7	209.9	93	431.2	239.0	53	483.7	268.1
14	274.6	152.2	74	327.1	181.3	34	379.6	210.4	94	432.1	239.5	54	484.5	268.6
15	275.5	152.7	75	328.0	181.8	35	380.5	210.9	95	432.9	240.0	55	485.4	269.1
16	276.4	153.2	76	328.9	182.3	36	381.3	211.4	96	433.8	240.5	56	486.3	269.6
17	277.3	153.7	77	329.7	182.8	37	382.2	211.9	97	434.7	241.0	57	487.2	270.0
18	278.1	154.2	78	330.6	183.3	38	383.1	212.3	98	435.6	241.4	58	488.0	270.5
19	279.0	154.7	79	331.5	183.7	39	384.0	212.8	99	436.4	241.9	59	488.9	271.0
20	279.9	155.1	80	332.4	184.2	40	384.8	213.3	500	437.3	242.4	60	489.8	271.5
321	280.8	155.6	381	333.2	184.7	441	385.7	213.8	501	438.2	242.9	561	490.7	272.0
22	281.6	156.1	82	334.1	185.2	42	386.6	214.3	02	439.1	243.4	62	491.5	272.5
23	282.5	156.6	83	335.0	185.7	43	387.5	214.8	03	439.9	243.9	63	492.4	272.9
24	283.4	157.1	84	335.9	186.2	44	388.3	215.3	04	440.8	244.3	64	493.3	273.4
25	284.3	157.6	85	336.7	186.7	45	389.2	215.7	05	441.7	244.8	65	494.2	273.9
26	285.1	158.0	86	337.6	187.1	46	390.0	216.2	06	442.6	245.3	66	495.0	274.4
27	286.0	158.5	87	338.5	187.6	47	391.0	216.7	07	443.4	245.8	67	495.9	274.9
28	286.9	159.0	88	339.4	188.1	48	391.8	217.2	08	444.3	246.3	68	496.8	275.4
29	287.7	159.5	89	340.2	188.6	49	392.7	217.7	09	445.2	246.8	69	497.7	275.9
30	288.6	160.0	90	341.1	189.1	50	393.6	218.2	10	446.1	247.3	70	498.5	276.3
331	289.5	160.5	391	342.0	189.6	451	394.5	218.6	511	446.9	247.7	571	499.4	276.8
32	290.4	161.0	92	342.9	190.0	52	395.3	219.1	12	447.8	248.2	72	500.3	277.3
33	291.2	161.4	93	343.7	190.5	53	396.2	219.6	13	448.7	248.7	73	501.2	277.8
34	292.1	161.9	94	344.6	191.0	54	397.1	220.1	14	449.6	249.2	74	502.0	278.3
35	293.0	162.4	95	345.5	191.5	55	398.0	220.6	15	450.4	249.7	75	502.9	278.8
36	293.9	162.9	96	346.3	192.0	56	398.8	221.1	16	451.3	250.2	76	503.8	279.3
37	294.7	163.4	97	347.2	192.5	57	399.7	221.6	17	452.2	250.6	77	504.7	279.7
38	295.6	163.9	98	348.1	193.0	58	400.6	222.0	18	453.1	251.1	78	505.5	280.2
39	296.5	164.4	99	349.0	193.4	59	401.5	222.5	19	453.9	251.6	79	506.4	280.7
40	297.4	164.8	400	349.8	193.9	60	402.3	223.0	20	454.8	252.1	80	507.3	281.2
341	298.2	165.3	401	350.7	194.4	461	403.2	223.5	521	455.7	252.6	581	508.2	281.7
42	299.1	165.8	02	351.6	194.9	62	404.0	224.0	22	456.6	253.1	82	509.0	282.2
43	300.0	166.3	03	352.5	195.4	63	404.9	224.5	23	457.4	253.6	83	509.9	282.6
44	300.9	166.8	04	353.3	195.9	64	405.8	225.0	24	458.3	254.0	84	510.7	283.1
45	301.7	167.3	05	354.2	196.3	65	406.7	225.4	25	459.2	254.5	85	511.7	283.6
46	302.6	167.7	06	355.1	196.8	66	407.5	225.9	26	460.0	255.0	86	512.5	284.1
47	303.5	168.2	07	356.0	197.3	67	408.4	226.4	27	460.9	255.5	87	513.4	284.6
48	304.4	168.7	08	356.8	197.8	68	409.3	226.9	28	461.8	256.0	88	514.3	285.1
49	305.2	169.2	09	357.7	198.3	69	410.2	227.4	29	462.7	256.5	89	515.2	285.6
50	306.1	169.7	10	358.6	198.8	70	411.0	227.9	30	463.5	256.9	90	516.0	286.0
351	307.0	170.2	411	359.5	199.3	471	411.9	228.3	531	464.4	257.4	591	516.9	286.5
52	307.9	170.7	12	360.3	199.7	72	412.8	228.8	32	465.3	257.9	92	517.8	287.0
53	308.7	171.1	13	361.2	200.2	73	413.7	229.3	33	466.2	258.4	93	518.6	287.5
54	309.6	171.6	14	362.1	200.7	74	414.5	229.8	34	467.0	258.9	94	519.5	288.0
55	310.5	172.1	15	363.0	201.2	75	415.4	230.3	35	467.9	259.4	95	520.4	288.5
56	311.4	172.6	16	363.8	201.7	76	416.3	230.8	36	468.8	259.9	96	521.3	288.9
57	312.2	173.1	17	364.7	202.2	77	417.2	231.3	37	469.6	260.3	97	522.1	289.4
58	313.1	173.6	18	365.6	202.7	78	418.0	231.7	38	470.5	260.8	98	523.0	289.9
59	314.0	174.0	19	366.5	203.1	79	418.9	232.2	39	471.4	261.3	99	523.9	290.4
60	314.9	174.5	20	367.3	203.6	80	419.8	232.7	40	472.3	261.8	600	524.8	290.9
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

61° (119°, 241°, 299°).

	Dist.	Lat.	Dep.
In **Plane Sailing.**			
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 30° (150°, 210°, 330°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.5	61	52.8	30.5	121	104.8	60.5	181	156.8	90.5	241	208.7	120.5
2	1.7	1.0	62	53.7	31.0	22	105.7	61.0	82	157.6	91.0	42	209.6	121.0
3	2.6	1.5	63	54.6	31.5	23	106.5	61.5	83	158.5	91.5	43	210.4	121.5
4	3.5	2.0	64	55.4	32.0	24	107.4	62.0	84	159.3	92.0	44	211.3	122.0
5	4.3	2.5	65	56.3	32.5	25	108.3	62.5	85	160.2	92.5	45	212.2	122.5
6	5.2	3.0	66	57.2	33.0	26	109.1	63.0	86	161.1	93.0	46	213.0	123.0
7	6.1	3.5	67	58.0	33.5	27	110.0	63.5	87	161.9	93.5	47	213.9	123.5
8	6.9	4.0	68	58.9	34.0	28	110.9	64.0	88	162.8	94.0	48	214.8	124.0
9	7.8	4.5	69	59.8	34.5	29	111.7	64.5	89	163.7	94.5	49	215.6	124.5
10	8.7	5.0	70	60.6	35.0	30	112.6	65.0	90	164.5	95.0	50	216.5	125.0
11	9.5	5.5	71	61.5	35.5	131	113.4	65.5	191	165.4	95.5	251	217.4	125.5
12	10.4	6.0	72	62.4	36.0	32	114.3	66.0	92	166.3	96.0	52	218.2	126.0
13	11.3	6.5	73	63.2	36.5	33	115.2	66.5	93	167.1	96.5	53	219.1	126.5
14	12.1	7.0	74	64.1	37.0	34	116.0	67.0	94	168.0	97.0	54	220.0	127.0
15	13.0	7.5	75	65.0	37.5	35	116.9	67.5	95	168.9	97.5	55	220.8	127.5
16	13.9	8.0	76	65.8	38.0	36	117.8	68.0	96	169.7	98.0	56	221.7	128.0
17	14.7	8.5	77	66.7	38.5	37	118.6	68.5	97	170.6	98.5	57	222.6	128.5
18	15.6	9.0	78	67.5	39.0	38	119.5	69.0	98	171.5	99.0	58	223.4	129.0
19	16.5	9.5	79	68.4	39.5	39	120.4	69.5	99	172.3	99.5	59	224.3	129.5
20	17.3	10.0	80	69.3	40.0	40	121.2	70.0	200	173.2	100.0	60	225.2	130.0
21	18.2	10.5	81	70.1	40.5	141	122.1	70.5	201	174.1	100.5	261	226.0	130.5
22	19.1	11.0	82	71.0	41.0	42	123.0	71.0	02	174.9	101.0	62	226.9	131.0
23	19.9	11.5	83	71.9	41.5	43	123.8	71.5	03	175.8	101.5	63	227.8	131.5
24	20.8	12.0	84	72.7	42.0	44	124.7	72.0	04	176.7	102.0	64	228.6	132.0
25	21.7	12.5	85	73.6	42.5	45	125.6	72.5	05	177.5	102.5	65	229.5	132.5
26	22.5	13.0	86	74.5	43.0	46	126.4	73.0	06	178.4	103.0	66	230.4	133.0
27	23.4	13.5	87	75.3	43.5	47	127.3	73.5	07	179.3	103.5	67	231.2	133.5
28	24.2	14.0	88	76.2	44.0	48	128.2	74.0	08	180.1	104.0	68	232.1	134.0
29	25.1	14.5	89	77.1	44.5	49	129.0	74.5	09	181.0	104.5	69	233.0	134.5
30	26.0	15.0	90	77.9	45.0	50	129.9	75.0	10	181.9	105.0	70	233.8	135.0
31	26.8	15.5	91	78.8	45.5	151	130.8	75.5	211	182.7	105.5	271	234.7	135.5
32	27.7	16.0	92	79.7	46.0	52	131.6	76.0	12	183.6	106.0	72	235.6	136.0
33	28.6	16.5	93	80.5	46.5	53	132.5	76.5	13	184.5	106.5	73	236.4	136.5
34	29.4	17.0	94	81.4	47.0	54	133.4	77.0	14	185.3	107.0	74	237.3	137.0
35	30.3	17.5	95	82.3	47.5	55	134.2	77.5	15	186.2	107.5	75	238.2	137.5
36	31.2	18.0	96	83.1	48.0	56	135.1	78.0	16	187.1	108.0	76	239.0	138.0
37	32.0	18.5	97	84.0	48.5	57	136.0	78.5	17	187.9	108.5	77	239.9	138.5
38	32.9	19.0	98	84.9	49.0	58	136.8	79.0	18	188.8	109.0	78	240.8	139.0
39	33.8	19.5	99	85.7	49.5	59	137.7	79.5	19	189.7	109.5	79	241.6	139.5
40	34.6	20.0	100	86.6	50.0	60	138.6	80.0	20	190.5	110.0	80	242.5	140.0
41	35.5	20.5	101	87.5	50.5	161	139.4	80.5	221	191.4	110.5	281	243.4	140.5
42	36.4	21.0	02	88.3	51.0	62	140.3	81.0	22	192.3	111.0	82	244.2	141.0
43	37.2	21.5	03	89.2	51.5	63	141.2	81.5	23	193.1	111.5	83	245.1	141.5
44	38.1	22.0	04	90.1	52.0	64	142.0	82.0	24	194.0	112.0	84	246.0	142.0
45	39.0	22.5	05	90.9	52.5	65	142.9	82.5	25	194.9	112.5	85	246.8	142.5
46	39.8	23.0	06	91.8	53.0	66	143.8	83.0	26	195.7	113.0	86	247.7	143.0
47	40.7	23.5	07	92.7	53.5	67	144.6	83.5	27	196.6	113.5	87	248.5	143.5
48	41.6	24.0	08	93.5	54.0	68	145.5	84.0	28	197.5	114.0	88	249.4	144.0
49	42.4	24.5	09	94.4	54.5	69	146.4	84.5	29	198.3	114.5	89	250.3	144.5
50	43.3	25.0	10	95.3	55.0	70	147.2	85.0	30	199.2	115.0	90	251.1	145.0
51	44.2	25.5	111	96.1	55.5	171	148.1	85.5	231	200.1	115.5	291	252.0	145.5
52	45.0	26.0	12	97.0	56.0	72	149.0	86.0	32	200.9	116.0	92	252.9	146.0
53	45.9	26.5	13	97.9	56.5	73	149.8	86.5	33	201.8	116.5	93	253.7	146.5
54	46.8	27.0	14	98.7	57.0	74	150.7	87.0	34	202.6	117.0	94	254.6	147.0
55	47.6	27.5	15	99.6	57.5	75	151.6	87.5	35	203.5	117.5	95	255.5	147.5
56	48.5	28.0	16	100.5	58.0	76	152.4	88.0	36	204.4	118.0	96	256.3	148.0
57	49.4	28.5	17	101.3	58.5	77	153.3	88.5	37	205.2	118.5	97	257.2	148.5
58	50.2	29.0	18	102.2	59.0	78	154.2	89.0	38	206.1	119.0	98	258.1	149.0
59	51.1	29.5	19	103.1	59.5	79	155.0	89.5	39	207.0	119.5	99	258.9	149.5
60	52.0	30.0	20	103.9	60.0	80	155.9	90.0	40	207.8	120.0	300	259.8	150.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

60° (120°, 240°, 300°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 30° (150°, 210°, 330°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	260.7	150.5	361	312.6	180.5	421	364.6	210.5	481	416.6	240.5	541	468.5	270.5
02	261.5	151.0	62	313.5	181.0	22	365.5	211.0	82	417.4	241.0	42	469.4	271.0
03	262.4	151.5	63	314.4	181.5	23	366.3	211.5	83	418.3	241.5	43	470.3	271.5
04	263.3	152.0	64	315.2	182.0	24	367.2	212.0	84	419.2	242.0	44	471.1	272.0
05	264.1	152.5	65	316.1	182.5	25	368.1	212.5	85	420.0	242.5	45	472.0	272.5
06	265.0	153.0	66	317.0	183.0	26	368.9	213.0	86	420.9	243.0	46	472.8	273.0
07	265.9	153.5	67	317.8	183.5	27	369.8	213.5	87	421.8	243.5	47	473.7	273.5
08	266.6	154.0	68	318.7	184.0	28	370.7	214.0	88	422.6	244.0	48	474.6	274.0
09	267.6	154.5	69	319.6	184.5	29	371.5	214.5	89	423.5	244.5	49	475.4	274.5
10	268.5	155.0	70	320.4	185.0	30	372.4	215.0	90	424.4	245.0	50	476.3	275.0
311	269.3	155.5	371	321.3	185.5	431	373.3	215.5	491	425.2	245.5	551	477.2	275.5
12	270.2	156.0	72	322.2	186.0	32	374.1	216.0	92	426.1	246.0	52	478.0	276.0
13	271.1	156.5	73	323.0	186.5	33	375.0	216.5	93	427.0	246.5	53	478.9	276.5
14	271.9	157.0	74	323.9	187.0	34	375.9	217.0	94	427.8	247.0	54	479.8	277.0
15	272.8	157.5	75	324.8	187.5	35	376.7	217.5	95	428.7	247.5	55	480.6	277.5
16	273.7	158.0	76	325.6	188.0	36	377.6	218.0	96	429.5	248.0	56	481.5	278.0
17	274.5	158.5	77	326.5	188.5	37	378.5	218.5	97	430.4	248.5	57	482.4	278.5
18	275.4	159.0	78	327.4	189.0	38	379.3	219.0	98	431.3	249.0	58	483.2	279.0
19	276.3	159.5	79	328.2	189.5	39	380.2	219.5	99	432.1	249.5	59	484.1	279.5
20	277.1	160.0	80	329.1	190.0	40	381.1	220.0	500	433.0	250.0	60	485.0	280.0
321	278.0	160.5	381	330.0	190.5	441	381.9	220.5	501	433.9	250.5	561	485.8	280.5
22	278.9	161.0	82	330.8	191.0	42	382.8	221.0	02	434.7	251.0	62	486.7	281.0
23	279.7	161.5	83	331.7	191.5	43	383.6	221.5	03	435.6	251.5	63	487.6	281.5
24	280.6	162.0	84	332.6	192.0	44	384.5	222.0	04	436.5	252.0	64	488.4	282.0
25	281.5	162.5	85	333.4	192.5	45	385.4	222.5	05	437.3	252.5	65	489.3	282.5
26	282.3	163.0	86	334.3	193.0	46	386.3	223.0	06	438.2	253.0	66	490.2	283.0
27	283.2	163.5	87	335.2	193.5	47	387.1	223.5	07	439.1	253.5	67	491.0	283.5
28	284.1	164.0	88	336.0	194.0	48	388.0	224.0	08	439.9	254.0	68	491.9	284.0
29	284.9	164.5	89	336.9	194.5	49	388.8	224.5	09	440.8	254.5	69	492.8	284.5
30	285.8	165.0	90	337.7	195.0	50	389.7	225.0	10	441.7	255.0	70	493.6	285.0
331	286.7	165.5	391	338.6	195.5	451	390.6	225.5	511	442.5	255.5	571	494.5	285.5
32	287.5	166.0	92	339.5	196.0	52	391.4	226.0	12	443.4	256.0	72	495.4	286.0
33	288.4	166.5	93	340.3	196.5	53	392.3	226.5	13	444.3	256.5	73	496.2	286.5
34	289.3	167.0	94	341.2	197.0	54	393.2	227.0	14	445.1	257.0	74	497.1	287.0
35	290.1	167.5	95	342.1	197.5	55	394.0	227.5	15	446.0	257.5	75	498.0	287.5
36	291.0	168.0	96	342.9	198.0	56	394.9	228.0	16	446.9	258.0	76	498.8	288.0
37	291.9	168.5	97	343.8	198.5	57	395.8	228.5	17	447.7	258.5	77	499.7	288.5
38	292.7	169.0	98	344.7	199.0	58	396.6	229.0	18	448.6	259.0	78	500.6	289.0
39	293.6	169.5	99	345.5	199.5	59	397.5	229.5	19	449.5	259.5	79	501.3	289.5
40	294.5	170.0	400	346.4	200.0	60	398.4	230.0	20	450.3	260.0	80	502.3	290.0
341	295.3	170.5	401	347.3	200.5	461	399.2	230.5	521	451.2	260.5	581	503.2	290.5
42	296.2	171.0	02	348.1	201.0	62	400.1	231.0	22	452.1	261.0	82	504.0	291.0
43	297.0	171.5	03	349.0	201.5	63	401.0	231.5	23	452.9	261.5	83	504.9	291.5
44	297.9	172.0	04	349.9	202.0	64	401.8	232.0	24	453.8	262.0	84	505.8	292.0
45	298.8	172.5	05	350.7	202.5	65	402.7	232.7	25	454.7	262.5	85	506.6	292.5
46	299.6	173.0	06	351.6	203.0	66	403.6	233.0	26	455.5	263.0	86	507.5	293.0
47	300.5	173.5	07	352.5	203.5	67	404.4	233.5	27	456.4	263.5	87	508.4	293.5
48	301.4	174.0	08	353.3	204.0	68	405.3	234.0	28	457.3	264.0	88	509.2	294.0
49	302.2	174.5	09	354.2	204.5	69	406.2	234.5	29	458.1	264.5	89	510.1	294.5
50	303.1	175.0	10	355.1	205.0	70	407.0	235.0	30	459.0	265.0	90	511.0	295.0
351	304.0	175.5	411	355.9	205.5	471	407.9	235.5	531	459.9	265.5	591	511.8	295.5
52	304.8	176.0	12	356.8	206.0	72	408.8	236.0	32	460.7	266.0	92	512.7	296.0
53	305.7	176.5	13	357.7	206.5	73	409.6	236.5	33	461.6	266.5	93	513.6	296.5
54	306.6	177.0	14	358.5	207.0	74	410.5	237.0	34	462.5	267.0	94	514.4	297.0
55	307.4	177.5	15	359.4	207.5	75	411.4	237.5	35	463.3	267.5	95	515.3	297.5
56	308.3	178.0	16	360.3	208.0	76	412.2	238.0	36	464.2	268.0	96	516.2	298.0
57	309.2	178.5	17	361.1	208.5	77	413.1	238.5	37	465.1	268.5	97	517.0	298.5
58	310.0	179.0	18	362.0	209.0	78	414.0	239.0	38	465.9	269.0	98	517.9	299.0
59	310.9	179.5	19	362.9	209.5	79	414.8	239.5	39	466.8	269.5	99	518.7	299.5
60	311.8	180.0	20	363.7	210.0	80	415.7	240.0	40	467.7	270.0	600	519.6	300.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

60° (120°, 240°, 300°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 31° (149°, 211°, 329°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.9	0.5	61	52.3	31.4	121	103.7	62.3	181	155.1	93.2	241	206.6	124.1
2	1.7	1.0	62	53.1	31.9	22	104.6	62.8	82	156.0	93.7	42	207.4	124.6
3	2.6	1.5	63	54 0	32.4	23	105.4	63.3	83	156.9	94.3	43	208.3	125.2
4	3.4	2.1	64	54.9	33.0	24	106.3	63.9	84	157.7	94.8	44	209.1	125.7
5	4.3	2.6	65	55.7	33.5	25	107.1	64.4	85	158.6	95.3	45	210.0	126.2
6	5.1	3.1	66	56.6	34.0	26	108.0	64.9	86	159.4	95.8	46	210.9	126.7
7	6.0	3.6	67	57.4	34.5	27	108.9	65.4	87	160.3	96.3	47	211.7	127.2
8	6.9	4.1	68	58.3	35.0	28	109.7	65.9	88	161.1	96.8	48	212.6	127.7
9	7.7	4.6	69	59.1	35.5	29	110.6	66.4	89	162.0	97.3	49	213.4	128.2
10	8.6	5.2	70	60.0	36.1	30	111.4	67.0	90	162.9	97.9	50	214.3	128.8
11	9.4	5.7	71	60.9	36.6	131	112.3	67.5	191	163.7	98.4	251	215.1	129.3
12	10.3	6.2	72	61.7	37.1	32	113.1	68.0	92	164.6	98.9	52	216.0	129.8
13	11.1	6.7	73	62.6	37.6	33	114.0	68.5	93	165.4	99.4	53	216.9	130.3
14	12.0	7.2	74	63.4	38.1	34	114.9	69.0	94	166.3	99.9	54	217.7	130.8
15	12.9	7.7	75	64.3	38.6	35	115.7	69.5	95	167.1	100.4	55	218.6	131.3
16	13.7	8.2	76	65.1	39.1	36	116.6	70.0	96	168.0	100.9	56	219.4	131.8
17	14.6	8.8	77	66.0	39.7	37	117.4	70.6	97	168.9	101.5	57	220.3	132.4
18	15.4	9.3	78	66.9	40.2	38	118.3	71.1	98	169.7	102.0	58	221.1	132.9
19	16.3	9.8	79	67.7	40.7	39	119.1	71.6	99	170.6	102.5	59	222.0	133.4
20	17.1	10.3	80	68.6	41.2	40	120.0	72.1	200	171.4	103.0	60	222.9	133.9
21	18.0	10.8	81	69.4	41.7	141	120.9	72.6	201	172.3	103.5	261	223.7	134.4
22	18.9	11.3	82	70.3	42.2	42	121.7	73.1	02	173.1	104.0	62	224.6	134.9
23	19.7	11.8	83	71.1	42.7	43	122.6	73.7	03	174.0	104.6	63	225.4	135.5
24	20.6	12.4	84	72.0	43.3	44	123.4	74.2	04	174.9	105.1	64	226.3	136.0
25	21.4	12.9	85	72.9	43.8	45	124.3	74.7	05	175.7	105.6	65	227.1	136.5
26	22.3	13.4	86	73.7	44.3	46	125.1	75.2	06	176.6	106.1	66	228.0	137.0
27	23.1	13.9	87	74.6	44.8	47	126.0	75.7	07	177.4	106.6	67	228.9	137.5
28	24.0	14.4	88	75.4	45.3	48	126.9	76.2	08	178.3	107.1	68	229.7	138.0
29	24.9	14.9	89	76.3	45.8	49	127.7	76.7	09	179.1	107.6	69	230.6	138.5
30	25.7	15.5	90	77.1	46.4	50	128.6	77.3	10	180.0	108.2	70	231.4	139.1
31	26.6	16.0	91	78.0	46.9	151	129.4	77.8	211	180.9	108.7	271	232.3	139.6
32	27.4	16.5	92	78.9	47.4	52	130.3	78.3	12	181.7	109.2	72	233.1	140.1
33	28.3	17.0	93	79.7	47.9	53	131.1	78.8	13	182.6	109.7	73	234.0	140.6
34	29.1	17.5	94	80.6	48.4	54	132.0	79.3	14	183.4	110.2	74	234.9	141.1
35	30.0	18.0	95	81.4	48.9	55	132.9	79.8	15	184.3	110.7	75	235.7	141.6
36	30.9	18.5	96	82.3	49.4	56	133.7	80.3	16	185.1	111.2	76	236.6	142.2
37	31.7	19.1	97	83.1	50.0	57	134.6	80.9	17	186.0	111.8	77	237.4	142.7
38	32.6	19.6	98	84.0	50.5	58	135.4	81.4	18	186.9	112.3	78	238.3	143.2
39	33.4	20.1	99	84.9	51.0	59	136.3	81.9	19	187.7	112.8	79	239.1	143.7
40	34.3	20.6	100	85.7	51.5	60	137.1	82.4	20	188.6	113.3	80	240.0	144.2
41	35.1	21.1	101	86.6	52.0	161	138.0	82.9	221	189.4	113.8	281	240.9	144.7
42	36.0	21.6	02	87.4	52.5	62	138.9	83.4	22	190.3	114.3	82	241.7	145.2
43	36.9	22.1	03	88.3	53.0	63	139.7	84.0	23	191.1	114.9	83	242.6	145.8
44	37.7	22.7	04	89.1	53.6	64	140.6	84.5	24	192.0	115.4	84	243.4	146.3
45	38.6	23.2	05	90.0	54.1	65	141.4	85.0	25	192.9	115.9	85	244.3	146.8
46	39.4	23.7	06	90.9	54.6	66	142.3	85.5	26	193.7	116.4	86	245.1	147.3
47	40.3	24.2	07	91.7	55.1	67	143.1	86.0	27	194.6	116.9	87	246.0	147.8
48	41.1	24.7	08	92.6	55.6	68	144.0	86.5	28	195.4	117.4	88	246.9	148.3
49	42.0	25.2	09	93.4	56.1	69	144.9	87.0	29	196.3	117.9	89	247.7	148.8
50	42.9	25.8	10	94.3	56.7	70	145.7	87.6	30	197.1	118.5	90	248.6	149.4
51	43.7	26.3	111	95.1	57.2	171	146.6	88.1	231	198.0	119.0	291	249.4	149.9
52	44.6	26.8	12	96.0	57.7	72	147.4	88.6	32	198.9	119.5	92	250.3	150.4
53	45.4	27.3	13	96.9	58.2	73	148.3	89.1	33	199.7	120.0	93	251.2	150.9
54	46.3	27.8	14	97.7	58.7	74	149.1	89.6	34	200.6	120.5	94	252.0	151.4
55	47.1	28.3	15	98.6	59.2	75	150.0	90.1	35	201.4	121.0	95	252.9	151.9
56	48.0	28.8	16	99.4	59.7	76	150.9	90.6	36	202.3	121.5	96	253.7	152.5
57	48.9	29.4	17	100.3	60.3	77	151.7	91.2	37	203.1	122.1	97	254.6	153.0
58	49.7	29.9	18	101.1	60.8	78	152.6	91.7	38	204.0	122.6	98	255.4	153.5
59	50.6	30.4	19	102.0	61.3	79	153.4	92.2	39	204.9	123.1	99	256.3	154.0
60	51.4	30.9	20	102.9	61.8	80	154.3	92.7	40	205.7	123.6	300	257.1	154.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

59° (121°, 239°, 301°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		m	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 31° (149°, 211°, 329°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	258.0	155.0	361	309.4	185.9	421	360.9	216.8	481	412.3	247.7	541	463.7	278.6
02	258.9	155.5	62	310.3	186.4	22	361.7	217.3	82	413.2	248.2	42	464.6	279.2
03	259.7	156.1	63	311.2	187.0	23	362.6	217.9	83	414.0	248.8	43	465.4	279.7
04	260.6	156.6	64	312.0	187.5	24	363.4	218.4	84	414.9	249.3	44	466.3	280.2
05	261.4	157.1	65	312.9	188.0	25	364.3	218.9	85	415.7	249.8	45	467.2	280.7
06	262.3	157.6	66	313.7	188.5	26	365.2	219.4	86	416.6	250.3	46	468.0	281.2
07	263.2	158.1	67	314.6	189.0	27	366.0	219.9	87	417.4	250.8	47	468.9	281.7
08	264.0	158.6	68	315.4	189.5	28	366.9	220.4	88	418.3	251 3	48	469.7	282.2
09	264.9	159.1	69	316.3	190.0	29	367.7	221.0	89	419.2	251.9	49	470.6	282.8
10	265.7	159.7	70	317.2	190.6	30	368.6	221.5	90	420.0	252.4	50	471.4	283.3
311	266.6	160.2	371	318.0	191.1	431	369.4	222.0	491	420.9	252.9	551	472.3	283.8
12	267.4	160.7	72	318.9	191.6	32	370.3	222.5	92	421.7	253.4	52	473.2	284.3
13	268.3	161.2	73	319.7	192.1	33	371.2	223.0	93	422.6	253.9	53	474.0	284.8
14	269.2	161.7	74	320.6	192.6	34	372.0	223.5	94	423.4	254.4	54	474.9	285.3
15	270.0	162.2	75	321.4	193.1	35	372.9	224.0	95	424.3	254.9	55	475.7	285.8
16	270.9	162.8	76	322.3	193.7	36	373.7	224.6	96	425.2	255.5	56	476.6	286.4
17	271.7	163.3	77	323.2	194.2	37	374.6	225.1	97	426.0	256.0	57	477.4	286.9
18	272.6	163.8	78	324.0	194.7	38	375.4	225.6	98	426.9	256.5	58	478.3	287.4
19	273.4	164.3	79	324.9	195.2	39	376.3	226.1	99	427.7	257.0	59	479.2	287.9
20	274.3	164.8	80	325.7	195.7	40	377.2	226.6	500	428.6	257.5	60	480.0	288.4
321	275.2	165.3	381	326.6	196.2	441	378.0	227.1	501	429.4	258.0	561	480.9	288.9
22	276.0	165.8	82	327.4	196.7	42	378.9	227.6	02	430.3	258.5	62	481.7	289.5
23	276.9	166.4	83	328.3	197.3	43	379.7	228.2	03	431.2	259.1	63	482.6	290.0
24	277.7	166.9	84	329.2	197.8	44	380.6	228.7	04	432.0	259.6	64	483.4	290.5
25	278.6	167.4	85	330.0	198.3	45	381.4	229.2	05	432.9	260.1	65	484.3	291.0
26	279.4	167.9	86	330.9	198.8	46	382.3	229.7	06	433.7	260.6	66	485.2	291.5
27	280.3	168.4	87	331.7	199.3	47	383.2	230.2	07	434.6	261.1	67	486.0	292.0
28	281.2	168.9	88	332.6	199.8	48	384.0	230.7	08	435.4	261.6	68	486.9	292.5
29	282.0	169.4	89	333.4	200.3	49	384.9	231.3	09	436.3	262.2	69	487.7	293.1
30	282.9	170.0	90	334.3	200.9	50	385.7	231.8	10	437.2	262.7	70	488.6	293.6
331	283.7	170.5	391	335.2	201.4	451	386.6	232.3	511	438.0	263.2	571	489.4	294.1
32	284.6	171.0	92	336.0	201.9	52	387.4	232.8	12	438.9	263.7	72	490.3	294.6
33	285.4	171.5	93	336.9	202.4	53	388.3	233.3	13	439.7	264.2	73	491.2	295.1
34	286.3	172.0	94	337.7	202.9	54	389.2	233.8	14	440.6	264.7	74	492.0	295.6
35	287.2	172.5	95	338.6	203.4	55	390.0	234.3	15	441.4	265.2	75	492.9	296.1
36	288.0	173.1	96	339.4	204.0	56	390.9	234.9	16	442.3	265.8	76	493.7	296.7
37	288.9	173.6	97	340.3	204.5	57	391.7	235.4	17	443.2	266.3	77	494.6	297.2
38	289.7	174.1	98	341.2	205.0	58	392.6	235.9	18	444.0	266.8	78	495.4	297.7
39	290.6	174.6	99	342.0	205.5	59	393.4	236.4	19	444.9	267.3	79	496.3	298.2
40	291.4	175.1	400	342.9	206.0	60	394.3	236.9	20	445.7	267.8	80	497.2	298.7
341	292.3	175.6	401	343.7	206.5	461	395.2	237.4	521	446.6	268.3	581	498.0	299.2
42	293.2	176.1	02	344.6	207.0	62	396.0	237.9	22	447.4	268.8	82	498.9	299.8
43	294.0	176.7	03	345.4	207.6	63	396.9	238.5	23	448.3	269.4	83	499.7	300.3
44	294.9	177.2	04	346.3	208.1	64	397.7	239.0	24	449.2	269.9	84	500.6	300.8
45	295.7	177.7	05	347.2	208.6	65	398.6	239.5	25	450.0	270.4	85	501.4	301.3
46	296.6	178.2	06	348.0	209.1	66	399.4	240.0	26	450.9	270.9	86	502.3	301.8
47	297.4	178.7	07	348.9	209.6	67	400.3	240.5	27	451.7	271.4	87	503.2	302.3
48	298.3	179.2	08	349.7	210.1	68	401.2	241.0	28	452.6	271.9	88	504.0	302.8
49	299.2	179.7	09	350.6	210.7	69	402.0	241.6	29	453.4	272.5	89	504.9	303.4
50	300.0	180.3	10	351.4	211.2	70	402.9	242.1	30	454.3	273.0	90	505.7	303.9
351	300.9	180.8	411	352.3	211.7	471	403.7	242.6	531	455.2	273.5	591	506.6	304.4
52	301.7	181.3	12	353.2	212.2	72	404.6	243.1	32	456.0	274.0	92	507.4	304.9
53	302.6	181.8	13	354.0	212.7	73	405.4	243.6	33	456.9	274.5	93	508.3	305.4
54	303.4	182.3	14	354.9	213.2	74	406 3	244.1	34	457.7	275.0	94	509.2	305.9
55	304.3	182.8	15	355.7	213.7	75	407.2	244.6	35	458.6	275.5	95	510.0	306.4
56	305.2	183.4	16	356.6	214.3	76	408.0	245.2	36	459.4	276.1	96	510.9	307.0
57	306.0	183.9	17	357.4	214.8	77	408.9	245.7	37	460.3	276.6	97	511.7	307.5
58	306.9	184.4	18	358.3	215.3	78	409.7	246.2	38	461.2	277.1	98	512.6	308.0
59	307.7	184.9	19	359.2	215.8	79	410.6	246.7	39	462.0	277.6	99	513.4	308.5
60	308.6	185.4	20	360.0	216.3	80	411.4	247.2	40	462.9	278.1	600	514.3	309.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

59° (121°, 239°, 301°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 32° (148°, 212°, 328°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.8	0.5	61	51.7	32.3	121	102.6	64.1	181	153.5	95.9	241	204.4	127.7
2	1.7	1.1	62	52.6	32.9	22	103.5	64.7	82	154.3	96.4	42	205.2	128.2
3	2.5	1.6	63	53.4	33.4	23	104.3	65.2	83	155.2	97.0	43	206.1	128.8
4	3.4	2.1	64	54.3	33.9	24	105.2	65.7	84	156.0	97.5	44	206.9	129.3
5	4.2	2.6	65	55.1	34.4	25	106.0	66.2	85	156.9	98.0	45	207.8	129.8
6	5.1	3.2	66	56.0	35.0	26	106.9	66.8	86	157.7	98.6	46	208.6	130.4
7	5.9	3.7	67	56.8	35.5	27	107.7	67.3	87	158.6	99.1	47	209.5	130.9
8	6.8	4.2	68	57.7	36.0	28	108.6	67.8	88	159.4	99.6	48	210.3	131.4
9	7.6	4.8	69	58.5	36.6	29	109.4	68.4	89	160.3	100.2	49	211.2	131.9
10	8.5	5.3	70	59.4	37.1	30	110.2	68.9	90	161.1	100.7	50	212.0	132.5
11	9.3	5.8	71	60.2	37.6	131	111.1	69.4	191	162.0	101.2	251	212.9	133.0
12	10.2	6.4	72	61.1	38.2	32	111.9	69.9	92	162.8	101.7	52	213.7	133.5
13	11.0	6.9	73	61.9	38.7	33	112.8	70.5	93	163.7	102.3	53	214.6	134.1
14	11.9	7.4	74	62.8	39.2	34	113.6	71.0	94	164.5	102.8	54	215.4	134.6
15	12.7	7.9	75	63.6	39.7	35	114.5	71.5	95	165.4	103.3	55	216.3	135.1
16	13.6	8.5	76	64.5	40.3	36	115.3	72.1	96	166.2	103.9	56	217.1	135.7
17	14.4	9.0	77	65.3	40.8	37	116.2	72.6	97	167.1	104.4	57	217.9	136.2
18	15.3	9.5	78	66.1	41.3	38	117.0	73.1	98	167.9	104.9	58	218.8	136.7
19	16.1	10.1	79	67.0	41.9	39	117.9	73.7	99	168.8	105.5	59	219.6	137.2
20	17.0	10.6	80	67.8	42.4	40	118.7	74.2	200	169.6	106.0	60	220.5	137.8
21	17.8	11.1	81	68.7	42.9	141	119.6	74.7	201	170.5	106.5	261	221.3	138.3
22	18.7	11.7	82	69.5	43.5	42	120.4	75.2	02	171.3	107.0	62	222.2	138.8
23	19.5	12.2	83	70.4	44.0	43	121.3	75.8	03	172.2	107.6	63	223.0	139.4
24	20.4	12.7	84	71.2	44.5	44	122.1	76.3	04	173.0	108.1	64	223.9	139.9
25	21.2	13.2	85	72.1	45.0	45	123.0	76.8	05	173.8	108.6	65	224.7	140.4
26	22.0	13.8	86	72.9	45.6	46	123.8	77.4	06	174.7	109.2	66	225.6	141.0
27	22.9	14.3	87	73.8	46.1	47	124.7	77.9	07	175.5	109.7	67	226.4	141.5
28	23.7	14.8	88	74.6	46.6	48	125.5	78.4	08	176.4	110.2	68	227.3	142.0
29	24.6	15.4	89	75.5	47.2	49	126.4	79.0	09	177.2	110.8	69	228.1	142.5
30	25.4	15.9	90	76.3	47.7	50	127.2	79.5	10	178.1	111.3	70	229.0	143.1
31	26.3	16.4	91	77.2	48.2	151	128.1	80.0	211	178.9	111.8	271	229.8	143.6
32	27.1	17.0	92	78.0	48.8	52	128.9	80.5	12	179.8	112.3	72	230.7	144.1
33	28.0	17.5	93	78.9	49.3	53	129.8	81.1	13	180.6	112.9	73	231.5	144.7
34	28.8	18.0	94	79.7	49.8	54	130.6	81.6	14	181.5	113.4	74	232.4	145.2
35	29.7	18.5	95	80.6	50.3	55	131.4	82.1	15	182.3	113.9	75	233.2	145.7
36	30.5	19.1	96	81.4	50.9	56	132.3	82.7	16	183.2	114.5	76	234.1	146.3
37	31.4	19.6	97	82.3	51.4	57	133.1	83.2	17	184.0	115.0	77	234.9	146.8
38	32.2	20.1	98	83.1	51.9	58	134.0	83.7	18	184.9	115.5	78	235.8	147.3
39	33.1	20.7	99	84.0	52.5	59	134.8	84.3	19	185.7	116.1	79	236.6	147.8
40	33.9	21.2	100	84.8	53.0	60	135.7	84.8	20	186.6	116.6	80	237.5	148.4
41	34.8	21.7	101	85.7	53.5	161	136.5	85.3	221	187.4	117.1	281	238.3	148.9
42	35.6	22.3	02	86.5	54.1	62	137.4	85.8	22	188.3	117.6	82	239.1	149.4
43	36.5	22.8	03	87.3	54.6	63	138.2	86.4	23	189.1	118.2	83	240.0	150.0
44	37.3	23.3	04	88.2	55.1	64	139.1	86.9	24	190.0	118.7	84	240.8	150.5
45	38.2	23.8	05	89.0	55.6	65	139.9	87.4	25	190.8	119.2	85	241.7	151.0
46	39.0	24.4	06	89.9	56.2	66	140.8	88.0	26	191.7	119.8	86	242.5	151.6
47	39.9	24.9	07	90.7	56.7	67	141.6	88.5	27	192.5	120.3	87	243.4	152.1
48	40.7	25.4	08	91.6	57.2	68	142.5	89.0	28	193.4	120.8	88	244.2	152.6
49	41.6	26.0	09	92.4	57.8	69	143.3	89.6	29	194.2	121.4	89	245.1	153.1
50	42.4	26.5	10	93.3	58.3	70	144.2	90.1	30	195.1	121.9	90	245.9	153.7
51	43.3	27.0	111	94.1	58.8	171	145.0	90.6	231	195.9	122.4	291	246.8	154.2
52	44.1	27.6	12	95.0	59.4	72	145.9	91.1	32	196.7	122.9	92	247.6	154.7
53	44.9	28.1	13	95.8	59.9	73	146.7	91.7	33	197.6	123.5	93	248.5	155.3
54	45.8	28.6	14	96.7	60.4	74	147.6	92.2	34	198.4	124.0	94	249.3	155.8
55	46.6	29.1	15	97.5	60.9	75	148.4	92.7	35	199.3	124.5	95	250.2	156.3
56	47.5	29.7	16	98.4	61.5	76	149.3	93.3	36	200.1	125.1	96	251.0	156.9
57	48.3	30.2	17	99.2	62.0	77	150.1	93.8	37	201.0	125.6	97	251.9	157.4
58	49.2	30.7	18	100.1	62.5	78	151.0	94.3	38	201.8	126.1	98	252.7	157.9
59	50.0	31.3	19	100.9	63.1	79	151.8	94.9	39	202.7	126.7	99	253.6	158.4
60	50.9	31.8	20	101.8	63.6	80	152.6	95.4	40	203.5	127.2	300	254.4	159.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

58° (122°, 238°, 302°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side. Adj.	Side Opp.

Difference of Latitude and Departure for 32° (148°, 212°, 328°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	255.3	159.5	361	306.1	191.3	421	357.0	223.1	481	407.9	254.9	541	458.8	286.7
02	256.1	160.0	62	307.0	191.8	22	357.9	223.6	82	408.8	255.4	42	459.6	287.2
03	257.0	160.6	63	307.8	192.4	23	358.7	224.2	83	409.6	256.0	43	460.5	287.7
04	257.8	161.1	64	308.7	192.9	24	359.6	224.7	84	410.5	256.5	44	461.3	288.3
05	258.7	161.6	65	309.5	193.4	25	360.4	225.2	85	411.3	257.0	45	462.2	288.8
06	259.5	162.2	66	310.4	194.0	26	361.3	225.7	86	412.2	257.5	46	463.0	289.3
07	260.4	162.7	67	311.2	194.5	27	362.1	226.3	87	413.0	258.1	47	463.9	289.9
08	261.2	163.2	68	312.1	195.0	28	363.0	226.8	88	413.8	258.6	48	464.7	290.4
09	262.0	163.7	69	312.9	195.5	29	363.8	227.3	89	414.7	259.1	49	465.6	290.9
10	262.9	164.3	70	313.8	196.1	30	364.7	227.9	90	415.5	259.7	50	466.4	291.5
311	263.7	164.8	371	314.6	196.6	431	365.5	228.4	491	416.4	260.2	551	467.3	292.0
12	264.6	165.3	72	315.5	197.1	32	366.4	228.9	92	417.2	260.7	52	468.1	292.5
13	265.4	165.9	73	316.3	197.7	33	367.2	229.5	93	418.1	261.3	53	469.0	293.0
14	266.3	166.4	74	317.2	198.2	34	368.1	230.0	94	418.9	261.8	54	469.8	293.6
15	267.1	166.9	75	318.0	198.7	35	368.9	230.5	95	419.8	262.3	55	470.7	294.1
16	268.0	167.5	76	318.9	199.2	36	369.7	231.0	96	420.6	262.8	56	471.5	294.6
17	268.8	168.0	77	319.7	199.8	37	370.6	231.6	97	421.5	263.4	57	472.4	295.2
18	269.7	168.5	78	320.6	200.3	38	371.4	232.1	98	422.3	263.9	58	473.2	295.7
19	270.5	169.0	79	321.4	200.8	39	372.3	232.6	99	423.2	264.4	59	474.1	296.2
20	271.4	169.6	80	322.3	201.4	40	373.1	233.2	500	424.0	265.0	60	474.9	296.8
321	272.2	170.1	381	323.1	201.9	441	374.0	233.7	501	424.9	265.5	561	475.8	297.3
22	273.1	170.6	82	324.0	202.4	42	374.8	234.2	02	425.7	266.0	62	476.6	297.8
23	273.9	171.2	83	324.8	203.0	43	375.7	234.8	03	426.6	266.5	63	477.5	298.3
24	274.8	171.7	84	325.7	203.5	44	376.5	235.3	04	427.4	267.1	64	478.3	298.9
25	275.6	172.2	85	326.5	204.0	45	377.4	235.8	05	428.3	267.6	65	479.1	299.4
26	276.5	172.8	86	327.3	204.5	46	378.2	236.3	06	429.1	268.1	66	480.0	299.9
27	277.3	173.3	87	328.2	205.1	47	379.1	236.9	07	430.0	268.7	67	480.8	300.5
28	278.2	173.8	88	329.0	205.6	48	379.9	237.4	08	430.8	269.2	68	481.7	301.0
29	279.0	174.3	89	329.9	206.1	49	380.8	237.9	09	431.7	269.7	69	482.5	301.5
30	279.9	174.9	90	330.7	206.7	50	381.6	238.5	10	432.5	270.3	70	483.4	302.1
331	280.7	175.4	391	331.6	207.2	451	382.5	239.0	511	433.4	270.8	571	484.2	302.6
32	281.6	175.9	92	332.4	207.7	52	383.3	239.5	12	434.2	271.3	72	485.1	303.1
33	282.4	176.5	93	333.3	208.3	53	384.2	240.1	13	435.0	271.9	73	485.9	303.6
34	283.2	177.0	94	334.1	208.8	54	385.0	240.6	14	435.9	272.4	74	486.8	304.2
35	284.1	177.5	95	335.0	209.3	55	385.9	241.1	15	436.7	272.9	75	487.6	304.7
36	284.9	178.1	96	335.8	209.8	56	386.7	241.6	16	437.6	273.4	76	488.5	305.2
37	285.8	178.6	97	336.7	210.4	57	387.6	242.2	17	438.4	274.0	77	489.3	305.8
38	286.6	179.1	98	337.5	210.9	58	388.4	242.7	18	439.3	274.5	78	490.2	306.3
39	287.5	179.6	99	338.4	211.4	59	389.3	243.2	19	440.1	275.0	79	491.0	306.8
40	288.3	180.2	400	339.2	212.0	60	390.1	243.8	20	441.0	275.6	80	491.9	307.4
341	289.2	180.7	401	340.1	212.5	461	391.0	244.3	521	441.8	276.1	581	492.7	307.9
42	290.0	181.2	02	340.9	213.0	62	391.8	244.8	22	442.7	276.6	82	493.6	308.4
43	290.9	181.8	03	341.8	213.6	63	392.6	245.4	23	443.5	277.1	83	494.4	308.9
44	291.7	182.3	04	342.6	214.1	64	393.5	245.9	24	444.4	277.7	84	495.3	309.5
45	292.6	182.8	05	343.5	214.6	65	394.3	246.4	25	445.2	278.2	85	496.1	310.0
46	293.4	183.4	06	344.3	215.1	66	395.2	246.9	26	446.1	278.7	86	497.0	310.5
47	294.3	183.9	07	345.2	215.7	67	396.0	247.5	27	446.9	279.3	87	497.8	311.1
48	295.1	184.4	08	346.0	216.2	68	396.9	248.0	28	447.8	279.8	88	498.7	311.6
49	296.0	184.9	09	346.9	216.7	69	397.7	248.5	29	448.6	280.3	89	499.5	312.1
50	296.8	185.5	10	347.7	217.3	70	398.6	249.1	30	449.5	280.9	90	500.3	312.7
351	297.7	186.0	411	348.5	217.8	471	399.4	249.6	531	450.3	281.4	591	501.2	313.2
52	298.5	186.5	12	349.4	218.3	72	400.3	250.1	32	451.2	281.9	92	502.0	313.7
53	299.4	187.1	13	350.2	218.9	73	401.1	250.7	33	452.0	282.4	93	502.9	314.2
54	300.2	187.6	14	351.1	219.4	74	402.0	251.2	34	452.9	283.0	94	503.7	314.8
55	301.1	188.1	15	351.9	219.9	75	402.8	251.7	35	453.7	283.5	95	504.6	315.3
56	301.9	188.7	16	352.8	220.4	76	403.7	252.2	36	454.6	284.0	96	505.4	315.8
57	302.8	189.2	17	353.6	221.0	77	404.5	252.8	37	455.4	284.6	97	506.3	316.4
58	303.6	189.7	18	354.5	221.5	78	405.4	253.3	38	456.2	285.1	98	507.1	316.9
59	304.4	190.2	19	355.3	222.0	79	406.2	253.8	39	457.1	285.6	99	508.0	317.4
60	305.3	190.8	20	356.2	222.6	80	407.1	254.4	40	457.9	286.2	600	508.8	318.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

58° (122°, 238°, 302°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 33° (147°, 213°, 327°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.8	0.5	61	51.2	33.2	121	101.5	65.9	181	151.8	98.6	241	202.1	131.3
2	1.7	1.1	62	52.0	33.8	22	102.3	66.4	82	152.6	99.1	42	203.0	131.8
3	2.5	1.6	63	52.8	34.3	23	103.2	67.0	83	153.5	99.7	43	203.8	132.3
4	3.4	2.2	64	53.7	34.9	24	104.0	67.5	84	154.3	100.2	44	204.6	132.9
5	4.2	2.7	65	54.5	35.4	25	104.8	68.1	85	155.2	100.8	45	205.5	133.4
6	5.0	3.3	66	55.4	35.9	26	105.7	68.6	86	156.0	101.3	46	206.3	134.0
7	5.9	3.8	67	56.2	36.5	27	106.5	69.2	87	156.8	101.8	47	207.2	134.5
8	6.7	4.4	68	57.0	37.0	28	107.3	69.7	88	157.7	102.4	48	208.0	135.1
9	7.5	4.9	69	57.9	37.6	29	108.2	70.3	89	158.5	102.9	49	208.8	135.6
10	8.4	5.4	70	58.7	38.1	30	109.0	70.8	90	159.3	103.5	50	209.7	136.2
11	9.2	6.0	71	59.5	38.7	131	109.9	71.3	191	160.2	104.0	251	210.5	136.7
12	10.1	6.5	72	60.4	39.2	32	110.7	71.9	92	161.0	104.6	52	211.3	137.2
13	10.9	7.1	73	61.2	39.8	33	111.5	72.4	93	161.9	105.1	53	212.2	137.8
14	11.7	7.6	74	62.1	40.3	34	112.4	73.0	94	162.7	105.7	54	213.0	138.3
15	12.6	8.2	75	62.9	40.8	35	113.2	73.5	95	163.5	106.2	55	213.9	138.9
16	13.4	8.7	76	63.7	41.4	36	114.1	74.1	96	164.4	106.7	56	214.7	139.4
17	14.3	9.3	77	64.6	41.9	37	114.9	74.6	97	165.2	107.3	57	215.5	140.0
18	15.1	9.8	78	65.4	42.5	38	115.7	75.2	98	166.1	107.8	58	216.4	140.5
19	15.9	10.3	79	66.3	43.0	39	116.6	75.7	99	166.9	108.4	59	217.2	141.1
20	16.8	10.9	80	67.1	43.6	40	117.4	76.2	200	167.7	108.9	60	218.1	141.6
21	17.6	11.4	81	67.9	44.1	141	118.3	76.8	201	168.6	109.5	261	218.9	142.2
22	18.5	12.0	82	68.8	44.7	42	119.1	77.3	02	169.4	110.0	62	219.7	142.7
23	19.3	12.5	83	69.6	45.2	43	119.9	77.9	03	170.3	110.6	63	220.6	143.2
24	20.1	13.1	84	70.4	45.7	44	120.8	78.4	04	171.1	111.1	64	221.4	143.8
25	21.0	13.6	85	71.3	46.3	45	121.6	79.0	05	171.9	111.7	65	222.2	144.3
26	21.8	14.2	86	72.1	46.8	46	122.4	79.5	06	172.8	112.2	66	223.1	144.9
27	22.6	14.7	87	73.0	47.4	47	123.3	80.1	07	173.6	112.7	67	223.9	145.4
28	23.5	15.2	88	73.8	47.9	48	124.1	80.6	08	174.4	113.3	68	224.8	146.0
29	24.3	15.8	89	74.6	48.5	49	125.0	81.2	09	175.3	113.8	69	225.6	146.5
30	25.2	16.3	90	75.5	49.0	50	125.8	81.7	10	176.1	114.4	70	226.4	147.1
31	26.0	16.9	91	76.3	49.6	151	126.6	82.2	211	177.0	114.9	271	227.3	147.6
32	26.8	17.4	92	77.2	50.1	52	127.5	82.8	12	177.8	115.5	72	228.1	148.1
33	27.7	18.0	93	78.0	50.7	53	128.3	83.3	13	178.6	116.0	73	229.0	148.7
34	28.5	18.5	94	78.8	51.2	54	129.2	83.9	14	179.5	116.6	74	229.8	149.2
35	29.4	19.1	95	79.7	51.7	55	130.0	84.4	15	180.3	117.1	75	230.6	149.8
36	30.2	19.6	96	80.5	52.3	56	130.8	85.0	16	181.2	117.6	76	231.5	150.3
37	31.0	20.2	97	81.4	52.8	57	131.7	85.5	17	182.0	118.2	77	232.3	150.9
38	31.9	20.7	98	82.2	53.4	58	132.5	86.1	18	182.8	118.7	78	233.2	151.4
39	32.7	21.2	99	83.0	53.9	59	133.3	86.6	19	183.7	119.3	79	234.0	152.0
40	33.5	21.8	100	83.9	54.5	60	134.2	87.1	20	184.5	119.8	80	234.8	152.5
41	34.4	22.3	101	84.7	55.0	161	135.0	87.7	221	185.3	120.4	281	235.7	153.0
42	35.2	22.9	02	85.5	55.6	62	135.9	88.2	22	186.2	120.9	82	236.5	153.6
43	36.1	23.4	03	86.4	56.1	63	136.7	88.8	23	187.0	121.5	83	237.3	154.1
44	36.9	24.0	04	87.2	56.6	64	137.5	89.3	24	187.9	122.0	84	238.2	154.7
45	37.7	24.5	05	88.1	57.2	65	138.4	89.9	25	188.7	122.5	85	239.0	155.2
46	38.6	25.1	06	88.9	57.7	66	139.2	90.4	26	189.5	123.1	86	239.9	155.8
47	39.4	25.6	07	89.7	58.3	67	140.1	91.0	27	190.4	123.6	87	240.7	156.3
48	40.3	26.1	08	90.6	58.8	68	140.9	91.5	28	191.2	124.2	88	241.5	156.9
49	41.1	26.7	09	91.4	59.4	69	141.7	92.0	29	192.1	124.7	89	242.4	157.4
50	41.9	27.2	10	92.3	59.9	70	142.6	92.6	30	192.9	125.3	90	243.2	157.9
51	42.8	27.8	111	93.1	60.5	171	143.4	93.1	231	193.7	125.8	291	244.1	158.5
52	43.6	28.3	12	93.9	61.0	72	144.3	93.7	32	194.6	126.4	92	244.9	159.0
53	44.4	28.9	13	94.8	61.5	73	145.1	94.2	33	195.4	126.9	93	245.7	159.6
54	45.3	29.4	14	95.6	62.1	74	145.9	94.8	34	196.2	127.4	94	246.6	160.1
55	46.1	30.0	15	96.4	62.6	75	146.8	95.3	35	197.1	128.0	95	247.4	160.7
56	47.0	30.5	16	97.3	63.2	76	147.6	95.9	36	197.9	128.5	96	248.2	161.2
57	47.8	31.0	17	98.1	63.7	77	148.4	96.4	37	198.8	129.1	97	249.1	161.8
58	48.6	31.6	18	99.0	64.3	78	149.3	96.9	38	199.6	129.6	98	249.9	162.3
59	49.5	32.1	19	99.8	64.8	79	150.1	97.5	39	200.4	130.2	99	250.8	162.8
60	50.3	32.7	20	100.6	65.4	80	151.0	98.0	40	201.3	130.7	300	251.6	163.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

57° (123°, 237°, 303°).

	Dist.	Lat.	Dep.
In **Plane Sailing.**			
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 33° (147°, 213°, 327°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	252.4	163.9	361	302.8	196.6	421	353.1	229.3	481	403.4	262.0	541	453.7	294.6
02	253.3	164.5	62	303.6	197.2	22	353.9	229.8	82	404.2	262.5	42	454.6	295.2
03	254.1	165.0	63	304.4	197.7	23	354.8	230.4	83	405.1	263.1	43	455.4	295.7
04	255.0	165.6	64	305.3	198.2	24	355.6	230.9	84	405.9	263.6	44	456.2	296.3
05	255.8	166.1	65	306.1	198.8	25	356.4	231.5	85	406.8	264.1	45	457.1	296.8
06	256.6	166.7	66	307.0	199.3	26	357.3	232.0	86	407.6	264.7	46	457.9	297.4
07	257.5	167.2	67	307.8	199.9	27	358.1	232.6	87	408.4	265.2	47	458.8	297.9
08	258.3	167.7	68	308.6	200.4	28	359.0	233.1	88	409.3	265.8	48	459.6	298.5
09	259.1	168.3	69	309.5	201.0	29	359.8	233.7	89	410.1	266.3	49	460.4	299.0
10	260.0	168.8	70	310.3	201.5	30	360.6	234.2	90	410.9	266.9	50	461.3	299.6
311	260.8	169.4	371	311.1	202.1	431	361.5	234.7	491	411.8	267.4	551	462.1	300.1
12	261.7	169.9	72	312.0	202.6	32	362.3	235.3	92	412.6	268.0	52	462.9	300.6
13	262.5	170.5	73	312.8	203.2	33	363.1	235.8	93	413.5	268.5	53	463.8	301.2
14	263.3	171.0	74	313.7	203.7	34	364.0	236.4	94	414.3	269.0	54	464.6	301.7
15	264.2	171.6	75	314.5	204.2	35	364.8	236.9	95	415.1	269.6	55	465.5	302.3
16	265.0	172.1	76	315.3	204.7	36	365.7	237.5	96	416.0	270.1	56	466.3	302.8
17	265.9	172.7	77	316.2	205.3	37	366.5	238.0	97	416.8	270.7	57	467.1	303.4
18	266.7	173.2	78	317.0	205.9	38	367.3	238.6	98	417.7	271.2	58	468.0	303.9
19	267.5	173.7	79	317.9	206.4	39	368.2	239.1	99	418.5	271.8	59	468.8	304.5
20	268.4	174.3	80	318.7	207.0	40	369.0	239.6	500	419.3	272.3	60	469.7	305.0
321	269.2	174.8	381	319.5	207.5	441	369.9	240.2	501	420.2	272.9	561	470.5	305.5
22	270.1	175.4	82	320.4	208.1	42	370.7	240.7	02	421.0	273.4	62	471.3	306.1
23	270.9	175.9	83	321.2	208.6	43	371.5	241.3	03	421.9	274.0	63	472.2	306.6
24	271.7	176.5	84	322.0	209.1	44	372.4	241.8	04	422.7	274.5	64	473.0	307.2
25	272.6	177.0	85	322.9	209.7	45	373.2	242.4	05	423.5	275.0	65	473.8	307.7
26	273.4	177.6	86	323.7	210.2	46	374.0	242.9	06	424.4	275.6	66	474.7	308.3
27	274.2	178.1	87	324.6	210.8	47	374.9	243.5	07	425.2	276.1	67	475.5	308.8
28	275.1	178.6	88	325.4	211.3	48	375.7	244.0	08	426.0	276.7	68	476.4	309.4
29	275.9	179.2	89	326.2	211.9	49	376.6	244.5	09	426.9	277.2	69	477.2	309.9
30	276.8	179.7	90	327.1	212.4	50	377.4	245.1	10	427.7	277.8	70	478.0	310.4
331	277.6	180.3	391	327.9	213.0	451	378.2	245.6	511	428.6	278.3	571	478.9	311.0
32	278.4	180.8	92	328.8	213.5	52	379.1	246.2	12	429.4	278.9	72	479.7	311.5
33	279.3	181.4	93	329.6	214.0	53	379.9	246.7	13	430.2	279.4	73	480.6	312.1
34	280.1	181.9	94	330.4	214.6	54	380.8	247.3	14	431.1	279.9	74	481.4	312.6
35	281.0	182.5	95	331.3	215.1	55	381.6	247.8	15	431.9	280.5	75	482.2	313.2
36	281.8	183.0	96	332.1	215.7	56	382.4	248.4	16	432.8	281.0	76	483.1	313.7
37	282.6	183.5	97	333.0	216.2	57	383.3	248.9	17	433.6	281.6	77	483.9	314.3
38	283.5	184.1	98	333.8	216.8	58	384.1	249.4	18	434.4	282.1	78	484.8	314.8
39	284.3	184.6	99	334.6	217.3	59	384.9	250.0	19	435.3	282.7	79	485.6	315.3
40	285.1	185.2	400	335.5	217.9	60	385.8	250.5	20	436.1	283.2	80	486.4	315.9
341	286.0	185.7	401	336.3	218.4	461	386.6	251.1	521	436.9	283.8	581	487.3	316.4
42	286.8	186.3	02	337.1	218.9	62	387.5	251.6	22	437.8	284.3	82	488.1	317.0
43	287.7	186.8	03	338.0	219.5	63	388.3	252.2	23	438.6	284.8	83	488.9	317.5
44	288.5	187.4	04	338.8	220.0	64	389.1	252.7	24	439.5	285.4	84	489.8	318.1
45	289.3	187.9	05	339.7	220.6	65	390.0	253.3	25	440.3	285.9	85	490.6	318.6
46	290.2	188.4	06	340.5	221.1	66	390.8	253.8	26	441.1	286.5	86	491.5	319.2
47	291.0	189.0	07	341.3	221.7	67	391.7	254.3	27	442.0	287.0	87	492.3	319.7
48	291.9	189.5	08	342.2	222.2	68	392.5	254.9	28	442.8	287.6	88	493.1	320.2
49	292.7	190.1	09	343.0	222.8	69	393.3	255.4	29	443.7	288.1	89	494.0	320.8
50	293.5	190.6	10	343.9	223.3	70	394.2	256.0	30	444.5	288.7	90	494.8	321.3
351	294.4	191.2	411	344.7	223.8	471	395.0	256.5	531	445.3	289.2	591	495.7	321.9
52	295.2	191.7	12	345.5	224.4	72	395.9	257.1	32	446.2	289.7	92	496.5	322.4
53	296.1	192.3	13	346.4	224.9	73	396.7	257.6	33	447.0	290.3	93	497.3	323.0
54	296.9	192.8	14	347.2	225.5	74	397.5	258.2	34	447.9	290.8	94	498.2	323.5
55	297.7	193.3	15	348.0	226.0	75	398.4	258.7	35	448.7	291.4	95	499.0	324.1
56	298.6	193.9	16	348.9	226.6	76	399.2	259.2	36	449.5	291.9	96	499.8	324.6
57	299.4	194.4	17	349.7	227.1	77	400.0	259.8	37	450.4	292.5	97	500.7	325.1
58	300.2	195.0	18	350.6	227.7	78	400.9	260.3	38	451.2	293.0	98	501.5	325.7
59	301.1	195.5	19	351.4	228.2	79	401.7	260.9	39	452.0	293.6	99	502.4	326.2
60	301.9	196.1	20	352.2	228.7	80	402.6	261.4	40	452.9	294.1	600	503.2	326.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

57° (123°, 237°, 303°).

In Plane Sailing.	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

TABLE 3.

Difference of Latitude and Departure for 34° (146°, 214°, 326°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.8	0.6	61	50.6	34.1	121	100.3	67.7	181	150.1	101.2	241	199.8	134.8
2	1.7	1.1	62	51.4	34.7	22	101.1	68.2	82	150.9	101.8	42	200.6	135.3
3	2.5	1.7	63	52.2	35.2	23	102.0	68.8	83	151.7	102.3	43	201.5	135.9
4	3.3	2.2	64	53.1	35.8	24	102.8	69.3	84	152.5	102.9	44	202.3	136.4
5	4.1	2.8	65	53.9	36.3	25	103.6	69.9	85	153.4	103.5	45	203.1	137.0
6	5.0	3.4	66	54.7	36.9	26	104.5	70.5	86	154.2	104.0	46	203.9	137.6
7	5.8	3.9	67	55.5	37.5	27	105.3	71.0	87	155.0	104.6	47	204.8	138.1
8	6.6	4.5	68	56.4	38.0	28	106.1	71.6	88	155.9	105.1	48	205.6	138.7
9	7.5	5.0	69	57.2	38.6	29	106.9	72.1	89	156.7	105.7	49	206.4	139.2
10	8.3	5.6	70	58.0	39.1	30	107.8	72.7	90	157.5	106.2	50	207.3	139.8
11	9.1	6.2	71	58.9	39.7	131	108.6	73.3	191	158.3	106.8	251	208.1	140.4
12	9.9	6.7	72	59.7	40.3	32	109.4	73.8	92	159.2	107.4	52	208.9	140.9
13	10.8	7.3	73	60.5	40.8	33	110.3	74.4	93	160.0	107.9	53	209.7	141.5
14	11.6	7.8	74	61.3	41.4	34	111.1	74.9	94	160.8	108.5	54	210.6	142.0
15	12.4	8.4	75	62.2	41.9	35	111.9	75.5	95	161.7	109.0	55	211.4	142.6
16	13.3	8.9	76	63.0	42.5	36	112.7	76.1	96	162.5	109.6	56	212.2	143.2
17	14.1	9.5	77	63.8	43.1	37	113.6	76.6	97	163.3	110.2	57	213.1	143.7
18	14.9	10.1	78	64.7	43.6	38	114.4	77.2	98	164.1	110.7	58	213.9	144.3
19	15.8	10.6	79	65.5	44.2	39	115.2	77.7	99	165.0	111.3	59	214.7	144.8
20	16.6	11.2	80	66.3	44.7	40	116.1	78.3	200	165.8	111.8	60	215.5	145.4
21	17.4	11.7	81	67.2	45.3	141	116.9	78.8	201	166.6	112.4	261	216.4	145.9
22	18.2	12.3	82	68.0	45.9	42	117.7	79.4	02	167.5	113.0	62	217.2	146.5
23	19.1	12.9	83	68.8	46.4	43	118.6	80.0	03	168.3	113.5	63	218.0	147.1
24	19.9	13.4	84	69.6	47.0	44	119.4	80.5	04	169.1	114.1	64	218.9	147.6
25	20.7	14.0	85	70.5	47.5	45	120.2	81.1	05	170.0	114.6	65	219.7	148.2
26	21.6	14.5	86	71.3	48.1	46	121.0	81.6	06	170.8	115.2	66	220.5	148.7
27	22.4	15.1	87	72.1	48.6	47	121.9	82.2	07	171.6	115.8	67	221.4	149.3
28	23.2	15.7	88	73.0	49.2	48	122.7	82.8	08	172.4	116.3	68	222.2	149.9
29	24.0	16.2	89	73.8	49.8	49	123.5	83.3	09	173.3	116.9	69	223.0	150.4
30	24.9	16.8	90	74.6	50.3	50	124.4	83.9	10	174.1	117.4	70	223.8	151.0
31	25.7	17.3	91	75.4	50.9	151	125.2	84.4	211	174.9	118.0	271	224.7	151.5
32	26.5	17.9	92	76.3	51.4	52	126.0	85.0	12	175.8	118.5	72	225.5	152.1
33	27.4	18.5	93	77.1	52.0	53	126.8	85.6	13	176.6	119.1	73	226.3	152.7
34	28.2	19.0	94	77.9	52.6	54	127.7	86.1	14	177.4	119.7	74	227.2	153.2
35	29.0	19.6	95	78.8	53.1	55	128.5	86.7	15	178.2	120.2	75	228.0	153.8
36	29.8	20.1	96	79.6	53.7	56	129.3	87.2	16	179.1	120.8	76	228.8	154.3
37	30.7	20.7	97	80.4	54.2	57	130.2	87.8	17	179.9	121.3	77	229.6	154.9
38	31.5	21.2	98	81.2	54.8	58	131.0	88.4	18	180.7	121.9	78	230.5	155.5
39	32.3	21.8	99	82.1	55.4	59	131.8	88.9	19	181.6	122.5	79	231.3	156.0
40	33.2	22.4	100	82.9	55.9	60	132.6	89.5	20	182.4	123.0	80	232.1	156.6
41	34.0	22.9	101	83.7	56.5	161	133.5	90.0	221	183.2	123.6	281	233.0	157.1
42	34.8	23.5	02	84.6	57.0	62	134.3	90.6	22	184.0	124.1	82	233.8	157.7
43	35.6	24.0	03	85.4	57.6	63	135.1	91.1	23	184.9	124.7	83	234.6	158.3
44	36.5	24.6	04	86.2	58.2	64	136.0	91.7	24	185.7	125.3	84	235.4	158.8
45	37.3	25.2	05	87.0	58.7	65	136.8	92.3	25	186.5	125.8	85	236.3	159.4
46	38.1	25.7	06	87.9	59.3	66	137.6	92.8	26	187.4	126.4	86	237.1	159.9
47	39.0	26.3	07	88.7	59.8	67	138.4	93.4	27	188.2	126.9	87	237.9	160.5
48	39.8	26.8	08	89.5	60.4	68	139.3	93.9	28	189.0	127.5	88	238.8	161.0
49	40.6	27.4	09	90.4	61.0	69	140.1	94.5	29	189.8	128.1	89	239.6	161.6
50	41.5	28.0	10	91.2	61.5	70	140.9	95.1	30	190.7	128.6	90	240.4	162.2
51	42.3	28.5	111	92.0	62.1	171	141.8	95.6	231	191.5	129.2	291	241.2	162.7
52	43.1	29.1	12	92.9	62.6	72	142.6	96.2	32	192.3	129.7	92	242.1	163.3
53	43.9	29.6	13	93.7	63.2	73	143.4	96.7	33	193.2	130.3	93	242.9	163.8
54	44.8	30.2	14	94.5	63.7	74	144.3	97.3	34	194.0	130.9	94	243.7	164.4
55	45.6	30.8	15	95.3	64.3	75	145.1	97.9	35	194.8	131.4	95	244.6	165.0
56	46.4	31.3	16	96.2	64.9	76	145.9	98.4	36	195.7	132.0	96	245.4	165.5
57	47.3	31.9	17	97.0	65.4	77	146.7	99.0	37	196.5	132.5	97	246.2	166.1
58	48.1	32.4	18	97.8	66.0	78	147.6	99.5	38	197.3	133.1	98	247.1	166.6
59	48.9	33.0	19	98.7	66.5	79	148.4	100.1	39	198.1	133.6	99	247.9	167.2
60	49.7	33.6	20	99.5	67.1	80	149.2	100.7	40	199.0	134.2	300	248.7	167.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

56° (124°, 236°, 304°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side. Adj.	Side Opp.

Difference of Latitude and Departure for 34° (146°, 214°, 326°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	249.5	168.3	361	299.3	201.9	421	349.0	235.4	481	398.8	269.0	541	448.5	302.5
02	250.4	168.9	62	300.1	202.4	22	349.9	236.0	82	399.6	269.5	42	449.3	303.1
03	251.2	169.4	63	300.9	203.0	23	350.7	236.5	83	400.4	270.1	43	450.2	303.6
04	252.0	170.0	64	301.8	203.5	24	351.5	237.1	84	401.3	270.6	44	451.0	304.2
05	252.9	170.6	65	302.6	204.1	25	352.3	237.7	85	402.1	271.2	45	451.8	304.8
06	253.7	171.1	66	303.4	204.7	26	353.2	238.2	86	402.9	271.8	46	452.7	305.3
07	254.5	171.7	67	304.3	205.2	27	354.0	238.8	87	403.7	272.3	47	453.5	305.9
08	255.3	172.2	68	305.1	205.8	28	354.8	239.3	88	404.6	272.9	48	454.3	306.4
09	256.2	172.8	69	305.9	206.3	29	355.7	239.9	89	405.4	273.4	49	455.1	307.0
10	257.0	173.3	70	306.7	206.9	30	356.5	240.5	90	406.2	274.0	50	456.0	307.6
311	257.8	173.9	371	307.6	207.5	431	357.3	241.0	491	407.1	274.6	551	456.8	308.1
12	258.7	174.5	72	308.4	208.0	32	358.1	241.6	92	407.9	275.1	52	457.6	308.7
13	259.5	175.0	73	309.2	208.6	33	359.0	242.1	93	408.7	275.7	53	458.5	309.2
14	260.3	175.6	74	310.1	209.1	34	359.8	242.7	94	409.5	276.2	54	459.3	309.8
15	261.1	176.1	75	310.9	209.7	35	360.6	243.2	95	410.4	276.8	55	460.1	310.4
16	262.0	176.7	76	311.7	210.3	36	361.5	243.8	96	411.2	277.4	56	460.9	310.9
17	262.8	177.3	77	312.5	210.8	37	362.3	244.4	97	412.0	277.9	57	461.8	311.5
18	263.6	177.8	78	313.4	211.4	38	363.1	244.9	98	412.9	278.5	58	462.6	312.0
19	264.5	178.4	79	314.2	211.9	39	364.0	245.5	99	413.7	279.0	59	463.4	312.6
20	265.3	178.9	80	315.0	212.5	40	364.8	246.0	500	414.5	279.6	60	464.3	313.1
321	266.1	179.5	381	315.9	213.1	441	365.6	246.6	501	415.3	280.2	561	465.1	313.7
22	267.0	180.1	82	316.7	213.6	42	366.4	247.2	02	416.2	280.7	62	465.9	314.3
23	267.8	180.6	83	317.5	214.2	43	367.3	247.7	03	417.0	281.3	63	466.7	314.8
24	268.6	181.2	84	318.4	214.7	44	368.1	248.3	04	417.8	281.8	64	467.6	315.5
25	269.4	181.7	85	319.2	215.3	45	368.9	248.8	05	418.7	282.4	65	468.4	315.9
26	270.3	182.3	86	320.0	215.8	46	369.8	249.4	06	419.5	283.0	66	469.2	316.5
27	271.1	182.9	87	320.8	216.4	47	370.6	250.0	07	420.3	283.5	67	470.1	317.1
28	271.9	183.4	88	321.7	217.0	48	371.4	250.5	08	421.2	284.1	68	470.9	317.6
29	272.8	184.0	89	322.5	217.5	49	372.2	251.1	09	422.0	284.6	69	471.7	318.2
30	273.6	184.5	90	323.3	218.1	50	373.1	251.6	10	422.8	285.2	70	472.6	318.7
331	274.4	185.1	391	324.2	218.6	451	373.9	252.2	511	423.6	285.9	571	473.4	319.3
32	275.2	185.7	92	325.0	219.2	52	374.7	252.8	12	424.5	286.3	72	474.2	319.9
33	276.1	186.2	93	325.8	219.8	53	375.6	253.3	13	425.3	286.9	73	475.0	320.4
34	276.9	186.8	94	326.6	220.3	54	376.4	253.9	14	426.1	287.4	74	475.9	321.0
35	277.7	187.3	95	327.5	220.9	55	377.2	254.4	15	427.0	288.0	75	476.7	321.5
36	278.6	187.9	96	328.3	221.4	56	378.0	255.0	16	427.8	288.5	76	477.5	322.1
37	279.4	188.4	97	329.1	222.0	57	378.9	255.6	17	428.6	289.1	77	478.4	322.7
38	280.2	189.0	98	330.0	222.6	58	379.7	256.1	18	429.4	289.7	78	479.2	323.2
39	281.0	189.6	99	330.8	223.1	59	380.5	256.7	19	430.3	290.2	79	480.0	323.8
40	281.9	190.1	400	331.6	223.7	60	381.4	257.2	20	431.1	290.8	80	480.8	324.3
341	282.7	190.7	401	332.4	224.2	461	382.2	257.8	521	431.9	291.3	581	481.7	324.9
42	283.5	191.2	02	333.3	224.8	62	383.0	258.3	22	432.8	291.9	82	482.5	325.4
43	284.4	191.8	03	334.1	225.4	63	383.8	258.9	23	433.6	292.5	83	483.3	326.0
44	285.2	192.4	04	334.9	225.9	64	384.7	259.5	24	434.4	293.0	84	484.2	326.6
45	286.0	192.9	05	335.8	226.5	65	385.5	260.0	25	435.2	293.6	85	485.0	327.1
46	286.8	193.5	06	336.6	227.0	66	386.3	260.6	26	436.1	294.1	86	485.8	327.7
47	287.7	194.0	07	337.4	227.6	67	387.2	261.1	27	436.9	294.7	87	486.6	328.2
48	288.5	194.6	08	338.2	228.2	68	388.0	261.7	28	437.7	295.3	88	487.5	328.8
49	289.3	195.2	09	339.1	228.7	69	388.8	262.3	29	438.6	295.8	89	488.3	329.4
50	290.2	195.7	10	339.9	229.3	70	389.6	262.8	30	439.4	296.4	90	489.1	329.9
351	291.0	196.3	411	340.7	229.8	471	390.5	263.4	531	440.2	296.9	591	490.0	330.5
52	291.8	196.8	12	341.6	230.4	72	391.3	263.9	32	441.0	297.5	92	490.8	331.0
53	292.7	197.4	13	342.4	230.9	73	392.1	264.5	33	441.9	298.0	93	491.6	331.6
54	293.5	198.0	14	343.2	231.5	74	393.0	265.1	34	442.7	298.6	94	492.4	332.2
55	294.3	198.5	15	344.1	232.1	75	393.8	265.6	35	443.5	299.2	95	493.3	332.7
56	295.1	199.1	16	344.9	232.6	76	394.6	266.2	36	444.4	299.7	96	494.1	333.3
57	296.0	199.6	17	345.7	233.2	77	395.5	266.7	37	445.3	300.3	97	494.9	333.8
58	296.8	200.2	18	346.5	233.7	78	396.3	267.3	38	446.0	300.8	98	495.8	334.4
59	297.6	200.8	19	347.4	234.3	79	397.1	267.9	39	446.9	301.4	99	496.6	335.0
60	298.5	201.3	20	348.2	234.9	80	397.9	268.4	40	447.7	302.0	600	497.4	335.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

56° (124°, 236°, 304°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 35° (145°, 215°, 325°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.8	0.6	61	50.0	35.0	121	99.1	69.4	131	148.3	103.8	241	197.4	138.2
2	1.6	1.1	62	50.8	35.6	22	99.9	70.0	82	149.1	104.4	42	198.2	138.8
3	2.5	1.7	63	51.6	36.1	23	100.8	70.5	83	149.9	105.0	43	199.1	139.4
4	3.3	2.3	64	52.4	36.7	24	101.6	71.1	84	150.7	105.5	44	199.9	140.0
5	4.1	2.9	65	53.2	37.3	25	102.4	71.7	85	151.5	106.1	45	200.7	140.5
6	4.9	3.4	66	54.1	37.9	26	103.2	72.3	86	152.4	106.7	46	201.5	141.1
7	5.7	4.0	67	54.9	38.4	27	104.0	72.8	87	153.2	107.3	47	202.3	141.7
8	6.6	4.6	68	55.7	39.0	28	104.9	73.4	88	154.0	107.8	48	203.1	142.2
9	7.4	5.2	69	56.5	39.6	29	105.7	74.0	89	154.8	108.4	49	204.0	142.8
10	8.2	5.7	70	57.3	40.2	30	106.5	74.6	90	155.6	109.0	50	204.8	143.4
11	9.0	6.3	71	58.2	40.7	131	107.3	75.1	191	156.5	109.6	251	205.6	144.0
12	9.8	6.9	72	59.0	41.3	32	108.1	75.7	92	157.3	110.1	52	206.4	144.5
13	10.6	7.5	73	59.8	41.9	33	108.9	76.3	93	158.1	110.7	53	207.2	145.1
14	11.5	8.0	74	60.6	42.4	34	109.8	76.9	94	158.9	111.3	54	208.1	145.7
15	12.3	8.6	75	61.4	43.0	35	110.6	77.4	95	159.7	111.8	55	208.9	146.3
16	13.1	9.2	76	62.3	43.6	36	111.4	78.0	96	160.6	112.4	56	209.7	146.8
17	13.9	9.8	77	63.1	44.2	37	112.2	78.6	97	161.4	113.0	57	210.5	147.4
18	14.7	10.3	78	63.9	44.7	38	113.0	79.2	98	162.2	113.6	58	211.3	148.0
19	15.6	10.9	79	64.7	45.3	39	113.9	79.7	99	163.0	114.1	59	212.2	148.6
20	16.4	11.5	80	65.5	45.9	40	114.7	80.3	200	163.8	114.7	60	213.0	149.1
21	17.2	12.0	81	66.4	46.5	141	115.5	80.9	201	164.6	115.3	261	213.8	149.7
22	18.0	12.6	82	67.2	47.0	42	116.3	81.4	02	165.5	115.9	62	214.6	150.3
23	18.8	13.2	83	68.0	47.6	43	117.1	82.0	03	166.3	116.4	63	215.4	150.9
24	19.7	13.8	84	68.8	48.2	44	118.0	82.6	04	167.1	117.0	64	216.3	151.4
25	20.5	14.3	85	69.6	48.8	45	118.8	83.2	05	167.9	117.6	65	217.1	152.0
26	21.3	14.9	86	70.4	49.3	46	119.6	83.7	06	168.7	118.2	66	217.9	152.6
27	22.1	15.5	87	71.3	49.9	47	120.4	84.3	07	169.6	118.7	67	218.7	153.1
28	22.9	16.1	88	72.1	50.5	48	121.2	84.9	08	170.4	119.3	68	219.5	153.7
29	23.8	16.6	89	72.9	51.0	49	122.1	85.5	09	171.2	119.9	69	220.4	154.3
30	24.6	17.2	90	73.7	51.6	50	122.9	86.0	10	172.0	120.5	70	221.2	154.9
31	25.4	17.8	91	74.5	52.2	151	123.7	86.6	211	172.8	121.0	271	222.0	155.4
32	26.2	18.4	92	75.4	52.8	52	124.5	87.2	12	173.7	121.6	72	222.8	156.0
33	27.0	18.9	93	76.2	53.3	53	125.3	87.8	13	174.5	122.2	73	223.6	156.6
34	27.9	19.5	94	77.0	53.9	54	126.1	88.3	14	175.3	122.7	74	224.4	157.2
35	28.7	20.1	95	77.8	54.5	55	127.0	88.9	15	176.1	123.3	75	225.3	157.7
36	29.5	20.6	96	78.6	55.1	56	127.8	89.5	16	176.9	123.9	76	226.1	158.3
37	30.3	21.2	97	79.5	55.6	57	128.6	90.1	17	177.8	124.5	77	226.9	158.9
38	31.1	21.8	98	80.3	56.2	58	129.4	90.6	18	178.6	125.0	78	227.7	159.5
39	31.9	22.4	99	81.1	56.8	59	130.2	91.2	19	179.4	125.6	79	228.5	160.0
40	32.8	22.9	100	81.9	57.4	60	131.1	91.8	20	180.2	126.2	80	229.4	160.6
41	33.6	23.5	101	82.7	57.9	161	131.9	92.3	221	181.0	126.8	281	230.2	161.2
42	34.4	24.1	02	83.6	58.5	62	132.7	92.9	22	181.9	127.3	82	231.0	161.7
43	35.2	24.7	03	84.4	59.1	63	133.5	93.5	23	182.7	127.9	83	231.8	162.3
44	36.0	25.2	04	85.2	59.7	64	134.3	94.1	24	183.5	128.5	84	232.6	162.9
45	36.9	25.8	05	86.0	60.2	65	135.2	94.6	25	184.3	129.1	85	233.5	163.5
46	37.7	26.4	06	86.8	60.8	66	136.0	95.2	26	185.1	129.6	86	234.3	164.0
47	38.5	27.0	07	87.6	61.4	67	136.8	95.8	27	185.9	130.2	87	235.1	164.6
48	39.3	27.5	08	88.5	61.9	68	137.6	96.4	28	186.8	130.8	88	235.9	165.2
49	40.1	28.1	09	89.3	62.5	69	138.4	96.9	29	187.6	131.3	89	236.7	165.8
50	41.0	28.7	10	90.1	63.1	70	139.3	97.5	30	188.4	131.9	90	237.6	166.3
51	41.8	29.3	111	90.9	63.7	171	140.1	98.1	231	189.2	132.5	291	238.4	166.9
52	42.6	29.8	12	91.7	64.2	72	140.9	98.7	32	190.0	133.1	92	239.2	167.5
53	43.4	30.4	13	92.6	64.8	73	141.7	99.2	33	190.9	133.6	93	240.0	168.1
54	44.2	31.0	14	93.4	65.4	74	142.5	99.8	34	191.7	134.2	94	240.8	168.6
55	45.1	31.5	15	94.2	66.0	75	143.4	100.4	35	192.5	134.8	95	241.6	169.2
56	45.9	32.1	16	95.0	66.5	76	144.2	100.9	36	193.3	135.4	96	242.5	169.8
57	46.7	32.7	17	95.8	67.1	77	145.0	101.5	37	194.1	135.9	97	243.3	170.4
58	47.5	33.3	18	96.7	67.7	78	145.8	102.1	38	195.0	136.5	98	244.1	170.9
59	48.3	33.8	19	97.5	68.3	79	146.6	102.7	39	195.8	137.1	99	244.9	171.5
60	49.1	34.4	20	98.3	68.8	80	147.4	103.2	40	196.6	137.7	300	245.7	172.1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

55° (125°, 235°, 305°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

Difference of Latitude and Departure for 35° (145°, 215°, 325°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	246. 6	172. 6	361	295. 7	207. 1	421	344. 9	241. 5	481	394. 0	275. 9	541	443. 2	310. 3
02	247. 4	173. 2	62	296. 5	207. 6	22	345. 7	242. 0	82	394. 8	276. 5	42	444. 0	310. 9
03	248. 2	173. 8	63	297. 4	208. 2	23	346. 5	242. 6	83	395. 7	277. 0	43	444. 8	311. 5
04	249. 0	174. 4	64	298. 2	208. 8	24	347. 3	243. 2	84	396. 5	277. 6	44	445. 6	312. 0
05	249. 8	174. 9	65	299. 0	209. 4	25	348. 1	243. 8	85	397. 3	278. 2	45	446. 4	312. 6
06	250. 7	175. 5	66	299. 8	209. 9	26	349. 0	244. 3	86	398. 1	278. 8	46	447. 3	313. 2
07	251. 5	176. 1	67	300. 6	210. 5	27	349. 8	244. 9	87	398. 9	279. 3	47	448. 1	313. 7
08	252. 3	176. 7	68	301. 4	211. 1	28	350. 6	245. 5	88	399. 7	279. 9	48	448. 9	314. 3
09	253. 1	177. 2	69	302. 3	211. 6	29	351. 4	246. 1	89	400. 6	280. 5	49	449. 7	314. 9
10	253. 9	177. 8	70	303. 1	212. 2	30	352. 2	246. 6	90	401. 4	281. 1	50	450. 5	315. 5
311	254. 8	178. 4	371	303. 9	212. 8	431	353. 1	247. 2	491	402. 2	281. 6	551	451. 4	316. 0
12	255. 6	179. 0	72	304. 7	213. 4	32	353. 9	247. 8	92	403. 0	282. 2	52	452. 2	316. 6
13	256. 4	179. 5	73	305. 5	213. 9	33	354. 7	248. 4	93	403. 8	282. 8	53	453. 0	317. 2
14	257. 2	180. 1	74	306. 4	214. 5	34	355. 5	248. 9	94	404. 7	283. 3	54	453. 8	317. 8
15	258. 0	180. 7	75	307. 2	215. 1	35	356. 3	249. 5	95	405. 5	283. 9	55	454. 6	318. 3
16	258. 9	181. 3	76	308. 0	215. 7	36	357. 2	250. 1	96	406. 3	284. 5	56	455. 4	318. 9
17	259. 7	181. 8	77	308. 8	216. 2	37	358. 0	250. 7	97	407. 1	285. 1	57	456. 3	319. 5
18	260. 5	182. 4	78	309. 6	216. 8	38	358. 8	251. 2	98	407. 9	285. 6	58	457. 1	320. 1
19	261. 3	183. 0	79	310. 5	217. 4	39	359. 6	251. 8	99	408. 8	286. 2	59	457. 9	320. 6
20	262. 1	183. 5	80	311. 3	218. 0	40	360. 4	252. 4	500	409. 6	286. 8	60	458. 7	321. 2
321	262. 9	184. 1	381	312. 1	218. 5	441	361. 2	252. 9	501	410. 4	287. 4	561	459. 5	321. 8
22	263. 8	184. 7	82	312. 9	219. 1	42	362. 1	253. 5	02	411. 2	287. 9	62	460. 4	322. 3
23	264. 6	185. 3	83	313. 7	219. 7	43	362. 9	254. 1	03	412. 0	288. 5	63	461. 2	322. 9
24	265. 4	185. 8	84	314. 6	220. 3	44	363. 7	254. 7	04	412. 9	289. 1	64	462. 0	323. 5
25	266. 2	186. 4	85	315. 4	220. 8	45	364. 5	255. 2	05	413. 7	289. 7	65	462. 8	324. 1
26	267. 0	187. 0	86	316. 2	221. 4	46	365. 3	255. 8	06	414. 5	290. 2	66	463. 6	324. 6
27	267. 9	187. 6	87	317. 0	222. 0	47	366. 2	256. 4	07	415. 3	290. 8	67	464. 5	325. 2
28	268. 7	188. 1	88	317. 8	222. 5	48	367. 0	257. 0	08	416. 1	291. 4	68	465. 3	325. 8
29	269. 5	188. 7	89	318. 7	223. 1	49	367. 8	257. 5	09	416. 9	292. 0	69	466. 1	326. 4
30	270. 3	189. 3	90	319. 5	223. 7	50	368. 6	258. 1	10	417. 8	292. 5	70	466. 9	326. 9
331	271. 1	189. 9	391	320. 3	224. 3	451	369. 4	258. 7	511	418. 6	293. 1	571	467. 7	327. 5
32	272. 0	190. 4	92	321. 1	224. 8	52	370. 3	259. 3	12	419. 4	293. 7	72	468. 6	328. 1
33	272. 8	191. 0	93	321. 9	225. 4	53	371. 1	259. 8	13	420. 2	294. 2	73	469. 4	328. 7
34	273. 6	191. 6	94	322. 7	226. 0	54	371. 9	260. 4	14	421. 0	294. 8	74	470. 2	329. 2
35	274. 4	192. 1	95	323. 6	226. 6	55	372. 7	261. 0	15	421. 9	295. 4	75	471. 0	329. 8
36	275. 2	192. 7	96	324. 4	227. 1	56	373. 5	261. 6	16	422. 7	296. 0	76	471. 8	330. 4
37	276. 1	193. 3	97	325. 2	227. 7	57	374. 4	262. 1	17	423. 5	296. 5	77	472. 7	331. 0
38	276. 9	193. 9	98	326. 0	228. 3	58	375. 2	262. 7	18	424. 3	297. 1	78	473. 5	331. 5
39	277. 7	194. 4	99	326. 8	228. 9	59	376. 0	263. 3	19	425. 1	297. 7	79	474. 3	332. 1
40	278. 5	195. 0	400	327. 7	229. 4	60	376. 8	263. 8	20	426. 0	298. 3	80	475. 1	332. 7
341	279. 3	195. 6	401	328. 5	230. 0	461	377. 6	264. 4	521	426. 8	298. 8	581	475. 9	333. 2
42	280. 1	196. 2	02	329. 3	230. 6	62	378. 4	265. 0	22	427. 6	299. 4	82	476. 7	333. 8
43	281. 0	196. 7	03	330. 1	231. 2	63	379. 3	265. 6	23	428. 4	300. 0	83	477. 6	334. 4
44	281. 8	197. 3	04	330. 9	231. 7	64	380. 1	266. 1	24	429. 2	300. 6	84	478. 4	335. 0
45	282. 6	197. 9	05	331. 8	232. 3	65	380. 9	266. 7	25	430. 1	301. 1	85	479. 2	335. 5
46	283. 4	198. 5	06	332. 6	232. 9	66	381. 7	267. 3	26	430. 9	301. 7	86	480. 0	336. 1
47	284. 2	199. 0	07	333. 4	233. 4	67	382. 5	267. 9	27	431. 7	302. 3	87	480. 8	336. 7
48	285. 1	199. 6	08	334. 2	234. 0	68	383. 4	268. 4	28	432. 5	302. 8	88	481. 7	337. 3
49	285. 9	200. 2	09	335. 0	234. 6	69	384. 2	269. 0	29	433. 3	303. 4	89	482. 5	337. 8
50	286. 7	200. 8	10	335. 9	235. 2	70	385. 0	269. 6	30	434. 2	304. 0	90	483. 3	338. 4
351	287. 5	201. 3	411	336. 7	235. 7	471	385. 8	270. 2	531	435. 0	304. 6	591	484. 1	339. 0
52	288. 3	201. 9	12	337. 5	236. 3	72	386. 6	270. 7	32	435. 8	305. 1	92	484. 9	339. 6
53	289. 2	202. 5	13	338. 3	236. 9	73	387. 5	271. 3	33	436. 6	305. 7	93	485. 8	340. 1
54	290. 0	203. 0	14	339. 1	237. 5	74	388. 3	271. 9	34	437. 4	306. 3	94	486. 6	340. 7
55	290. 8	203. 6	15	339. 9	238. 0	75	389. 1	272. 4	35	438. 2	306. 9	95	487. 4	341. 3
56	291. 6	204. 2	16	340. 8	238. 6	76	389. 9	273. 0	36	439. 1	307. 4	96	488. 2	341. 9
57	292. 4	204. 8	17	341. 6	239. 2	77	390. 7	273. 6	37	439. 9	308. 0	97	489. 0	342. 4
58	293. 3	205. 3	18	342. 4	239. 8	78	391. 6	274. 2	38	440. 7	308. 6	98	489. 9	343. 0
59	294. 1	205. 9	19	343. 2	240. 3	79	392. 4	274. 7	39	441. 5	309. 2	99	490. 7	343. 6
60	294. 9	206. 5	20	344. 1	240. 9	80	393. 2	275. 3	40	442. 3	309. 7	600	491. 5	344. 1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

55° (125°, 235°, 305°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 36° (144°, 216°, 324°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.8	0.6	61	49.4	35.9	121	97.9	71.1	181	146.4	106.4	241	195.0	141.7
2	1.6	1.2	62	50.2	36.4	22	98.7	71.7	82	147.2	107.0	42	195.8	142.2
3	2.4	1.8	63	51.0	37.0	23	99.5	72.3	83	148.1	107.6	43	196.6	142.8
4	3.2	2.4	64	51.8	37.6	24	100.3	72.9	84	148.9	108.2	44	197.4	143.4
5	4.0	2.9	65	52.6	38.2	25	101.1	73.5	85	149.7	108.7	45	198.2	144.0
6	4.9	3.5	66	53.4	38.8	26	101.9	74.1	86	150.5	109.3	46	199.0	144.6
7	5.7	4.1	67	54.2	39.4	27	102.7	74.6	87	151.3	109.9	47	199.8	145.2
8	6.5	4.7	68	55.0	40.0	28	103.6	75.2	88	152.1	110.5	48	200.6	145.8
9	7.3	5.3	69	55.8	40.6	29	104.4	75.8	89	152.9	111.1	49	201.4	146.4
10	8.1	5.9	70	56.6	41.1	30	105.2	76.4	90	153.7	111.7	50	202.3	146.9
11	8.9	6.5	71	57.4	41.7	131	106.0	77.0	191	154.5	112.3	251	203.1	147.5
12	9.7	7.1	72	58.2	42.3	32	106.8	77.6	92	155.3	112.9	52	203.9	148.1
13	10.5	7.6	73	59.1	42.9	33	107.6	78.2	93	156.1	113.4	53	204.7	148.7
14	11.3	8.2	74	59.9	43.5	34	108.4	78.8	94	156.9	114.0	54	205.5	149.3
15	12.1	8.8	75	60.7	44.1	35	109.2	79.4	95	157.8	114.6	55	206.3	149.9
16	12.9	9.4	76	61.5	44.7	36	110.0	79.9	96	158.6	115.2	56	207.1	150.5
17	13.8	10.0	77	62.3	45.3	37	110.8	80.5	97	159.4	115.8	57	207.9	151.1
18	14.6	10.6	78	63.1	45.8	38	111.6	81.1	98	160.2	116.4	58	208.7	151.6
19	15.4	11.2	79	63.9	46.4	39	112.5	81.7	99	161.0	117.0	59	209.5	152.2
20	16.2	11.8	80	64.7	47.0	40	113.3	82.3	200	161.8	117.6	60	210.3	152.8
21	17.0	12.3	81	65.5	47.6	141	114.1	82.9	201	162.6	118.1	261	211.2	153.4
22	17.8	12.9	82	66.3	48.2	42	114.9	83.5	02	163.4	118.7	62	212.0	154.0
23	18.6	13.5	83	67.1	48.8	43	115.7	84.1	03	164.2	119.3	63	212.8	154.6
24	19.4	14.1	84	68.0	49.4	44	116.5	84.6	04	165.0	119.9	64	213.6	155.2
25	20.2	14.7	85	68.8	50.0	45	117.3	85.2	05	165.8	120.5	65	214.4	155.8
26	21.0	15.3	86	69.6	50.5	46	118.1	85.8	06	166.7	121.1	66	215.2	156.4
27	21.8	15.9	87	70.4	51.1	47	118.9	86.4	07	167.5	121.7	67	216.0	156.9
28	22.7	16.5	88	71.2	51.7	48	119.7	87.0	08	168.3	122.3	68	216.8	157.5
29	23.5	17.0	89	72.0	52.3	49	120.5	87.6	09	169.1	122.8	69	217.6	158.1
30	24.3	17.6	90	72.8	52.9	50	121.4	88.2	10	169.9	123.4	70	218.4	158.7
31	25.1	18.2	91	73.6	53.5	151	122.2	88.8	211	170.7	124.0	271	219.2	159.3
32	25.9	18.8	92	74.4	54.1	52	123.0	89.3	12	171.5	124.6	72	220.1	159.9
33	26.7	19.4	93	75.2	54.7	53	123.8	89.9	13	172.3	125.2	73	220.9	160.5
34	27.5	20.0	94	76.0	55.3	54	124.6	90.5	14	173.1	125.8	74	221.7	161.1
35	28.3	20.6	95	76.9	55.8	55	125.4	91.1	15	173.9	126.4	75	222.5	161.6
36	29.1	21.2	96	77.7	56.4	56	126.2	91.7	16	174.7	127.0	76	223.3	162.2
37	29.9	21.7	97	78.5	57.0	57	127.0	92.3	17	175.6	127.5	77	224.1	162.8
38	30.7	22.3	98	79.3	57.6	58	127.8	92.9	18	176.4	128.1	78	224.9	163.4
39	31.6	22.9	99	80.1	58.2	59	128.6	93.5	19	177.2	128.7	79	225.7	164.0
40	32.4	23.5	100	80.9	58.8	60	129.4	94.0	20	178.0	129.3	80	226.5	164.6
41	33.2	24.1	101	81.7	59.4	161	130.3	94.6	221	178.8	129.9	281	227.3	165.2
42	34.0	24.7	02	82.5	60.0	62	131.1	95.2	22	179.6	130.5	82	228.1	165.8
43	34.8	25.3	03	83.3	60.5	63	131.9	95.8	23	180.4	131.1	83	229.0	166.3
44	35.6	25.9	04	84.1	61.1	64	132.7	96.4	24	181.2	131.7	84	229.8	166.9
45	36.4	26.5	05	84.9	61.7	65	133.5	97.0	25	182.0	132.3	85	230.6	167.5
46	37.2	27.0	06	85.8	62.3	66	134.3	97.6	26	182.8	132.8	86	231.4	168.1
47	38.0	27.6	07	86.6	62.9	67	135.1	98.2	27	183.6	133.4	87	232.2	168.7
48	38.8	28.2	08	87.4	63.5	68	135.9	98.7	28	184.5	134.0	88	233.0	169.3
49	39.6	28.8	09	88.2	64.1	69	136.7	99.3	29	185.3	134.6	89	233.8	169.9
50	40.5	29.4	10	89.0	64.7	70	137.5	99.9	30	186.1	135.2	90	234.6	170.5
51	41.3	30.0	111	89.8	65.2	171	138.3	100.5	231	186.9	135.8	291	235.4	171.0
52	42.1	30.6	12	90.6	65.8	72	139.2	101.1	32	187.7	136.4	92	236.2	171.6
53	42.9	31.2	13	91.4	66.4	73	140.0	101.7	33	188.5	137.0	93	237.0	172.2
54	43.7	31.7	14	92.2	67.0	74	140.8	102.3	34	189.3	137.5	94	237.9	172.8
55	44.5	32.3	15	93.0	67.6	75	141.6	102.9	35	190.1	138.1	95	238.7	173.4
56	45.3	32.9	16	93.8	68.2	76	142.4	103.5	36	190.9	138.7	96	239.5	174.0
57	46.1	33.5	17	94.7	68.8	77	143.2	104.0	37	191.7	139.3	97	240.3	174.6
58	46.9	34.1	18	95.5	69.4	78	144.0	104.6	38	192.5	139.9	98	241.1	175.2
59	47.7	34.7	19	96.3	69.9	79	144.8	105.2	39	193.4	140.5	99	241.9	175.7
60	48.5	35.3	20	97.1	70.5	80	145.6	105.8	40	194.2	141.1	300	242.7	176.3
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

54° (126°, 234°, 306°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side. Adj.	Side Opp.

Difference of Latitude and Departure for 36° (144°, 216°, 324°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	243.5	176.9	361	292.1	212.2	421	340.6	247.5	481	389.1	282.7	541	437.7	318.0
02	244.3	177.5	62	292.9	212.8	22	341.4	248.0	82	389.9	283.3	42	438.5	318.6
03	245.1	178.1	63	293.7	213.4	23	342.2	248.6	83	390.8	283.9	43	439.3	319.2
04	245.9	178.7	64	294.5	214.0	24	343.0	249.2	84	391.6	284.5	44	440.2	319.8
05	246.8	179.3	65	295.3	214.5	25	343.8	249.8	85	392.4	285.1	45	440.9	320.3
06	247.6	179.9	66	296.1	215.1	26	344.6	250.4	86	393.2	285.7	46	441.7	320.9
07	248.4	180.5	67	296.9	215.7	27	345.5	251.0	87	394.0	286.3	47	442.5	321.5
08	249.2	181.0	68	297.7	216.3	28	346.3	251.6	88	394.8	286.8	48	443.3	322.1
09	250.0	181.6	69	298.5	216.9	29	347.1	252.2	89	395.6	287.4	49	444.2	322.7
10	250.8	182.2	70	299.3	217.5	30	347.9	252.7	90	396.4	288.0	50	445.0	323.3
311	251.6	182.8	371	300.1	218.1	431	348.7	253.3	491	397.2	288.6	551	445.8	323.9
12	252.4	183.4	72	301.0	218.7	32	349.5	253.9	92	398.0	289.2	52	446.6	324.5
13	253.2	184.0	73	301.8	219.2	33	350.3	254.5	93	398.8	289.8	53	447.4	325.0
14	254.0	184.6	74	302.6	219.8	34	351.1	255.1	94	399.7	290.4	54	448.2	325.6
15	254.8	185.2	75	303.4	220.4	35	351.9	255.7	95	400.5	291.0	55	449.0	326.2
16	255.6	185.7	76	304.2	221.0	36	352.7	256.3	96	401.3	291.5	56	449.8	326.8
17	256.5	186.3	77	305.0	221.6	37	353.5	256.9	97	402.1	292.1	57	450.6	327.4
18	257.3	186.9	78	305.8	222.2	38	354.3	257.4	98	402.9	292.7	58	451.4	328.0
19	258.1	187.5	79	306.6	222.8	39	355.2	258.0	99	403.7	293.3	59	452.2	328.6
20	258.9	188.1	80	307.4	223.4	40	356.0	258.6	500	404.5	293.9	60	453.0	329.2
321	259.7	188.7	381	308.2	223.9	441	356.8	259.2	501	405.3	294.5	561	453.9	329.7
22	260.5	189.3	82	309.0	224.5	42	357.6	259.8	02	406.1	295.1	62	454.7	330.3
23	261.3	189.9	83	309.9	225.1	43	358.4	260.4	03	406.9	295.7	63	455.5	330.9
24	262.1	190.4	84	310.7	225.7	44	359.2	261.0	04	407.7	296.2	64	456.3	331.5
25	262.9	191.0	85	311.5	226.3	45	360.0	261.6	05	408.6	296.8	65	457.1	332.1
26	263.7	191.6	86	312.3	226.9	46	360.8	262.2	06	409.4	297.4	66	457.9	332.7
27	264.5	192.2	87	313.1	227.5	47	361.6	262.7	07	410.2	298.0	67	458.7	333.3
28	265.4	192.8	88	313.9	228.1	48	362.4	263.3	08	411.0	298.6	68	459.5	333.9
29	266.2	193.4	89	314.7	228.6	49	363.2	263.9	09	411.8	299.2	69	460.3	334.4
30	267.0	194.0	90	315.5	229.2	50	364.1	264.5	10	412.6	299.8	70	461.1	335.0
331	267.8	194.6	391	316.3	229.8	451	364.9	265.1	511	413.4	300.4	571	461.9	335.6
32	268.6	195.1	92	317.1	230.4	52	365.7	265.7	12	414.2	300.9	72	462.8	336.2
33	269.4	195.7	93	317.9	231.0	53	366.5	266.3	13	415.0	301.5	73	463.6	336.8
34	270.2	196.3	94	318.8	231.6	54	367.3	266.9	14	415.8	302.1	74	464.4	337.4
35	271.0	196.9	95	319.6	232.2	55	368.1	267.6	15	416.6	302.7	75	465.2	338.0
36	271.8	197.5	96	320.4	232.8	56	368.9	268.0	16	417.5	303.3	76	466.0	338.6
37	272.6	198.1	97	321.2	233.4	57	369.7	268.6	17	418.3	303.9	77	466.8	339.2
38	273.4	198.7	98	322.0	233.9	58	370.5	269.2	18	419.1	304.5	78	467.6	339.7
39	274.3	199.3	99	322.8	234.5	59	371.3	269.8	19	419.9	305.1	79	468.4	340.3
40	275.1	199.8	400	323.6	235.1	60	372.1	270.4	20	420.7	305.6	80	469.2	340.9
341	275.9	200.4	401	324.4	235.7	461	373.0	271.0	521	421.5	306.2	581	470.0	341.5
42	276.7	201.0	02	325.2	236.3	62	373.8	271.6	22	422.3	306.8	82	470.8	342.1
43	277.5	201.6	03	326.0	236.9	63	374.6	272.1	23	423.1	307.4	83	471.7	342.7
44	278.3	202.2	04	326.9	237.5	64	375.4	272.7	24	423.9	308.0	84	472.5	343.3
45	279.1	202.8	05	327.7	238.1	65	376.2	273.3	25	424.7	308.6	85	473.3	343.9
46	279.9	203.4	06	328.5	238.7	66	377.0	273.9	26	425.5	309.2	86	474.1	344.4
47	280.7	204.0	07	329.3	239.2	67	377.8	274.5	27	426.4	309.8	87	474.9	345.0
48	281.5	204.5	08	330.1	239.8	68	378.6	275.1	28	427.2	310.4	88	475.7	345.6
49	282.3	205.1	09	330.9	240.4	69	379.4	275.7	29	428.0	310.9	89	476.5	346.2
50	283.2	205.7	10	331.7	241.0	70	380.2	276.3	30	428.8	311.5	90	477.3	346.8
351	284.0	206.3	411	332.5	241.6	471	381.1	276.8	531	429.6	312.1	591	478.1	347.4
52	284.8	206.9	12	333.3	242.2	72	381.9	277.4	32	430.4	312.7	92	478.9	348.0
53	285.6	207.5	13	334.1	242.8	73	382.7	278.0	33	431.2	313.3	93	479.7	348.6
54	286.4	208.1	14	334.9	243.3	74	383.5	278.6	34	432.0	313.9	94	480.6	349.1
55	287.2	208.7	15	335.7	243.9	75	384.3	279.2	35	432.8	314.5	95	481.4	349.7
56	288.0	209.3	16	336.6	244.5	76	385.1	279.8	36	433.6	315.1	96	482.2	350.3
57	288.8	209.8	17	337.4	245.1	77	385.9	280.4	37	434.4	315.6	97	483.0	350.9
58	289.6	210.4	18	338.2	245.7	78	386.7	281.0	38	435.3	316.2	98	483.8	351.5
59	290.4	211.0	19	339.0	246.3	79	387.5	281.5	39	436.1	316.8	99	484.6	352.1
60	291.2	211.6	20	339.8	246.9	80	388.3	282.1	40	436.9	317.4	600	485.4	352.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

54° (126°, 234°, 306°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 37° (143°, 217°, 323°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0. 8	0. 6	61	48. 7	36. 7	121	96. 6	72. 8	181	144. 6	108. 9	241	192. 5	145. 0
2	1. 6	1. 2	62	49. 5	37. 3	22	97. 4	73. 4	82	145. 4	109. 5	42	193. 3	145. 6
3	2. 4	1. 8	63	50. 3	37. 9	23	98. 2	74. 0	83	146. 2	110. 1	43	194. 1	146. 2
4	3. 2	2. 4	64	51. 1	38. 5	24	99. 0	74. 6	84	146. 9	110. 7	44	194. 9	146. 8
5	4. 0	3. 0	65	51. 9	39. 1	25	99. 8	75. 2	85	147. 7	111. 3	45	195. 7	147. 4
6	4. 8	3. 6	66	52. 7	39. 7	26	100. 6	75. 8	86	148. 5	111. 9	46	196. 5	148. 0
7	5. 6	4. 2	67	53. 5	40. 3	27	101. 4	76. 4	87	149. 3	112. 5	47	197. 3	148. 6
8	6. 4	4. 8	68	54. 3	40. 9	28	102. 2	77. 0	88	150. 1	113. 1	48	198. 1	149. 3
9	7. 2	5. 4	69	55. 1	41. 5	29	103. 0	77. 6	89	150. 9	113. 7	49	198. 9	149. 9
10	8. 0	6. 0	70	55. 9	42. 1	30	103. 8	78. 2	90	151. 7	114. 3	50	199. 7	150. 5
11	8. 8	6. 6	71	56. 7	42. 7	131	104. 6	78. 8	191	152. 5	114. 9	251	200. 5	151. 1
12	9. 6	7. 2	72	57. 5	43. 3	32	105. 4	79. 4	92	153. 3	115. 5	52	201. 3	151. 7
13	10. 4	7. 8	73	58. 3	43. 9	33	106. 2	80. 0	93	154. 1	116. 2	53	202. 1	152. 3
14	11. 2	8. 4	74	59. 1	44. 5	34	107. 0	80. 6	94	154. 9	116. 8	54	202. 9	152. 9
15	12. 0	9. 0	75	59. 9	45. 1	35	107. 8	81. 2	95	155. 7	117. 4	55	203. 7	153. 5
16	12. 8	9. 6	76	60. 7	45. 7	36	108. 6	81. 8	96	156. 5	118. 0	56	204. 5	154. 1
17	13. 6	10. 2	77	61. 5	46. 3	37	109. 4	82. 4	97	157. 3	118. 6	57	205. 2	154. 7
18	14. 4	10. 8	78	62. 3	46. 9	38	110. 2	83. 1	98	158. 1	119. 2	58	206. 0	155. 3
19	15. 2	11. 4	79	63. 1	47. 5	39	111. 0	83. 7	99	158. 9	119. 8	59	206. 8	155. 9
20	16. 0	12. 0	80	63. 9	48. 1	40	111. 8	84. 3	200	159. 7	120. 4	60	207. 6	156. 5
21	16. 8	12. 6	81	64. 7	48. 7	141	112. 6	84. 9	201	160. 5	121. 0	261	208. 4	157. 1
22	17. 6	13. 2	82	65. 5	49. 3	42	113. 4	85. 5	02	161. 3	121. 6	62	209. 2	157. 7
23	18. 4	13. 8	83	66. 3	50. 0	43	114. 2	86. 1	03	162. 1	122. 2	63	210. 0	158. 3
24	19. 2	14. 4	84	67. 1	50. 6	44	115. 0	86. 7	04	162. 9	122. 8	64	210. 8	158. 9
25	20. 0	15. 0	85	67. 9	51. 2	45	115. 8	87. 3	05	163. 7	123. 4	65	211. 6	159. 5
26	20. 8	15. 6	86	68. 7	51. 8	46	116. 6	87. 9	06	164. 5	124. 0	66	212. 4	160. 1
27	21. 6	16. 2	87	69. 5	52. 4	47	117. 4	88. 5	07	165. 3	124. 6	67	213. 2	160. 7
28	22. 4	16. 9	88	70. 3	53. 0	48	118. 2	89. 1	08	166. 1	125. 2	68	214. 0	161. 3
29	23. 2	17. 5	89	71. 1	53. 6	49	119. 0	89. 7	09	166. 9	125. 8	69	214. 8	161. 9
30	24. 0	18. 1	90	71. 9	54. 2	50	119. 8	90. 3	10	167. 7	126. 4	70	215. 6	162. 5
31	24. 8	18. 7	91	72. 7	54. 8	151	120. 6	90. 9	211	168. 5	127. 0	271	216. 4	163. 1
32	25. 6	19. 3	92	73. 5	55. 4	52	121. 4	91. 5	12	169. 3	127. 6	72	217. 2	163. 7
33	26. 4	19. 9	93	74. 3	56. 0	53	122. 2	92. 1	13	170. 1	128. 2	73	218. 0	164. 3
34	27. 2	20. 5	94	75. 1	56. 6	54	123. 0	92. 7	14	170. 9	128. 8	74	218. 8	164. 9
35	28. 0	21. 1	95	75. 9	57. 2	55	123. 8	93. 3	15	171. 7	129. 4	75	219. 6	165. 5
36	28. 8	21. 7	96	76. 7	57. 8	56	124. 6	93. 9	16	172. 5	130. 0	76	220. 4	166. 1
37	29. 5	22. 3	97	77. 5	58. 4	57	125. 4	94. 5	17	173. 3	130. 6	77	221. 2	166. 7
38	30. 3	22. 9	98	78. 3	59. 0	58	126. 2	95. 1	18	174. 1	131. 2	78	222. 0	167. 3
39	31. 1	23. 5	99	79. 1	59. 6	59	127. 0	95. 7	19	174. 9	131. 8	79	222. 8	167. 9
40	31. 9	24. 1	100	79. 9	60. 2	60	127. 8	96. 3	20	175. 7	132. 4	80	223. 6	168. 5
41	32. 7	24. 7	101	80. 7	60. 8	161	128. 6	96. 9	221	176. 5	133. 0	281	224. 4	169. 1
42	33. 5	25. 3	02	81. 5	61. 4	62	129. 4	97. 5	22	177. 3	133. 6	82	225. 2	169. 7
43	34. 3	25. 9	03	82. 3	62. 0	63	130. 2	98. 1	23	178. 1	134. 2	83	226. 0	170. 3
44	35. 1	26. 5	04	83. 1	62. 6	64	131. 0	98. 7	24	178. 9	134. 8	84	226. 8	170. 9
45	35. 9	27. 1	05	83. 9	63. 2	65	131. 8	99. 3	25	179. 7	135. 4	85	227. 6	171. 5
46	36. 7	27. 7	06	84. 7	63. 8	66	132. 6	99. 9	26	180. 5	136. 0	86	228. 4	172. 1
47	37. 5	28. 3	07	85. 5	64. 4	67	133. 4	100. 5	27	181. 3	136. 6	87	229. 2	172. 7
48	38. 3	28. 9	08	86. 3	65. 0	68	134. 2	101 1	28	182. 1	137. 2	88	230. 0	173. 3
49	39. 1	29. 5	09	87. 1	65. 6	69	135. 0	101. 7	29	182. 9	137. 8	89	230. 8	173. 9
50	39. 9	30. 1	10	87. 8	66. 2	70	135. 8	102. 3	30	183. 7	138. 4	90	231. 6	174. 5
51	40. 7	30. 7	111	88. 6	66. 8	171	136. 6	102. 9	231	184. 5	139. 0	291	232. 4	175. 1
52	41. 5	31. 3	12	89. 4	67. 4	72	137. 4	103. 5	32	185. 3	139. 6	92	233. 2	175. 7
53	42. 3	31. 9	13	90. 2	68. 0	73	138. 2	104. 1	33	186. 1	140. 2	93	234. 0	176. 3
54	43. 1	32. 5	14	91. 0	68. 6	74	139. 0	104. 7	34	186. 9	140. 8	94	234. 8	176. 9
55	43. 9	33. 1	15	91. 8	69. 2	75	139. 8	105. 3	35	187. 7	141. 4	95	235. 6	177. 5
56	44. 7	33. 7	16	92. 6	69. 8	76	140. 6	105. 9	36	188. 5	142. 0	96	236. 4	178. 1
57	45. 5	34. 3	17	93. 4	70. 4	77	141. 4	106. 5	37	189. 3	142. 6	97	237. 2	178. 7
58	46. 3	34. 9	18	94. 2	71. 0	78	142. 2	107. 1	38	190. 1	143. 2	98	238. 0	179. 3
59	47. 1	35. 5	19	95. 0	71. 6	79	143. 0	107. 7	39	190. 9	143. 8	99	238. 8	179. 9
60	47. 9	36. 1	20	95. 8	72. 2	80	143. 8	108. 3	40	191. 7	144. 4	300	239. 6	180. 5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

53° (127°, 233°, 307°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 37° (143°, 217°, 323°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	240.4	181.1	361	288.3	217.3	421	336.2	253.4	481	384.1	289.5	541	432.1	325.6
02	241.2	181.7	62	289.1	217.9	22	337.0	254.0	82	384.9	290.1	42	432.9	326.2
03	242.0	182.4	63	289.9	218.5	23	337.8	254.6	83	385.7	290.7	43	433.7	326.8
04	242.7	183.0	64	290.7	219.1	24	338.6	255.2	84	386.5	291.3	44	434.5	327.4
05	243.6	183.6	65	291.5	219.7	25	339.4	255.8	85	387.3	291.9	45	435.3	328.0
06	244.4	184.2	66	292.3	220.3	26	340.2	256.4	86	388.1	292.5	46	436.1	328.6
07	245.2	184.8	67	293.1	220.9	27	341.0	257.0	87	388.9	293.1	47	436.9	329.2
08	246.0	185.4	68	293.9	221.5	28	341.8	257.6	88	389.7	293.7	48	437.7	329.8
09	246.8	186.0	69	294.7	222.1	29	342.6	258.2	89	390.5	294.3	49	438.5	330.4
10	247.6	186.6	70	295.5	222.7	30	343.4	258.8	90	391.3	294.9	50	439.2	331.0
311	248.4	187.2	371	296.3	223.3	431	344.2	259.4	491	392.1	295.5	551	440.0	331.6
12	249.2	187.8	72	297.1	223.9	32	345.0	260.0	92	392.9	296.1	52	440.8	332.2
13	250.0	188.4	73	297.9	224.5	33	345.8	260.6	93	393.7	296.7	53	441.6	332.8
14	250.8	189.0	74	298.7	225.1	34	346.6	261.2	94	394.5	297.3	54	442.4	333.4
15	251.6	189.6	75	299.5	225.7	35	347.4	261.8	95	395.3	297.9	55	443.2	334.0
16	252.4	190.2	76	300.3	226.3	36	348.2	262.4	96	396.1	298.5	56	444.0	334.6
17	253.2	190.8	77	301.1	226.9	37	249.0	263.0	97	396.9	299.1	57	444.8	335.2
18	254.0	191.4	78	301.9	227.5	38	349.8	263.6	98	397.7	299.7	58	445.6	335.8
19	254.8	192.0	79	302.7	228.1	39	350.6	264.2	99	398.5	300.3	59	446.4	336.4
20	255.6	192.6	80	303.5	228.7	40	351.4	264.8	500	399.3	300.9	60	447.2	337.0
321	256.4	193.2	381	304.3	229.3	441	352.2	265.4	501	400.1	301.5	561	448.0	337.6
22	257.2	193.8	82	305.1	229.9	42	353.0	266.0	02	400.9	302.1	62	448.8	338.2
23	258.0	194.4	83	305.9	230.5	43	353.8	266.6	03	401.7	302.7	63	449.6	338.8
24	258.8	195.0	84	306.7	231.1	44	354.6	267.2	04	402.5	303.3	64	450.4	339.4
25	259.6	195.6	85	307.5	231.7	45	355.4	267.8	05	403.3	303.9	65	451.2	340.0
26	260.4	196.2	86	308.3	232.3	46	356.2	268.4	06	404.1	304.5	66	452.0	340.6
27	261.2	196.8	87	309.1	232.9	47	357.0	269.0	07	404.9	305.1	67	452.8	341.2
28	262.0	197.4	88	309.9	233.5	48	357.8	269.6	08	405.7	305.7	68	453.6	341.8
29	262.8	198.0	89	310.7	234.1	49	358.6	270.2	09	406.5	306.3	69	454.4	342.4
30	263.5	198.6	90	311.5	234.7	50	359.4	270.8	10	407.3	306.9	70	455.2	343.0
331	264.3	199.2	391	312.3	235.3	451	360.2	271.4	511	408.1	307.5	571	456.0	343.6
32	265.1	199.8	92	313.1	235.9	52	361.0	272.0	12	408.9	308.1	72	456.8	344.2
33	265.9	200.4	93	313.9	236.5	53	361.8	272.6	13	409.7	308.7	73	457.6	344.8
34	266.7	201.0	94	314.7	237.1	54	362.6	273.2	14	410.5	309.3	74	458.4	345.4
35	267.5	201.6	95	315.5	237.7	55	363.4	273.8	15	411.3	309.9	75	459.2	346.0
36	268.3	202.2	96	316.3	238.3	56	364.2	274.4	16	412.1	310.5	76	460.0	346.6
37	269.1	202.8	97	317.1	238.9	57	365.0	275.0	17	412.9	311.1	77	460.8	347.2
38	269.9	203.4	98	317.9	239.5	58	365.8	275.6	18	413.7	311.7	78	461.6	347.8
39	270.7	204.0	99	318.7	240.1	59	366.6	276.2	19	414.5	312.3	79	462.4	348.5
40	271.5	204.6	400	319.5	240.7	60	367.4	276.8	20	415.3	312.1	80	463.2	349.1
341	272.3	205.2	401	320.3	241.3	461	368.2	277.4	521	416.1	313.5	581	464.0	349.7
42	273.1	205.8	02	321.1	241.9	62	369.0	278.0	22	416.9	314.1	82	464.8	350.3
43	273.9	206.4	03	321.9	242.5	63	369.8	278.6	23	417.7	314.7	83	465.6	350.9
44	274.7	207.0	04	322.6	243.1	64	370.6	279.2	24	418.5	315.4	84	466.4	351.5
45	275.5	207.6	05	323.4	243.7	65	371.4	279.8	25	419.3	316.0	85	467.2	352.1
46	276.3	208.2	06	324.2	244.3	66	372.2	280.4	26	420.1	316.6	86	468.0	352.7
47	277.1	208.8	07	325.0	244.9	67	373.0	281.0	27	420.9	317.2	87	468.8	353.3
48	277.9	209.4	08	325.8	245.5	68	373.8	281.6	28	421.7	317.8	88	469.6	353.9
49	278.7	210.0	09	326.6	246.1	69	374.6	282.3	29	422.5	318.4	89	470.4	354.5
50	279.5	210.6	10	327.4	246.7	70	375.4	282.9	30	423.3	319.0	90	471.2	355.1
351	280.3	211.2	411	328.2	247.3	471	376.2	283.5	531	424.1	319.6	591	472.0	355.7
52	281.1	211.8	12	329.0	247.9	72	377.0	284.1	32	424.9	320.2	92	472.8	356.3
53	281.9	212.4	13	329.8	248.5	73	377.8	284.7	33	425.7	320.8	93	473.6	356.9
54	282.7	213.0	14	330.6	249.2	74	378.6	285.3	34	426.5	321.4	94	474.4	357.5
55	283.5	213.6	15	331.4	249.8	75	379.4	285.9	35	427.3	322.0	95	475.2	358.1
56	284.3	214.2	16	332.2	250.4	76	380.2	286.5	36	428.1	322.6	96	476.0	358.7
57	285.1	214.8	17	333.0	251.0	77	380.9	287.1	37	428.9	323.2	97	476.8	359.3
58	285.9	215.4	18	333.8	251.6	78	381.7	287.7	38	429.7	323.8	98	477.6	359.9
59	286.7	216.1	19	334.6	252.2	79	382.5	288.3	39	430.5	324.4	99	478.4	360.5
60	287.5	216.7	20	335.4	252.8	80	383.3	288.9	40	431.3	325.0	600	479.2	361.1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

53° (127°, 233°, 307°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 38° (142°, 218°, 322°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.8	0.6	61	48.1	37.6	121	95.3	74.5	181	142.6	111.4	241	189.9	148.4
2	1.6	1.2	62	48.9	38.2	22	96.1	75.1	82	143.4	112.1	42	190.7	149.0
3	2.4	1.8	63	49.6	38.8	23	96.9	75.7	83	144.2	112.7	43	191.5	149.6
4	3.2	2.5	64	50.4	39.4	24	97.7	76.3	84	145.0	113.3	44	192.3	150.2
5	3.9	3.1	65	51.2	40.0	25	98.5	77.0	85	145.8	113.9	45	193.1	150.8
6	4.7	3.7	66	52.0	40.6	26	99.3	77.6	86	146.6	114.5	46	193.9	151.5
7	5.5	4.3	67	52.8	41.2	27	100.1	78.2	87	147.4	115.1	47	194.6	152.1
8	6.3	4.9	68	53.6	41.9	28	100.9	78.8	88	148.1	115.7	48	195.4	152.7
9	7.1	5.5	69	54.4	42.5	29	101.7	79.4	89	148.9	116.4	49	196.2	153.3
10	7.9	6.2	70	55.2	43.1	30	102.4	80.0	90	149.7	117.0	50	197.0	153.9
11	8.7	6.8	71	55.9	43.7	131	103.2	80.7	191	150.5	117.6	251	197.8	154.5
12	9.5	7.4	72	56.7	44.3	32	104.0	81.3	92	151.3	118.2	52	198.6	155.1
13	10.2	8.0	73	57.5	44.9	33	104.8	81.9	93	152.1	118.8	53	199.4	155.8
14	11.0	8.6	74	58.3	45.6	34	105.6	82.5	94	152.9	119.4	54	200.2	156.4
15	11.8	9.2	75	59.1	46.2	35	106.4	83.1	95	153.7	120.1	55	200.9	157.0
16	12.6	9.9	76	59.9	46.8	36	107.2	83.7	96	154.5	120.7	56	201.7	157.6
17	13.4	10.5	77	60.7	47.4	37	108.0	84.3	97	155.2	121.3	57	202.5	158.2
18	14.2	11.1	78	61.5	48.0	38	108.7	85.0	98	156.0	121.9	58	203.3	158.8
19	15.0	11.7	79	62.3	48.6	39	109.5	85.6	99	156.8	122.5	59	204.1	159.5
20	15.8	12.3	80	63.0	49.3	40	110.3	86.2	200	157.6	123.1	60	204.9	160.1
21	16.5	12.9	81	63.8	49.9	141	111.1	86.8	201	158.4	123.7	261	205.7	160.7
22	17.3	13.5	82	64.6	50.5	42	111.9	87.4	02	159.2	124.4	62	206.5	161.3
23	18.1	14.2	83	65.4	51.1	43	112.7	88.0	03	160.0	125.0	63	207.2	161.9
24	18.9	14.8	84	66.2	51.7	44	113.5	88.7	04	160.8	125.6	64	208.0	162.5
25	19.7	15.4	85	67.0	52.3	45	114.3	89.3	05	161.5	126.2	65	208.8	163.2
26	20.5	16.0	86	67.8	52.9	46	115.0	89.9	06	162.3	126.8	66	209.6	163.8
27	21.3	16.6	87	68.6	53.6	47	115.8	90.5	07	163.1	127.4	67	210.4	164.4
28	22.1	17.2	88	69.3	54.2	48	116.6	91.1	08	163.9	128.1	68	211.2	165.0
29	22.9	17.9	89	70.1	54.8	49	117.4	91.7	09	164.7	128.7	69	212.0	165.6
30	23.6	18.5	90	70.9	55.4	50	118.2	92.3	10	165.5	129.3	70	212.8	166.2
31	24.4	19.1	91	71.7	56.0	151	119.0	93.0	211	166.3	129.9	271	213.6	166.8
32	25.2	19.7	92	72.5	56.6	52	119.8	93.6	12	167.1	130.5	72	214.3	167.5
33	26.0	20.3	93	73.3	57.3	53	120.6	94.2	13	167.8	131.1	73	215.1	168.1
34	26.8	20.9	94	74.1	57.9	54	121.4	94.8	14	168.6	131.8	74	215.9	168.7
35	27.6	21.5	95	74.9	58.5	55	122.1	95.4	15	169.4	132.4	75	216.7	169.3
36	28.4	22.2	96	75.6	59.1	56	122.9	96.0	16	170.2	133.0	76	217.5	169.9
37	29.2	22.8	97	76.4	59.7	57	123.7	96.7	17	171.0	133.6	77	218.3	170.5
38	29.9	23.4	98	77.2	60.3	58	124.5	97.3	18	171.8	134.2	78	219.1	171.2
39	30.7	24.0	99	78.0	61.0	59	125.3	97.9	19	172.6	134.8	79	219.9	171.8
40	31.5	24.6	100	78.8	61.6	60	126.1	98.5	20	173.4	135.4	80	220.6	172.4
41	32.3	25.2	101	79.6	62.2	161	126.9	99.1	221	174.2	136.1	281	221.4	173.0
42	33.1	25.9	02	80.4	62.8	62	127.7	99.7	22	174.9	136.7	82	222.2	173.6
43	33.9	26.5	03	81.2	63.4	63	128.4	100.4	23	175.7	137.3	83	223.0	174.2
44	34.7	27.1	04	82.0	64.0	64	129.2	101.0	24	176.5	137.9	84	223.8	174.8
45	35.5	27.7	05	82.7	64.6	65	130.0	101.6	25	177.3	138.5	85	224.6	175.5
46	36.2	28.3	06	83.5	65.3	66	130.8	102.2	26	178.1	139.1	86	225.4	176.1
47	37.0	28.9	07	84.3	65.9	67	131.6	102.8	27	178.9	139.8	87	226.2	176.7
48	37.8	29.6	08	85.1	66.5	68	132.4	103.4	28	179.7	140.4	88	226.9	177.3
49	38.6	30.2	09	85.9	67.1	69	133.2	104.0	29	180.5	141.0	89	227.7	177.9
50	39.4	30.8	10	86.7	67.7	70	134.0	104.7	30	181.2	141.6	90	228.5	178.5
51	40.2	31.4	111	87.5	68.3	171	134.7	105.3	231	182.0	142.2	291	229.3	179.2
52	41.0	32.0	12	88.3	69.0	72	135.5	105.9	32	182.8	142.8	92	230.1	179.8
53	41.8	32.6	13	89.0	69.6	73	136.3	106.5	33	183.6	143.4	93	230.9	180.4
54	42.6	33.2	14	89.8	70.2	74	137.1	107.1	34	184.4	144.1	94	231.7	181.0
55	43.3	33.9	15	90.6	70.8	75	137.9	107.7	35	185.2	144.7	95	232.5	181.6
56	44.1	34.5	16	91.4	71.4	76	138.7	108.4	36	186.0	145.3	96	233.3	182.2
57	44.9	35.1	17	92.2	72.0	77	139.5	109.0	37	186.8	145.9	97	234.0	182.9
58	45.7	35.7	18	93.0	72.6	78	140.3	109.6	38	187.5	146.5	98	234.8	183.5
59	46.5	36.3	19	93.8	73.3	79	141.1	110.2	39	188.3	147.1	99	235.6	184.1
60	47.3	36.9	20	94.6	73.9	80	141.8	110.8	40	189.1	147.8	300	236.4	184.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

52° (128°, 232°, 308°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 38° (142°, 218°, 322°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	237.2	185.3	361	284.5	222.3	421	331.8	259.2	481	379.0	296.1	541	426.3	333.1
02	238.0	185.9	62	285.3	222.9	22	332.5	259.8	82	379.8	296.7	42	427.1	333.7
03	238.8	186.6	63	286.0	223.5	23	333.3	260.4	83	380.6	297.4	43	427.9	334.3
04	239.6	187.2	64	286.8	224.1	24	334.1	261.0	84	381.4	298.0	44	428.7	334.9
05	240.3	187.8	65	287.6	224.7	25	334.9	261.7	85	382.2	298.6	45	429.5	335.5
06	241.1	188.4	66	288.4	225.3	26	335.7	262.3	86	383.0	299.2	46	430.3	336.2
07	241.9	189.0	67	289.2	225.9	27	336.5	262.9	87	383.8	299.8	47	431.0	336.8
08	242.7	189.6	68	290.0	226.6	28	337.3	263.5	88	384.5	300.4	48	431.8	337.4
09	243.5	190.2	69	290.8	227.2	29	338.1	264.1	89	385.3	301.1	49	432.6	338.0
10	244.3	190.9	70	291.6	227.8	30	338.8	264.7	90	386.1	301.7	50	433.4	338.6
311	245.1	191.5	371	292.4	228.4	431	339.6	265.4	491	386.9	302.3	551	434.2	339.2
12	245.9	192.1	72	293.1	229.0	32	340.4	266.0	92	387.7	302.9	52	435.0	339.8
13	246.6	192.7	73	293.9	229.6	33	341.2	266.6	93	388.5	303.5	53	435.8	340.5
14	247.4	193.3	74	294.7	230.3	34	342.0	267.2	94	389.3	304.1	54	436.6	341.1
15	248.2	193.9	75	295.5	230.9	35	342.8	267.8	95	390.1	304.8	55	437.3	341.7
16	249.0	194.5	76	296.3	231.5	36	343.6	268.4	96	390.9	305.4	56	438.1	342.3
17	249.8	195.2	77	297.1	232.1	37	344.4	269.0	97	391.6	306.0	57	438.9	342.9
18	250.6	195.8	78	297.9	232.7	38	345.1	269.7	98	392.4	306.6	58	439.7	343.5
19	251.4	196.4	79	298.7	233.3	39	345.9	270.3	99	393.2	307.2	59	440.5	344.2
20	252.2	197.0	80	299.4	234.0	40	346.7	270.9	500	394.0	307.8	60	441.3	344.8
321	253.0	197.6	381	300.2	234.6	441	347.5	271.5	501	394.8	308.4	561	442.1	345.4
22	253.7	198.2	82	301.0	235.2	42	348.3	272.1	02	395.6	309.1	62	442.9	346.0
23	254.5	198.9	83	301.8	235.8	43	349.1	272.7	03	396.4	309.7	63	443.7	346.6
24	255.3	199.5	84	302.6	236.4	44	349.9	273.4	04	397.2	310.3	64	444.4	347.2
25	256.1	200.1	85	303.4	237.0	45	350.7	274.0	05	397.9	310.9	65	445.2	347.8
26	256.9	200.7	86	304.2	237.6	46	351.5	274.6	06	398.7	311.5	66	446.0	348.5
27	257.7	201.3	87	305.0	238.3	47	352.2	275.2	07	399.5	312.1	67	446.8	349.1
28	258.5	201.9	88	305.7	238.9	48	353.0	275.8	08	400.3	312.8	68	447.6	349.7
29	259.3	202.6	89	306.5	239.5	49	353.8	276.4	09	401.1	313.4	69	448.4	350.3
30	260.0	203.2	90	307.3	240.1	50	354.6	277.0	10	401.9	314.0	70	449.2	350.9
331	260.8	203.8	391	308.1	240.7	451	355.4	277.7	511	402.7	314.6	571	450.0	351.5
32	261.6	204.4	92	308.9	241.3	52	356.2	278.3	12	403.5	315.2	72	450.7	352.2
33	262.4	205.0	93	309.7	242.0	53	357.0	278.9	13	404.2	315.8	73	451.5	352.8
34	263.2	205.6	94	310.5	242.6	54	357.8	279.5	14	405.0	316.5	74	452.3	353.4
35	264.0	206.2	95	311.3	243.2	55	358.5	280.1	15	405.8	317.1	75	453.1	354.0
36	264.8	206.9	96	312.1	243.8	56	359.3	280.7	16	406.6	317.7	76	453.9	354.6
37	265.6	207.5	97	312.8	244.4	57	360.1	281.4	17	407.4	318.3	77	454.7	355.2
38	266.3	208.1	98	313.6	245.0	58	360.9	282.0	18	408.2	318.9	78	455.5	355.7
39	267.1	208.7	99	314.4	245.6	59	361.7	282.6	19	409.0	319.5	79	456.3	356.5
40	267.9	209.3	400	315.2	246.3	60	362.5	283.2	20	409.8	320.1	80	457.0	357.1
341	268.7	209.9	401	316.0	246.9	461	363.3	283.8	521	410.6	320.8	581	457.8	357.7
42	269.5	210.6	02	316.8	247.5	62	364.1	284.4	22	411.3	321.4	82	458.6	358.3
43	270.3	211.2	03	317.6	248.1	63	364.8	285.1	23	412.1	322.0	83	459.4	358.9
44	271.1	211.8	04	318.4	248.7	64	365.6	285.7	24	412.9	322.6	84	460.2	359.5
45	271.9	212.4	05	319.1	249.3	65	366.4	286.3	25	413.7	323.2	85	461.0	360.2
46	272.7	213.0	06	319.9	250.0	66	367.2	286.9	26	414.5	323.8	86	461.8	360.8
47	273.4	213.6	07	320.7	250.6	67	368.0	287.5	27	415.3	324.5	87	462.6	361.4
48	274.2	214.3	08	321.5	251.2	68	368.8	288.1	28	416.1	325.1	88	463.4	362.0
49	275.0	214.9	09	322.3	251.8	69	369.6	288.7	29	416.9	325.7	89	464.1	362.6
50	275.8	215.5	10	323.1	252.4	70	370.4	289.4	30	417.6	326.3	90	464.9	363.2
351	276.6	216.1	411	323.9	253.0	471	371.2	290.0	531	418.4	326.9	591	465.7	363.7
52	277.4	216.7	12	324.7	253.7	72	371.9	290.6	32	419.2	327.5	92	466.5	364.5
53	278.2	217.3	13	325.5	254.3	73	372.7	291.2	33	420.0	328.1	93	467.3	365.1
54	279.0	217.9	14	326.2	254.9	74	373.5	291.8	34	420.8	328.8	94	468.1	365.7
55	279.7	218.6	15	327.0	255.5	75	374.3	292.4	35	421.6	329.4	95	468.9	366.3
56	280.5	219.2	16	327.8	256.1	76	375.1	293.1	36	422.4	330.0	96	469.7	366.9
57	281.3	219.8	17	328.6	256.7	77	375.9	293.7	37	423.2	330.6	97	470.4	367.5
58	282.1	220.4	18	329.4	257.3	78	376.7	294.3	38	424.0	331.2	98	471.2	368.2
59	282.9	221.0	19	330.2	258.0	79	377.5	294.9	39	424.7	331.8	99	472.0	368.8
60	283.7	221.6	20	331.0	258.6	80	378.2	295.5	40	425.5	332.5	600	472.8	369.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

52° (128°, 232°, 308°).

In Plane Sailing.	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 39° (141°, 219°, 321°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.8	0.6	61	47.4	38.4	121	94.0	76.1	181	140.7	113.9	241	187.3	151.7
2	1.6	1.3	62	48.2	39.0	22	94.8	76.8	82	141.4	114.5	42	188.1	152.3
3	2.3	1.9	63	49.0	39.6	23	95.6	77.4	83	142.2	115.2	43	188.8	152.9
4	3.1	2.5	64	49.7	40.3	24	96.4	78.0	84	143.0	115.8	44	189.6	153.6
5	3.9	3.1	65	50.5	40.9	25	97.1	78.7	85	143.8	116.4	45	190.4	154.2
6	4.7	3.8	66	51.3	41.5	26	97.9	79.3	86	144.5	117.1	46	191.2	154.8
7	5.4	4.4	67	52.1	42.2	27	98.7	79.9	87	145.3	117.7	47	192.0	155.4
8	6.2	5.0	68	52.8	42.8	28	99.5	80.6	88	146.1	118.3	48	192.7	156.1
9	7.0	5.7	69	53.6	43.4	29	100.3	81.2	89	146.9	118.9	49	193.5	156.7
10	7.8	6.3	70	54.4	44.1	30	101.0	81.8	90	147.7	119.6	50	194.3	157.3
11	8.5	6.9	71	55.2	44.7	131	101.8	82.4	191	148.4	120.2	251	195.1	158.0
12	9.3	7.6	72	56.0	45.3	32	102.6	83.1	92	149.2	120.8	52	195.8	158.6
13	10.1	8.2	73	56.7	45.9	33	103.4	83.7	93	150.0	121.5	53	196.6	159.2
14	10.9	8.8	74	57.5	46.6	34	104.1	84.3	94	150.8	122.1	54	197.4	159.8
15	11.7	9.4	75	58.3	47.2	35	104.9	85.0	95	151.5	122.7	55	198.2	160.5
16	12.4	10.1	76	59.1	47.8	36	105.7	85.6	96	152.3	123.3	56	198.9	161.1
17	13.2	10.7	77	59.8	48.5	37	106.5	86.2	97	153.1	124.0	57	199.7	161.7
18	14.0	11.3	78	60.6	49.1	38	107.2	86.8	98	153.9	124.6	58	200.5	162.4
19	14.8	12.0	79	61.4	49.7	39	108.0	87.5	99	154.7	125.2	59	201.3	163.0
20	15.5	12.6	80	62.2	50.3	40	108.8	88.1	200	155.4	125.9	60	202.1	163.6
21	16.3	13.2	81	62.9	51.0	141	109.6	88.7	201	156.2	126.5	261	202.8	164.3
22	17.1	13.8	82	63.7	51.6	42	110.4	89.4	02	157.0	127.1	62	203.6	164.9
23	17.9	14.5	83	64.5	52.2	43	111.1	90.0	03	157.8	127.8	63	204.4	165.5
24	18.7	15.1	84	65.3	52.9	44	111.9	90.6	04	158.5	128.4	64	205.2	166.1
25	19.4	15.7	85	66.1	53.5	45	112.7	91.3	05	159.3	129.0	65	205.9	166.8
26	20.2	16.4	86	66.8	54.1	46	113.5	91.9	06	160.1	129.6	66	206.7	167.4
27	21.0	17.0	87	67.6	54.8	47	114.2	92.5	07	160.9	130.3	67	207.5	168.0
28	21.8	17.6	88	68.4	55.4	48	115.0	93.1	08	161.6	130.9	68	208.3	168.7
29	22.5	18.3	89	69.2	56.0	49	115.8	93.8	09	162.4	131.5	69	209.1	169.3
30	23.3	18.9	90	69.9	56.6	50	116.6	94.4	10	163.2	132.2	70	209.8	169.9
31	24.1	19.5	91	70.7	57.3	151	117.3	95.0	211	164.0	132.8	271	210.6	170.5
32	24.9	20.1	92	71.5	57.9	52	118.1	95.7	12	164.8	133.4	72	211.4	171.2
33	25.6	20.8	93	72.3	58.5	53	118.9	96.3	13	165.5	134.0	73	212.2	171.8
34	26.4	21.4	94	73.1	59.2	54	119.7	96.9	14	166.3	134.7	74	212.9	172.4
35	27.2	22.0	95	73.8	59.8	55	120.5	97.5	15	167.1	135.3	75	213.7	173.1
36	28.0	22.7	96	74.6	60.4	56	121.2	98.2	16	167.9	135.9	76	214.5	173.7
37	28.8	23.3	97	75.4	61.0	57	122.0	98.8	17	168.6	136.6	77	215.3	174.3
38	29.5	23.9	98	76.2	61.7	58	122.8	99.4	18	169.4	137.2	78	216.0	175.0
39	30.3	24.5	99	76.9	62.3	59	123.6	100.1	19	170.2	137.8	79	216.8	175.6
40	31.1	25.2	100	77.7	62.9	60	124.3	100.7	20	171.0	138.5	80	217.6	176.2
41	31.9	25.8	101	78.5	63.6	161	125.1	101.3	221	171.7	139.1	281	218.4	176.8
42	32.6	26.4	02	79.3	64.2	62	125.9	101.9	22	172.5	139.7	82	219.2	177.5
43	33.4	27.1	03	80.0	64.8	63	126.7	102.6	23	173.3	140.3	83	219.9	178.1
44	34.2	27.7	04	80.8	65.4	64	127.5	103.2	24	174.1	141.0	84	220.7	178.7
45	35.0	28.3	05	81.6	66.1	65	128.2	103.8	25	174.9	141.6	85	221.5	179.4
46	35.7	28.9	06	82.4	66.7	66	129.0	104.5	26	175.6	142.2	86	222.3	180.0
47	36.5	29.6	07	83.2	67.3	67	129.8	105.1	27	176.4	142.9	87	223.0	180.6
48	37.3	30.2	08	83.9	68.0	68	130.6	105.7	28	177.2	143.5	88	223.8	181.2
49	38.1	30.8	09	84.7	68.6	69	131.3	106.4	29	178.0	144.1	89	224.6	181.9
50	38.9	31.5	10	85.5	69.2	70	132.1	107.0	30	178.7	144.7	90	225.4	182.5
51	39.6	32.1	111	86.3	69.9	171	132.9	107.6	231	179.5	145.4	291	226.1	183.1
52	40.4	32.7	12	87.0	70.5	72	133.7	108.2	32	180.3	146.0	92	226.9	183.8
53	41.2	33.4	13	87.8	71.1	73	134.4	108.9	33	181.1	146.6	93	227.7	184.4
54	42.0	34.0	14	88.6	71.7	74	135.2	109.5	34	181.9	147.3	94	228.5	185.0
55	42.7	34.6	15	89.4	72.4	75	136.0	110.1	35	182.6	147.9	95	229.3	185.6
56	43.5	35.2	16	90.1	73.0	76	136.8	110.8	36	183.4	148.5	96	230.0	186.3
57	44.3	35.9	17	90.9	73.6	77	137.6	111.4	37	184.2	149.1	97	230.8	186.9
58	45.1	36.5	18	91.7	74.3	78	138.3	112.0	38	185.0	149.8	98	231.6	187.5
59	45.9	37.1	19	92.5	74.9	79	139.1	112.6	39	185.7	150.4	99	232.4	188.2
60	46.6	37.8	20	93.3	75.5	80	139.9	113.3	40	186.5	151.0	300	233.1	188.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

51° (129°, 231°, 309°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 39° (141°, 219°, 321°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	233.9	189.4	361	280.5	227.2	421	327.2	264.9	481	373.8	302.7	541	420.4	340.5
02	234.7	190.1	62	281.3	227.8	22	328.0	265.6	82	374.6	303.3	42	421.2	341.1
03	235.5	190.7	63	282.1	228.4	23	328.7	266.2	83	375.4	304.0	43	422.0	341.7
04	236.3	191.3	64	282.9	229.1	24	329.5	266.8	84	376.1	304.6	44	422.8	342.2
05	237.0	191.9	65	283.7	229.7	25	330.3	267.5	85	376.9	305.2	45	423.5	343.0
06	237.8	192.6	66	284.4	230.3	26	331.1	268.1	86	377.7	305.8	46	424.3	343.6
07	238.6	193.2	67	285.2	231.0	27	331.8	268.7	87	378.5	306.5	47	425.1	344.2
08	239.4	193.8	68	286.0	231.5	28	332.6	269.3	88	379.2	307.1	48	425.9	344.9
09	240.1	194.5	69	286.8	232.2	29	333.4	270.0	89	380.0	307.7	49	426.7	345.5
10	240.9	195.1	70	287.5	232.8	30	334.2	270.6	90	380.8	308.4	50	427.4	346.1
311	241.7	195.7	371	288.3	233.5	431	334.9	271.2	491	381.6	309.0	551	428.2	346.8
12	242.5	196.3	72	289.1	234.1	32	335.7	271.9	92	382.4	309.6	52	429.0	347.4
13	243.2	197.0	73	289.9	234.7	33	336.5	272.5	93	383.1	310.3	53	429.8	348.0
14	244.0	197.6	74	290.7	235.4	34	337.3	273.1	94	383.9	310.9	54	430.5	348.6
15	244.8	198.2	75	291.4	236.0	35	338.1	273.8	95	384.7	311.5	55	431.3	349.3
16	245.6	198.9	76	292.2	236.6	36	338.8	274.4	96	385.5	312.1	56	432.1	349.9
17	246.4	199.5	77	293.0	237.3	37	339.6	275.0	97	386.2	312.8	57	432.9	350.5
18	247.1	200.1	78	293.8	237.9	38	340.4	275.6	98	387.0	313.4	58	433.6	351.2
19	247.9	200.8	79	294.5	238.5	39	341.2	276.3	99	387.8	314.0	59	434.4	351.8
20	248.7	201.4	80	295.3	239.1	40	341.9	276.9	500	388.6	314.7	60	435.2	352.4
321	249.5	202.0	381	296.1	239.8	441	342.7	277.5	501	389.4	315.3	561	436.0	353.0
22	250.2	202.6	82	296.9	240.4	42	343.5	278.2	02	390.1	315.9	62	436.8	353.7
23	251.0	203.3	83	297.6	241.0	43	344.3	278.8	03	390.9	316.5	63	437.5	354.3
24	251.8	203.9	84	298.4	241.7	44	345.1	279.4	04	391.7	317.2	64	438.3	354.9
25	252.6	204.5	85	299.2	242.3	45	345.8	280.0	05	392.5	317.8	65	439.1	355.6
26	253.3	205.2	86	300.0	242.9	46	346.6	280.7	06	393.2	318.4	66	439.9	356.2
27	254.1	205.8	87	300.8	243.5	47	347.4	281.3	07	394.0	319.1	67	440.6	356.8
28	254.9	206.4	88	301.5	244.2	48	348.2	281.9	08	394.8	319.7	68	441.4	357.5
29	255.7	207.0	89	302.3	244.8	49	348.9	282.6	09	395.6	320.3	69	442.2	358.1
30	256.5	207.7	90	303.1	245.4	50	349.7	283.2	10	396.3	321.0	70	443.0	358.7
331	257.2	208.3	391	303.9	246.1	451	350.5	283.8	511	397.1	321.6	571	443.8	359.3
32	258.0	208.9	92	304.6	246.7	52	351.3	284.5	12	397.9	322.2	72	444.5	360.0
33	258.8	209.6	93	305.4	247.3	53	352.0	285.1	13	398.7	322.8	73	445.3	360.6
34	259.6	210.2	94	306.2	248.0	54	352.8	285.7	14	399.5	323.5	74	446.1	361.2
35	260.3	210.8	95	307.0	248.6	55	353.6	286.3	15	400.2	324.1	75	446.9	361.9
36	261.1	211.5	96	307.7	249.2	56	354.4	287.0	16	401.0	324.7	76	447.7	362.5
37	261.9	212.1	97	308.5	249.8	57	355.2	287.6	17	401.8	325.4	77	448.4	363.1
38	262.7	212.7	98	309.3	250.5	58	355.9	288.2	18	402.6	326.0	78	449.2	363.7
39	263.5	213.3	99	310.1	251.1	59	356.7	288.9	19	403.3	326.6	79	450.0	364.4
40	264.2	214.0	400	310.9	251.7	60	357.5	289.5	20	404.1	327.2	80	450.7	365.0
341	265.0	214.6	401	311.6	252.4	461	358.3	290.1	521	404.9	327.9	581	451.5	365.6
42	265.8	215.2	02	312.4	253.0	62	359.0	290.7	22	405.7	328.5	82	452.3	366.3
43	266.6	215.9	03	313.2	253.6	63	359.8	291.4	23	406.4	329.1	83	453.1	366.9
44	267.3	216.5	04	314.0	254.2	64	360.6	292.0	24	407.2	329.8	84	453.9	367.5
45	268.1	217.1	05	314.7	254.9	65	361.4	292.6	25	408.0	330.4	85	454.6	368.2
46	268.9	217.7	06	315.5	255.5	66	362.2	293.3	26	408.8	331.0	86	455.4	368.8
47	269.7	218.4	07	316.3	256.1	67	362.9	293.9	27	409.6	331.7	87	456.2	369.4
48	270.4	219.0	08	317.1	256.8	68	363.7	294.5	28	410.3	332.3	88	457.0	370.0
49	271.2	219.6	09	317.9	257.4	69	364.5	295.2	29	411.1	332.9	89	457.8	370.7
50	272.0	220.3	10	318.6	258.0	70	365.3	295.8	30	411.9	333.5	90	458.5	371.3
351	272.8	220.9	411	319.4	258.7	471	366.0	296.4	531	412.7	334.2	591	459.3	371.9
52	273.6	221.5	12	320.2	259.3	72	366.8	297.0	32	413.4	334.8	92	460.1	372.6
53	274.3	222.2	13	321.0	259.9	73	367.6	297.7	33	414.2	335.4	93	460.8	373.2
54	275.1	222.7	14	321.7	260.5	74	368.4	298.3	34	415.0	336.1	94	461.6	373.8
55	275.9	223.4	15	322.5	261.2	75	369.1	298.9	35	415.8	336.7	95	462.4	374.4
56	276.7	224.0	16	323.3	261.8	76	369.9	299.6	36	416.6	337.3	96	463.2	375.1
57	277.4	224.7	17	324.1	262.4	77	370.7	300.2	37	417.3	337.9	97	464.0	375.7
58	278.2	225.3	18	324.8	263.1	78	371.5	300.8	38	418.1	338.6	98	464.7	376.3
59	279.0	225.9	19	325.6	263.7	79	372.3	301.4	39	418.9	339.2	99	465.5	377.0
60	279.8	226.6	20	326.4	264.3	80	373.0	302.1	40	419.7	339.8	600	466.3	377.6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

51° (129°, 231°, 309°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 3.

Difference of Latitude and Departure for 40° (140°, 220°, 320°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.8	0.6	61	46.7	39.2	121	92.7	77.8	181	138.7	116.3	241	184.6	154.9
2	1.5	1.3	62	47.5	39.9	22	93.5	78.4	82	139.4	117.0	42	185.4	155.6
3	2.3	1.9	63	48.3	40.5	23	94.2	79.1	83	140.2	117.6	43	186.1	156.2
4	3.1	2.6	64	49.0	41.1	24	95.0	79.7	84	141.0	118.3	44	186.9	156.8
5	3.8	3.2	65	49.8	41.8	25	95.8	80.3	85	141.7	118.9	45	187.7	157.5
6	4.6	3.9	66	50.6	42.4	26	96.5	81.0	86	142.5	119.6	46	188.4	158.1
7	5.4	4.5	67	51.3	43.1	27	97.3	81.6	87	143.3	120.2	47	189.2	158.8
8	6.1	5.1	68	52.1	43.7	28	98.1	82.3	88	144.0	120.8	48	190.0	159.4
9	6.9	5.8	69	52.9	44.4	29	98.8	82.9	89	144.8	121.5	49	190.7	160.1
10	7.7	6.4	70	53.6	45.0	30	99.6	83.6	90	145.5	122.1	50	191.5	160.7
11	8.4	7.1	71	54.4	45.6	131	100.4	84.2	191	146.3	122.8	251	192.3	161.3
12	9.2	7.7	72	55.2	46.3	32	101.1	84.8	92	147.1	123.4	52	193.0	162.0
13	10.0	8.4	73	55.9	46.9	33	101.9	85.5	93	147.8	124.1	53	193.8	162.6
14	10.7	9.0	74	56.7	47.6	34	102.6	86.1	94	148.6	124.7	54	194.6	163.3
15	11.5	9.6	75	57.5	48.2	35	103.4	86.8	95	149.4	125.3	55	195.3	163.9
16	12.3	10.3	76	58.2	48.9	36	104.2	87.4	96	150.1	126.0	56	196.1	164.6
17	13.0	10.9	77	59.0	49.5	37	104.9	88.1	97	150.9	126.6	57	196.9	165.2
18	13.8	11.6	78	59.8	50.1	38	105.7	88.7	98	151.7	127.3	58	197.6	165.8
19	14.6	12.2	79	60.5	50.8	39	106.5	89.3	99	152.4	127.9	59	198.4	166.5
20	15.3	12.9	80	61.3	51.4	40	107.2	90.0	200	153.2	128.6	60	199.2	167.1
21	16.1	13.5	81	62.0	52.1	141	108.0	90.6	201	154.0	129.2	261	199.9	167.8
22	16.9	14.1	82	62.8	52.7	42	108.8	91.3	02	154.7	129.8	62	200.7	168.4
23	17.6	14.8	83	63.6	53.4	43	109.5	91.9	03	155.5	130.5	63	201.5	169.1
24	18.4	15.4	84	64.3	54.0	44	110.3	92.6	04	156.3	131.1	64	202.2	169.7
25	19.2	16.1	85	65.1	54.6	45	111.1	93.2	05	157.0	131.8	65	203.0	170.3
26	19.9	16.7	86	65.9	55.3	46	111.8	93.8	06	157.8	132.4	66	203.8	171.0
27	20.7	17.4	87	66.6	55.9	47	112.6	94.5	07	158.6	133.1	67	204.5	171.6
28	21.4	18.0	88	67.4	56.6	48	113.4	95.1	08	159.3	133.7	68	205.3	172.3
29	22.2	18.6	89	68.2	57.2	49	114.1	95.8	09	160.1	134.3	69	206.1	172.9
30	23.0	19.3	90	68.9	57.9	50	114.9	96.4	10	160.9	135.0	70	206.8	173.6
31	23.7	19.9	91	69.7	58.5	151	115.7	97.1	211	161.6	135.6	271	207.6	174.2
32	24.5	20.6	92	70.5	59.1	52	116.4	97.7	12	162.4	136.3	72	208.4	174.8
33	25.3	21.2	93	71.2	59.8	53	117.2	98.3	13	163.2	136.9	73	209.1	175.5
34	26.0	21.9	94	72.0	60.4	54	118.0	99.0	14	163.9	137.6	74	209.9	176.1
35	26.8	22.5	95	72.8	61.1	55	118.7	99.6	15	164.7	138.2	75	210.7	176.8
36	27.6	23.1	96	73.5	61.7	56	119.5	100.3	16	165.5	138.8	76	211.4	177.4
37	28.3	23.8	97	74.3	62.4	57	120.3	100.9	17	166.2	139.5	77	212.2	178.1
38	29.1	24.4	98	75.1	63.0	58	121.0	101.6	18	167.0	140.1	78	213.0	178.7
39	29.9	25.1	99	75.8	63.6	59	121.8	102.2	19	167.8	140.8	79	213.7	179.3
40	30.6	25.7	100	76.6	64.3	60	122.6	102.8	20	168.5	141.4	80	214.5	180.0
41	31.4	26.4	101	77.4	64.9	161	123.3	103.5	221	169.3	142.1	281	215.3	180.6
42	32.2	27.0	02	78.1	65.6	62	124.1	104.1	22	170.1	142.7	82	216.0	181.3
43	32.9	27.6	03	78.9	66.2	63	124.9	104.8	23	170.8	143.3	83	216.8	181.9
44	33.7	28.3	04	79.7	66.8	64	125.6	105.4	24	171.6	144.0	84	217.6	182.6
45	34.5	28.9	05	80.4	67.5	65	126.4	106.1	25	172.4	144.6	85	218.3	183.2
46	35.2	29.6	06	81.2	68.1	66	127.2	106.7	26	173.1	145.3	86	219.1	183.8
47	36.0	30.2	07	82.0	68.8	67	127.9	107.3	27	173.9	145.9	87	219.9	184.5
48	36.8	30.9	08	82.7	69.4	68	128.7	108.0	28	174.7	146.6	88	220.6	185.1
49	37.5	31.5	09	83.5	70.1	69	129.5	108.6	29	175.4	147.2	89	221.4	185.8
50	38.3	32.1	10	84.3	70.7	70	130.2	109.3	30	176.2	147.8	90	222.2	186.4
51	39.1	32.8	111	85.0	71.3	171	131.0	109.9	231	177.0	148.5	291	222.9	187.1
52	39.8	33.4	12	85.8	72.0	72	131.8	110.6	32	177.7	149.1	92	223.7	187.7
53	40.6	34.1	13	86.6	72.6	73	132.5	111.2	33	178.5	149.8	93	224.5	188.3
54	41.4	34.7	14	87.3	73.3	74	133.3	111.8	34	179.3	150.4	94	225.2	189.0
55	42.1	35.4	15	88.1	73.9	75	134.1	112.5	35	180.0	151.1	95	226.0	189.6
56	42.9	36.0	16	88.9	74.6	76	134.8	113.1	36	180.8	151.7	96	226.7	190.3
57	43.7	36.6	17	89.6	75.2	77	135.6	113.8	37	181.6	152.3	97	227.5	190.9
58	44.4	37.3	18	90.4	75.8	78	136.4	114.4	38	182.3	153.0	98	228.3	191.6
59	45.2	37.9	19	91.2	76.5	79	137.1	115.1	39	183.1	153.6	99	229.0	192.2
60	46.0	38.6	20	91.9	77.1	80	137.9	115.7	40	183.9	154.3	300	229.8	192.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

50° (130°, 230°, 310°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side. Adj.	Side Opp.

Difference of Latitude and Departure for 40° (140°, 220°, 320°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	230.6	193.5	361	276.5	232.1	421	322.5	270.6	481	368.5	309.2	541	414.4	347.7
02	231.3	194.1	62	277.3	232.7	22	323.3	271.3	82	369.2	309.8	42	415.2	348.4
03	232.1	194.8	63	278.1	233.3	23	324.0	271.9	83	370.0	310.5	43	416.0	349.0
04	232.9	195.4	64	278.8	234.0	24	324.8	272.5	84	370.8	311.1	44	416.7	349.7
05	233.6	196.1	65	279.6	234.6	25	325.6	273.2	85	371.5	311.8	45	417.5	350.3
06	234.4	196.7	66	280.4	235.3	26	326.3	273.8	86	372.3	312.4	46	418.3	351.0
07	235.2	197.3	67	281.1	235.9	27	327.1	274.5	87	373.1	313.0	47	419.0	351.6
08	235.9	198.0	68	281.9	236.5	28	327.9	275.1	88	373.8	313.7	48	419.8	352.2
09	236.7	198.6	69	282.7	237.2	29	328.6	275.8	89	374.6	314.3	49	420.6	352.9
10	237.5	199.3	70	283.4	237.8	30	329.4	276.4	90	375.4	315.0	50	421.3	353.5
311	238.2	199.9	371	284.2	238.5	431	330.2	277.0	491	376.1	315.6	551	422.1	354.2
12	239.0	200.5	72	285.0	239.1	32	330.9	277.7	92	376.9	316.3	52	422.9	354.8
13	239.8	201.2	73	285.7	239.8	33	331.7	278.3	93	377.7	316.9	53	423.6	355.5
14	240.5	201.8	74	286.5	240.4	34	332.5	279.0	94	378.4	317.5	54	424.4	356.1
15	241.3	202.5	75	287.3	241.0	35	333.2	279.6	95	379.2	318.2	55	425.2	356.7
16	242.1	203.1	76	288.0	241.7	36	334.0	280.3	96	380.0	318.8	56	425.9	357.4
17	242.8	203.8	77	288.8	242.3	37	334.8	280.9	97	380.7	319.5	57	426.7	358.0
18	243.6	204.4	78	289.6	243.0	38	335.5	281.5	98	381.5	320.1	58	427.5	358.7
19	244.4	205.0	79	290.3	243.6	39	336.3	282.2	99	382.3	320.8	59	428.2	359.3
20	245.1	205.7	80	291.1	244.3	40	337.1	282.8	500	383.0	321.4	60	429.0	360.0
321	245.9	206.3	381	291.9	244.9	441	337.8	283.5	501	383.8	322.0	561	429.8	360.6
22	246.7	207.0	82	292.6	245.5	42	338.6	284.1	02	384.6	322.7	62	430.5	361.2
23	247.4	207.6	83	293.4	246.2	43	339.4	284.8	03	385.3	323.3	63	431.3	361.9
24	248.2	208.3	84	294.2	246.8	44	340.1	285.4	04	386.1	324.0	64	432.0	362.5
25	249.0	208.9	85	294.9	247.5	45	340.9	286.0	05	386.9	324.6	65	432.8	363.2
26	249.7	209.5	86	295.7	248.1	46	341.7	286.7	06	387.6	325.3	66	433.6	363.8
27	250.5	210.2	87	296.5	248.8	47	342.4	287.3	07	388.4	325.9	67	434.3	364.5
28	251.3	210.8	88	297.2	249.4	48	343.2	288.0	08	389.2	326.5	68	435.1	365.1
29	252.0	211.5	89	298.0	250.0	49	344.0	288.6	09	389.9	327.2	69	435.9	365.7
30	252.8	212.1	90	298.8	250.7	50	344.7	289.3	10	390.7	327.8	70	436.6	366.4
331	253.6	212.8	391	299.5	251.3	451	345.5	289.9	511	391.4	328.5	571	437.4	367.0
32	254.3	213.4	92	300.3	252.0	52	346.3	290.5	12	392.2	329.1	72	438.2	367.7
33	255.1	214.0	93	301.1	252.6	53	347.0	291.2	13	393.0	329.8	73	438.9	368.3
34	255.9	214.7	94	301.8	253.3	54	347.8	291.8	14	393.7	330.4	74	439.7	369.0
35	256.6	215.3	95	302.6	253.9	55	348.6	292.5	15	394.5	331.0	75	440.5	369.6
36	257.4	216.0	96	303.4	254.5	56	349.3	293.1	16	395.3	331.7	76	441.2	370.2
37	258.2	216.6	97	304.1	255.2	57	350.1	293.8	17	396.0	332.3	77	442.0	370.9
38	258.9	217.3	98	304.9	255.8	58	350.8	294.4	18	396.8	333.0	78	442.8	371.5
39	259.7	217.9	99	305.7	256.5	59	351.6	295.0	19	397.6	333.6	79	443.5	372.2
40	260.5	218.5	400	306.4	257.1	60	352.4	295.7	20	398.3	334.2	80	444.3	372.8
341	261.2	219.2	401	307.2	257.8	461	353.1	296.3	521	399.1	334.9	581	445.1	373.5
42	262.0	219.8	02	307.9	258.4	62	353.9	297.0	22	399.9	335.5	82	445.8	374.1
43	262.8	220.5	03	308.7	259.0	63	354.7	297.6	23	400.6	336.2	83	446.6	374.7
44	263.5	221.1	04	309.5	259.7	64	355.4	298.3	24	401.4	336.8	84	447.4	375.4
45	264.3	221.8	05	310.2	260.3	65	356.2	298.9	25	402.2	337.5	85	448.1	376.0
46	265.1	222.4	06	311.0	261.0	66	357.0	299.5	26	402.9	338.1	86	448.9	376.7
47	265.8	223.0	07	311.8	261.6	67	357.7	300.2	27	403.7	338.7	87	449.7	377.3
48	266.6	223.7	08	312.5	262.3	68	358.5	300.8	28	404.5	339.4	88	450.4	378.0
49	267.3	224.3	09	313.3	262.9	69	359.3	301.5	29	405.2	340.0	89	451.2	378.6
50	268.1	225.0	10	314.1	263.5	70	360.0	302.1	30	406.0	340.7	90	452.0	379.2
351	268.9	225.6	411	314.8	264.2	471	360.8	302.8	531	406.8	341.3	591	452.7	379.9
52	269.6	226.3	12	315.6	264.8	72	361.6	303.4	32	407.5	342.0	92	453.5	380.5
53	270.4	226.9	13	316.4	265.5	73	362.3	304.0	33	408.3	342.6	93	454.3	381.2
54	271.2	227.5	14	317.1	266.1	74	363.1	304.7	34	409.1	343.2	94	455.0	381.8
55	271.9	228.2	15	317.9	266.8	75	363.9	305.3	35	409.8	343.9	95	455.8	382.5
56	272.7	228.8	16	318.7	267.4	76	364.6	306.0	36	410.6	344.5	96	456.6	383.1
57	273.5	229.5	17	319.4	268.0	77	365.4	306.6	37	411.4	345.2	97	457.3	383.7
58	274.2	230.1	18	320.2	268.7	78	366.2	307.3	38	412.1	345.8	98	458.1	384.4
59	275.0	230.8	19	321.0	269.3	79	366.9	307.9	39	412.9	346.5	99	458.9	385.0
60	275.8	231.4	20	321.7	270.0	80	367.7	308.5	40	413.7	347.1	600	459.6	385.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

50° (130°, 230°, 310°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 41° (139°, 221°, 319°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.8	0.7	61	46.0	40.0	121	91.3	79.4	181	136.6	118.7	241	181.9	158.1
2	1.5	1.3	62	46.8	40.7	22	92.1	80.0	82	137.4	119.4	42	182.6	158.8
3	2.3	2.0	63	47.5	41.3	23	92.8	80.7	83	138.1	120.1	43	183.4	159.4
4	3.0	2.6	64	48.3	42.0	24	93.6	81.4	84	138.9	120.7	44	184.1	160.1
5	3.8	3.3	65	49.1	42.6	25	94.3	82.0	85	139.6	121.4	45	184.9	160.7
6	4.5	3.9	66	49.8	43.3	26	95.1	82.7	86	140.4	122.0	46	185.7	161.4
7	5.3	4.6	67	50.6	44.0	27	95.8	83.3	87	141.1	122.7	47	186.4	162.0
8	6.0	5.2	68	51.3	44.6	28	96.6	84.0	88	141.9	123.3	48	187.2	162.7
9	6.8	5.9	69	52.1	45.3	29	97.4	84.6	89	142.6	124.0	49	187.9	163.4
10	7.5	6.6	70	52.8	45.9	30	98.1	85.3	90	143.4	124.7	50	188.7	164.0
11	8.3	7.2	71	53.6	46.6	131	98.9	85.9	191	144.1	125.3	251	189.4	164.7
12	9.1	7.9	72	54.3	47.2	32	99.6	86.6	92	144.9	126.0	52	190.2	165.3
13	9.8	8.5	73	55.1	47.9	33	100.4	87.3	93	145.7	126.6	53	190.9	166.0
14	10.6	9.2	74	55.8	48.5	34	101.1	87.9	94	146.4	127.3	54	191.7	166.6
15	11.3	9.8	75	56.6	49.2	35	101.9	88.6	95	147.2	127.9	55	192.5	167.3
16	12.1	10.5	76	57.4	49.9	36	102.6	89.2	96	147.9	128.6	56	193.2	168.0
17	12.8	11.2	77	58.1	50.5	37	103.4	89.9	97	148.7	129.2	57	194.0	168.6
18	13.6	11.8	78	58.9	51.2	38	104.1	90.5	98	149.4	129.9	58	194.7	169.3
19	14.3	12.5	79	59.6	51.8	39	104.9	91.2	99	150.2	130.6	59	195.5	169.9
20	15.1	13.1	80	60.4	52.5	40	105.7	91.8	200	150.9	131.2	60	196.2	170.6
21	15.8	13.8	81	61.1	53.1	141	106.4	92.5	201	151.7	131.9	261	197.0	171.2
22	16.6	14.4	82	61.9	53.8	42	107.2	93.2	02	152.5	132.5	62	197.7	171.9
23	17.4	15.1	83	62.6	54.5	43	107.9	93.8	03	153.2	133.2	63	198.5	172.5
24	18.1	15.7	84	63.4	55.1	44	108.7	94.5	04	154.0	133.8	64	199.2	173.2
25	18.9	16.4	85	64.2	55.8	45	109.4	95.1	05	154.7	134.5	65	200.0	173.9
26	19.6	17.1	86	64.9	56.4	46	110.2	95.8	06	155.5	135.1	66	200.8	174.5
27	20.4	17.7	87	65.7	57.1	47	110.9	96.4	07	156.2	135.8	67	201.5	175.2
28	21.1	18.4	88	66.4	57.7	48	111.7	97.1	08	157.0	136.5	68	202.3	175.8
29	21.9	19.0	89	67.2	58.4	49	112.5	97.8	09	157.7	137.1	69	203.0	176.5
30	22.6	19.7	90	67.9	59.0	50	113.2	98.4	10	158.5	137.8	70	203.8	177.1
31	23.4	20.3	91	68.7	59.7	151	114.0	99.1	211	159.2	138.4	271	204.5	177.8
32	24.2	21.0	92	69.4	60.4	52	114.7	99.7	12	160.0	139.1	72	205.3	178.4
33	24.9	21.6	93	70.2	61.0	53	115.5	100.4	13	160.8	139.7	73	206.0	179.1
34	25.7	22.3	94	70.9	61.7	54	116.2	101.0	14	161.5	140.4	74	206.8	179.8
35	26.4	23.0	95	71.7	62.3	55	117.0	101.7	15	162.3	141.1	75	207.5	180.4
36	27.2	23.6	96	72.5	63.0	56	117.7	102.3	16	163.0	141.7	76	208.3	181.1
37	27.9	24.3	97	73.2	63.6	57	118.5	103.0	17	163.8	142.4	77	209.1	181.7
38	28.7	24.9	98	74.0	64.3	58	119.2	103.7	18	164.5	143.0	78	209.8	182.4
39	29.4	25.6	99	74.7	64.9	59	120.0	104.3	19	165.3	143.7	79	210.6	183.0
40	30.2	26.2	100	75.5	65.6	60	120.8	105.0	20	166.0	144.3	80	211.3	183.7
41	30.9	26.9	101	76.2	66.3	161	121.5	105.6	221	166.8	145.0	281	212.1	184.4
42	31.7	27.6	02	77.0	66.9	62	122.3	106.3	22	167.5	145.6	82	212.8	185.0
43	32.5	28.2	03	77.7	67.6	63	123.0	106.9	23	168.3	146.3	83	213.6	185.7
44	33.2	28.9	04	78.5	68.2	64	123.8	107.6	24	169.1	147.0	84	214.3	186.3
45	34.0	29.5	05	79.2	68.9	65	124.5	108.2	25	169.8	147.6	85	215.1	187.0
46	34.7	30.2	06	80.0	69.5	66	125.3	108.9	26	170.6	148.3	86	215.8	187.6
47	35.5	30.8	07	80.8	70.2	67	126.0	109.6	27	171.3	148.9	87	216.6	188.3
48	36.2	31.5	08	81.5	70.9	68	126.8	110.2	28	172.1	149.6	88	217.4	188.9
49	37.0	32.1	09	82.3	71.5	69	127.5	110.9	29	172.8	150.2	89	218.1	189.6
50	37.7	32.8	10	83.0	72.2	70	128.3	111.5	30	173.6	150.9	90	218.9	190.3
51	38.5	33.5	111	83.8	72.8	171	129.1	112.2	231	174.3	151.5	291	219.6	190.9
52	39.2	34.1	12	84.5	73.5	72	129.8	112.8	32	175.1	152.2	92	220.4	191.6
53	40.0	34.8	13	85.3	74.1	73	130.6	113.5	33	175.8	152.9	93	221.1	192.2
54	40.8	35.4	14	86.0	74.8	74	131.3	114.2	34	176.6	153.5	94	221.9	192.9
55	41.5	36.1	15	86.8	75.4	75	132.1	114.8	35	177.4	154.2	95	222.6	193.5
56	42.3	36.7	16	87.5	76.1	76	132.8	115.5	36	178.1	154.8	96	223.4	194.2
57	43.0	37.4	17	88.3	76.8	77	133.6	116.1	37	178.9	155.5	97	224.1	194.8
58	43.8	38.1	18	89.1	77.4	78	134.3	116.8	38	179.6	156.1	98	224.9	195.5
59	44.5	38.7	19	89.8	78.1	79	135.1	117.4	39	180.4	156.8	99	225.7	196.2
60	45.3	39.4	20	90.6	78.7	80	135.8	118.1	40	181.1	157.5	300	226.4	196.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

49° (131°, 229°, 311°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Middle Latitude Sailing.	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In Mercator Sailing.		*m*	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

Difference of Latitude and Departure for 41° (139°, 221°, 319°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	227.2	197.5	361	272.5	236.8	421	317.7	276.2	481	363.0	315.6	541	408.3	354.9
02	227.9	198.1	62	273.2	237.5	22	318.5	276.9	82	363.8	316.2	42	409.1	355.6
03	228.7	198.8	63	274.0	238.1	23	319.2	277.5	83	364.5	316.9	43	409.8	356.2
04	229.4	199.4	64	274.7	238.8	24	320.0	278.2	84	365.3	317.5	44	410.6	356.9
05	230.2	200.1	65	275.5	239.5	25	320.8	278.8	85	366.0	318.2	45	411.3	357.6
06	230.9	200.8	66	276.2	240.1	26	321.5	279.5	86	366.8	318.8	46	412.1	358.2
07	231.7	201.4	67	277.0	240.8	27	322.3	280.1	87	367.5	319.5	47	412.8	358.9
08	232.5	202.1	68	277.7	241.4	28	323.0	280.8	88	368.3	320.2	48	413.6	359.5
09	233.2	202.7	69	278.5	242.1	29	323.8	281.4	89	369.1	320.8	49	414.3	360.2
10	234.0	203.4	70	279.2	242.7	30	324.5	282.1	90	369.8	321.5	50	415.1	360.8
311	234.7	204.0	371	280.0	243.4	431	325.3	282.8	491	370.6	322.1	551	415.8	361.5
12	235.5	204.7	72	280.8	244.1	32	326.0	283.4	92	371.3	322.8	52	416.6	362.1
13	236.2	205.3	73	281.5	244.7	33	326.8	284.1	93	372.1	323.4	53	417.4	362.8
14	237.0	206.0	74	282.3	245.4	34	327.5	284.7	94	372.8	324.1	54	418.1	363.5
15	237.7	206.7	75	283.0	246.0	35	328.3	285.4	95	373.6	324.7	55	418.9	364.1
16	238.5	207.3	76	283.8	246.7	36	329.1	286.0	96	374.3	325.4	56	419.6	364.8
17	239.2	208.0	77	284.5	247.3	37	329.8	286.7	97	375.1	326.1	57	420.4	365.4
18	240.0	208.6	78	285.3	248.0	38	330.6	287.4	98	375.8	326.7	58	421.1	366.1
19	240.8	209.3	79	286.0	248.6	39	331.3	288.0	99	376.6	327.4	59	421.9	366.7
20	241.5	209.9	80	286.8	249.3	40	332.1	288.7	500	377.4	328.0	60	422.6	367.4
321	242.3	210.6	381	287.5	250.0	441	332.8	289.3	501	378.1	328.7	561	423.4	368.0
22	243.0	211.3	82	288.3	250.6	42	333.6	290.0	02	378.9	329.3	62	424.1	368.7
23	243.8	211.9	83	289.1	251.3	43	334.3	290.6	03	379.6	330.0	63	424.9	369.4
24	244.5	212.6	84	289.8	251.9	44	335.1	291.3	04	380.4	330.7	64	425.7	370.0
25	245.3	213.2	85	290.6	252.6	45	335.8	291.9	05	381.1	331.3	65	426.4	370.7
26	246.0	213.9	86	291.3	253.2	46	336.6	292.6	06	381.9	332.0	66	427.2	371.3
27	246.8	214.5	87	292.1	253.9	47	337.4	293.3	07	382.6	332.6	67	427.9	372.0
28	247.5	215.2	88	292.8	254.6	48	338.1	293.9	08	383.4	333.3	68	428.7	372.6
29	248.3	215.8	89	293.6	255.2	49	338.9	294.6	09	384.1	333.9	69	429.4	373.3
30	249.1	216.5	90	294.3	255.9	50	339.6	295.2	10	384.9	334.6	70	430.2	374.0
331	249.8	217.2	391	295.1	256.5	451	340.4	295.9	511	385.7	335.2	571	430.9	374.6
32	250.6	217.8	92	295.8	257.2	52	341.1	296.5	12	386.4	335.9	72	431.7	375.3
33	251.3	218.5	93	296.6	257.8	53	341.9	297.2	13	387.2	336.6	73	432.4	375.9
34	252.1	219.1	94	297.4	258.5	54	342.6	297.9	14	387.9	337.2	74	433.2	376.6
35	252.8	219.8	95	298.1	259.1	55	343.4	298.5	15	388.7	337.9	75	434.0	377.2
36	253.6	220.4	96	298.9	259.8	56	344.1	299.2	16	389.4	338.5	76	434.7	377.9
37	254.3	221.1	97	299.6	260.5	57	344.9	299.8	17	390.2	339.2	77	435.5	378.5
38	255.1	221.7	98	300.4	261.1	58	345.7	300.5	18	390.9	339.8	78	436.2	379.2
39	255.8	222.4	99	301.1	261.8	59	346.4	301.1	19	391.7	340.5	79	437.0	379.9
40	256.6	223.1	400	301.9	262.4	60	347.2	301.8	20	392.4	341.2	80	437.7	380.5
341	257.4	223.7	401	302.6	263.1	461	347.9	302.4	521	393.2	341.8	581	438.5	381.2
42	258.1	224.4	02	303.4	263.7	62	348.7	303.1	22	394.0	342.5	82	439.2	381.8
43	258.9	225.0	03	304.1	264.4	63	349.4	303.8	23	394.7	343.1	83	440.0	382.5
44	259.6	225.7	04	304.9	265.0	64	350.2	304.4	24	395.5	343.8	84	440.8	383.1
45	260.4	226.3	05	305.7	265.7	65	350.9	305.1	25	396.2	344.4	85	441.5	383.8
46	261.1	227.0	06	306.4	266.4	66	351.7	305.7	26	397.0	345.1	86	442.3	384.5
47	261.9	227.7	07	307.2	267.0	67	352.4	306.4	27	397.7	345.7	87	443.0	385.1
48	262.6	228.3	08	307.9	267.7	68	353.2	307.0	28	398.5	346.4	88	443.8	385.8
49	263.4	229.0	09	308.7	268.3	69	354.0	307.7	29	399.2	347.1	89	444.5	386.4
50	264.1	229.6	10	309.4	269.0	70	354.7	308.3	30	400.0	347.7	90	445.3	387.1
351	264.9	230.3	411	310.2	269.6	471	355.5	309.0	531	400.8	348.4	591	446.0	387.7
52	265.7	230.9	12	310.9	270.3	72	356.2	309.7	32	401.5	349.0	92	446.8	388.4
53	266.4	231.6	13	311.7	271.0	73	357.0	310.3	33	402.3	349.7	93	447.5	389.0
54	267.2	232.2	14	312.4	271.6	74	357.7	311.0	34	403.0	350.3	94	448.3	389.7
55	267.9	232.9	15	313.2	272.3	75	358.5	311.6	35	403.8	351.0	95	449.1	390.4
56	268.7	233.6	16	314.0	272.9	76	359.2	312.3	36	404.5	351.6	96	449.8	391.0
57	269.4	234.2	17	314.7	273.6	77	360.0	312.9	37	405.3	352.3	97	450.6	391.7
58	270.2	234.9	18	315.5	274.2	78	360.8	313.6	38	406.0	353.0	98	451.3	392.3
59	270.9	235.5	19	316.2	274.9	79	361.5	314.3	39	406.8	353.6	99	452.1	393.0
60	271.7	236.2	20	317.0	275.5	80	362.3	314.9	40	407.5	354.3	600	452.8	393.6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

49° (131°, 229°, 311°).

In Plane Sailing.	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 42° (138°, 222°, 318°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.7	0.7	61	45.3	40.8	121	89.9	81.0	181	134.5	121.1	241	179.1	161.3
2	1.5	1.3	62	46.1	41.5	22	90.7	81.6	82	135.3	121.8	42	179.8	161.9
3	2.2	2.0	63	46.8	42.2	23	91.4	82.3	83	136.0	122.5	43	180.6	162.6
4	3.0	2.7	64	47.6	42.8	24	92.1	83.0	84	136.7	123.1	44	181.3	163.3
5	3.7	3.3	65	48.3	43.5	25	92.9	83.6	85	137.5	123.8	45	182.1	163.9
6	4.5	4.0	66	49.0	44.2	26	93.6	84.3	86	138.2	124.5	46	182.8	164.6
7	5.2	4.7	67	49.8	44.8	27	94.4	85.0	87	139.0	125.1	47	183.6	165.3
8	5.9	5.4	68	50.5	45.5	28	95.1	85.6	88	139.7	125.8	48	184.3	165.9
9	6.7	6.0	69	51.3	46.2	29	95.9	86.3	89	140.5	126.5	49	185.0	166.6
10	7.4	6.7	70	52.0	46.8	30	96.6	87.0	90	141.2	127.1	50	185.8	167.3
11	8.2	7.4	71	52.8	47.5	131	97.4	87.7	191	141.9	127.8	251	186.5	168.0
12	8.9	8.0	72	53.5	48.2	32	98.1	88.3	92	142.7	128.5	52	187.3	168.6
13	9.7	8.7	73	54.2	48.8	33	98.8	89.0	93	143.4	129.1	53	188.0	169.3
14	10.4	9.4	74	55.0	49.5	34	99.6	89.7	94	144.2	129.8	54	188.8	170.0
15	11.1	10.0	75	55.7	50.2	35	100.3	90.3	95	144.9	130.5	55	189.5	170.6
16	11.9	10.7	76	56.5	50.9	36	101.1	91.0	96	145.7	131.1	56	190.2	171.3
17	12.6	11.4	77	57.2	51.5	37	101.8	91.7	97	146.4	131.8	57	191.0	172.0
18	13.4	12.0	78	58.0	52.2	38	102.6	92.3	98	147.1	132.5	58	191.7	172.6
19	14.1	12.7	79	58.7	52.9	39	103.3	93.0	99	147.9	133.2	59	192.5	173.3
20	14.9	13.4	80	59.5	53.5	40	104.0	93.7	200	148.6	133.8	60	193.2	174.0
21	15.6	14.1	81	60.2	54.2	141	104.8	94.3	201	149.4	134.5	261	194.0	174.6
22	16.3	14.7	82	60.9	54.9	42	105.5	95.0	02	150.1	135.2	62	194.7	175.3
23	17.1	15.4	83	61.7	55.5	43	106.3	95.7	03	150.9	135.8	63	195.4	176.0
24	17.8	16.1	84	62.4	56.2	44	107.0	96.4	04	151.6	136.5	64	196.2	176.7
25	18.6	16.7	85	63.2	56.9	45	107.8	97.0	05	152.3	137.2	65	196.9	177.3
26	19.3	17.4	86	63.9	57.5	46	108.5	97.7	06	153.1	137.8	66	197.7	178.0
27	20.1	18.1	87	64.7	58.2	47	109.2	98.4	07	153.8	138.5	67	198.4	178.7
28	20.8	18.7	88	65.4	58.9	48	110.0	99.0	08	154.6	139.2	68	199.2	179.3
29	21.6	19.4	89	66.1	59.6	49	110.7	99.7	09	155.3	139.8	69	199.9	180.0
30	22.3	20.1	90	66.9	60.2	50	111.5	100.4	10	156.1	140.5	70	200.6	180.7
31	23.0	20.7	91	67.6	60.9	151	112.2	101.0	211	156.8	141.2	271	201.4	181.3
32	23.8	21.4	92	68.4	61.6	52	113.0	101.7	12	157.5	141.9	72	202.1	182.0
33	24.5	22.1	93	69.1	62.2	53	113.7	102.4	13	158.3	142.5	73	202.9	182.7
34	25.3	22.8	94	69.9	62.9	54	114.4	103.0	14	159.0	143.2	74	203.6	183.3
35	26.0	23.4	95	70.6	63.6	55	115.2	103.7	15	159.8	143.9	75	204.4	184.0
36	26.8	24.1	96	71.3	64.2	56	115.9	104.4	16	160.5	144.5	76	205.1	184.7
37	27.5	24.8	97	72.1	64.9	57	116.7	105.1	17	161.3	145.2	77	205.9	185.3
38	28.2	25.4	98	72.8	65.6	58	117.4	105.7	18	162.0	145.9	78	206.6	186.0
39	29.0	26.1	99	73.6	66.2	59	118.2	106.4	19	162.7	146.5	79	207.3	186.7
40	29.7	26.8	100	74.3	66.9	60	118.9	107.1	20	163.5	147.2	80	208.1	187.4
41	30.5	27.4	101	75.1	67.6	161	119.6	107.7	221	164.2	147.9	281	208.8	188.0
42	31.2	28.1	02	75.8	68.3	62	120.4	108.4	22	165.0	148.5	82	209.6	188.7
43	32.0	28.8	03	76.5	68.9	63	121.1	109.1	23	165.7	149.2	83	210.3	189.4
44	32.7	29.4	04	77.3	69.6	64	121.9	109.7	24	166.5	149.9	84	211.1	190.0
45	33.4	30.1	05	78.0	70.3	65	122.6	110.4	25	167.2	150.6	85	211.8	190.7
46	34.2	30.8	06	78.8	70.9	66	123.4	111.1	26	168.0	151.2	86	212.5	191.4
47	34.9	31.4	07	79.5	71.6	67	124.1	111.7	27	168.7	151.9	87	213.3	192.0
48	35.7	32.1	08	80.3	72.3	68	124.8	112.4	28	169.4	152.6	88	214.0	192.7
49	36.4	32.8	09	81.0	72.9	69	125.6	113.1	29	170.2	153.2	89	214.8	193.4
50	37.2	33.5	10	81.7	73.6	70	126.3	113.8	30	170.9	153.9	90	215.5	194.0
51	37.9	34.1	111	82.5	74.3	171	127.1	114.4	231	171.7	154.6	291	216.3	194.7
52	38.6	34.8	12	83.2	74.9	72	127.8	115.1	32	172.4	155.2	92	217.0	195.4
53	39.4	35.5	13	84.0	75.6	73	128.6	115.8	33	173.2	155.9	93	217.7	196.1
54	40.1	36.1	14	84.7	76.3	74	129.3	116.4	34	173.9	156.6	94	218.5	196.7
55	40.9	36.8	15	85.5	77.0	75	130.1	117.1	35	174.6	157.2	95	219.2	197.4
56	41.6	37.5	16	86.2	77.6	76	130.8	117.8	36	175.4	157.9	96	220.0	198.1
57	42.4	38.1	17	86.9	78.3	77	131.5	118.4	37	176.1	158.6	97	220.7	198.7
58	43.1	38.8	18	87.7	79.0	78	132.3	119.1	38	176.9	159.3	98	221.5	199.4
59	43.8	39.5	19	88.4	79.6	79	133.0	119.8	39	177.6	159.9	99	222.2	200.1
60	44.6	40.1	20	89.2	80.3	80	133.8	120.4	40	178.4	160.6	300	222.9	200.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

48° (132°, 228°, 312).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 42° (138°, 222°, 318°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	223.7	201.4	361	268.3	241.6	421	312.9	281.7	481	357.5	321.9	541	402.0	362.0
02	224.4	202.1	62	269.0	242.2	22	313.6	282.4	82	358.2	322.5	42	402.8	362.7
03	225.2	202.7	63	269.8	242.9	23	314.4	283.0	83	358.9	323.2	43	403.5	363.3
04	225.9	203.4	64	270.5	243.6	24	315.1	283.7	84	359.7	323.9	44	404.3	364.0
05	226.7	204.1	65	271.2	244.2	25	315.8	284.4	85	360.4	324.5	45	405.0	364.7
06	227.4	204.8	66	272.0	244.9	26	316.6	285.1	86	361.2	325.2	46	405.8	365.3
07	228.1	205.4	67	272.7	245.6	27	317.3	285.7	87	361.9	325.9	47	406.5	366.0
08	228.9	206.1	68	273.5	246.2	28	318.1	286.4	88	362.7	326.5	48	407.2	366.7
09	229.6	206.8	69	274.2	246.9	29	318.8	287.1	89	363.4	327.2	49	408.0	367.4
10	230.4	207.4	70	275.0	247.6	30	319.6	287.7	90	364.1	327.9	50	408.7	368.0
311	231.1	208.1	371	275.7	248.2	431	320.3	288.4	491	364.9	328.5	551	409.5	368.7
12	231.9	208.8	72	276.4	248.9	32	321.0	289.1	92	365.6	329.2	52	410.2	369.4
13	232.6	209.4	73	277.2	249.6	33	321.8	289.7	93	366.4	329.9	53	411.0	370.0
14	233.3	210.1	74	277.9	250.3	34	322.5	290.4	94	367.1	330.6	54	411.7	370.7
15	234.1	210.8	75	278.7	250.9	35	323.3	291.1	95	367.9	331.2	55	412.4	371.4
16	234.8	211.4	76	279.4	251.6	36	324.0	291.7	96	368.6	331.9	56	413.2	372.0
17	235.6	212.1	77	280.2	252.3	37	324.8	292.4	97	369.3	332.6	57	413.9	372.7
18	236.3	212.8	78	280.9	252.9	38	325.5	293.1	98	370.1	333.2	58	414.7	373.4
19	237.1	213.5	79	281.7	253.6	39	326.2	293.7	99	370.8	333.9	59	415.4	374.0
20	237.8	214.1	80	282.4	254.3	40	327.0	294.4	500	371.6	334.6	60	416.2	374.7
321	238.5	214.8	381	283.1	254.9	441	327.7	295.1	501	372.3	335.2	561	416.9	375.4
22	239.3	215.5	82	283.9	255.6	42	328.5	295.8	02	373.1	335.9	62	417.6	376.1
23	240.0	216.1	83	284.6	256.3	43	329.2	296.4	03	373.8	336.6	63	418.4	376.7
24	240.8	216.8	84	285.4	256.9	44	330.0	297.1	04	374.5	337.2	64	419.1	377.4
25	241.5	217.5	85	286.1	257.6	45	330.7	297.8	05	375.3	337.9	65	419.9	378.1
26	242.3	218.1	86	286.9	258.3	46	331.4	298.4	06	376.0	338.6	66	420.6	378.7
27	243.0	218.8	87	287.6	259.0	47	332.2	299.1	07	376.8	339.2	67	421.4	379.4
28	243.8	219.5	88	288.3	259.6	48	332.9	299.8	08	377.5	339.9	68	422.1	380.1
29	244.5	220.1	89	289.1	260.3	49	333.7	300.4	09	378.3	340.6	69	422.8	380.7
30	245.2	220.8	90	289.8	261.0	50	334.4	301.1	10	379.0	341.3	70	423.6	381.4
331	246.0	221.5	391	290.6	261.6	451	335.2	301.8	511	379.7	341.9	571	424.3	382.1
32	246.7	222.2	92	291.3	262.3	52	335.9	302.4	12	380.5	342.6	72	425.1	382.7
33	247.5	222.8	93	292.1	263.0	53	336.6	303.1	13	381.2	343.3	73	425.8	383.4
34	248.2	223.5	94	292.8	263.6	54	337.4	303.8	14	382.0	343.9	74	426.6	384.1
35	249.0	224.2	95	293.5	264.3	55	338.1	304.5	15	382.7	344.6	75	427.3	384.8
36	249.7	224.8	96	294.3	265.0	56	338.9	305.1	16	383.5	345.3	76	428.1	385.4
37	250.4	225.5	97	295.0	265.6	57	339.6	305.8	17	384.2	345.9	77	428.8	386.1
38	251.2	226.2	98	295.8	266.3	58	340.4	306.5	18	384.9	346.6	78	429.5	386.8
39	251.9	226.8	99	296.5	267.0	59	341.1	307.1	19	385.7	347.3	79	430.3	387.4
40	252.7	227.5	400	297.3	267.7	60	341.8	307.8	20	386.4	347.9	80	431.0	388.1
341	253.4	228.2	401	298.0	268.3	461	342.6	308.5	521	387.2	348.6	581	431.8	388.8
42	254.2	228.8	02	298.7	269.0	62	343.3	309.1	22	387.9	349.3	82	432.5	389.4
43	254.9	229.5	03	299.5	269.7	63	344.1	309.8	23	388.7	350.0	83	433.3	390.1
44	255.6	230.2	04	300.2	270.3	64	344.8	310.5	24	389.4	350.6	84	434.0	390.8
45	256.4	230.9	05	301.0	271.0	65	345.6	311.1	25	390.2	351.3	85	434.7	391.4
46	257.1	231.5	06	301.7	271.7	66	346.3	311.8	26	390.9	352.0	86	435.5	392.1
47	257.9	232.2	07	302.5	272.3	67	347.0	312.5	27	391.6	352.6	87	436.2	392.8
48	258.6	232.9	08	303.2	273.0	68	347.8	313.2	28	392.4	353.3	88	437.0	393.4
49	259.4	233.5	09	303.9	273.7	69	348.5	313.8	29	393.1	354.0	89	437.7	394.1
50	260.1	234.2	10	304.7	274.3	70	349.3	314.5	30	393.9	354.6	90	438.5	394.8
351	260.8	234.9	411	305.4	275.0	471	350.0	315.2	531	394.6	355.3	591	439.2	395.5
52	261.6	235.5	12	306.2	275.7	72	350.8	315.8	32	395.4	356.0	92	439.9	396.1
53	262.3	236.2	13	306.9	276.4	73	351.5	316.5	33	396.1	356.6	93	440.7	396.8
54	263.1	236.9	14	307.7	277.0	74	352.3	317.2	34	396.8	357.3	94	441.4	397.5
55	263.8	237.5	15	308.4	277.7	75	353.0	317.8	35	397.6	358.0	95	442.2	398.1
56	264.6	238.2	16	309.1	278.4	76	353.7	318.5	36	398.3	358.7	96	442.9	398.8
57	265.3	238.9	17	309.9	279.0	77	354.5	319.2	37	399.1	359.3	97	443.7	399.5
58	266.0	239.5	18	310.6	279.7	78	355.2	319.8	38	399.8	360.0	98	444.4	400.1
59	266.8	240.2	19	311.4	280.4	79	356.0	320.5	39	400.6	360.7	99	445.1	400.8
60	267.5	240.9	20	312.1	281.0	80	356.7	321.2	40	401.3	361.3	600	445.9	401.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

48° (132°, 228°, 312°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 43° (137°, 223°, 317°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.7	0.7	61	44.6	41.6	121	88.5	82.5	181	132.4	123.4	241	176.3	164.4
2	1.5	1.4	62	45.3	42.3	22	89.2	83.2	82	133.1	124.1	42	177.0	165.0
3	2.2	2.0	63	46.1	43.0	23	90.0	83.9	83	133.8	124.8	43	177.7	165.7
4	2.9	2.7	64	46.8	43.6	24	90.7	84.6	84	134.6	125.5	44	178.5	166.4
5	3.7	3.4	65	47.5	44.3	25	91.4	85.2	85	135.3	126.2	45	179.2	167.1
6	4.4	4.1	66	48.3	45.0	26	92.2	85.9	86	136.0	126.9	46	179.9	167.8
7	5.1	4.8	67	49.0	45.7	27	92.9	86.6	87	136.8	127.5	47	180.6	168.5
8	5.9	5.5	68	49.7	46.4	28	93.6	87.3	88	137.5	128.2	48	181.4	169.1
9	6.6	6.1	69	50.5	47.1	29	94.3	88.0	89	138.2	128.9	49	182.1	169.8
10	7.3	6.8	70	51.2	47.7	30	95.1	88.7	90	139.0	129.6	50	182.8	170.5
11	8.0	7.5	71	51.9	48.4	131	95.8	89.3	191	139.7	130.3	251	183.6	171.2
12	8.8	8.2	72	52.7	49.1	32	96.5	90.0	92	140.4	130.9	52	184.3	171.9
13	9.5	8.9	73	53.4	49.8	33	97.3	90.7	93	141.2	131.6	53	185.0	172.5
14	10.2	9.5	74	54.1	50.5	34	98.0	91.4	94	141.9	132.3	54	185.8	173.2
15	11.0	10.2	75	54.9	51.1	35	98.7	92.1	95	142.6	133.0	55	186.5	173.9
16	11.7	10.9	76	55.6	51.8	36	99.5	92.8	96	143.3	133.7	56	187.2	174.6
17	12.4	11.6	77	56.3	52.5	37	100.2	93.4	97	144.1	134.4	57	188.0	175.3
18	13.2	12.3	78	57.0	53.2	38	100.9	94.1	98	144.8	135.0	58	188.7	176.0
19	13.9	13.0	79	57.8	53.9	39	101.7	94.8	99	145.5	135.7	59	189.4	176.6
20	14.6	13.6	80	58.5	54.6	40	102.4	95.5	200	146.3	136.4	60	190.2	177.3
21	15.4	14.3	81	59.2	55.2	141	103.1	96.2	201	147.0	137.1	261	190.9	178.0
22	16.1	15.0	82	60.0	55.9	42	103.9	96.8	02	147.7	137.8	62	191.6	178.7
23	16.8	15.7	83	60.7	56.6	43	104.6	97.5	03	148.5	138.4	63	192.3	179.4
24	17.6	16.4	84	61.4	57.3	44	105.3	98.2	04	149.2	139.1	64	193.1	180.0
25	18.3	17.0	85	62.2	58.0	45	106.0	98.9	05	149.9	139.8	65	193.8	180.7
26	19.0	17.7	86	62.9	58.7	46	106.8	99.6	06	150.7	140.5	66	194.5	181.4
27	19.7	18.4	87	63.6	59.3	47	107.5	100.3	07	151.4	141.2	67	195.3	182.1
28	20.5	19.1	88	64.4	60.0	48	108.2	100.9	08	152.1	141.9	68	196.0	182.8
29	21.2	19.8	89	65.1	60.7	49	109.0	101.6	09	152.9	142.5	69	196.7	183.5
30	21.9	20.5	90	65.8	61.4	50	109.7	102.3	10	153.6	143.2	70	197.5	184.1
31	22.7	21.1	91	66.6	62.1	151	110.4	103.0	211	154.3	143.9	271	198.2	184.8
32	23.4	21.8	92	67.3	62.7	52	111.2	103.7	12	155.0	144.6	72	198.9	185.5
33	24.1	22.5	93	68.0	63.4	53	111.9	104.3	13	155.8	145.3	73	199.7	186.2
34	24.9	23.2	94	68.7	64.1	54	112.6	105.0	14	156.5	145.9	74	200.4	186.9
35	25.6	23.9	95	69.5	64.8	55	113.4	105.7	15	157.2	146.6	75	201.1	187.5
36	26.3	24.6	96	70.2	65.5	56	114.1	106.4	16	158.0	147.3	76	201.9	188.2
37	27.1	25.2	97	70.9	66.2	57	114.8	107.1	17	158.7	148.0	77	202.6	188.9
38	27.8	25.9	98	71.7	66.8	58	115.6	107.8	18	159.4	148.7	78	203.3	189.6
39	28.5	26.6	99	72.4	67.5	59	116.3	108.4	19	160.2	149.4	79	204.0	190.3
40	29.3	27.3	100	73.1	68.2	60	117.0	109.1	20	160.9	150.0	80	204.8	191.0
41	30.0	28.0	101	73.9	68.9	161	117.7	109.8	221	161.6	150.7	281	205.5	191.6
42	30.7	28.6	02	74.6	69.6	62	118.5	110.5	22	162.4	151.4	82	206.2	192.3
43	31.4	29.3	03	75.3	70.2	63	119.2	111.2	23	163.1	152.1	83	207.0	193.0
44	32.2	30.0	04	76.1	70.9	64	119.9	111.8	24	163.8	152.8	84	207.7	193.7
45	32.9	30.7	05	76.8	71.6	65	120.7	112.5	25	164.6	153.4	85	208.4	194.4
46	33.6	31.4	06	77.5	72.3	66	121.4	113.2	26	165.3	154.1	86	209.2	195.1
47	34.4	32.1	07	78.3	73.0	67	122.1	113.9	27	166.0	154.8	87	209.9	195.7
48	35.1	32.7	08	79.0	73.7	68	122.9	114.6	28	166.7	155.5	88	210.6	196.4
49	35.8	33.4	09	79.7	74.3	69	123.6	115.3	29	167.5	156.2	89	211.4	197.1
50	36.6	34.1	10	80.4	75.0	70	124.3	115.9	30	168.2	156.9	90	212.1	197.8
51	37.3	34.8	111	81.2	75.7	171	125.1	116.6	231	168.9	157.5	291	212.8	198.5
52	38.0	35.5	12	81.9	76.4	72	125.8	117.3	32	169.7	158.2	92	213.6	199.1
53	38.8	36.1	13	82.6	77.1	73	126.5	118.0	33	170.4	158.9	93	214.3	199.8
54	39.5	36.8	14	83.4	77.7	74	127.3	118.7	34	171.1	159.6	94	215.0	200.5
55	40.2	37.5	15	84.1	78.4	75	128.0	119.3	35	171.9	160.3	95	215.7	201.2
56	41.0	38.2	16	84.8	79.1	76	128.7	120.0	36	172.6	161.0	96	216.5	201.9
57	41.7	38.9	17	85.6	79.8	77	129.4	120.7	37	173.3	161.6	97	217.2	202.6
58	42.4	39.6	18	86.3	80.5	78	130.2	121.4	38	174.1	162.3	98	217.9	203.2
59	43.1	40.2	19	87.0	81.2	79	130.9	122.1	39	174.8	163.0	99	218.7	203.9
60	43.9	40.9	20	87.8	81.8	80	131.6	122.8	40	175.5	163.7	300	219.4	204.6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

47° (133°, 227°, 313°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. Hypotenuse.	N×Cos. Side Adj.	N×Sin. Side Opp.

Difference of Latitude and Departure for 43° (137°, 223°, 317°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	220.1	205.3	361	264.0	246.2	421	307.9	287.1	481	351.8	328.1	541	395.7	369.0
02	220.9	206.0	62	264.8	246.9	22	308.6	287.8	82	352.5	328.7	42	396.4	369.6
03	221.6	206.6	63	265.5	247.6	23	309.4	288.5	83	353.2	329.4	43	397.1	370.3
04	222.3	207.3	64	266.2	248.2	24	310.1	289.2	84	354.0	330.1	44	397.9	371.0
05	223.1	208.0	65	266.9	248.9	25	310.8	289.8	85	354.7	330.8	45	398.6	371.7
06	223.8	208.7	66	267.7	249.6	26	311.6	290.5	86	355.4	331.5	46	399.3	372.4
07	224.5	209.4	67	268.4	250.3	27	312.3	291.2	87	356.2	332.1	47	400.1	373.1
08	225.3	210.1	68	269.1	251.0	28	313.0	291.9	88	356.9	332.8	48	400.8	373.7
09	226.0	210.7	69	269.9	251.7	29	313.8	292.6	89	357.6	333.5	49	401.5	374.4
10	226.7	211.4	70	270.6	252.3	30	314.5	293.3	90	358.4	334.2	50	402.2	375.1
311	227.5	212.1	371	271.3	253.0	431	315.2	293.9	491	359.1	334.9	551	403.0	375.8
12	228.2	212.8	72	272.1	253.7	32	315.9	294.6	92	359.8	335.5	52	403.7	376.5
13	228.9	213.5	73	272.8	254.4	33	316.7	295.3	93	360.6	336.2	53	404.4	377.1
14	229.6	214.1	74	273.5	255.1	34	317.4	296.0	94	361.3	336.9	54	405.2	377.8
15	230.4	214.8	75	274.3	255.7	35	318.1	296.7	95	362.0	337.6	55	405.9	378.5
16	231.1	215.5	76	275.0	256.4	36	318.9	297.4	96	362.8	338.3	56	406.6	379.2
17	231.8	216.2	77	275.7	257.1	37	319.6	298.0	97	363.5	339.0	57	407.4	379.9
18	232.6	216.9	78	276.5	257.8	38	320.3	298.7	98	364.2	339.6	58	408.1	380.6
19	233.3	217.6	79	277.2	258.5	39	321.1	299.4	99	364.9	340.3	59	408.8	381.2
20	234.0	218.2	80	277.9	259.2	40	321.8	300.1	500	365.7	341.0	60	409.6	381.9
321	234.8	218.9	381	278.6	259.8	441	322.5	300.8	501	366.4	341.7	561	410.3	382.6
22	235.5	219.6	82	279.4	260.5	42	323.3	301.4	02	367.1	342.4	62	411.0	383.3
23	236.2	220.3	83	280.1	261.2	43	324.0	302.1	03	367.9	343.0	63	411.8	384.0
24	237.0	221.0	84	280.8	261.9	44	324.7	302.8	04	368.6	343.7	64	412.5	384.6
25	237.7	221.6	85	281.6	262.6	45	325.5	303.5	05	369.3	344.4	65	413.2	385.3
26	238.4	222.3	86	282.3	263.3	46	326.2	304.2	06	370.1	345.1	66	413.9	386.0
27	239.2	223.0	87	283.0	263.9	47	326.9	304.9	07	370.8	345.8	67	414.7	386.7
28	239.9	223.7	88	283.8	264.6	48	327.6	305.5	08	371.5	346.5	68	415.4	387.4
29	240.6	224.4	89	284.5	265.3	49	328.4	306.2	09	372.3	347.1	69	416.1	388.1
30	241.3	225.1	90	285.2	266.0	50	329.1	306.9	10	373.0	347.8	70	416.9	388.7
331	242.1	225.7	391	286.0	266.7	451	329.9	307.6	511	373.7	348.5	571	417.6	389.4
32	242.8	226.4	92	286.7	267.3	52	330.6	308.3	12	374.5	349.2	72	418.3	390.1
33	243.5	227.1	93	287.4	268.0	53	331.3	308.9	13	375.2	349.9	73	419.1	390.8
34	244.3	227.8	94	288.2	268.7	54	332.0	309.6	14	375.9	350.5	74	419.8	391.5
35	245.0	228.5	95	288.9	269.4	55	332.8	310.3	15	376.6	351.2	75	420.5	392.1
36	245.7	229.2	96	289.6	270.1	56	333.5	311.0	16	377.4	351.9	76	421.3	392.8
37	246.5	229.8	97	290.3	270.8	57	334.2	311.7	17	378.1	352.6	77	422.0	393.5
38	247.2	230.5	98	291.1	271.4	58	335.0	312.4	18	378.8	353.3	78	422.7	394.2
39	247.9	231.2	99	291.8	272.1	59	335.7	313.0	19	379.6	354.0	79	423.5	394.9
40	248.7	231.9	400	292.5	272.8	60	336.4	313.7	20	380.3	354.6	80	424.2	395.6
341	249.4	232.6	401	293.3	273.5	461	337.2	314.4	521	381.0	355.3	581	424.9	396.2
42	250.1	233.2	02	294.0	274.2	62	337.9	315.1	22	381.8	356.0	82	425.6	396.9
43	250.9	233.9	03	294.7	274.8	63	338.6	315.8	23	382.5	356.7	83	426.4	397.6
44	251.6	234.6	04	295.5	275.5	64	339.3	316.4	24	383.2	357.4	84	427.1	398.3
45	252.3	235.3	05	296.2	276.2	65	340.1	317.1	25	384.0	358.0	85	427.8	399.0
46	253.0	236.0	06	296.9	276.9	66	340.8	317.8	26	384.7	358.7	86	428.6	399.7
47	253.8	236.7	07	297.7	277.6	67	341.5	318.5	27	385.4	359.4	87	429.3	400.3
48	254.5	237.3	08	298.4	278.3	68	342.3	319.2	28	386.2	360.1	88	430.0	401.0
49	255.2	238.0	09	299.1	278.9	69	343.0	319.9	29	386.9	360.8	89	430.8	401.7
50	256.0	238.7	10	299.9	279.6	70	343.7	320.5	30	387.6	361.5	90	431.5	402.4
351	256.7	239.4	411	300.6	280.3	471	344.5	321.2	531	388.3	362.1	591	432.2	403.1
52	257.4	240.1	12	301.3	281.0	72	345.2	321.9	32	389.1	362.8	92	433.0	403.7
53	258.2	240.9	13	302.0	281.7	73	345.9	322.6	33	389.8	363.5	93	433.7	404.4
54	258.9	241.4	14	302.8	282.3	74	346.7	323.3	34	390.5	364.2	94	434.4	405.1
55	259.6	242.1	15	303.5	283.0	75	347.4	323.9	35	391.3	364.9	95	435.2	405.8
56	260.4	242.8	16	304.3	283.7	76	348.1	324.6	36	392.0	365.6	96	435.9	406.5
57	261.1	243.5	17	305.0	284.4	77	348.9	325.3	37	392.7	366.2	97	436.6	407.2
58	261.8	244.2	18	305.7	285.1	78	349.6	326.0	38	393.5	366.9	98	437.3	407.8
59	262.6	244.8	19	306.4	285.8	79	350.3	326.7	39	394.2	367.6	99	438.1	408.5
60	263.3	245.5	20	307.2	286.4	80	351.0	327.4	40	394.9	368.3	600	438.8	409.2
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

47° (133°, 227°, 313°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		m	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 44° (136°, 224°, 316°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.7	0.7	61	43.9	42.4	121	87.0	84.1	181	130.2	125.7	241	173.4	167.4
2	1.4	1.4	62	44.6	43.1	22	87.8	84.7	82	130.9	126.4	42	174.1	168.1
3	2.2	2.1	63	45.3	43.8	23	88.5	85.4	83	131.6	127.1	43	174.8	168.8
4	2.9	2.8	64	46.0	44.5	24	89.2	86.1	84	132.4	127.8	44	175.5	169.5
5	3.6	3.5	65	46.8	45.2	25	89.9	86.8	85	133.1	128.5	45	176.2	170.2
6	4.3	4.2	66	47.5	45.8	26	90.6	87.5	86	133.8	129.2	46	177.0	170.9
7	5.0	4.9	67	48.2	46.5	27	91.4	88.2	87	134.5	129.9	47	177.7	171.6
8	5.8	5.6	68	48.9	47.2	28	92.1	88.9	88	135.2	130.6	48	178.4	172.3
9	6.5	6.3	69	49.6	47.9	29	92.8	89.6	89	136.0	131.3	49	179.1	173.0
10	7.2	6.9	70	50.4	48.6	30	93.5	90.3	90	136.7	132.0	50	179.8	173.7
11	7.9	7.6	71	51.1	49.3	131	94.2	91.0	191	137.4	132.7	251	180.6	174.4
12	8.6	8.3	72	51.8	50.0	32	95.0	91.7	92	138.1	133.4	52	181.3	175.1
13	9.4	9.0	73	52.5	50.7	33	95.7	92.4	93	138.8	134.1	53	182.0	175.7
14	10.1	9.7	74	53.2	51.4	34	96.4	93.1	94	139.6	134.8	54	182.7	176.4
15	10.8	10.4	75	54.0	52.1	35	97.1	93.8	95	140.3	135.5	55	183.4	177.1
16	11.5	11.1	76	54.7	52.8	36	97.8	94.5	96	141.0	136.2	56	184.2	177.8
17	12.2	11.8	77	55.4	53.5	37	98.5	95.2	97	141.7	136.8	57	184.9	178.5
18	12.9	12.5	78	56.1	54.2	38	99.3	95.9	98	142.4	137.5	58	185.6	179.2
19	13.7	13.2	79	56.8	54.9	39	100.0	96.6	99	143.1	138.2	59	186.3	179.9
20	14.4	13.9	80	57.5	55.6	40	100.7	97.3	200	143.9	138.9	60	187.0	180.6
21	15.1	14.6	81	58.3	56.3	141	101.4	97.9	201	144.6	139.6	261	187.7	181.3
22	15.8	15.3	82	59.0	57.0	42	102.1	98.6	02	145.3	140.3	62	188.5	182.0
23	16.5	16.0	83	59.7	57.7	43	102.9	99.3	03	146.0	141.0	63	189.2	182.7
24	17.3	16.7	84	60.4	58.4	44	103.6	100.0	04	146.7	141.7	64	189.9	183.4
25	18.0	17.4	85	61.1	59.0	45	104.3	100.7	05	147.5	142.4	65	190.6	184.1
26	18.7	18 1	86	61.9	59.7	46	105.0	101.4	06	148.2	143.1	66	191.3	184.8
27	19.4	18.8	87	62.6	60.4	47	105.7	102.1	07	148.9	143.8	67	192.1	185.5
28	20.1	19.5	88	63.3	61.1	48	106.5	102.8	08	149.6	144.5	68	192.8	186.2
29	20.9	20.1	89	64.0	61.8	49	107.2	103.5	09	150.3	145.2	69	193.5	186.9
30	21.6	20.8	90	64.7	62.5	50	107.9	104.2	10	151.1	145.9	70	194.2	187.6
31	22.3	21.5	91	65.5	63.2	151	108.6	104.9	211	151.8	146.6	271	194.9	188.3
32	23.0	22.2	92	66.2	63.9	52	109.3	105.6	12	152.5	147.3	72	195.7	188.9
33	23.7	22.9	93	66.9	64.6	53	110.1	106.3	13	153.2	148.0	73	196.4	189.6
34	24.5	23.6	94	67.6	65.3	54	110.8	107.0	14	153.9	148.7	74	197.1	190.3
35	25.2	24.3	95	68.3	66.0	55	111.5	107.7	15	154.7	149.4	75	197.8	191.0
36	25.9	25.0	96	69.1	66.7	56	112.2	108.4	16	155.4	150.0	76	198.5	191.7
37	26.6	25.7	97	69.8	67.4	57	112.9	109.1	17	156.1	150.7	77	199.3	192.4
38	27.3	26.4	98	70.5	68.1	58	113.7	109.8	18	156.8	151.4	78	200.0	193.1
39	28.1	27.1	99	71.2	68.8	59	114.4	110.5	19	157.5	152.1	79	200.7	193.8
40	28.8	27.8	100	71.9	69.5	60	115.1	111.1	20	158.3	152.8	80	201.4	194.5
41	29.5	28.5	101	72.7	70.2	161	115.8	111.8	221	159.0	153.5	281	202.1	195.2
42	30.2	29.2	02	73.4	70.9	62	116.5	112.5	22	159.7	154.2	82	202.9	195.9
43	30.9	29.9	03	74.1	71.5	63	117.3	113.2	23	160.4	154.9	83	203.6	196.6
44	31.7	30.6	04	74.8	72.2	64	118.0	113.9	24	161.1	155.6	84	204.3	197.3
45	32.4	31.3	05	75.5	72.9	65	118.7	114.6	25	161.9	156.3	85	205.0	198.0
46	33.1	32.0	06	76.3	73.6	66	119.4	115.3	26	162.6	157.0	86	205.7	198.7
47	33.8	32.6	07	77.0	74.3	67	120.1	116.0	27	163.3	157.7	87	206.5	199.4
48	34.5	33.3	08	77.7	75.0	68	120.8	116.7	28	164.0	158.4	88	207.2	200.1
49	35.2	34.0	09	78.4	75.7	69	121.6	117.4	29	164.7	159.1	89	207.9	200.8
50	36.0	34.7	10	79.1	76.4	70	122.3	118.1	30	165.4	159.8	90	208.6	201.5
51	36.7	35.4	111	79.8	77.1	171	123.0	118.8	231	166.2	160.5	291	209.3	202.1
52	37.4	36.1	12	80.6	77.8	72	123.7	119.5	32	166.9	161.2	92	210.0	202.8
53	38.1	36.8	13	81.3	78.5	73	124.4	120.2	33	167.6	161.9	93	210.8	203.5
54	38.8	37.5	14	82.0	79.2	74	125.2	120.9	34	168.3	162.6	94	211.5	204.2
55	39.6	38.2	15	82.7	79.9	75	125.9	121.6	35	169.0	163.2	95	212.2	204.9
56	40.3	38.9	16	83.4	80.6	76	126.6	122.3	36	169.8	163.9	96	212.9	205.6
57	41.0	39.6	17	84.2	81.3	77	127.3	123.0	37	170.5	164.6	97	213.6	206.3
58	41.7	40.3	18	84.9	82.0	78	128.0	123.6	38	171.2	165.3	98	214.4	207.0
59	42.4	41.0	19	85.6	82.7	79	128.8	124.3	39	171.9	166.0	99	215.1	207.7
60	43.2	41.7	20	86.3	83.4	80	129.5	125.0	40	172.6	166.7	300	215.8	208.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

46° (134°, 226°, 314°).

In Plane Sailing.	Dist.	Lat.	Dep.
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 44° (136°, 224°, 316°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	216.5	209.1	361	259.7	250.8	421	302.8	292.5	481	346.0	334.1	541	389.2	375.8
02	217.2	209.8	62	260.4	251.5	22	303.6	293.1	82	346.7	334.8	42	389.9	376.5
03	218.0	210.5	63	261.1	252.2	23	304.3	293.8	83	347.4	335.5	43	390.6	377.2
04	218.7	211.2	64	261.8	252.9	24	305.0	294.5	84	348.2	336.2	44	391.3	377.9
05	219.4	211.9	65	262.6	253.6	25	305.7	295.2	85	348.9	336.9	45	392.0	378.6
06	220.1	212.6	66	263.3	254.2	26	306.4	295.9	86	349.6	337.6	46	392.8	379.3
07	220.8	213.3	67	264.0	254.9	27	307.2	296.6	87	350.3	338.3	47	393.5	380.0
08	221.6	214.0	68	264.7	255.6	28	307.9	297.3	88	351.0	339.0	48	394.2	380.7
09	222.3	214.6	69	265.4	256.3	29	308.6	298.0	89	351.7	339.7	49	394.9	381.4
10	223.0	215.3	70	266.2	257.0	30	309.3	298.7	90	352.5	340.4	50	395.6	382.1
311	223.7	216.0	371	266.9	257.7	431	310.0	299.4	491	353.2	341.1	551	396.4	382.8
12	224.4	216.7	72	267.6	258.4	32	310.8	300.1	92	353.9	341.8	52	397.1	383.5
13	225.2	217.4	73	268.3	259.1	33	311.5	300.8	93	354.6	342.5	53	397.8	384.1
14	225.9	218.1	74	269.0	259.8	34	312.2	301.5	94	355.4	343.2	54	398.5	384.8
15	226.6	218.8	75	269.8	260.5	35	312.9	302.2	95	356.1	343.9	55	399.2	385.5
16	227.3	219.5	76	270.5	261.2	36	313.6	302.9	96	356.8	344.6	56	400.0	386.2
17	228.0	220.2	77	271.2	261.9	37	314.4	303.6	97	357.5	345.2	57	400.7	386.9
18	228.8	220.9	78	271.9	262.6	38	315.1	304.3	98	358.2	345.9	58	401.4	387.6
19	229.5	221.6	79	272.6	263.3	39	315.8	305.0	99	359.0	346.6	59	402.1	388.3
20	230.2	222.3	80	273.3	264.0	40	316.6	305.6	500	359.7	347.3	60	402.8	389.0
321	230.9	223.0	381	274.1	264.7	441	317.2	306.3	501	360.4	348.0	561	403.5	389.7
22	231.6	223.7	82	274.8	265.4	42	317.9	307.0	02	361.1	348.7	62	404.3	390.4
23	232.3	224.4	83	275.5	266.1	43	318.7	307.7	03	361.8	349.4	63	405.0	391.1
24	233.1	225.1	84	276.2	266.7	44	319.4	308.4	04	362.5	350.1	64	405.7	391.8
25	233.8	225.8	85	276.9	267.4	45	320.1	309.1	05	363.3	350.8	65	406.4	392.5
26	234.5	226.5	86	277.7	268.1	46	320.8	309.8	06	364.0	351.5	66	407.1	393.2
27	235.2	227.2	87	278.4	268.8	47	321.5	310.5	07	364.7	352.2	67	407.9	393.9
28	235.9	227.8	88	279.1	269.5	48	322.3	311.2	08	365.4	352.9	68	408.6	394.6
29	236.7	228.5	89	279.8	270.2	49	323.0	311.9	09	366.1	353.6	69	409.3	395.3
30	237.4	229.2	90	280.5	270.9	50	323.7	312.6	10	366.9	354.3	70	410.0	396.0
331	238.1	229.9	391	281.3	271.6	451	324.4	313.3	511	367.6	355.0	571	410.7	396.6
32	238.8	230.6	92	282.0	272.3	52	325.1	314.0	12	368.3	355.7	72	411.5	397.3
33	239.5	231.3	93	282.7	273.0	53	325.9	314.7	13	369.0	356.4	73	412.2	398.0
34	240.3	232.0	94	283.4	273.7	54	326.6	315.4	14	369.7	357.1	74	412.9	398.7
35	241.0	232.7	95	284.1	274.4	55	327.3	316.1	15	370.5	357.7	75	413.6	399.4
36	241.7	233.4	96	284.9	275.1	56	328.0	316.8	16	371.2	358.4	76	414.3	400.1
37	242.4	234.1	97	285.6	275.8	57	328.7	317.5	17	371.9	359.1	77	415.1	400.8
38	243.1	234.8	98	286.3	276.5	58	329.5	318.2	18	372.6	359.8	78	415.8	401.5
39	243.9	235.5	99	287.0	277.2	59	330.2	318.8	19	373.3	360.5	79	416.5	402.2
40	244.6	236.2	400	287.7	277.9	60	330.9	319.5	20	374.1	361.2	80	417.2	402.9
341	245.3	236.9	401	288.5	278.6	461	331.6	320.2	521	374.8	361.9	581	417.9	403.6
42	246.0	237.6	02	289.2	279.3	62	332.3	320.9	22	375.5	362.6	82	418.7	404.3
43	246.7	238.3	03	289.9	279.9	63	333.1	321.6	23	376.2	363.3	83	419.4	405.0
44	247.5	239.0	04	290.6	280.6	64	333.8	322.3	24	376.9	364.0	84	420.1	405.7
45	248.2	239.7	05	291.3	281.3	65	334.5	323.0	25	377.7	364.7	85	420.8	406.4
46	248.9	240.4	06	292.1	282.0	66	335.2	323.7	26	378.4	365.4	86	421.5	407.1
47	249.6	241.0	07	292.8	282.7	67	335.9	324.4	27	379.1	366.1	87	422.3	407.8
48	250.3	241.7	08	293.5	283.4	68	336.7	325.1	28	379.8	366.8	88	423.0	408.5
49	251.0	242.4	09	294.2	284.1	69	337.4	325.8	29	380.5	367.5	89	423.7	409.2
50	251.8	243.1	10	294.9	284.8	70	338.1	326.5	30	381.3	368.2	90	424.4	409.8
351	252.5	243.8	411	295.6	285.5	471	338.8	327.2	531	382.0	368.9	591	425.1	410.5
52	253.2	244.5	12	296.4	286.2	72	339.5	327.9	32	382.7	369.6	92	425.8	411.2
53	253.9	245.2	13	297.1	286.9	73	340.2	328.6	33	383.4	370.3	93	426.6	411.9
54	254.6	245.9	14	297.8	287.6	74	341.0	329.3	34	384.1	370.9	94	427.3	412.6
55	255.4	246.6	15	298.5	288.3	75	341.7	330.0	35	384.8	371.6	95	428.0	413.3
56	256.1	247.3	16	299.2	289.0	76	342.4	330.7	36	385.6	372.3	96	428.7	414.0
57	256.8	248.0	17	300.0	289.7	77	343.1	331.4	37	386.3	373.0	97	429.4	414.7
58	257.5	248.7	18	300.7	290.4	78	343.8	332.0	38	387.0	373.7	98	430.2	415.4
59	258.2	249.4	19	301.4	291.1	79	344.6	332.7	39	387.7	374.4	99	430.9	416.1
60	259.0	250.1	20	302.1	291.8	80	345.3	333.4	40	388.4	375.1	600	431.6	416.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

46° (134°, 226°, 314°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

TABLE 3.

Difference of Latitude and Departure for 45° (135°, 225°, 315°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	0.7	0.7	61	43.1	43.1	121	85.6	85.6	181	128.0	128.0	241	170.4	170.4
2	1.4	1.4	62	43.8	43.8	22	86.3	86.3	82	128.7	128.7	42	171.1	171.1
3	2.1	2.1	63	44.5	44.5	23	87.0	87.0	83	129.4	129.4	43	171.8	171.8
4	2.8	2.8	64	45.3	45.3	24	87.7	87.7	84	130.1	130.1	44	172.5	172.5
5	3.5	3.5	65	46.0	46.0	25	88.4	88.4	85	130.8	130.8	45	173.2	173.2
6	4.2	4.2	66	46.7	46.7	26	89.1	89.1	86	131.5	131.5	46	173.9	173.9
7	4.9	4.9	67	47.4	47.4	27	89.8	89.8	87	132.2	132.2	47	174.7	174.7
8	5.7	5.7	68	48.1	48.1	28	90.5	90.5	88	132.9	132.9	48	175.4	175.4
9	6.4	6.4	69	48.8	48.8	29	91.2	91.2	89	133.6	133.6	49	176.1	176.1
10	7.1	7.1	70	49.5	49.5	30	91.9	91.9	90	134.4	134.4	50	176.8	176.8
11	7.8	7.8	71	50.2	50.2	131	92.6	92.6	191	135.1	135.1	251	177.5	177.5
12	8.5	8.5	72	50.9	50.9	32	93.3	93.3	92	135.8	135.8	52	178.2	178.2
13	9.2	9.2	73	51.6	51.6	33	94.0	94.0	93	136.5	136.5	53	178.9	178.9
14	9.9	9.9	74	52.3	52.3	34	94.8	94.8	94	137.2	137.2	54	179.6	179.6
15	10.6	10.6	75	53.0	53.0	35	95.5	95.5	95	137.9	137.9	55	180.3	180.3
16	11.3	11.3	76	53.7	53.7	36	96.2	96.2	96	138.6	138.6	56	181.0	181.0
17	12.0	12.0	77	54.4	54.4	37	96.9	96.9	97	139.3	139.3	57	181.7	181.7
18	12.7	12.7	78	55.2	55.2	38	97.6	97.6	98	140.0	140.0	58	182.4	182.4
19	13.4	13.4	79	55.9	55.9	39	98.3	98.3	99	140.7	140.7	59	183.1	183.1
20	14.1	14.1	80	56.6	56.6	40	99.0	99.0	200	141.4	141.4	60	183.8	183.8
21	14.8	14.8	81	57.3	57.3	141	99.7	99.7	201	142.1	142.1	261	184.6	184.6
22	15.6	15.6	82	58.0	58.0	42	100.4	100.4	02	142.8	142.8	62	185.3	185.3
23	16.3	16.3	83	58.7	58.7	43	101.1	101.1	03	143.5	143.5	63	186.0	186.0
24	17.0	17.0	84	59.4	59.4	44	101.8	101.8	04	144.2	144.2	64	186.7	186.7
25	17.7	17.7	85	60.1	60.1	45	102.5	102.5	05	145.0	145.0	65	187.4	187.4
26	18.4	18.4	86	60.8	60.8	46	103.2	103.2	06	145.7	145.7	66	188.1	188.1
27	19.1	19.1	87	61.5	61.5	47	103.9	103.9	07	146.4	146.4	67	188.8	188.8
28	19.8	19.8	88	62.2	62.2	48	104.7	104.7	08	147.1	147.1	68	189.5	189.5
29	20.5	20.5	89	62.9	62.9	49	105.4	105.4	09	147.8	147.8	69	190.2	190.2
30	21.2	21.2	90	63.6	63.6	50	106.1	106.1	10	148.5	148.5	70	190.9	190.9
31	21.9	21.9	91	64.3	64.3	151	106.8	106.8	211	149.2	149.2	271	191.6	191.6
32	22.6	22.6	92	65.1	65.1	52	107.5	107.5	12	149.9	149.9	72	192.3	192.3
33	23.3	23.3	93	65.8	65.8	53	108.2	108.2	13	150.6	150.6	73	193.0	193.0
34	24.0	24.0	94	66.5	66.5	54	108.9	108.9	14	151.3	151.3	74	193.7	193.7
35	24.7	24.7	95	67.2	67.2	55	109.6	109.6	15	152.0	152.0	75	194.5	194.5
36	25.5	25.5	96	67.9	67.9	56	110.3	110.3	16	152.7	152.7	76	195.2	195.2
37	26.2	26.2	97	68.6	68.6	57	111.0	111.0	17	153.4	153.4	77	195.9	195.9
38	26.9	26.9	98	69.3	69.3	58	111.7	111.7	18	154.1	154.1	78	196.6	196.6
39	27.6	27.6	99	70.0	70.0	59	112.4	112.4	19	154.9	154.9	79	197.3	197.3
40	28.3	28.3	100	70.7	70.7	60	113.1	113.1	20	155.6	155.6	80	198.0	198.0
41	29.0	29.0	101	71.4	71.4	161	113.8	113.8	221	156.3	156.3	281	198.7	198.7
42	29.7	29.7	02	72.1	72.1	62	114.6	114.6	22	157.0	157.0	82	199.4	199.4
43	30.4	30.4	03	72.8	72.8	63	115.3	115.3	23	157.7	157.7	83	200.1	200.1
44	31.1	31.1	04	73.5	73.5	64	116.0	116.0	24	158.4	158.4	84	200.8	200.8
45	31.8	31.8	05	74.2	74.2	65	116.7	116.7	25	159.1	159.1	85	201.5	201.5
46	32.5	32.5	06	75.0	75.0	66	117.4	117.4	26	159.8	159.8	86	202.2	202.2
47	33.2	33.2	07	75.7	75.7	67	118.1	118.1	27	160.5	160.5	87	202.9	202.9
48	33.9	33.9	08	76.4	76.4	68	118.8	118.8	28	161.2	161.2	88	203.6	203.6
49	34.6	34.6	09	77.1	77.1	69	119.5	119.5	29	161.9	161.9	89	204.4	204.4
50	35.4	35.4	10	77.8	77.8	70	120.2	120.2	30	162.6	162.6	90	205.1	205.1
51	36.1	36.1	111	78.5	78.5	171	120.9	120.9	231	163.3	163.3	291	205.8	205.8
52	36.8	36.8	12	79.2	79.2	72	121.6	121.6	32	164.0	164.0	92	206.5	206.5
53	37.5	37.5	13	79.9	79.9	73	122.3	122.3	33	164.8	164.8	93	207.2	207.2
54	38.2	38.2	14	80.6	80.6	74	123.0	123.0	34	165.5	165.5	94	207.9	207.9
55	38.9	38.9	15	81.3	81.3	75	123.7	123.7	35	166.2	166.2	95	208.6	208.6
56	39.6	39.6	16	82.0	82.0	76	124.5	124.5	36	166.9	166.9	96	209.3	209.3
57	40.3	40.3	17	82.7	82.7	77	125.2	125.2	37	167.6	167.6	97	210.0	210.0
58	41.0	41.0	18	83.4	83.4	78	125.9	125.9	38	168.3	168.3	98	210.7	210.7
59	41.7	41.7	19	84.1	84.1	79	126.6	126.6	39	169.0	169.0	99	211.4	211.4
60	42.4	42.4	20	84.9	84.9	80	127.3	127.3	40	169.7	169.7	300	212.1	212.1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

45° (135°, 225°, 315°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* **In Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N.	N×Cos.	N×Sin.
	Hypotenuse.	Side Adj.	Side Opp.

Difference of Latitude and Departure for 45° (135°, 225°, 315°).

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
301	212.8	212.8	361	255.3	255.3	421	297.7	297.7	481	340.1	340.1	541	382.5	382.5
02	213.5	213.5	62	256.0	256.0	22	298.4	298.4	82	340.8	340.8	42	383.2	383.3
03	214.3	214.3	63	256.7	256.7	23	299.1	299.1	83	341.5	341.5	43	383.9	384.0
04	215.0	215.0	64	257.4	257.4	24	299.8	299.8	84	342.2	342.2	44	384.7	384.7
05	215.7	215.7	65	258.1	258.1	25	300.5	300.5	85	342.9	342.9	45	385.4	385.4
06	216.4	216.4	66	258.8	258.8	26	301.2	301.2	86	343.7	343.6	46	386.1	386.1
07	217.1	217.1	67	259.5	259.5	27	301.9	301.9	87	344.4	344.3	47	386.8	386.8
08	217.8	217.8	68	260.2	260.2	28	302.6	302.6	88	345.1	345.1	48	387.5	387.5
09	218.5	218.5	69	260.9	260.9	29	303.4	303.3	89	345.8	345.8	49	388.2	388.2
10	219.2	219.2	70	261.6	261.6	30	304.1	304.1	90	346.5	346.5	50	388.9	388.9
311	219.9	219.9	371	262.3	262.3	431	304.8	304.8	491	347.2	347.2	551	389.6	389.6
12	220.6	220.6	72	263.0	263.0	32	305.5	305.5	92	347.9	347.9	52	390.3	390.3
13	221.3	221.3	73	263.8	263.8	33	306.2	306.2	93	348.6	348.6	53	391.0	391.0
14	222.0	222.0	74	264.5	264.5	34	306.9	306.9	94	349.3	349.3	54	391.7	391.7
15	222.7	222.7	75	265.2	265.2	35	307.6	307.6	95	350.0	350.0	55	392.4	392.4
16	223.4	223.4	76	265.9	265.9	36	308.3	308.3	96	350.7	350.7	56	393.1	393.2
17	224.2	224.2	77	266.6	266.6	37	309.0	309.0	97	351.4	351.4	57	393.9	393.9
18	224.9	224.9	78	267.3	267.3	38	309.7	309.7	98	352.1	352.1	58	394.6	394.6
19	225.6	225.6	79	268.0	268.0	39	310.4	310.4	99	352.8	352.8	59	395.3	395.3
20	226.3	226.3	80	268.7	268.7	40	311.1	311.1	500	353.6	353.6	60	396.0	396.0
321	227.0	227.0	381	269.4	269.4	441	311.8	311.8	501	354.3	354.3	561	396.7	396.7
22	227.7	227.7	82	270.1	270.1	42	312.5	312.5	02	355.0	355.0	62	397.4	397.4
23	228.4	228.4	83	270.8	270.8	43	313.3	313.2	03	355.7	355.7	63	398.1	398.1
24	229.1	229.1	84	271.5	271.5	44	314.0	314.0	04	356.4	356.4	64	398.8	398.8
25	229.8	229.8	85	272.2	272.2	45	314.7	314.7	05	357.1	357.1	65	399.5	399.5
26	230.5	230.5	86	272.9	272.9	46	315.4	315.4	06	357.8	357.8	66	400.2	400.2
27	231.2	231.2	87	273.7	273.7	47	316.1	316.1	07	358.5	358.5	67	400.9	400.9
28	231.9	231.9	88	274.4	274.4	48	316.8	316.8	08	359.2	359.2	68	401.6	401.6
29	232.6	232.6	89	275.1	275.1	49	317.5	317.5	09	359.9	359.9	69	402.3	402.3
30	233.3	233.3	90	275.8	275.8	50	318.2	318.2	10	360.6	360.6	70	403.0	403.1
331	234.1	234.1	391	276.5	276.5	451	318.9	318.9	511	361.3	361.3	571	403.8	403.8
32	234.8	234.8	92	277.2	277.2	52	319.6	319.6	12	362.0	362.0	72	404.5	404.5
33	235.5	235.5	93	277.9	277.9	53	320.3	320.3	13	362.7	362.7	73	405.2	405.2
34	236.2	236.2	94	278.6	278.6	54	321.0	321.0	14	363.5	363.5	74	405.9	405.9
35	236.9	236.9	95	279.3	279.3	55	321.7	321.7	15	364.2	364.2	75	406.6	406.6
36	237.6	237.6	96	280.0	280.0	56	322.4	322.4	16	364.9	364.9	76	407.3	407.3
37	238.3	238.3	97	280.7	280.7	57	323.2	323.1	17	365.6	365.6	77	408.0	408.0
38	239.0	239.0	98	281.4	281.4	58	323.9	323.9	18	366.3	366.3	78	408.7	408.7
39	239.7	239.7	99	282.1	282.1	59	324.6	324.6	19	367.0	367.0	79	409.4	409.4
40	240.4	240.4	400	282.8	282.8	60	325.3	325.3	20	367.7	367.7	80	410.1	410.1
341	241.1	241.1	401	283.6	283.5	461	326.0	326.0	521	368.4	368.4	581	410.8	410.8
42	241.8	241.8	02	284.3	284.3	62	326.7	326.7	22	369.1	369.1	82	411.5	411.5
43	242.5	242.5	03	285.0	285.0	63	327.4	327.4	23	369.8	369.8	83	412.2	412.2
44	243.2	243.2	04	285.7	285.7	64	328.1	328.1	24	370.5	370.5	84	412.9	413.0
45	244.0	244.0	05	286.4	286.4	65	328.8	328.8	25	371.2	371.2	85	413.7	413.7
46	244.7	244.7	06	287.1	287.1	66	329.5	329.5	26	371.9	371.9	86	414.4	414.4
47	245.4	245.4	07	287.8	287.8	67	330.2	330.2	27	372.6	372.6	87	415.1	415.1
48	246.1	246.1	08	288.5	288.5	68	330.9	330.9	28	373.4	373.4	88	415.8	415.8
49	246.8	246.8	09	289.2	289.2	69	331.6	331.6	29	374.1	374.1	89	416.5	416.5
50	247.5	247.5	10	289.9	289.9	70	332.3	332.3	30	374.8	374.8	90	417.2	417.2
351	248.2	248.2	411	290.6	290.6	471	333.1	333.0	531	375.5	375.5	591	417.9	417.9
52	248.9	248.9	12	291.3	291.3	72	333.8	333.8	32	376.2	376.2	92	418.6	418.6
53	249.6	249.6	13	292.0	292.0	73	334.5	334.5	33	376.9	376.9	93	419.3	419.3
54	250.3	250.3	14	292.7	292.7	74	335.2	335.2	34	377.6	377.6	94	420.0	420.0
55	251.0	251.0	15	293.5	293.4	75	335.9	335.9	35	378.3	378.3	95	420.7	420.7
56	251.7	251.7	16	294.2	294.2	76	336.6	336.6	36	379.0	379.0	96	421.4	421.4
57	252.4	252.4	17	294.9	294.9	77	337.3	337.3	37	379.7	379.7	97	422.1	422.1
58	253.1	253.1	18	295.6	295.6	78	338.0	338.0	38	380.4	380.4	98	422.8	422.8
59	253.9	253.9	19	296.3	296.3	79	338.7	338.7	39	381.1	381.1	99	423.6	423.6
60	254.6	254.6	20	297.0	297.0	80	339.4	339.4	40	381.8	381.8	600	424.3	424.3
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

45° (135°, 225°, 315°).

In **Plane Sailing.**	**Dist.**	**Lat.**	**Dep.**
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Middle Latitude Sailing.**	Diff. Long.	Dep.	
For converting *Dep.* into *Diff. Long.* and *Diff. Long.* into *Dep.* In **Mercator Sailing.**		*m*	Diff. Long.
For multiplication of numbers by sines and by cosines, or solution of plane right-angled triangles.	N. / Hypotenuse.	N×Cos. / Side Adj.	N×Sin. / Side Opp.

TABLE 4.

Conversion of Departure into Difference of Longitude.

Dep.	Middle Latitude 4°	6°	8°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	Dep.
	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	
1	1. 0	1. 0	1. 0	1. 0	1. 0	1. 0	1. 0	1. 0	1. 0	1. 0	1. 0	1. 1	1. 1	1
2	2. 0	2. 0	2. 0	2. 0	2. 0	2. 0	2. 1	2. 1	2. 1	2. 1	2. 1	2. 1	2. 1	2
3	3. 0	3. 0	3. 0	3. 1	3. 1	3. 1	3. 1	3. 1	3. 1	3. 1	3. 1	3. 2	3. 2	3
4	4. 0	4. 0	4. 0	4. 1	4. 1	4. 1	4. 1	4. 1	4. 1	4. 2	4. 2	4. 2	4. 2	4
5	5. 0	5. 0	5. 0	5. 1	5. 1	5. 1	5. 1	5. 2	5. 2	5. 2	5. 2	5. 3	5. 3	5
6	6. 0	6. 0	6. 1	6. 1	6. 1	6. 1	6. 2	6. 2	6. 2	6. 2	6. 3	6. 3	6. 3	6
7	7. 0	7. 0	7. 1	7. 1	7. 1	7. 2	7. 2	7. 2	7. 2	7. 3	7. 3	7. 4	7. 4	7
8	8. 0	8. 0	8. 1	8. 1	8. 2	8. 2	8. 2	8. 2	8. 3	8. 3	8. 4	8. 4	8. 5	8
9	9. 0	9. 0	9. 1	9. 1	9. 2	9. 2	9. 2	9. 3	9. 3	9. 4	9. 4	9. 5	9. 5	9
10	10. 0	10. 1	10. 1	10. 2	10. 2	10. 2	10. 3	10. 3	10. 4	10. 4	10. 5	10. 5	10. 6	10
11	11. 0	11. 1	11. 1	11. 2	11. 2	11. 2	11. 3	11. 3	11. 4	11. 4	11. 5	11. 6	11. 6	11
12	12. 0	12. 1	12. 1	12. 2	12. 2	12. 3	12. 3	12. 4	12. 4	12. 5	12. 5	12. 6	12. 7	12
13	13. 0	13. 1	13. 1	13. 2	13. 2	13. 3	13. 3	13. 4	13. 5	13. 5	13. 6	13. 7	13. 7	13
14	14. 0	14. 1	14. 1	14. 2	14. 3	14. 3	14. 4	14. 4	14. 5	14. 6	14. 6	14. 7	14. 8	14
15	15. 0	15. 1	15. 1	15. 2	15. 3	15. 3	15. 4	15. 5	15. 5	15. 6	15. 7	15. 8	15. 9	15
16	16. 0	16. 1	16. 2	16. 2	16. 3	16. 4	16. 4	16. 5	16. 6	16. 6	16. 7	16. 8	16. 9	16
17	17. 0	17. 1	17. 2	17. 3	17. 3	17. 4	17. 4	17. 5	17. 6	17. 7	17. 8	17. 9	18. 0	17
18	18. 0	18. 1	18. 2	18. 3	18. 3	18. 4	18. 5	18. 6	18. 6	18. 7	18. 8	18. 9	19. 0	18
19	19. 0	19. 1	19. 2	19. 3	19. 4	19. 4	19. 5	19. 6	19. 7	19. 8	19. 9	20. 0	20. 1	19
20	20. 0	20. 1	20. 2	20. 3	20. 4	20. 4	20. 5	20. 6	20. 7	20. 8	20. 9	21. 0	21. 2	20
21	21. 1	21. 1	21. 2	21. 3	21. 4	21. 5	21. 6	21. 6	21. 7	21. 8	22. 0	22. 1	22. 2	21
22	22. 1	22. 1	22. 2	22. 3	22. 4	22. 5	22. 6	22. 7	22. 8	22. 9	23. 0	23. 1	23. 3	22
23	23. 1	23. 1	23. 2	23. 4	23. 4	23. 5	23. 6	23. 7	23. 8	24. 0	24. 1	24. 2	24. 3	23
24	24. 1	24. 1	24. 2	24. 4	24. 4	24. 5	24. 6	24. 7	24. 8	25. 0	25. 1	25. 2	25. 4	24
25	25. 1	25. 1	25. 2	25. 4	25. 5	25. 6	25. 7	25. 8	25. 9	26. 0	26. 1	26. 3	26. 4	25
26	26. 1	26. 1	26. 3	26. 4	26. 5	26. 6	26. 7	26. 8	26. 9	27. 1	27. 2	27. 3	27. 5	26
27	27. 1	27. 1	27. 3	27. 4	27. 5	27. 6	27. 7	27. 8	28. 0	28. 1	28. 2	28. 4	28. 6	27
28	28. 1	28. 2	28. 3	28. 4	28. 5	28. 6	28. 7	28. 9	29. 0	29. 2	29. 3	29. 4	29. 6	28
29	29. 1	29. 2	29. 3	29. 4	29. 5	29. 6	29. 8	29. 9	30. 0	30. 2	30. 3	30. 5	30. 7	29
30	30. 1	30. 2	30. 3	30. 5	30. 6	30. 7	30. 8	30. 9	31. 1	31. 2	31. 4	31. 5	31. 7	30
31	31. 1	31. 2	31. 3	31. 5	31. 6	31. 7	31. 8	31. 9	32. 1	32. 2	32. 4	32. 6	32. 8	31
32	32. 1	32. 2	32. 3	32. 5	32. 6	32. 7	32. 8	33. 0	33. 1	33. 3	33. 4	33. 6	33. 8	32
33	33. 1	33. 2	33. 3	33. 5	33. 6	33. 7	33. 9	34. 0	34. 2	34. 3	34. 5	34. 7	34. 9	33
34	34. 1	34. 2	34. 3	34. 5	34. 6	34. 8	34. 9	35. 0	35. 2	35. 4	35. 6	35. 7	36. 0	34
35	35. 1	35. 2	35. 3	35. 5	35. 7	35. 8	35. 9	36. 1	36. 2	36. 4	36. 6	36. 8	37. 0	35
36	36. 1	36. 2	36. 4	36. 6	36. 7	36. 8	36. 9	37. 1	37. 3	37. 5	37. 6	37. 9	38. 1	36
37	37. 1	37. 2	37. 4	37. 6	37. 7	37. 8	38. 0	38. 1	38. 3	38. 5	38. 7	38. 9	39. 1	37
38	38. 1	38. 2	38. 4	38. 6	38. 7	38. 8	39. 0	39. 2	39. 3	39. 5	39. 7	40. 0	40. 2	38
39	39. 1	39. 2	39. 4	39. 6	39. 7	39. 9	40. 0	40. 2	40. 4	40. 6	40. 8	41. 0	41. 2	39
40	40. 1	40. 2	40. 4	40. 6	40. 7	40. 9	41. 1	41. 2	41. 4	41. 6	41. 8	42. 1	42. 3	40
41	41. 1	41. 2	41. 4	41. 6	41. 8	41. 9	42. 1	42. 3	42. 4	42. 7	42. 9	43. 1	43. 4	41
42	42. 1	42. 2	42. 4	42. 6	42. 8	42. 9	43. 1	43. 3	43. 5	43. 7	43. 9	44. 2	44. 4	42
43	43. 1	43. 2	43. 4	43. 7	43. 8	44. 0	44. 1	44. 3	44. 5	44. 7	45. 0	45. 2	45. 5	43
44	44. 1	44. 2	44. 4	44. 7	44. 8	45. 0	45. 2	45. 3	45. 6	45. 8	46. 0	46. 3	46. 5	44
45	45. 1	45. 2	45. 4	45. 7	45. 8	46. 0	46. 2	46. 4	46. 6	46. 8	47. 1	47. 3	47. 6	45
46	46. 1	46. 3	46. 5	46. 7	46. 9	47. 0	47. 2	47. 4	47. 6	47. 9	48. 1	48. 4	48. 7	46
47	47. 1	47. 3	47. 5	47. 7	47. 9	48. 1	48. 2	48. 4	48. 7	48. 9	49. 1	49. 4	49. 7	47
48	48. 1	48. 3	48. 5	48. 7	48. 9	49. 1	49. 3	49. 5	49. 7	49. 9	50. 2	50. 5	50. 8	48
49	49. 1	49. 3	49. 5	49. 8	49. 9	50. 1	50. 3	50. 5	50. 7	51. 0	51. 2	51. 5	51. 8	49
50	50. 1	50. 3	50. 5	50. 8	50. 9	51. 1	51. 3	51. 5	51. 8	52. 0	52. 3	52. 6	52. 9	50
51	51. 1	51. 3	51. 5	51. 8	52. 0	52. 1	52. 3	52. 6	52. 8	53. 1	53. 3	53. 6	53. 9	51
52	52. 1	52. 3	52. 5	52. 8	53. 0	53. 2	53. 4	53. 6	53. 8	54. 1	54. 4	54. 7	55. 0	52
53	53. 1	53. 3	53. 5	53. 8	54. 0	54. 2	54. 4	54. 6	54. 9	55. 1	55. 4	55. 7	56. 1	53
54	54. 1	54. 3	54. 5	54. 8	55. 0	55. 2	55. 4	55. 7	55. 9	56. 2	56. 5	56. 8	57. 1	54
55	55. 1	55. 3	55. 5	55. 8	56. 0	56. 2	56. 4	56. 7	56. 9	57. 2	57. 5	57. 8	58. 2	55
56	56. 1	56. 3	56. 6	56. 9	57. 1	57. 2	57. 5	57. 7	58. 0	58. 3	58. 6	58. 9	59. 2	56
57	57. 1	57. 3	57. 6	57. 9	58. 1	58. 3	58. 5	58. 7	59. 0	59. 3	59. 6	59. 9	60. 3	57
58	58. 1	58. 3	58. 6	58. 9	59. 1	59. 3	59. 5	59. 8	60. 0	60. 3	60. 7	61. 0	61. 3	58
59	59. 1	59. 3	59. 6	59. 9	60. 1	60. 3	60. 6	60. 8	61. 1	61. 4	61. 7	62. 0	62. 4	59
60	60. 1	60. 3	60. 6	60. 9	61. 1	61. 3	61. 6	61. 8	62. 1	62. 4	62. 7	63. 1	63. 5	60

TABLE 4.

Conversion of Departure into Difference of Longitude.

Dep.	Middle Latitude.													Dep.
	20°	21°	22°	23°	24°	25°	26°	27°	28°	29°	30°	31°	32°	
	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	
1	1. 1	1. 1	1. 1	1. 1	1. 1	1. 1	1. 1	1. 1	1. 1	1. 1	1. 2	1. 2	1. 2	1
2	2. 1	2. 1	2. 2	2. 2	2. 2	2. 2	2. 2	2. 2	2. 3	2. 3	2. 3	2. 3	2. 4	2
3	3. 2	3. 2	3. 2	3. 3	3. 3	3. 3	3. 3	3. 4	3. 4	3. 4	3. 5	3. 5	3. 5	3
4	4. 3	4. 3	4. 3	4. 3	4. 4	4. 4	4. 5	4. 5	4. 5	4. 6	4. 6	4. 7	4. 7	4
5	5. 3	5. 4	5. 4	5. 4	5. 5	5. 5	5. 6	5. 6	5. 7	5. 7	5. 8	5. 8	5. 9	5
6	6. 4	6. 4	6. 5	6. 5	6. 6	6. 6	6. 7	6. 7	6. 8	6. 9	6. 9	7. 0	7. 1	6
7	7. 4	7. 5	7. 5	7. 6	7. 7	7. 7	7. 8	7. 9	7. 9	8. 0	8. 1	8. 2	8. 3	7
8	8. 5	8. 6	8. 6	8. 7	8. 8	8. 8	8. 9	9. 0	9. 1	9. 1	9. 2	9. 3	9. 4	8
9	9. 6	9. 6	9. 7	9. 8	9. 9	9. 9	10. 0	10. 1	10. 2	10. 3	10. 4	10. 5	10. 6	9
10	10. 6	10. 7	10. 8	10. 9	10. 9	11. 0	11. 1	11. 2	11. 3	11. 4	11. 5	11. 7	11. 8	10
11	11. 7	11. 8	11. 9	12. 0	12. 0	12. 1	12. 2	12. 3	12. 5	12. 6	12. 7	12. 8	13. 0	11
12	12. 8	12. 9	12. 9	13. 0	13. 1	13. 2	13. 4	13. 5	13. 6	13. 7	13. 9	14. 0	14. 2	12
13	13. 8	13. 9	14. 0	14. 1	14. 2	14. 3	14. 5	14. 6	14. 7	14. 9	15. 0	15. 2	15. 3	13
14	14. 9	15. 0	15. 1	15. 2	15. 3	15. 4	15. 6	15. 7	15. 9	16. 0	16. 2	16. 3	16. 5	14
15	16. 0	16. 1	16. 2	16. 3	16. 4	16. 6	16. 7	16. 8	17. 0	17. 1	17. 3	17. 5	17. 7	15
16	17. 0	17. 1	17. 3	17. 4	17. 5	17. 7	17. 8	18. 0	18. 1	18. 3	18. 5	18. 7	18. 9	16
17	18. 1	18. 2	18. 3	18. 5	18. 6	18. 8	18. 9	19. 1	19. 3	19. 4	19. 6	19. 8	20. 0	17
18	19. 2	19. 3	19. 4	19. 6	19. 7	19. 9	20. 0	20. 2	20. 4	20. 6	20. 8	21. 0	21. 2	18
19	20. 2	20. 4	20. 5	20. 6	20. 8	21. 0	21. 1	21. 3	21. 5	21. 7	21. 9	22. 2	22. 4	19
20	21. 3	21. 4	21. 6	21. 7	21. 9	22. 1	22. 3	22. 5	22. 7	22. 9	23. 1	23. 3	23. 6	20
21	22. 3	22. 5	22. 7	22. 8	23. 0	23. 2	23. 4	23. 6	23. 8	24. 0	24. 2	24. 5	24. 8	21
22	23. 4	23. 6	23. 7	23. 9	24. 1	24. 3	24. 5	24. 7	24. 9	25. 2	25. 4	25. 7	25. 9	22
23	24. 5	24. 6	24. 8	25. 0	25. 2	25. 4	25. 6	25. 8	26. 0	26. 3	26. 6	26. 8	27. 1	23
24	25. 5	25. 7	25. 9	26. 1	26. 3	26. 5	26. 7	26. 9	27. 2	27. 4	27. 7	28. 0	28. 3	24
25	26. 6	26. 8	26. 9	27. 2	27. 4	27. 6	27. 8	28. 0	28. 3	28. 6	28. 9	29. 2	29. 5	25
26	27. 7	27. 8	28. 0	28. 2	28. 5	28. 7	28. 9	29. 1	29. 4	29. 7	30. 0	30. 3	30. 7	26
27	28. 7	28. 9	29. 1	29. 3	29. 6	29. 8	30. 0	30. 3	30. 6	30. 9	31. 2	31. 5	31. 8	27
28	29. 8	30. 0	30. 2	30. 4	30. 6	30. 9	31. 2	31. 4	31. 7	32. 0	32. 3	32. 7	33. 0	28
29	30. 9	31. 1	31. 3	31. 5	31. 7	32. 0	32. 3	32. 5	32. 8	33. 2	33. 5	33. 8	34. 2	29
30	31. 9	32. 1	32. 4	32. 6	32. 8	33. 1	33. 4	33. 7	34. 0	34. 3	34. 6	35. 0	35. 4	30
31	33. 0	33. 2	33. 4	33. 7	33. 9	34. 2	34. 5	34. 8	35. 1	35. 4	35. 8	36. 2	36. 6	31
32	34. 1	34. 3	34. 5	34. 8	35. 1	35. 3	35. 6	35. 9	36. 2	36. 6	37. 0	37. 3	37. 7	32
33	35. 1	35. 3	35. 6	35. 9	36. 2	36. 4	36. 7	37. 0	37. 4	37. 7	38. 1	38. 5	38. 9	33
34	36. 2	36. 4	36. 7	36. 9	37. 3	37. 5	37. 8	38. 1	38. 5	38. 9	39. 3	39. 7	40. 1	34
35	37. 2	37. 5	37. 7	38. 0	38. 4	38. 6	38. 9	39. 2	39. 6	40. 0	40. 4	40. 8	41. 3	35
36	38. 3	38. 6	38. 8	39. 1	39. 5	39. 7	40. 1	40. 4	40. 8	41. 2	41. 6	42. 0	42. 5	36
37	39. 4	39. 6	39. 9	40. 2	40. 6	40. 8	41. 2	41. 5	41. 9	42. 3	42. 7	43. 2	43. 6	37
38	40. 4	40. 7	41. 0	41. 3	41. 7	41. 9	42. 3	42. 6	43. 0	43. 4	43. 9	44. 3	44. 8	38
39	41. 5	41. 8	42. 1	42. 4	42. 8	43. 0	43. 4	43. 8	44. 2	44. 6	45. 0	45. 5	46. 0	39
40	42. 6	42. 8	43. 1	43. 5	43. 8	44. 1	44. 5	44. 9	45. 3	45. 7	46. 2	46. 7	47. 2	40
41	43. 6	43. 9	44. 2	44. 5	44. 9	45. 2	45. 6	46. 0	46. 4	46. 9	47. 3	47. 8	48. 3	41
42	44. 7	45. 0	45. 3	45. 6	46. 0	46. 3	46. 7	47. 1	47. 6	48. 0	48. 5	49. 0	49. 5	42
43	45. 8	46. 1	46. 4	46. 7	47. 1	47. 4	47. 8	48. 3	48. 7	49. 2	49. 7	50. 2	50. 7	43
44	46. 8	47. 1	47. 5	47. 8	48. 2	48. 5	49. 0	49. 4	49. 8	50. 3	50. 8	51. 3	51. 9	44
45	47. 9	48. 2	48. 5	48. 9	49. 3	49. 7	50. 1	50. 5	51. 0	51. 5	52. 0	52. 5	53. 1	45
46	49. 0	49. 3	49. 6	50. 0	50. 4	50. 8	51. 2	51. 6	52. 1	52. 6	53. 1	53. 7	54. 2	46
47	50. 0	50. 3	50. 7	51. 1	51. 4	51. 9	52. 3	52. 7	53. 2	53. 7	54. 3	54. 8	55. 4	47
48	51. 1	51. 4	51. 8	52. 1	52. 5	52. 9	53. 4	53. 9	54. 4	54. 9	55. 4	56. 0	56. 6	48
49	52. 1	52. 5	52. 8	53. 2	53. 6	54. 0	54. 5	55. 0	55. 5	56. 0	56. 6	57. 2	57. 8	49
50	53. 2	53. 6	53. 9	54. 3	54. 7	55. 2	55. 6	56. 1	56. 6	57. 2	57. 7	58. 3	59. 0	50
51	54. 3	54. 6	55. 0	55. 4	55. 8	56. 3	56. 7	57. 2	57. 8	58. 3	58. 9	59. 5	60. 1	51
52	55. 3	55. 7	56. 1	56. 5	56. 9	57. 4	57. 9	58. 4	58. 9	59. 5	60. 0	60. 7	61. 3	52
53	56. 4	56. 8	57. 2	57. 6	58. 0	58. 5	59. 0	59. 5	60. 0	60. 6	61. 2	61. 8	62. 5	53
54	57. 5	57. 8	58. 2	58. 7	59. 1	59. 6	60. 1	60. 6	61. 2	61. 8	62. 4	63. 0	63. 7	54
55	58. 5	58. 9	59. 3	59. 8	60. 2	60. 7	61. 2	61. 7	62. 3	62. 9	63. 5	64. 2	64. 9	55
56	59. 6	60. 0	60. 4	60. 8	61. 3	61. 8	62. 3	62. 9	63. 4	64. 0	64. 7	65. 3	66. 0	56
57	60. 7	61. 1	61. 5	61. 9	62. 4	62. 9	63. 4	64. 0	64. 6	65. 2	65. 8	66. 5	67. 2	57
58	61. 7	62. 1	62. 6	63. 0	63. 5	64. 0	64. 5	65. 1	65. 7	66. 3	67. 0	67. 7	68. 4	58
59	62. 8	63. 2	63. 6	64. 1	64. 6	65. 1	65. 6	66. 2	66. 8	67. 5	68. 1	68. 8	69. 6	59
60	63. 9	64. 3	64. 7	65. 2	65. 7	66. 2	66. 8	67. 3	68. 0	68. 6	69. 3	70. 0	70. 8	60

TABLE 4.

Conversion of Departure into Difference of Longitude.

Dep.	Middle Latitude. 33°	34°	35°	36°	37°	38°	39°	39° 30′	40°	40° 30′	41°	41° 30′	Dep.
	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	
1	1. 2	1. 2	1. 2	1. 2	1. 3	1. 3	1. 3	1. 3	1. 3	1. 3	1. 3	1. 3	1
2	2. 4	2. 4	2. 4	2. 5	2. 5	2. 5	2. 6	2. 6	2. 6	2. 6	2. 7	2. 7	2
3	3. 6	3. 6	3. 7	3. 7	3. 8	3. 8	3. 9	3. 9	3. 9	3. 9	4. 0	4. 0	3
4	4. 8	4. 8	4. 9	4. 9	5. 0	5. 1	5. 1	5. 2	5. 2	5. 2	5. 3	5. 3	4
5	6. 0	6. 0	6. 1	6. 2	6. 3	6. 3	6. 4	6. 4	6. 5	6. 5	6. 6	6. 6	5
6	7. 2	7. 2	7. 3	7. 4	7. 5	7. 6	7. 7	7. 8	7. 8	7. 9	8. 0	8. 0	6
7	8. 3	8. 4	8. 5	8. 7	8. 8	8. 9	9. 0	9. 0	9. 1	9. 2	9. 3	9. 3	7
8	9. 5	9. 6	9. 8	9. 9	10. 0	10. 2	10. 3	10. 4	10. 4	10. 5	10. 6	10. 7	8
9	10. 7	10. 9	11. 0	11. 1	11. 3	11. 4	11. 6	11. 7	11. 7	11. 8	11. 9	12. 0	9
10	11. 9	12. 1	12. 2	12. 4	12. 5	12. 7	12. 9	13. 0	13. 1	13. 2	13. 3	13. 4	10
11	13. 1	13. 3	13. 4	13. 6	13. 8	14. 0	14. 2	14. 3	14. 4	14. 5	14. 6	14. 7	11
12	14. 3	14. 5	14. 6	14. 8	15. 0	15. 2	15. 4	15. 6	15. 7	15. 8	15. 9	16. 0	12
13	15. 5	15. 7	15. 9	16. 1	16. 3	16. 5	16. 7	16. 9	17. 0	17. 1	17. 2	17. 3	13
14	16. 7	16. 9	17. 1	17. 3	17. 5	17. 8	18. 0	18. 2	18. 3	18. 4	18. 6	18. 7	14
15	17. 9	18. 1	18. 3	18. 5	18. 8	19. 0	19. 3	19. 5	19. 6	19. 7	19. 9	20. 1	15
16	19. 1	19. 3	19. 5	19. 8	20. 0	20. 3	20. 6	20. 8	20. 9	21. 0	21. 2	21. 3	16
17	20. 3	20. 5	20. 8	21. 0	21. 3	21. 6	21. 9	22. 1	22. 2	22. 4	22. 5	22. 7	17
18	21. 5	21. 7	22. 0	22. 2	22. 5	22. 8	23. 2	23. 4	23. 5	23. 7	23. 9	24. 1	18
19	22. 6	22. 9	23. 2	23. 5	23. 8	24. 1	24. 4	24. 6	24. 8	25. 0	25. 2	25. 4	19
20	23. 8	24. 1	24. 4	24. 7	25. 0	25. 4	25. 7	25. 9	26. 1	26. 3	26. 5	26. 7	20
21	25. 0	25. 3	25. 6	26. 0	26. 3	26. 6	27. 0	27. 2	27. 4	27. 6	27. 8	28. 1	21
22	26. 2	26. 5	26. 9	27. 2	27. 5	27. 9	28. 3	28. 5	28. 7	29. 0	29. 2	29. 4	22
23	27. 4	27. 7	28. 1	28. 4	28. 8	29. 2	29. 6	29. 8	30. 0	30. 2	30. 5	30. 7	23
24	28. 6	28. 9	29. 3	29. 7	30. 1	30. 5	30. 9	31. 1	31 3	31. 6	31. 8	32. 1	24
25	29. 8	30. 2	30. 5	30. 9	31. 3	31. 7	32. 2	32. 4	32. 6	32. 9	33. 1	33. 4	25
26	31. 0	31. 4	31. 7	32. 1	32. 6	33. 0	33. 5	33. 7	33. 9	34. 2	34. 5	34. 8	26
27	32. 2	32. 6	33. 0	33. 4	33. 8	34. 3	34. 7	34. 9	35. 2	35. 5	35. 8	36. 1	27
28	33. 4	33. 8	34. 2	34. 6	35. 1	35. 5	36. 0	36. 3	36. 6	36. 9	37. 1	37. 4	28
29	34. 6	35. 0	35. 4	35. 8	36. 3	36. 8	37. 3	37. 6	37. 9	38. 2	38. 4	38. 7	29
30	35. 8	36. 2	36. 6	37. 1	37. 6	38. 1	38. 6	38. 9	39. 2	39. 5	39. 8	40. 1	30
31	37. 0	37. 4	37. 8	38. 3	38. 8	39. 3	39. 9	40. 2	40. 5	40. 8	41. 1	41. 4	31
32	38. 2	38. 6	39. 1	39. 6	40. 1	40. 6	41. 2	41. 5	41. 8	42. 1	42. 4	42 8	32
33	39. 3	39. 8	40. 3	40. 8	41. 3	41. 9	42. 5	42. 8	43. 1	43. 4	43. 7	44. 1	33
34	40. 5	41. 0	41. 5	42. 0	42. 6	43. 1	43. 8	44. 1	44. 4	44. 7	45. 1	45. 5	34
35	41. 7	42. 2	42. 7	43. 3	43. 8	44. 4	45. 0	45. 4	45. 7	46. 1	46. 4	46. 5	35
36	42. 9	43. 4	43. 9	44. 5	45. 1	45. 7	46. 3	46. 7	47. 0	47. 4	47. 7	48. 1	36
37	44. 1	44. 6	45. 2	45. 7	46. 3	47. 0	47. 6	47. 9	48. 3	48. 7	49. 0	49. 4	37
38	45. 3	45. 8	46. 4	47. 0	47. 6	48. 2	48. 9	49. 3	49. 6	50. 0	50. 4	50. 8	38
39	46. 5	47. 0	47. 6	48. 2	48. 8	49. 5	50. 2	50. 6	50. 9	51. 3	51. 7	52. 1	39
40	47. 7	48. 2	48. 8	49. 4	50. 1	50. 8	51. 5	51. 9	52. 2	52. 6	53. 0	53. 4	40
41	48. 9	49. 5	50. 1	50. 7	51. 3	52. 0	52. 8	53. 2	53. 5	53. 9	54. 3	54. 7	41
42	50. 1	50. 7	51. 3	51. 9	52. 6	53. 3	54. 0	54. 4	54. 8	55. 2	55. 7	56. 1	42
43	51. 3	51. 9	52. 5	53. 2	53. 8	54. 6	55. 3	55. 7	56. 1	56. 5	57. 0	57. 5	43
44	52. 5	53. 1	53. 7	54. 4	55. 1	55. 8	56. 6	57. 0	57. 4	57. 9	58. 3	58. 8	44
45	53. 7	54. 2	54. 9	55. 6	56. 3	57. 1	57. 9	58. 3	58. 7	59. 1	59. 6	60. 1	45
46	54. 8	55. 5	56. 2	56. 9	57. 6	58. 4	59. 2	59. 6	60. 0	60. 5	61. 0	61. 5	46
47	56. 0	56. 7	57. 4	58. 1	58. 9	59. 6	60. 5	61. 0	61. 4	61. 9	62. 3	62. 8	47
48	57. 2	57. 9	58. 6	59. 3	60. 1	60. 9	61. 8	62. 3	62. 7	63. 1	63. 6	64. 1	48
49	58. 4	59. 1	59. 8	60. 6	61. 4	62. 2	63. 1	63. 6	64. 0	64. 5	64. 9	65. 4	49
50	59. 6	60. 3	61. 0	61. 8	62. 6	63. 5	64. 3	64. 8	65. 3	65. 8	66. 3	66. 8	50
51	60. 8	61. 5	62. 3	63. 0	63. 9	64. 7	65. 6	66. 1	66. 6	67. 1	67. 6	68. 1	51
52	62. 0	62. 7	63. 5	64. 3	65. 1	66. 0	66. 9	67. 4	67. 9	68. 4	69. 0	69. 5	52
53	63. 2	63. 9	64. 7	65. 5	66. 4	67. 3	68. 2	68. 7	69. 2	69. 7	70. 2	70. 8	53
54	64. 4	65. 1	65. 9	66. 7	67. 6	68. 5	69. 5	69. 9	70. 5	71. 0	71. 6	72. 1	54
55	65. 6	66. 3	67. 1	68. 0	68. 9	69. 8	70. 8	71. 3	71. 8	72. 3	72. 9	73. 5	55
56	66. 8	67. 5	68. 3	69. 2	70. 1	71. 1	72. 1	72. 6	73. 1	73. 6	74. 2	74. 8	56
57	68. 0	68. 7	69. 5	70. 5	71. 4	72. 3	73. 3	73. 8	74. 4	74. 9	75. 5	76. 1	57
58	69. 2	70. 0	70. 7	71. 7	72. 6	73. 6	74. 6	75. 2	75. 7	76. 3	76. 9	77. 5	58
59	70. 4	71. 2	72. 0	72. 9	73. 9	74. 9	75. 9	76. 5	77. 0	77. 6	78. 2	78. 8	59
60	71. 5	72. 4	73. 2	74. 2	75. 1	76. 1	77. 2	77. 8	78. 3	78. 9	79. 5	80. 1	60

TABLE 4.

Conversion of Departure into Difference of Longitude.

Dep.	Middle Latitude. 42°	42°30′	43°	43°30′	44°	44°30′	45°	45°30′	46°	46°30′	47°	47°30′	Dep.
	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	
1	1. 3	1. 3	1. 4	1. 4	1. 4	1. 4	1. 4	1. 4	1. 4	1. 4	1. 5	1. 5	1
2	2. 7	2. 7	2. 7	2. 7	2. 8	2. 8	2. 8	2. 8	2. 9	2. 9	2. 9	2. 9	2
3	4. 0	4. 0	4. 1	4. 1	4. 2	4. 2	4. 2	4. 2	4. 3	4. 3	4. 4	4. 4	3
4	5. 4	5. 4	5. 5	5. 5	5. 6	5. 6	5. 7	5. 7	5. 8	5. 8	5. 9	5. 9	4
5	6. 7	6. 7	6. 8	6. 9	7. 0	7. 0	7. 1	7. 1	7. 2	7. 2	7. 3	7. 4	5
6	8. 1	8. 1	8. 2	8. 2	8. 3	8. 4	8. 5	8. 5	8. 6	8. 7	8. 8	8. 9	6
7	9. 4	9. 5	9. 6	9. 6	9. 7	9. 8	9. 9	10. 0	10. 1	10. 2	10. 3	10. 4	7
8	10. 8	10. 8	10. 9	11. 0	11. 1	11. 2	11. 3	11. 4	11. 5	11. 6	11. 7	11. 9	8
9	12. 1	12. 2	12. 3	12. 4	12. 5	12. 6	12. 7	12. 8	13. 0	13. 1	13. 2	13. 3	9
10	13. 5	13. 6	13. 7	13. 8	13. 9	14. 0	14. 1	14. 3	14. 4	14. 5	14. 7	14. 8	10
11	14. 8	14. 9	15. 0	15. 2	15. 3	15. 4	15. 6	15. 7	15. 8	16. 0	16. 1	16. 3	11
12	16. 1	16. 3	16. 4	16. 6	16. 7	16. 9	17. 0	17. 1	17. 3	17. 5	17. 6	17. 8	12
13	17. 5	17. 6	17. 8	18. 0	18. 1	18. 3	18. 4	18. 6	18. 7	18. 9	19. 1	19. 3	13
14	18. 8	19. 0	19. 1	19. 3	19. 5	19. 7	19. 8	20. 0	20. 2	20. 4	20. 5	20. 7	14
15	20. 2	20. 4	20. 5	20. 7	20. 9	21. 1	21. 2	21. 4	21. 6	21. 8	22. 0	22. 2	15
16	21. 5	21. 7	21. 9	22. 1	22. 2	22. 4	22. 6	22. 8	23. 0	23. 3	23. 5	23. 7	16
17	22. 9	23. 1	23. 2	23. 4	23. 6	23. 8	24. 0	24. 3	24. 5	24. 7	24. 9	25. 2	17
18	24. 2	24. 4	24. 6	24. 8	25. 0	25. 3	25. 5	25. 7	25. 9	26. 2	26. 4	26. 7	18
19	25. 6	25. 8	26. 0	26. 2	26. 4	26. 7	26. 9	27. 2	27. 4	27. 7	27. 9	28. 2	19
20	26. 9	27. 1	27. 3	27. 6	27. 8	28. 2	28. 3	28. 6	28. 8	29. 1	29. 3	29. 6	20
21	28. 3	28. 5	28. 7	29. 0	29. 2	29. 5	29. 7	30. 0	30. 2	30. 5	30. 8	31. 1	21
22	29. 6	29. 9	30. 1	30. 3	30. 6	30. 9	31. 1	31. 4	31. 7	32. 0	32. 3	32. 6	22
23	30. 9	31. 2	31. 4	31. 7	32. 0	32. 3	32. 5	32. 8	33. 1	33. 4	33. 7	34. 1	23
24	32. 3	32. 6	32. 8	33. 1	33. 4	33. 7	33. 9	34. 2	34. 5	34. 9	35. 2	35. 6	24
25	33. 6	33. 9	34. 2	34. 5	34. 8	35. 1	35. 4	35. 7	36. 0	36. 4	36. 7	37. 1	25
26	35. 0	35. 3	35. 6	35. 9	36. 1	36. 5	36. 8	37. 1	37. 4	37. 8	38. 1	38. 5	26
27	36 3	36. 6	36. 9	37. 2	37. 5	37. 9	38. 2	38. 5	38. 9	39. 4	39. 6	40. 0	27
28	37. 7	38. 0	38. 3	38. 6	38. 9	39. 3	39. 6	40. 0	40. 3	40. 7	41. 1	41. 5	28
29	39. 0	39. 4	39. 7	40. 0	40. 3	40. 7	41. 0	41. 4	41. 7	42. 1	42. 5	42. 9	29
30	40. 4	40. 7	41. 0	41. 4	41. 7	42. 1	42. 4	42. 8	43. 2	43. 6	44. 0	44. 4	30
31	41. 7	42. 1	42. 4	42. 8	43. 1	43. 5	43. 8	44. 2	44. 6	45. 1	45. 5	45. 9	31
32	43. 1	43. 5	43. 8	44. 1	44. 4	44. 9	45. 3	45. 7	46. 1	46. 5	46. 9	47. 4	32
33	44. 4	44. 8	45. 1	45. 5	45. 8	46. 3	46. 7	47. 1	47. 5	48. 0	48. 4	48. 9	33
34	45. 8	46. 2	46. 5	46. 9	47. 2	47. 7	48. 1	48. 5	48. 9	49. 4	49. 9	50. 4	34
35	47. 1	47. 5	47. 9	48. 3	48. 6	49. 1	49. 5	50. 0	50. 4	50. 9	51. 3	51. 8	35
36	48. 4	48. 8	49. 2	49. 6	50. 0	50. 5	50. 9	51. 4	51. 8	52. 3	52. 8	53. 3	36
37	49. 8	50. 2	50. 6	51. 0	51. 4	51. 9	52. 3	52. 8	53. 3	53. 8	54. 2	54. 8	37
38	51. 1	51. 6	52. 0	52. 4	52. 8	53. 3	53. 7	54. 2	54. 7	55. 2	55. 7	56. 3	38
39	52. 5	52. 9	53. 3	53. 8	54. 2	54. 7	55. 2	55. 7	56. 1	56. 7	57. 2	57. 8	39
40	53. 8	54. 2	54. 7	55. 2	55. 6	56. 1	56. 6	57. 1	57. 6	58. 2	58. 7	59. 3	40
41	55. 2	55. 7	56. 1	56. 6	57. 0	57. 5	58. 0	58. 5	59. 0	59. 6	60. 1	60. 7	41
42	56. 5	57. 0	57. 4	57. 9	58. 4	59. 0	59. 4	59. 9	60. 5	61. 1	61. 6	62. 2	42
43	57. 9	58. 4	58. 8	59. 3	59. 8	60. 4	60. 8	61. 4	61. 9	62. 5	63. 0	63. 7	43
44	59. 2	59. 7	60. 2	60. 7	61. 2	61. 8	62. 2	62. 8	63. 3	63. 9	64. 5	65. 2	44
45	60. 6	61. 1	61. 5	62. 1	62. 6	63. 1	63. 6	64. 2	64. 8	65. 4	66. 0	66. 7	45
46	61. 9	62. 5	62. 9	63. 5	64. 0	64. 6	65. 1	65. 7	66. 2	66. 8	67. 4	68. 1	46
47	63. 3	63. 8	64. 3	64. 9	65. 4	66. 0	66. 5	67. 2	67. 7	68. 3	68. 9	69. 6	47
48	64. 6	65. 1	65. 6	66. 2	66. 7	67. 3	67. 9	68. 5	69. 1	69. 8	70. 4	71. 1	48
49	65. 9	66. 6	67. 0	67. 6	68. 1	68. 7	69. 3	69. 9	70. 5	71. 2	71. 8	72. 5	49
50	67. 3	67. 9	68. 4	69. 0	69. 5	70. 1	70. 7	71. 4	72. 0	72. 7	73. 3	74. 0	50
51	68. 6	69. 2	69. 7	70. 3	70. 9	71. 5	72. 1	72. 8	73. 4	74. 1	74. 8	75. 5	51
52	70. 0	70. 6	71. 1	71. 7	72. 3	72. 9	73. 5	74. 2	74. 9	75. 4	76. 2	77. 0	52
53	71. 3	71. 9	72. 5	73. 1	73. 7	74. 4	75. 0	75. 7	76. 3	77. 0	77. 7	78. 5	53
54	72. 7	73. 3	73. 8	74. 4	75. 1	75. 8	76. 4	77. 1	77. 8	78. 5	79. 2	80. 0	54
55	74. 0	74. 6	75. 2	75. 8	76. 5	77. 2	77. 8	78. 5	79. 3	80. 0	80. 6	81. 4	55
56	75. 4	76. 0	76. 6	77. 2	77. 8	78. 5	79. 2	80. 0	80. 7	81. 4	82. 1	82. 9	56
57	76. 7	77. 3	77. 9	78. 6	79. 2	79. 9	80. 6	81. 4	82. 2	82. 9	83. 6	84. 4	57
58	78. 0	78. 7	79. 3	80. 0	80. 6	81. 3	82. 0	82. 8	83. 6	84. 3	85. 0	85. 9	58
59	79. 4	80. 0	80. 7	81. 4	82. 0	82. 7	83. 4	84. 2	85. 0	85. 8	86. 5	87. 4	59
60	80. 7	81. 4	82. 0	82. 7	83. 4	84. 1	84. 9	85. 7	86. 4	87. 2	88. 0	88. 9	60

TABLE 4.

Conversion of Departure into Difference of Longitude.

Dep.	Middle Latitude. 48°	48° 30′	49°	49° 30′	50°	50° 30′	51°	51° 30′	52°	52° 30′	53°	53° 30′	Dep.
	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	
1	1. 5	1. 5	1. 5	1. 5	1. 6	1. 6	1. 6	1. 6	1. 6	1. 6	1. 7	1. 7	1
2	3. 0	3. 0	3. 0	3. 0	3. 1	3. 1	3. 2	3. 2	3. 2	3. 2	3. 3	3. 3	2
3	4. 5	4. 6	4. 6	4. 6	4. 7	4. 7	4. 8	4. 8	4. 9	4. 9	5. 0	5. 0	3
4	6. 0	6. 0	6. 1	6. 1	6. 2	6. 3	6. 4	6. 4	6. 5	6. 5	6. 6	6. 7	4
5	7. 5	7. 5	7. 6	7. 7	7. 8	7. 8	7. 9	8. 0	8. 1	8. 2	8. 3	8. 4	5
6	9. 0	9. 0	9. 1	9. 2	9. 3	9. 4	9. 5	9. 6	9. 7	9. 8	10. 0	10. 1	6
7	10. 5	10. 6	10. 7	10. 8	10. 9	11. 0	11. 1	11. 2	11. 4	11. 5	11. 6	11. 7	7
8	12. 0	12. 1	12. 2	12. 3	12. 4	12. 5	12. 7	12. 8	13. 0	13. 1	13. 3	13. 4	8
9	13. 4	13. 6	13. 7	13. 8	14. 0	14. 1	14. 3	14. 4	14. 6	14. 8	15. 0	15. 1	9
10	14. 9	15. 1	15. 2	15. 4	15. 6	15. 7	15. 9	16. 0	16. 2	16. 4	16. 6	16. 8	10
11	16. 4	16. 6	16. 8	16. 9	17. 1	17. 3	17. 5	17. 7	17. 9	18. 1	18. 3	18. 5	11
12	17. 9	18. 1	18. 3	18. 5	18. 7	18. 9	19. 1	19. 3	19. 5	19. 7	19. 9	20. 1	12
13	19. 4	19. 6	19. 8	20. 0	20. 2	20. 4	20. 7	20. 9	21. 1	21. 3	21. 6	21. 8	13
14	20. 9	21. 1	21. 3	21. 5	21. 8	22. 0	22. 2	22. 4	22. 7	23. 0	23. 3	23. 5	14
15	22. 4	22. 6	22. 9	23. 1	23. 3	23. 5	23. 8	24. 1	24. 4	24. 6	24. 9	25. 2	15
16	23. 9	24. 2	24. 4	24. 6	24. 9	25. 1	25. 4	25. 7	26. 0	26. 3	26. 6	26. 9	16
17	25. 4	25. 7	25. 9	26. 2	26. 4	26. 7	27. 0	27. 3	27. 6	27. 9	28. 2	28. 5	17
18	26. 9	27. 2	27. 4	27. 7	28. 0	28. 3	28. 6	28. 9	29. 2	29. 5	29. 9	30. 2	18
19	28. 4	28. 7	29. 0	29. 3	29. 6	29. 9	30. 2	30. 5	30. 9	31. 2	31. 6	31. 9	19
20	29. 9	30. 2	30. 5	30. 8	31. 1	31. 4	31. 8	32. 1	32. 5	32. 8	33. 2	33. 6	20
21	31. 4	31. 7	32. 0	32. 3	32. 7	33. 0	33. 4	33. 7	34. 1	34. 5	34. 9	35. 3	21
22	32. 9	33. 2	33. 5	33. 8	34. 2	34. 6	35. 0	35. 3	35. 7	36. 1	36. 6	37. 0	22
23	34. 4	34. 7	35. 1	35. 4	35. 8	36. 1	36. 5	36. 9	37. 4	37. 8	38. 2	38. 6	23
24	35. 9	36. 3	36. 6	36. 9	37. 3	37. 7	38. 1	38. 5	39. 0	39. 4	39. 9	40. 3	24
25	37. 4	37. 7	38. 1	38. 5	38. 9	39. 3	39. 7	40. 1	40. 6	41. 0	41. 5	42. 0	25
26	38. 9	39. 2	39. 6	40. 0	40. 4	40. 8	41. 3	41. 7	42. 2	42. 7	43. 2	43. 7	26
27	40. 4	40. 8	41. 2	41. 6	42. 0	42. 4	42. 9	43. 4	43. 9	44. 4	44. 9	45. 4	27
28	41. 8	42. 2	42. 7	43. 1	43. 6	44. 0	44. 5	45. 0	45. 5	46. 0	46. 5	47. 0	28
29	43. 3	43. 7	44. 2	44. 6	45. 1	45. 6	46. 1	46. 6	47. 1	47. 6	48. 2	48. 7	29
30	44. 8	45. 2	45. 7	46. 2	46. 7	47. 2	47. 7	48. 2	48. 7	49. 2	49. 8	50. 4	30
31	46. 3	46. 8	47. 3	47. 7	48. 2	48. 7	49. 3	49. 8	50. 4	50. 9	51. 5	52. 1	31
32	47. 8	48. 3	48. 8	49. 3	49. 8	50. 3	50. 8	51. 4	52. 0	52. 6	53. 2	53. 8	32
33	49. 3	49. 8	50. 3	50. 8	51. 3	51. 8	52. 4	53. 0	53. 6	54. 2	54. 8	55. 4	33
34	50. 8	51. 3	51. 8	52. 3	52. 9	53. 4	54. 0	54. 6	55. 2	55. 8	56. 5	57. 1	34
35	52. 3	52. 8	53. 3	53. 8	54. 4	55. 0	55. 6	56. 2	56. 8	57. 5	58. 2	58. 8	35
36	53. 8	54. 3	54. 9	55. 5	56. 0	56. 6	57. 2	57. 8	58. 5	59. 1	59. 8	60. 4	36
37	55. 3	55. 8	56. 4	57. 0	57. 6	58. 2	58. 8	59. 4	60. 1	60. 7	61. 5	62. 2	37
38	56. 8	57. 3	57. 9	58. 5	59. 1	59. 7	60. 4	61. 0	61. 7	62. 4	63. 1	63. 8	38
39	58. 3	58. 8	59. 4	59. 9	60. 7	61. 3	62. 0	62. 6	63. 3	64. 0	64. 8	65. 5	39
40	59. 8	60. 4	61. 0	61. 6	62. 2	62. 9	63. 6	64. 3	65. 0	65. 7	66. 5	67. 3	40
41	61. 3	61. 9	62. 5	63. 1	63. 8	64. 5	65. 2	65. 9	66. 6	67. 3	68. 1	68. 9	41
42	62. 8	63. 4	64. 0	64. 6	65. 3	66. 0	66. 7	67. 4	68. 2	69. 0	69. 8	70. 4	42
43	64. 3	64. 9	65. 5	66. 2	66. 9	67. 6	68. 3	69. 0	69. 8	70. 6	71. 5	72. 3	43
44	65. 8	66. 4	67. 1	67. 8	68. 5	69. 2	69. 9	70. 7	71. 5	72. 3	73. 1	74. 0	44
45	67. 3	68. 0	68. 6	69. 3	70. 0	70. 7	71. 5	72. 3	73. 1	73. 9	74. 8	75. 7	45
46	68. 7	69. 4	70. 1	70. 8	71. 6	72. 3	73. 1	73. 8	74. 7	75. 5	76. 4	77. 3	46
47	70. 2	70. 9	71. 6	72. 3	73. 1	73. 8	74. 7	75. 5	76. 3	77. 2	78. 1	79. 0	47
48	71. 7	72. 4	73. 2	73. 9	74. 7	75. 5	76. 3	77. 1	78. 0	78. 9	79. 8	80. 7	48
49	73. 2	74. 0	74. 7	75. 4	76. 2	77. 0	77. 9	78. 7	79. 6	80. 5	81. 4	82. 4	49
50	74. 7	75. 5	76. 2	77. 0	77. 8	78. 6	79. 5	80. 3	81. 2	82. 1	83. 1	84. 1	50
51	76. 2	76. 9	77. 7	78. 5	79. 3	80. 1	81. 0	81. 9	82. 8	83. 7	84. 7	85. 7	51
52	77. 7	78. 5	79. 3	80. 1	80. 9	81. 7	82. 6	83. 5	84. 5	85. 4	86. 4	87. 4	52
53	79. 2	80. 0	80. 8	81. 6	82. 4	83. 2	84. 2	85. 1	86. 1	87. 1	88. 1	89. 1	53
54	80. 7	81. 5	82. 3	83. 1	84. 0	84. 9	85. 8	86. 7	87. 7	88. 7	89. 7	90. 8	54
55	82. 2	83. 0	83. 8	84. 7	85. 6	86. 4	87. 4	88. 3	89. 3	90. 3	91. 4	92. 5	55
56	83. 7	84. 5	85. 4	86. 2	87. 1	88. 0	89. 0	90. 0	91. 0	92. 0	93. 1	94. 2	56
57	85. 2	86. 0	86. 9	87. 8	88. 7	89. 6	90. 6	91. 6	92. 6	93. 6	94. 7	95. 8	57
58	86. 7	87. 5	88. 4	89. 3	90. 2	91. 2	92. 2	93. 2	94. 2	95. 2	96. 3	97. 5	58
59	88. 2	89. 0	89. 9	90. 8	91. 8	92. 8	93. 8	94. 8	95. 8	96. 9	98. 0	99. 2	59
60	89. 7	90. 6	91. 5	92. 4	93. 3	94. 3	95. 3	96. 2	97. 5	98. 4	99. 7	100. 9	60

TABLE 4.

Conversion of Departure into Difference Longitude.

Dep.	Middle Latitude. 54°	54°30′	55°	55°30′	56°	56°30′	57°	57°30′	58°	58°30′	59°	59°30′	Dep.
	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	D. Lo.	
1	1. 7	1. 7	1. 7	1. 7	1. 8	1. 8	1. 8	1. 8	1. 9	1. 9	1. 9	2. 0	1
2	3. 4	3. 4	3. 5	3. 5	3. 6	3. 6	3. 7	3. 7	3. 8	3. 8	3. 9	3. 9	2
3	5. 1	5. 1	5. 2	5. 3	5. 4	5. 4	5. 5	5. 6	5. 7	5. 7	5. 8	5. 9	3
4	6. 8	6. 9	7. 0	7. 1	7. 2	7. 2	7. 3	7. 4	7. 5	7. 6	7. 8	7. 9	4
5	8. 5	8. 6	8. 7	8. 8	8. 9	9. 0	9. 2	9. 3	9. 4	9. 5	9. 7	9. 8	5
6	10. 2	10. 3	10. 5	10. 6	10. 7	10. 8	11. 0	11. 1	11. 3	11. 4	11. 6	11. 8	6
7	11. 9	12. 0	12. 2	12. 3	12. 5	12. 7	12. 9	13. 0	13. 2	13. 4	13. 6	13. 8	7
8	13. 6	13. 7	13. 9	14. 1	14. 3	14. 5	14. 7	14. 9	15. 1	15. 3	15. 5	15. 8	8
9	15. 3	15. 5	15. 7	15. 9	16. 1	16. 3	16. 5	16. 7	17. 0	17. 2	17. 5	17. 7	9
10	17. 0	17. 2	17. 4	17. 6	17. 9	18. 1	18. 4	18. 7	18. 9	19. 1	19. 4	19. 7	10
11	18. 7	18. 9	19. 2	19. 4	19. 7	20. 0	20. 2	20. 5	20. 8	21. 1	21. 4	21. 6	11
12	20. 4	20. 6	20. 9	21. 2	21. 5	21. 8	22. 0	22. 3	22. 6	22. 9	23. 3	23. 7	12
13	22. 1	22. 4	22. 7	22. 9	23. 2	23. 5	23. 9	24. 2	24. 5	24. 9	25. 2	25. 6	13
14	23. 8	24. 1	24. 4	24. 7	25. 0	25. 3	25. 7	26. 0	26. 4	26. 8	27. 2	27. 6	14
15	25. 5	25. 8	26. 2	26. 5	26. 8	27. 1	27. 5	27. 9	28. 3	28. 7	29. 1	29. 6	15
16	27. 2	27. 5	27. 9	28. 2	28. 6	29. 0	29. 4	29. 8	30. 2	30. 6	31. 1	31. 5	16
17	28. 9	29. 2	29. 6	30. 0	30. 4	30. 8	31. 2	31. 6	32. 1	32. 6	33. 0	33. 5	17
18	30. 6	31. 0	31. 4	31. 8	32. 2	32. 6	33. 0	33. 5	34. 0	34. 5	34. 9	35. 5	18
19	32. 3	32. 7	33. 1	33. 5	34. 0	34. 4	34. 9	35. 4	35. 9	36. 4	36. 9	37. 4	19
20	34. 0	34. 4	34. 9	35. 3	35. 8	36. 2	36. 7	37. 2	37. 7	38. 2	38. 8	39. 4	20
21	35. 7	36. 1	36. 6	37. 1	37. 6	38. 1	38. 6	39. 1	39. 6	40. 2	40. 8	41. 4	21
22	37. 4	37. 9	38. 4	38. 9	39. 3	39. 8	40. 4	40. 9	41. 5	42. 1	42. 7	43. 3	22
23	39. 1	39. 6	40. 1	40. 6	41. 1	41. 6	42. 2	42. 8	43. 4	44. 0	44. 7	45. 3	23
24	40. 8	41. 3	41. 8	42. 3	42. 9	43. 5	44. 1	44. 7	45. 3	45. 9	46. 6	47. 3	24
25	42. 5	43. 0	43. 6	44. 1	44. 7	45. 3	45. 9	46. 5	47. 2	47. 8	48. 5	49. 3	25
26	44. 2	44. 7	45. 3	45. 9	46. 5	47. 1	47. 7	48. 4	49. 1	49. 8	50. 5	51. 2	26
27	45. 9	46. 4	47. 1	47. 7	48. 3	48. 9	49. 6	50. 3	51. 0	51. 7	52. 4	53. 2	27
28	47. 6	48. 2	48. 8	49. 4	50. 1	50. 7	51. 4	52. 1	52. 8	53. 4	54. 4	55. 2	28
29	49. 3	49. 9	50. 6	51. 2	51. 9	52. 5	53. 2	53. 9	54. 7	55. 5	56. 3	57. 1	29
30	51. 0	51. 6	52. 3	52. 9	53. 6	54. 3	55. 1	55. 8	56. 6	57. 4	58. 2	59. 1	30
31	52. 7	53. 3	54. 0	54. 7	55. 4	56. 1	56. 9	57. 7	58. 5	59. 3	60. 2	61. 0	31
32	54. 4	55. 2	55. 8	56. 5	57. 2	58. 0	58. 8	59. 6	60. 4	61. 2	62. 1	63. 0	32
33	56. 1	56. 8	57. 5	58. 2	59. 0	59. 8	60. 6	61. 4	62. 3	63. 2	64. 1	65. 0	33
34	57. 8	58. 5	59. 3	60. 0	60. 8	61. 4	62. 4	63. 3	64. 2	65. 1	66. 0	67. 0	34
35	59. 5	60. 2	61. 0	61. 8	62. 6	63. 4	64. 3	65. 1	66. 0	67. 0	68. 0	69. 0	35
36	61. 2	62. 0	62. 8	63. 6	64. 4	65. 2	66. 1	67. 0	67. 9	68. 9	69. 9	70. 9	36
37	62. 9	63. 7	64. 5	65. 3	66. 2	67. 0	67. 9	68. 8	69. 8	70. 8	71. 8	72. 9	37
38	64. 6	65. 4	66. 3	67. 1	68. 0	68. 9	69. 8	70. 7	71. 7	72. 7	73. 8	74. 9	38
39	66. 3	67. 1	68. 0	68. 8	69. 7	70. 6	71. 6	72. 6	73. 6	74. 6	75. 7	76. 8	39
40	68. 1	68. 9	69. 7	70. 4	71. 5	72. 4	73. 4	74. 4	75. 5	76. 6	77. 7	78. 8	40
41	69. 8	70. 6	71. 5	72. 4	73. 3	74. 3	75. 3	76. 3	77. 4	78. 5	79. 6	80. 8	41
42	71. 5	72. 3	73. 2	74. 1	75. 1	76. 1	77. 1	78. 2	79. 3	80. 4	81. 5	82. 8	42
43	73. 2	74. 1	75. 0	75. 9	76. 9	77. 9	79. 0	80. 0	81. 1	82. 3	83. 5	84. 7	43
44	74. 9	75. 8	76. 7	77. 7	78. 7	79. 7	80. 8	81. 9	83. 0	84. 2	85. 4	86. 7	44
45	76. 6	77. 5	78. 5	79. 5	80. 5	81. 5	82. 6	83. 7	84. 9	86. 1	87. 4	88. 7	45
46	78. 3	79. 2	80. 2	81. 2	82. 3	83. 4	84. 5	85. 6	86. 8	88. 0	89. 3	90. 6	46
47	80. 0	80. 9	81. 9	82. 9	84. 0	85. 1	86. 3	87. 5	88. 7	90. 0	91. 3	92. 6	47
48	81. 7	82. 7	83. 7	84. 7	85. 8	86. 9	88. 1	89. 3	90. 6	91. 9	93. 2	94. 6	48
49	83. 4	84. 4	85. 4	86. 5	87. 6	88. 8	90. 0	91. 2	92. 5	93. 8	95. 1	96. 5	49
50	85. 1	86. 1	87. 2	88. 4	89. 4	90. 6	91. 8	93. 1	94. 4	95. 7	97. 1	98. 5	50
51	86. 8	87. 8	88. 9	90. 0	91. 2	92. 4	93. 6	94. 9	96. 2	97. 6	99. 0	100. 5	51
52	88. 5	89. 6	90. 7	91. 8	93. 0	94. 2	95. 5	96. 8	98. 1	99. 6	101. 0	102. 5	52
53	90. 2	91. 3	92. 5	93. 6	94. 8	96. 0	97. 3	98. 6	100. 0	101. 5	102. 9	104. 4	53
54	91. 9	93. 0	94. 2	95. 4	96. 6	97. 9	99. 1	100. 5	101. 9	103. 4	104. 8	106. 4	54
55	93. 6	94. 8	96. 0	97. 2	98. 4	99. 7	101. 0	102. 4	103. 8	105. 1	106. 7	108. 3	55
56	95. 3	96. 5	97. 7	98. 9	100. 1	101. 4	102. 8	104. 2	105. 7	107. 2	108. 6	110. 3	56
57	97. 0	98. 2	99. 5	100. 7	101. 9	103. 3	104. 7	106. 1	107. 6	109. 1	110. 6	112. 3	57
58	98. 7	99. 9	101. 2	102. 4	103. 7	105. 1	106. 5	108. 0	109. 5	111. 0	112. 5	114. 2	58
59	100. 4	101. 6	102. 9	104. 2	105. 5	106. 9	108. 3	109. 8	111. 3	112. 9	114. 5	116. 2	59
60	102. 1	103. 3	104. 6	106. 0	107. 3	108. 8	110. 2	111. 7	113. 2	114. 8	116. 5	118. 2	60

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TABLE 5.

Meridional Parts, or Increased Latitudes.

Comp. $\frac{1}{293.465}$

M.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	M.
0	0.0	59.6	119.2	178.9	238.6	298.3	358.2	418.2	478.3	538.6	0
1	1.0	60.6	20.2	79.9	39.6	99.3	59.2	19.2	79.3	39.6	1
2	2.0	61.6	21.2	80.8	40.6	300.3	60.2	20.2	80.3	40.6	2
3	3.0	62.6	22.2	81.8	41.6	01.3	61.2	21.2	81.3	41.6	3
4	4.0	63.6	23.2	82.8	42.5	02.3	62.2	22.2	82.3	42.6	4
5	5.0	64.6	124.2	183.8	243.5	303.3	363.2	423.2	483.3	543.6	5
6	6.0	65.6	25.2	84.8	44.5	04.3	64.2	24.2	84.3	44.6	6
7	7.0	66.5	26.2	85.8	45.5	05.3	65.2	25.2	85.3	45.6	7
8	7.9	67.5	27.2	86.8	46.5	06.3	66.2	26.2	86.3	46.6	8
9	8.9	68.5	28.2	87.8	47.5	07.3	67.2	27.2	87.3	47.6	9
10	9.9	69.5	129.1	188.8	248.5	308.3	368.2	428.2	488.3	548.6	10
11	10.9	70.5	30.1	89.8	49.5	09.3	69.2	29.2	89.3	49.6	11
12	11.9	71.5	31.1	90.8	50.5	10.3	70.2	30.2	90.4	50.6	12
13	12.9	72.5	32.1	91.8	51.5	11.3	71.2	31.2	91.4	51.7	13
14	13.9	73.5	33.1	92.8	52.5	12.3	72.2	32.2	92.4	52.7	14
15	14.9	74.5	134.1	193.8	253.5	313.3	373.2	433.2	493.4	553.7	15
16	15.9	75.5	35.1	94.8	54.5	14.3	74.2	34.2	94.4	54.7	16
17	16.9	76.5	36.1	95.8	55.5	15.3	75.2	35.2	95.4	55.7	17
18	17.9	77.5	37.1	96.8	56.5	16.3	76.2	36.2	96.4	56.7	18
19	18.9	78.5	38.1	97.8	57.5	17.3	77.2	37.2	97.4	57.7	19
20	19.9	79.5	139.1	198.8	258.5	318.3	378.2	438.2	498.4	558.7	20
21	20.9	80.5	40.1	99.7	59.5	19.3	79.2	39.2	99.4	59.7	21
22	21.9	81.5	41.1	200.7	60.5	20.3	80.2	40.2	500.4	60.7	22
23	22.8	82.4	42.1	01.7	61.5	21.3	81.2	41.2	01.4	61.7	23
24	23.8	83.4	43.1	02.7	62.5	22.3	82.2	42.2	02.4	62.7	24
25	24.8	84.4	144.1	203.7	263.5	323.3	383.2	443.2	503.4	563.7	25
26	25.8	85.4	45.1	04.7	64.5	24.3	84.2	44.2	04.4	64.7	26
27	26.8	86.4	46.0	05.7	65.5	25.3	85.2	45.2	05.4	65.7	27
28	27.8	87.4	47.0	06.7	66.5	26.3	86.2	46.2	06.4	66.8	28
29	28.8	88.4	48.0	07.7	67.4	27.3	87.2	47.2	07.4	67.8	29
30	29.8	89.4	149.0	208.7	268.4	328.3	388.2	448.2	508.4	568.8	30
31	30.8	90.4	50.0	09.7	69.4	29.3	89.2	49.2	09.4	69.8	31
32	31.8	91.4	51.0	10.7	70.4	30.3	90.2	50.2	10.4	70.8	32
33	32.8	92.4	52.0	11.7	71.4	31.3	91.2	51.2	11.4	71.8	33
34	33.8	93.4	53.0	12.7	72.4	32.3	92.2	52.2	12.4	72.8	34
35	34.8	94.4	154.0	213.7	273.4	333.3	393.2	453.2	513.4	573.8	35
36	35.8	95.4	55.0	14.7	74.4	34.3	94.2	54.3	14.5	74.8	36
37	36.7	96.4	56.0	15.7	75.4	35.3	95.2	55.3	15.5	75.8	37
38	37.7	97.3	57.0	16.7	76.4	36.2	96.2	56.3	16.5	76.8	38
39	38.7	98.3	58.0	17.7	77.4	37.2	97.2	57.3	17.5	77.8	39
40	39.7	99.3	159.0	218.7	278.4	338.2	398.2	458.3	518.5	578.8	40
41	40.7	100.3	60.0	19.7	79.4	39.2	99.2	59.3	19.5	79.9	41
42	41.7	01.3	61.0	20.6	80.4	40.2	400.2	60.3	20.5	80.9	42
43	42.7	02.3	62.0	21.6	81.4	41.2	01.2	61.3	21.5	81.9	43
44	43.7	03.3	63.0	22.6	82.4	42.2	02.2	62.3	22.5	82.9	44
45	44.7	104.3	164.0	223.6	283.4	343.2	403.2	463.3	523.5	583.9	45
46	45.7	05.3	65.0	24.6	84.4	44.2	04.2	64.3	24.5	84.9	46
47	46.7	06.3	66.0	25.6	85.4	45.2	05.2	65.3	25.5	85.9	47
48	47.7	07.3	67.0	26.6	86.4	46.2	06.2	66.3	26.5	86.9	48
49	48.7	08.3	68.0	27.6	87.4	47.2	07.2	67.3	27.5	87.9	49
50	49.7	109.3	168.9	228.6	288.4	348.2	408.2	468.3	528.5	588.9	50
51	50.7	10.3	69.9	29.6	89.4	49.2	09.2	69.3	29.5	89.9	51
52	51.6	11.3	70.9	30.6	90.4	50.2	10.2	70.3	30.5	90.9	52
53	52.6	12.3	71.9	31.6	91.4	51.2	11.2	71.3	31.5	91.9	53
54	53.6	13.2	72.9	32.6	92.4	52.2	12.2	72.3	32.5	93.0	54
55	54.6	114.2	173.9	233.6	293.4	353.2	413.2	473.3	533.5	594.0	55
56	55.6	15.2	74.9	34.6	94.4	54.2	14.2	74.3	34.6	95.0	56
57	56.6	16.2	75.9	35.6	95.4	55.2	15.2	75.3	35.6	96.0	57
58	57.6	17.2	76.9	36.6	96.3	56.2	16.2	76.3	36.6	97.0	58
59	58.6	18.2	77.9	37.6	97.3	57.2	17.2	77.3	37.6	98.0	59
M.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	M.

TABLE 5.

Meridional Parts, or Increased Latitudes.

Comp. $\frac{1}{293.465}$

M.	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	M.
0	599.0	659.6	720.5	781.5	842.8	904.4	966.3	1028.5	1091.0	1153.9	0
1	600.0	60.6	21.5	82.5	43.9	05.4	67.3	29.5	92.0	54.9	1
2	01.0	61.7	22.5	83.6	44.9	06.5	68.3	30.5	93.1	56.0	2
3	02.0	62.7	23.5	84.6	45.9	07.5	69.4	31.6	94.1	57.0	3
4	03.0	63.7	24.5	85.6	46.9	08.5	70.4	32.6	95.2	58.1	4
5	604.1	664.7	725.5	786.6	847.9	909.6	971.4	1033.7	1096.2	1159.1	5
6	05.1	65.7	26.6	87.6	49.0	10.6	72.5	34.7	97.3	60.2	6
7	06.1	66.7	27.6	88.7	50.0	11.6	73.5	35.7	98.3	61.2	7
8	07.1	67.7	28.6	89.7	51.0	12.6	74.6	36.8	99.4	62.3	8
9	08.1	68.7	29.6	90.7	52.0	13.7	75.6	37.8	1100.4	63.3	9
10	609.1	669.8	730.6	791.7	853.1	914.7	976.6	1038.9	1101.4	1164.4	10
11	10.1	70.8	31.6	92.7	54.1	15.7	77.7	39.9	02.5	65.4	11
12	11.1	71.8	32.7	93.8	55.1	16.8	78.7	40.9	03.5	66.5	12
13	12.1	72.8	33.7	94.8	56.1	17.8	79.7	42.0	04.6	67.5	13
14	13.1	73.8	34.7	95.8	57.2	18.8	80.8	43.0	05.6	68.6	14
15	614.1	674.8	735.7	796.8	858.2	919.8	981.8	1044.1	1106.7	1169.7	15
16	15.2	75.8	36.7	97.8	59.2	20.9	82.8	45.1	07.7	70.7	16
17	16.2	76.8	37.7	98.9	60.2	21.9	83.9	46.1	08.8	71.8	17
18	17.2	77.9	38.8	99.9	61.3	22.9	84.9	47.2	09.8	72.8	18
19	18.2	78.9	39.8	800.9	62.3	24.0	85.9	48.2	10.9	73.9	19
20	619.2	679.9	740.8	801.9	863.3	925.0	987.0	1049.3	1111.9	1174.9	20
21	20.2	80.9	41.8	02.9	64.3	26.0	88.0	50.3	13.0	76.0	21
22	21.2	81.9	42.8	04.0	65.4	27.1	89.0	51.3	14.0	77.0	22
23	22.2	82.9	43.8	05.0	66.4	28.1	90.1	52.4	15.0	78.1	23
24	23.2	83.9	44.9	06.0	67.4	29.1	91.1	53.4	16.1	79.1	24
25	624.2	684.9	745.9	807.0	868.5	930.1	992.1	1054.5	1117.1	1180.2	25
26	25.3	86.0	46.9	08.1	69.5	31.2	93.2	55.5	18.2	81.2	26
27	26.3	87.0	47.9	09.1	70.5	32.2	94.2	56.6	19.2	82.3	27
28	27.3	88.0	48.9	10.1	71.5	33.2	95.3	57.6	20.3	83.3	28
29	28.3	89.0	49.9	11.1	72.6	34.3	96.3	58.6	21.3	84.4	29
30	629.3	690.0	751.0	812.1	873.6	935.3	997.3	1059.7	1122.4	1185.5	30
31	30.3	91.0	52.0	13.2	74.6	36.3	98.4	60.7	23.4	86.5	31
32	31.3	92.0	53.0	14.2	75.6	37.4	99.4	61.8	24.5	87.6	32
33	32.3	93.1	54.0	15.2	76.7	38.4	1000.4	62.8	25.5	88.6	33
34	33.3	94.1	55.0	16.2	77.7	39.4	01.5	63.9	26.6	89.7	34
35	634.3	695.1	756.0	817.3	878.7	940.5	1002.5	1064.9	1127.6	1190.7	35
36	35.4	96.1	57.1	18.3	79.7	41.5	03.6	65.9	28.7	91.8	36
37	36.4	97.1	58.1	19.3	80.8	42.5	04.6	67.0	29.7	92.8	37
38	37.4	98.1	59.1	20.3	81.8	43.6	05.6	68.0	30.8	93.9	38
39	38.4	99.1	60.1	21.3	82.8	44.6	06.7	69.1	31.8	95.0	39
40	639.4	700.2	761.1	822.4	883.8	945.6	1007.7	1070.1	1132.9	1196.0	40
41	40.4	01.2	62.2	23.4	84.9	46.7	08.7	71.2	33.9	97.1	41
42	41.4	02.2	63.2	24.4	85.9	47.7	09.8	72.2	35.0	98.1	42
43	42.4	03.2	64.2	25.4	86.9	48.7	10.8	73.2	36.0	99.2	43
44	43.4	04.2	65.2	26.5	88.0	49.7	11.8	74.3	37.1	1200.2	44
45	644.5	705.2	766.2	827.5	889.0	950.8	1012.9	1075.3	1138.1	1201.3	45
46	45.5	06.2	67.3	28.5	90.0	51.8	13.9	76.4	39.2	02.3	46
47	46.5	07.3	68.3	29.5	91.0	52.8	15.0	77.4	40.2	03.4	47
48	47.5	08.3	69.3	30.5	92.1	53.9	16.0	78.5	41.3	04.5	48
49	48.5	09.3	70.3	31.6	93.1	54.9	17.0	79.5	42.3	05.5	49
50	649.5	710.3	771.3	832.6	894.1	955.9	1018.1	1080.5	1143.4	1206.6	50
51	50.5	11.3	72.3	33.6	95.2	57.0	19.1	81.6	44.4	07.6	51
52	51.5	12.3	73.4	34.6	96.2	58.0	20.2	82.6	45.5	08.7	52
53	52.5	13.4	74.4	35.7	97.2	59.0	21.2	83.7	46.5	09.7	53
54	53.6	14.4	75.4	36.7	98.2	60.1	22.2	84.7	47.6	10.8	54
55	654.6	715.4	776.4	837.7	899.3	961.1	1023.3	1085.8	1148.6	1211.8	55
56	55.6	16.4	77.4	38.7	900.3	62.1	24.3	86.8	49.7	12.9	56
57	56.6	17.4	78.5	39.8	01.3	63.2	25.3	87.9	50.7	14.0	57
58	57.6	18.4	79.5	40.8	02.3	64.2	26.4	88.9	51.8	15.0	58
59	58.6	19.4	80.5	41.8	03.4	65.2	27.4	89.9	52.8	16.1	59
M.	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	M.

TABLE 5.

Meridional Parts, or Increased Latitudes.

Comp. $\frac{1}{293.465}$

M.	20°	21°	22°	23°	24°	25°	26°	27°	28°	29°	M.
0	1217.1	1280.8	1344.9	1409.5	1474.5	1540.1	1606.2	1672.9	1740.2	1808.1	0
1	18.2	81.9	46.0	10.6	75.6	41.2	07.3	74.0	41.3	09.2	1
2	19.3	82.9	47.1	11.6	76.7	42.3	08.4	75.1	42.4	10.4	2
3	20.3	84.0	48.1	12.7	77.8	43.4	09.5	76.2	43.6	11.5	3
4	21.4	85.1	49.2	13.8	78.9	44.5	10.6	77.4	44.7	12.6	4
5	1222.4	1286.1	1350.3	1414.9	1480.0	1545.6	1611.7	1678.5	1745.8	1813.8	5
6	23.5	87.2	51.4	16.0	81.1	46.7	12.9	79.6	46.9	14.9	6
7	24.5	88.3	52.4	17.1	82.2	47.8	14.0	80.7	48.1	16.1	7
8	25.6	89.3	53.5	18.1	83.3	48.9	15.1	81.8	49.2	17.2	8
9	26.7	90.4	54.6	19.2	84.3	50.0	16.2	82.9	50.3	18.3	9
10	1227.7	1291.5	1355.7	1420.3	1485.4	1551.1	1617.3	1684.1	1751.5	1819.5	10
11	28.8	92.5	56.7	21.4	86.5	52.2	18.4	85.2	52.6	20.6	11
12	29.8	93.6	57.8	22.5	87.6	53.3	19.5	86.3	53.7	21.8	12
13	30.9	94.7	58.9	23.5	88.7	54.4	20.6	87.4	54.8	22.9	13
14	32.0	95.7	59.9	24.6	89.8	55.5	21.7	88.5	56.0	24.0	14
15	1233.0	1296.8	1361.0	1425.7	1490.9	1556.6	1622.8	1689.7	1757.1	1825.2	15
16	34.1	97.9	62.1	26.8	92.0	57.7	23.9	90.8	58.2	26.3	16
17	35.1	98.9	63.2	27.9	93.1	58.8	25.0	91.9	59.4	27.5	17
18	36.2	1300.0	64.2	29.0	94.2	59.9	26.2	93.0	60.5	28.6	18
19	37.3	01.1	65.3	30.0	95.2	61.0	27.3	94.1	61.6	29.7	19
20	1238.3	1302.1	1366.4	1431.1	1496.3	1562.1	1628.4	1695.3	1762.7	1830.9	20
21	39.4	03.2	67.5	32.2	97.4	63.2	29.5	96.4	63.9	32.0	21
22	40.4	04.3	68.5	33.3	98.5	64.3	30.6	97.5	65.0	33.2	22
23	41.5	05.3	69.6	34.4	99.6	65.4	31.7	98.6	66.1	34.3	23
24	42.6	06.4	70.7	35.4	1500.7	66.5	32.8	99.7	67.3	35.4	24
25	1243.6	1307.5	1371.8	1436.5	1501.8	1567.6	1633.9	1700.9	1768.4	1836.6	25
26	44.7	08.5	72.8	37.6	02.9	68.7	35.0	02.0	69.5	37.7	26
27	45.7	09.6	73.9	38.7	04.0	69.8	36.1	03.1	70.7	38.9	27
28	46.8	10.7	75.0	39.8	05.1	70.9	37.3	04.2	71.8	40.0	28
29	47.9	11.7	76.1	40.9	06.2	72.0	38.4	05.3	72.9	41.2	29
30	1248.9	1312.8	1377.1	1442.0	1507.3	1573.1	1639.5	1706.5	1774.1	1842.3	30
31	50.0	13.9	78.2	43.0	08.4	74.2	40.6	07.6	75.2	43.4	31
32	51.0	14.9	79.3	44.1	09.4	75.3	41.7	08.7	76.3	44.6	32
33	52.1	16.0	80.4	45.2	10.5	76.4	42.8	09.8	77.4	45.7	33
34	53.2	17.1	81.5	46.3	11.6	77.5	43.9	10.9	78.6	46.9	34
35	1254.2	1318.2	1382.5	1447.4	1512.7	1578.6	1645.0	1712.1	1779.7	1848.0	35
36	55.3	19.2	83.6	48.5	13.8	79.7	46.2	13.2	80.8	49.2	36
37	56.4	20.3	84.7	49.5	14.9	80.8	47.3	14.3	82.0	50.3	37
38	57.4	21.4	85.8	50.6	16.0	81.9	48.4	15.4	83.1	51.4	38
39	58.5	22.4	86.8	51.7	17.1	83.0	49.5	16.6	84.2	52.6	39
40	1259.5	1323.5	1387.9	1452.8	1518.2	1584.1	1650.6	1717.7	1785.4	1853.7	40
41	60.6	24.6	89.0	53.9	19.3	85.2	51.7	18.8	86.5	54.9	41
42	61.7	25.6	90.1	55.0	20.4	86.3	52.8	19.9	87.6	56.0	42
43	62.7	26.7	91.1	56.1	21.5	87.4	53.9	21.1	88.8	57.2	43
44	63.8	27.8	92.2	57.1	22.6	88.5	55.1	22.2	89.9	58.3	44
45	1264.9	1328.9	1393.3	1458.2	1523.7	1589.6	1656.2	1723.3	1791.1	1859.5	45
46	65.9	29.9	94.4	59.3	24.8	90.7	57.3	24.4	92.2	60.6	46
47	67.0	31.0	95.5	60.4	25.9	91.8	58.4	25.5	93.3	61.8	47
48	68.0	32.1	96.5	61.5	27.0	92.9	59.5	26.7	94.5	62.9	48
49	69.1	33.1	97.6	62.6	28.0	94.1	60.6	27.8	95.6	64.0	49
50	1270.2	1334.2	1398.7	1463.7	1529.1	1595.2	1661.7	1728.9	1796.7	1865.2	50
51	71.2	35.3	99.8	64.8	30.2	96.3	62.9	30.0	97.9	66.3	51
52	72.3	36.3	1400.9	65.8	31.3	97.4	64.0	31.2	99.0	67.5	52
53	73.4	37.4	01.9	66.9	32.4	98.5	65.1	32.3	1800.1	68.6	53
54	74.4	38.5	03.0	68.0	33.5	99.6	66.2	33.4	01.3	69.8	54
55	1275.5	1339.6	1404.1	1469.1	1534.6	1600.7	1667.3	1734.5	1802.4	1870.9	55
56	76.6	40.6	05.2	70.2	35.7	01.8	68.4	35.7	03.5	72.1	56
57	77.6	41.7	06.2	71.3	36.8	02.9	69.5	36.8	04.7	73.2	57
58	78.7	42.8	07.3	72.4	37.9	04.0	70.7	37.9	05.8	74.4	58
59	79.7	43.8	08.4	73.5	39.0	05.1	71.8	39.1	07.0	75.5	59
M.	20°	21°	22°	23°	24°	25°	26°	27°	28°	29°	M.

TABLE 5.

Meridional Parts, or Increased Latitudes.

Comp. $\frac{1}{293.465}$

M.	30°	31°	32°	33°	34°	35°	36°	37°	38°	39°	M.
0	1876. 7	1946. 0	2016. 0	2086. 8	2158. 4	2230. 9	2304. 2	2378. 5	2453. 8	2530. 2	0
1	77. 8	47. 1	17. 2	88. 0	59. 6	32. 1	05. 5	79. 8	55. 1	31. 5	1
2	79. 0	48. 3	18. 3	89. 2	60. 8	33. 3	06. 7	81. 0	56. 4	32. 8	2
3	80. 1	49. 4	19. 5	90. 3	62. 0	34. 5	07. 9	82. 3	57. 6	34. 0	3
4	81. 3	50. 6	20. 7	91. 5	63. 2	35. 7	09. 2	83. 5	58. 9	35. 3	4
5	1882. 4	1951. 8	2021. 9	2092. 7	2164. 4	2236. 9	2310. 4	2384. 8	2460. 2	2536. 6	5
6	83. 6	52. 9	23. 0	93. 9	65. 6	38. 2	11. 6	86. 0	61. 4	37. 9	6
7	84. 7	54. 1	24. 2	95. 1	66. 8	39. 4	12. 9	87. 3	62. 7	39. 2	7
8	85. 9	55. 3	25. 4	96. 3	68. 0	40. 6	14. 1	88. 5	64. 0	40. 5	8
9	87. 0	56. 4	26. 6	97. 5	69. 2	41. 8	15. 3	89. 8	65. 2	41. 7	9
10	1888. 2	1957. 6	2027. 7	2098. 7	2170. 4	2243. 0	2316. 5	2391. 0	2466. 5	2543. 0	10
11	89. 3	58. 7	28. 9	99. 8	71. 6	44. 2	17. 8	92. 3	67. 8	44. 3	11
12	90. 5	59. 9	30. 1	2101. 0	72. 8	45. 5	19. 0	93. 5	69. 0	45. 6	12
13	91. 6	61. 1	31. 3	02. 2	74. 0	46. 7	20. 3	94. 8	70. 3	46. 9	13
14	92. 8	62. 2	32. 4	03. 4	75. 2	47. 9	21. 5	96. 0	71. 6	48. 2	14
15	1893. 9	1963. 4	2033. 6	2104. 6	2176. 4	2249. 1	2322. 7	2397. 3	2472. 8	2549. 5	15
16	95. 1	64. 6	34. 8	05. 8	77. 6	50. 3	24. 0	98. 5	74. 1	50. 7	16
17	96. 2	65. 7	36. 0	07. 0	78. 8	51. 6	25. 2	99. 8	75. 4	52. 0	17
18	97. 4	66. 9	37. 1	08. 2	80. 0	52. 8	26. 4	2401. 0	76. 6	53. 3	18
19	98. 5	68. 1	38. 3	09. 4	81. 2	54. 0	27. 7	02. 3	77. 9	54. 6	19
20	1899. 7	1969. 2	2039. 5	2110. 6	2182. 5	2255. 2	2328. 9	2403. 5	2479. 2	2555. 9	20
21	1900. 8	70. 4	40. 7	11. 8	83. 7	56. 4	30. 1	04. 8	80. 4	57. 2	21
22	02. 0	71. 5	41. 8	12. 9	84. 9	57. 7	31. 4	06. 0	81. 7	58. 5	22
23	03. 1	72. 7	43. 0	14. 1	86. 1	58. 9	32. 6	07. 3	83. 0	59. 8	23
24	04. 3	73. 9	44. 2	15. 3	87. 3	60. 1	33. 8	08. 5	84. 3	61. 0	24
25	1905. 5	1975. 0	2045. 1	2116. 5	2188. 5	2261. 3	2335. 1	2409. 8	2485. 5	2562. 3	25
26	06. 6	76. 2	46. 6	17. 7	89. 7	62. 5	36. 3	11. 1	86. 8	63. 6	26
27	07. 8	77. 4	47. 7	18. 9	90. 9	63. 8	37. 6	12. 3	88. 1	64. 9	27
28	08. 9	78. 5	48. 9	20. 1	92. 1	65. 0	38. 8	13. 6	89. 3	66. 2	28
29	10. 1	79. 7	50. 1	21. 3	93. 3	66. 2	40. 0	14. 8	90. 6	67. 5	29
30	1911. 2	1980. 9	2051. 3	2122. 5	2194. 5	2267. 4	2341. 3	2416. 1	2491. 9	2568. 8	30
31	12. 4	82. 0	52. 5	23. 7	95. 7	68. 7	42. 5	17. 3	93. 2	70. 1	31
32	13. 5	83. 2	53. 6	24. 9	96. 9	69. 9	43. 7	18. 6	94. 4	71. 4	32
33	14. 7	84. 4	54. 8	26. 1	98. 1	71. 1	45. 0	19. 8	95. 7	72. 7	33
34	15. 8	85. 5	56. 0	27. 3	99. 4	72. 3	46. 2	21. 1	97. 0	73. 9	34
35	1917. 0	1986. 7	2057. 2	2128. 5	2200. 6	2273. 5	2347. 5	2422. 3	2498. 3	2575. 2	35
36	18. 2	87. 9	58. 4	29. 6	01. 8	74. 8	48. 7	23. 6	99. 5	76. 5	36
37	19. 3	89. 1	59. 5	30. 8	03. 0	76. 0	49. 9	24. 9	2500. 8	77. 8	37
38	20. 5	90. 2	60. 7	32. 0	04. 2	77. 2	51. 2	26. 1	02. 1	79. 1	38
39	21. 6	91. 4	61. 9	33. 2	05. 4	78. 4	52. 4	27. 4	03. 4	80. 4	39
40	1922. 8	1992. 6	2063. 1	2134. 4	2206. 6	2279. 7	2353. 7	2428. 6	2504. 6	2581. 7	40
41	23. 9	93. 7	64. 3	35. 6	07. 8	80. 9	54. 9	29. 9	05. 9	83. 0	41
42	25. 1	94. 9	65. 5	36. 8	09. 0	82. 1	56. 1	31. 2	07. 2	84. 3	42
43	26. 3	96. 1	66. 6	38. 0	10. 2	83. 3	57. 4	32. 4	08. 5	85. 6	43
44	27. 4	97. 2	67. 8	39. 2	11. 5	84. 6	58. 6	33. 7	09. 7	86. 9	44
45	1928. 6	1998. 4	2069. 0	2140. 4	2212. 7	2285. 8	2359. 9	2434. 9	2511. 0	2588. 2	45
46	29. 7	99. 6	70. 2	41. 6	13. 9	87. 0	61. 1	36. 2	12. 3	89. 5	46
47	30. 9	2000. 7	71. 4	42. 8	15. 1	88. 3	62. 4	37. 4	13. 6	90. 8	47
48	32. 0	01. 9	72. 6	44. 0	16. 3	89. 5	63. 6	38. 7	14. 8	92. 1	48
49	33. 2	03. 1	73. 7	45. 2	17. 5	90. 7	64. 8	40. 0	16. 1	93. 4	49
50	1934. 4	2004. 3	2074. 9	2146. 4	2218. 7	2291. 9	2366. 1	2441. 2	2517. 4	2594. 7	50
51	35. 5	05. 4	76. 1	47. 6	19. 9	93. 2	67. 3	42. 5	18. 7	96. 0	51
52	36. 7	06. 6	77. 3	48. 8	21. 1	94. 4	68. 6	43. 7	20. 0	97. 3	52
53	37. 8	07. 8	78. 5	50. 0	22. 4	95. 6	69. 8	45. 0	21. 2	98. 5	53
54	39. 0	08. 9	79. 7	51. 2	23. 6	96. 9	71. 1	46. 3	22. 5	99. 8	54
55	1940. 2	2010. 1	2080. 8	2152. 4	2224. 8	2298. 1	2372. 3	2447. 5	2523. 8	2601. 1	55
56	41. 3	11. 3	82. 0	53. 6	26. 0	99. 3	73. 6	48. 8	25. 1	02. 4	56
57	42. 5	12. 5	83. 2	54. 8	27. 2	2300. 5	74. 8	50. 1	26. 4	03. 7	57
58	43. 6	13. 6	84. 4	56. 0	28. 4	01. 8	76. 1	51. 3	27. 6	05. 0	58
59	44. 8	14. 8	85. 6	57. 2	29. 6	03. 0	77. 3	52. 6	28. 9	06. 3	59
M.	30°	31°	32°	33°	34°	35°	36°	37°	38°	39°	M.

TABLE 5.

Meridional Parts, or Increased Latitudes.

Comp. $\frac{1}{293.465}$

M.	40°	41°	42°	43°	44°	45°	46°	47°	48°	49°	M.
0	2607.6	2686.2	2766.0	2847.1	2929.5	3013.4	3098.7	3185.6	3274.1	3364.4	0
1	08.9	87.6	67.4	48.5	30.9	14.8	3100.1	87.1	75.6	65.9	1
2	10.2	88.9	68.7	49.9	32.3	16.2	01.6	88.5	77.1	67.4	2
3	11.5	90.2	70.1	51.2	33.7	17.6	03.0	90.0	78.6	69.0	3
4	12.8	91.5	71.4	52.6	35.1	19.0	04.4	91.4	80.1	70.5	4
5	2614.1	2692.8	2772.8	2853.9	2936.5	3020.4	3105.9	3192.9	3281.6	3372.0	5
6	15.4	94.2	74.1	55.3	37.9	21.8	07.3	94.4	83.1	73.5	6
7	16.8	95.5	75.4	56.7	39.3	23.3	08.8	95.8	84.6	75.1	7
8	18.1	96.8	76.8	58.0	40.6	24.7	10.2	97.3	86.1	76.6	8
9	19.4	98.1	78.1	59.4	42.0	26.1	11.6	98.8	87.6	78.1	9
10	2620.7	2699.5	2779.5	2860.8	2943.4	3027.5	3113.1	3200.2	3289.0	3379.6	10
11	22.0	2700.8	80.8	62.1	44.8	28.9	14.5	01.7	90.5	81.2	11
12	23.3	02.1	82.2	63.5	46.2	30.3	16.0	03.2	92.0	82.7	12
13	24.6	03.4	83.5	64.9	47.6	31.7	17.4	04.6	93.5	84.2	13
14	25.9	04.8	84.8	66.2	49.0	33.2	18.8	06.1	95.0	85.7	14
15	2627.2	2706.1	2786.2	2867.6	2950.4	3034.6	3120.3	3207.6	3296.5	3387.3	15
16	28.5	07.4	87.5	69.0	51.8	36.0	21.7	09.0	98.0	88.8	16
17	29.8	08.7	88.9	70.3	53.2	37.4	23.2	10.5	99.5	90.3	17
18	31.1	10.1	90.2	71.7	54.5	38.8	24.6	12.0	3301.0	91.8	18
19	32.4	11.4	91.6	73.1	55.9	40.2	26.0	13.4	02.5	93.4	19
20	2633.7	2712.7	2792.9	2874.4	2957.3	3041.7	3127.5	3214.9	3304.0	3394.9	20
21	35.0	14.0	94.3	75.8	58.7	43.1	28.9	16.4	05.5	96.4	21
22	36.3	15.4	95.6	77.2	60.1	44.5	30.4	17.9	07.0	98.0	22
23	37.6	16.7	97.0	78.6	61.5	45.9	31.8	19.3	08.5	99.5	23
24	38.9	18.0	98.3	79.9	62.9	47.3	33.3	20.8	10.0	3401.0	24
25	2640.2	2719.3	2799.7	2881.3	2964.3	3048.7	3134.7	3222.3	3311.5	3402.6	25
26	41.6	20.7	2801.0	82.7	65.7	50.2	36.2	23.7	13.0	04.1	26
27	42.9	22.0	02.4	84.0	67.1	51.6	37.6	25.2	14.5	05.6	27
28	44.2	23.3	03.7	85.4	68.5	53.0	39.0	26.7	16.0	07.2	28
29	45.5	24.7	05.1	86.8	69.9	54.4	40.5	28.2	17.5	08.7	29
30	2646.8	2726.0	2806.4	2888.2	2971.3	3055.9	3141.9	3229.6	3319.0	3410.2	30
31	48.1	27.3	07.8	89.5	72.7	57.3	43.4	31.1	20.5	11.8	31
32	49.4	28.6	09.1	90.9	74.1	58.7	44.8	32.6	22.1	13.3	32
33	50.7	30.0	10.5	92.3	75.5	60.1	46.3	34.1	23.6	14.8	33
34	52.0	31.3	11.8	93.7	76.9	61.5	47.7	35.6	25.1	16.4	34
35	2653.3	2732.6	2813.2	2895.0	2978.3	3063.0	3149.2	3237.0	3326.6	3417.9	35
36	54.7	34.0	14.5	96.4	79.7	64.4	50.6	38.5	28.1	19.5	36
37	56.0	35.3	15.9	97.8	81.1	65.8	52.1	40.0	29.6	21.0	37
38	57.3	36.6	17.2	99.2	82.5	67.2	53.5	41.5	31.1	22.5	38
39	58.6	38.0	18.6	2900.5	83.9	68.7	55.0	42.9	32.6	24.1	39
40	2659.9	2739.3	2820.0	2901.9	2985.3	3070.1	3156.4	3244.4	3334.1	3425.6	40
41	61.2	40.6	21.3	03.3	86.7	71.5	57.9	45.9	35.6	27.2	41
42	62.5	42.0	22.7	04.7	88.1	72.9	59.4	47.4	37.1	28.7	42
43	63.9	43.3	24.0	06.1	89.5	74.4	60.8	48.9	38.6	30.2	43
44	65.2	44.6	25.4	07.4	90.9	75.8	62.3	50.3	40.2	31.8	44
45	2666.5	2746.0	2826.7	2908.8	2992.3	3077.2	3163.7	3251.8	3341.7	3433.3	45
46	67.8	47.3	28.1	10.2	93.7	78.7	65.2	53.3	43.2	34.9	46
47	69.1	48.6	29.4	11.6	95.1	80.1	66.6	54.8	44.7	36.4	47
48	70.4	50.0	30.8	13.0	96.5	81.5	68.1	56.3	46.2	38.0	48
49	71.7	51.3	32.2	14.3	97.9	82.9	69.5	57.8	47.7	39.5	49
50	2673.1	2752.7	2833.5	2915.7	2999.3	3084.4	3171.0	3259.3	3349.2	3441.0	50
51	74.4	54.0	34.9	17.1	3000.7	85.8	72.5	60.7	50.8	42.6	51
52	75.7	55.3	36.2	18.5	02.1	87.2	73.9	62.2	52.3	44.1	52
53	77.0	56.7	37.6	19.9	03.5	88.7	75.4	63.7	53.8	45.7	53
54	78.3	58.0	39.0	21.2	04.9	90.1	76.8	65.2	55.3	47.2	54
55	2679.6	2759.3	2840.3	2922.6	3006.3	3091.5	3178.3	3266.7	3356.8	3448.8	55
56	81.0	60.7	41.7	24.0	07.7	93.0	79.7	68.2	58.3	50.3	56
57	82.3	62.0	43.0	25.4	09.2	94.4	81.2	69.7	59.9	51.9	57
58	83.6	63.4	44.4	26.8	10.6	95.8	82.7	71.1	61.4	53.4	58
59	84.9	64.7	45.8	28.2	12.0	97.3	84.1	72.6	62.9	55.0	59
M.	40°	41°	42°	43°	44°	45°	46°	47°	48°	49°	M.

TABLE 5.

Meridional Parts, or Increased Latitudes.

Comp. $\frac{1}{293.465}$

M.	50°	51°	52°	53°	54°	55°	56°	57°	58°	59°	M.
0	3456.5	3550.6	3646.7	3745.1	3845.7	3948.8	4054.5	4163.0	4274.4	4389.1	0
1	58.1	52.2	48.4	46.7	47.4	50.5	56.3	64.8	76.3	91.0	1
2	59.6	53.8	50.0	48.4	49.1	52.3	58.1	66.6	78.2	92.9	2
3	61.2	55.4	51.6	50.0	50.8	54.0	59.8	68.5	80.1	94.9	3
4	62.7	56.9	53.2	51.7	52.5	55.7	61.6	70.3	82.0	96.8	4
5	3464.3	3558.5	3654.8	3753.4	3854.2	3957.5	4063.4	4172.1	4283.9	4398.8	5
6	65.9	60.1	56.5	55.0	55.9	59.2	65.2	74.0	85.7	4400.7	6
7	67.4	61.7	58.1	56.7	57.6	61.0	67.0	75.8	87.6	02.6	7
8	69.0	63.3	59.7	58.3	59.3	62.7	68.8	77.7	89.5	04.6	8
9	70.5	64.9	61.3	60.0	61.0	64.5	70.6	79.5	91.4	06.5	9
10	3472.1	3566.5	3663.0	3761.7	3862.7	3966.2	4072.4	4181.3	4293.3	4408.5	10
11	73.6	68.1	64.6	63.3	64.4	68.0	74.2	83.2	95.2	10.4	11
12	75.2	69.7	66.2	65.0	66.1	69.7	76.0	85.0	97.1	12.4	12
13	76.7	71.3	67.9	66.7	67.8	71.5	77.7	86.9	99.0	14.3	13
14	78.3	72.8	69.5	68.3	69.5	73.2	79.5	88.7	4300.9	16.3	14
15	3479.9	3574.4	3671.1	3770.0	3871.2	3975.0	4081.3	4190.6	4302.8	4418.2	15
16	81.4	76.0	72.7	71.7	72.9	76.7	83.1	92.4	04.7	20.2	16
17	83.0	77.6	74.4	73.3	74.6	78.5	84.9	94.2	06.6	22.1	17
18	84.5	79.2	76.0	75.0	76.3	80.2	86.7	96.1	08.5	24.1	18
19	86.1	80.8	77.6	76.7	78.1	82.0	88.5	97.9	10.4	26.1	19
20	3487.7	3582.4	3679.3	3778.3	3879.8	3983.7	4090.3	4199.8	4312.3	4428.0	20
21	89.2	84.0	80.9	80.0	81.5	85.5	92.1	4201.6	14.2	30.0	21
22	90.8	85.6	82.5	81.7	83.2	87.2	93.9	03.5	16.1	31.9	22
23	92.4	87.2	84.2	83.3	84.9	89.0	95.7	05.3	18.0	33.9	23
24	93.9	88.8	85.8	85.0	86.6	90.7	97.5	07.2	19.9	35.8	24
25	3495.5	3590.4	3687.4	3786.7	3888.3	3992.5	4099.3	4209.0	4321.8	4437.8	25
26	97.1	92.0	89.1	88.4	90.0	94.3	4101.1	10.9	23.7	39.8	26
27	98.6	93.6	90.7	90.0	91.8	96.0	02.9	12.8	25.6	41.7	27
28	3500.2	95.2	92.3	91.7	93.5	97.8	04.8	14.6	27.5	43.7	28
29	01.8	96.8	94.0	93.4	95.2	99.5	06.6	16.5	29.4	45.7	29
30	3503.3	3598.4	3695.6	3795.1	3896.9	4001.3	4108.4	4218.3	4331.3	4447.6	30
31	04.9	3600.0	97.3	96.8	98.6	03.1	10.2	20.2	33.2	49.6	31
32	06.5	01.6	98.9	98.4	3900.4	04.8	12.0	22.0	35.2	51.6	32
33	08.0	03.2	3700.5	3800.1	02.1	06.6	13.8	23.9	37.1	53.5	33
34	09.6	04.8	02.2	01.8	03.8	08.3	15.6	25.8	39.0	55.5	34
35	3511.2	3606.4	3703.8	3803.5	3905.5	4010.1	4117.4	4227.6	4340.9	4457.5	35
36	12.7	08.0	05.5	05.1	07.2	11.9	19.2	29.5	42.8	59.4	36
37	14.3	09.6	07.1	06.8	09.0	13.6	21.0	31.3	44.7	61.4	37
38	15.9	11.2	08.7	08.5	10.7	15.4	22.9	33.2	46.6	63.4	38
39	17.5	12.8	10.4	10.2	12.4	17.2	24.7	35.1	48.6	65.4	39
40	3519.0	3614.5	3712.0	3811.9	3914.1	4018.9	4126.5	4236.9	4350.5	4467.3	40
41	20.6	16.1	13.7	13.6	15.9	20.7	28.3	38.8	52.4	69.3	41
42	22.2	17.7	15.3	15.2	17.6	22.5	30.1	40.7	54.3	71.3	42
43	23.7	19.3	17.0	17.0	19.3	24.3	31.9	42.5	56.2	73.3	43
44	25.3	20.9	18.6	18.6	21.0	26.0	33.8	44.4	58.2	75.3	44
45	3526.9	3622.5	3720.3	3820.3	3922.8	4027.8	4135.6	4246.3	4360.1	4477.2	45
46	28.5	24.1	21.9	22.0	24.5	29.6	37.4	48.1	62.0	79.2	46
47	30.1	25.7	23.6	23.7	26.2	31.4	39.2	50.0	63.9	81.2	47
48	31.6	27.3	25.2	25.4	28.0	33.1	41.0	51.9	65.9	83.2	48
49	33.2	29.0	26.9	27.1	29.7	34.9	42.9	53.8	67.8	85.2	49
50	3534.8	3630.6	3728.5	3828.7	3931.4	4036.7	4144.7	4255.6	4369.7	4487.2	50
51	36.4	32.2	30.2	30.4	33.2	38.5	46.5	57.5	71.7	89.1	51
52	37.9	33.8	31.8	32.1	34.9	40.2	48.3	59.4	73.6	91.1	52
53	39.5	35.4	33.5	33.8	36.6	42.0	50.2	61.3	75.5	93.1	53
54	41.1	37.0	35.1	35.5	38.4	43.8	52.0	63.1	77.4	95.1	54
55	3542.7	3638.6	3736.8	3837.2	3940.1	4045.6	4153.8	4265.0	4379.4	4497.1	55
56	44.3	40.3	38.4	38.9	41.8	47.4	55.7	66.9	81.3	99.1	56
57	45.9	41.9	40.1	40.6	43.6	49.1	57.5	68.8	83.2	4501.1	57
58	47.4	43.5	41.7	42.3	45.3	50.9	59.3	70.7	85.2	03.1	58
59	49.0	45.1	43.4	45.0	47.0	52.7	61.1	72.5	87.1	05.1	59
M.	50°	51°	52°	53°	54°	55°	56°	57°	58°	59°	M.

TABLE 5.

Meridional Parts, or Increased Latitudes.

Comp. $\frac{1}{293.465}$

M.	60°	61°	62°	63°	64°	65°	66°	67°	68°	69°	M.
0	4507.1	4628.7	4754.3	4884.1	5018.4	5157.6	5302.1	5452.4	5609.1	5772.7	0
1	09.1	30.8	56.4	86.3	20.6	59.9	04.6	55.0	11.8	75.5	1
2	11.1	32.9	58.6	88.5	22.9	62.3	07.0	57.6	14.4	78.3	2
3	13.1	34.9	60.7	90.7	25.2	64.7	09.5	60.1	17.1	81.1	3
4	15.1	37.0	62.8	92.9	27.5	67.0	11.9	62.7	19.8	83.8	4
5	4517.1	4639.0	4764.9	4895.1	5029.8	5169.4	5314.4	5465.2	5622.4	5786.6	5
6	19.1	41.1	67.1	97.3	32.1	71.8	16.9	67.8	25.1	89.4	6
7	21.1	43.2	69.2	99.5	34.3	74.2	19.3	70.4	27.8	92.2	7
8	23.1	45.2	71.3	4901.7	36.6	76.5	21.8	72.9	30.5	95.1	8
9	25.1	47.3	73.5	03.9	38.9	78.9	24.3	75.5	33.2	97.9	9
10	4527.1	4649.4	4775.6	4906.1	5041.2	5181.3	5326.7	5477.1	5635.9	5800.7	10
11	29.1	51.5	77.8	08.3	43.5	83.7	29.2	80.7	38.5	03.5	11
12	31.1	53.5	79.9	10.5	45.8	86.0	31.7	83.2	41.2	06.3	12
13	33.1	55.6	82.0	12.8	48.1	88.4	34.2	85.8	43.9	09.1	13
14	35.1	57.7	84.2	15.0	50.4	90.8	36.6	88.4	46.6	11.9	14
15	4537.1	4659.7	4786.3	4917.2	5052.7	5193.2	5339.1	5491.0	5649.3	5814.7	15
16	39.2	61.8	88.5	19.4	55.0	95.6	41.6	93.6	52.0	17.6	16
17	41.2	63.9	90.6	21.6	57.3	98.0	44.1	96.2	54.7	20.4	17
18	43.2	66.0	92.8	23.9	59.6	5200.4	46.6	98.7	57.4	23.2	18
19	45.2	68.1	94.9	26.1	61.9	02.7	49.1	5501.3	60.1	26.0	19
20	4547.2	4670.1	4797.1	4928.3	5064.2	5205.1	5351.5	5503.9	5662.8	5828.9	20
21	49.2	72.2	99.2	30.5	66.5	07.5	54.0	06.5	65.5	31.7	21
22	51.3	74.3	4801.4	32.8	68.8	09.9	56.5	09.1	68.2	34.5	22
23	53.3	76.4	03.5	35.0	71.1	12.3	59.0	11.7	70.9	37.4	23
24	55.3	78.5	05.7	37.2	73.4	14.7	61.5	14.3	73.7	40.2	24
25	4557.3	4680.6	4807.8	4939.4	5075.7	5217.1	5364.0	5516.9	5676.4	5843.0	25
26	59.3	82.6	10.0	41.7	78.1	19.5	66.5	19.5	79.1	45.9	26
27	61.4	84.7	12.1	43.9	80.4	21.9	69.0	22.1	81.8	48.7	27
28	63.4	86.8	14.3	46.1	82.7	24.3	71.5	24.7	84.5	51.6	28
29	65.4	88.9	16.5	48.4	85.0	26.7	74.0	27.3	87.3	54.4	29
30	4567.4	4691.0	4818.6	4950.6	5087.3	5229.1	5376.5	5529.9	5690.0	5857.3	30
31	69.5	93.1	20.8	52.9	89.6	31.6	79.0	32.5	92.7	60.1	31
32	71.5	95.2	23.0	55.1	92.0	34.0	81.5	35.2	95.4	63.0	32
33	73.5	97.3	25.1	57.3	94.3	36.4	84.0	37.8	98.2	65.9	33
34	75.6	99.4	27.3	59.6	96.6	38.8	86.5	40.4	5700.9	68.7	34
35	4577.6	4701.5	4829.5	4961.8	5098.9	5241.2	5389.1	5543.0	5703.6	5871.6	35
36	79.6	03.6	31.6	64.1	5101.3	43.6	91.6	45.6	06.4	74.4	36
37	81.7	05.7	33.8	66.3	03.6	46.0	94.1	48.3	09.1	77.3	37
38	83.7	07.8	36.0	68.6	05.9	48.5	96.6	50.9	11.9	80.2	38
39	85.7	09.9	38.1	70.8	08.3	50.9	99.1	53.5	14.6	83.1	39
40	4587.8	4712.0	4840.3	4973.1	5110.6	5253.3	5401.6	5556.1	5717.3	5885.9	40
41	89.8	14.1	42.5	75.3	12.9	55.7	04.2	58.8	20.1	88.8	41
42	91.8	16.2	44.7	77.6	15.3	58.2	06.7	61.4	22.8	91.7	42
43	93.9	18.3	46.8	79.8	17.6	60.6	09.2	64.0	25.6	94.6	43
44	95.9	20.4	49.0	82.1	19.9	63.0	11.8	66.7	28.3	97.4	44
45	4598.0	4722.5	4851.2	4984.3	5122.3	5265.4	5414.3	5569.3	5731.1	5900.3	45
46	4600.0	24.6	53.4	86.6	24.6	67.9	16.8	71.9	33.9	03.2	46
47	02.1	26.7	55.6	88.9	27.0	70.3	19.3	74.6	36.6	06.1	47
48	04.1	28.9	57.8	91.1	29.3	72.8	21.9	77.2	39.4	09.0	48
49	06.1	31.0	59.9	93.4	31.7	75.2	24.4	79.9	42.1	11.9	49
50	4608.2	4733.1	4862.1	4995.6	5134.0	5277.6	5427.0	5582.5	5744.9	5914.8	50
51	10.2	35.2	64.3	97.9	36.4	80.1	29.5	85.2	47.7	17.7	51
52	12.3	37.3	66.5	5000.2	38.7	82.5	32.0	87.8	50.4	20.6	52
53	14.3	39.4	68.7	02.4	41.1	85.0	34.6	90.5	53.2	23.5	53
54	16.4	41.6	70.9	04.7	43.4	87.4	37.1	93.1	56.0	26.4	54
55	4618.5	4743.7	4873.1	5007.0	5145.8	5289.8	5439.7	5595.8	5758.8	5929.3	55
56	20.5	45.8	75.3	09.3	48.1	92.3	42.2	98.4	61.5	32.2	56
57	22.6	47.9	77.5	11.5	50.5	94.7	44.8	5601.1	64.3	35.1	57
58	24.6	50.0	79.7	13.8	52.8	97.2	47.3	03.8	67.1	38.1	58
59	26.7	52.2	81.9	16.1	55.2	99.7	49.9	06.4	69.9	41.0	59
M.	60°	61°	62°	63°	64°	65°	66°	67°	68°	69°	M.

TABLE 5.

Meridional Parts, or Increased Latitudes.

Comp. $\frac{1}{293.465}$

M.	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	M.
0	5943. 9	6123. 5	6312. 5	6512. 0	6723. 2	6947. 7	7187. 3	7444. 4	7721. 6	8022. 7	0
1	46. 8	26. 6	15. 8	15. 4	26. 8	51. 6	91. 5	48. 8	26. 4	27. 9	1
2	49. 7	29. 7	19. 0	18. 9	30. 5	55. 4	95. 6	53. 3	31. 3	33. 2	2
3	52. 7	32. 8	22. 3	22. 3	34. 1	59. 3	99. 7	57. 7	36. 1	38. 5	3
4	55. 6	35. 8	25. 5	25. 7	37. 7	63. 2	7203. 9	62. 2	40. 9	43. 7	4
5	5958. 5	6138. 9	6328. 8	6529. 1	6741. 4	6967. 1	7208. 0	7466. 7	7745. 8	8049. 0	5
6	61. 5	42. 0	32. 0	32. 6	45. 0	70. 9	12. 2	71. 1	50. 6	54. 3	6
7	64. 4	45. 1	35. 3	36. 0	48. 7	74. 8	16. 4	75. 6	55. 5	59. 6	7
8	67. 3	48. 2	38. 5	39. 5	52. 3	78. 7	20. 5	80. 1	60. 3	64. 9	8
9	70. 3	51. 3	41. 8	42. 9	56. 0	82. 6	24. 7	84. 6	65. 2	70. 2	9
10	5973. 2	6154. 4	6345. 0	6546. 4	6759. 7	6986. 5	7228. 9	7489. 1	7770. 1	8075. 5	10
11	76. 2	57. 5	48. 3	49. 8	63. 3	90. 4	33. 1	93. 6	74. 9	80. 8	11
12	79. 1	60. 6	51. 6	53. 3	67. 0	94. 3	37. 3	98. 1	79. 8	86. 1	12
13	82. 1	63. 7	54. 8	56. 7	70. 7	98. 3	41. 5	7502. 6	84. 7	91. 5	13
14	85. 0	66. 8	58. 1	60. 2	74. 3	7002. 2	45. 7	07. 1	89. 6	96. 8	14
15	5988. 0	6169. 9	6361. 4	6563. 7	6778. 0	7006. 1	7249. 9	7511. 7	7794. 5	8102. 2	15
16	90. 9	73. 0	64. 7	67. 1	81. 7	10. 0	54. 1	16. 2	99. 4	07. 5	16
17	93. 9	76. 1	67. 9	70. 6	85. 4	14. 0	58. 3	20. 7	7804. 3	12. 9	17
18	96. 9	79. 2	71. 2	74. 1	89. 1	17. 9	62. 5	25. 3	09. 3	18. 3	18
19	99. 8	82. 3	74. 5	77. 6	92. 8	21. 8	66. 7	29. 8	14. 2	23. 7	19
20	6002. 8	6185. 5	6377. 8	6581. 0	6796. 5	7025. 8	7270. 9	7534. 4	7819. 1	8129. 1	20
21	05. 8	88. 6	81. 1	84. 5	6800. 2	29. 7	75. 2	38. 9	24. 1	34. 5	21
22	08. 7	91. 7	84. 4	88. 0	03. 9	33. 7	79. 4	43. 5	29. 0	39. 9	22
23	11. 7	94. 8	87. 7	91. 5	07. 6	37. 7	83. 7	48. 1	34. 0	45. 3	23
24	14. 7	98. 0	91. 0	95. 0	11. 3	41. 6	87. 9	52. 7	39. 0	50. 8	24
25	6017. 7	6201. 1	6394. 3	6598. 5	6815. 0	7045. 6	7292. 2	7557. 3	7844. 0	8156. 2	25
26	20. 7	04. 2	97. 6	6602. 0	18. 8	49. 6	96. 4	61. 8	48. 9	61. 6	26
27	23. 6	07. 4	6400. 9	05. 5	22. 5	53. 5	7300. 7	66. 4	53. 9	67. 1	27
28	26. 6	10. 5	04. 3	09. 0	26. 2	57. 5	05. 0	71. 0	58. 9	72. 6	28
29	29. 6	13. 7	07. 6	12. 5	30. 0	61. 5	09. 2	75. 7	63. 9	78. 0	29
30	6032. 6	6216. 8	6410. 9	6616. 1	6833. 7	7065. 5	7313. 5	7580. 3	7868. 9	8183. 5	30
31	35. 6	20. 0	14. 2	19. 6	37. 4	69. 5	17. 8	84. 9	74. 0	89. 0	31
32	38. 6	23. 1	17. 6	23. 1	41. 2	73. 5	22. 1	89. 5	79. 0	94. 5	32
33	41. 6	26. 3	20. 9	26. 6	44. 9	77. 5	26. 4	94. 2	84. 0	8200. 0	33
34	44. 6	29. 4	24. 2	30. 2	48. 7	81. 5	30. 7	98. 8	89. 1	05. 5	34
35	6047. 6	6232. 6	6427. 6	6633. 7	6852. 4	7085. 5	7335. 0	7603. 4	7894. 1	8211. 1	35
36	50. 6	35. 8	30. 9	37. 2	56. 2	89. 5	39. 3	08. 1	99. 2	16. 6	36
37	53. 6	38. 9	34. 2	40. 8	60. 0	93. 5	43. 6	12. 8	7904. 2	22. 1	37
38	56. 6	42. 1	37. 6	44. 3	63. 7	97. 6	47. 9	17. 4	09. 3	27. 7	38
39	59. 7	45. 3	40. 9	47. 9	67. 5	7101. 6	52. 3	22. 1	14. 4	33. 3	39
40	6062. 7	6248. 4	6444. 3	6651. 4	6871. 3	7105. 6	7356. 6	7626. 8	7919. 4	8238. 8	40
41	65. 7	51. 6	47. 6	55. 0	75. 1	09. 7	60. 9	31. 4	24. 5	44. 4	41
42	68. 7	54. 8	51. 0	58. 5	78. 9	13. 7	65. 3	36. 1	29. 6	50. 0	42
43	71. 7	58. 0	54. 4	62. 1	82. 6	17. 8	69. 6	40. 8	34. 7	55. 6	43
44	74. 8	61. 2	57. 7	65. 7	86. 4	21. 8	74. 0	45. 5	39. 9	61. 2	44
45	6077. 8	6264. 4	6461. 1	6669. 2	6890. 2	7125. 9	7378. 3	7650. 2	7945. 0	8266. 8	45
46	80. 8	67. 6	64. 5	72. 8	94. 0	29. 9	82. 7	55. 0	50. 1	72. 4	46
47	83. 9	70. 8	67. 8	76. 4	97. 8	34. 0	87. 1	59. 7	55. 2	78. 1	47
48	86. 9	74. 0	71. 2	80. 0	6901. 7	38. 1	91. 4	64. 4	60. 4	83. 7	48
49	89. 9	77. 2	74. 6	83. 5	05. 5	42. 2	95. 8	69. 1	65. 5	89. 3	49
50	6093. 0	6280. 4	6478. 0	6687. 1	6909. 3	7146. 2	7400. 2	7673. 9	7970. 7	8295. 0	50
51	96. 0	83. 6	81. 4	90. 7	13. 1	50. 3	04. 6	78. 6	75. 9	8300. 7	51
52	99. 1	86. 8	84. 8	94. 3	16. 9	54. 4	09. 0	83. 4	81. 0	06. 4	52
53	6102. 1	90. 0	88. 2	97. 9	20. 8	58. 5	13. 4	88. 1	86. 2	12. 0	53
54	05. 2	93. 2	91. 6	6701. 5	24. 6	62. 6	17. 8	92. 9	91. 4	17. 7	54
55	6108. 2	6296. 4	6495. 0	6705. 1	6928. 4	7166. 7	7422. 2	7697. 7	7996. 6	8323. 4	55
56	11. 3	99. 6	98. 4	08. 7	32. 3	70. 8	26. 6	7702. 5	8001. 8	29. 2	56
57	14. 3	6302. 9	6501. 8	12. 4	36. 1	75. 0	31. 1	07. 2	07. 0	34. 9	57
58	17. 4	06. 1	05. 2	16. 0	40. 0	79. 1	35. 5	12. 0	12. 2	40. 6	58
59	20. 5	09. 3	08. 6	19. 6	43. 8	83. 2	39. 9	16. 8	17. 5	46. 4	59
M.	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	M.

TABLE 6.

Length of a Degree in Latitude and Longitude.

Lat.	Degree of Long.			Degree of Lat.			Lat.
	Naut. miles.	Statute miles.	Meters.	Naut. miles.	Statute miles.	Meters.	
°							°
0	60.068	69.172	111 321	59.661	68.704	110 567	0
1	0.059	9.162	1 304	.661	.704	568	1
2	0.031	9.130	1 253	.662	.705	569	2
3	59.986	9.078	1 169	.663	.706	570	3
4	9.922	9.005	1 051	.664	.708	573	4
5	59.840	68.911	110 900	59.666	68.710	110 576	5
6	9.741	8.795	0 715	.668	.712	580	6
7	9.622	8.660	0 497	.670	.715	584	7
8	9.487	8.504	0 245	.673	.718	589	8
9	9.333	8.326	109 959	.676	.721	595	9
10	59.161	68.129	109 641	59.680	68.725	110 601	10
11	8.971	7.910	9 289	.684	.730	608	11
12	8.764	7.670	8 904	.687	.734	616	12
13	8.538	7.410	8 486	.692	.739	624	13
14	8.295	7.131	8 036	.697	.744	633	14
15	58.034	66.830	107 553	59.702	68.751	110 643	15
16	7.756	6.510	7 036	.707	.757	653	16
17	7.459	6.169	6 487	.713	.764	663	17
18	7.146	5.808	5 906	.719	.771	675	18
19	6.816	5.427	5 294	.725	.778	686	19
20	56.468	65.026	104 649	59.732	68.786	110 699	20
21	6.102	4.606	3 972	.739	.794	712	21
22	5.720	4.166	3 264	.746	.802	725	22
23	5.321	3.706	2 524	.754	.811	739	23
24	4.905	3.228	1 754	.761	.820	753	24
25	54.473	62.729	100 952	59.769	68.829	110 768	25
26	4.024	2.212	0 119	.777	.839	783	26
27	3.558	1.676	99 257	.786	.848	799	27
28	3.076	1.122	8 364	.795	.858	815	28
29	2.578	0.548	7 441	.804	.869	832	29
30	52.064	59.956	96 488	59.813	68.879	110 849	30
31	1.534	9.345	5 506	.822	.890	866	31
32	0.989	8.716	4 495	.831	.901	883	32
33	0.428	8.071	3 455	.841	.912	901	33
34	49.851	7.407	2 387	.851	.923	919	34
35	49.259	56.725	91 290	59.861	68.935	110 938	35
36	8.653	6.027	0 166	.871	.946	956	36
37	8.031	5.311	89 014	.881	.958	975	37
38	7.395	4.579	7 835	.891	.969	994	38
39	6.744	3.829	6 629	.902	.981	111 013	39
40	46.079	53.063	85 396	59.912	68.993	111 033	40
41	5.399	2.281	4 137	.923	69.006	052	41
42	4.706	1.483	2 853	.933	.018	072	42
43	4.000	0.669	1 543	.944	.030	091	43
44	3.280	49.840	0 208	.954	.042	111	44
45	2.546	8.995	78 849	.965	.054	131	45

TABLE 6.

Length of a Degree in Latitude and Longitude.

Lat.	Degree of Long.			Degree of Lat.			Lat.
	Naut. miles.	Statute miles.	Meters.	Naut. miles.	Statute miles.	Meters.	
°							°
45	42.546	48.995	78 849	59.965	69.054	111 131	45
46	1.801	8.136	7 466	.976	.066	151	46
47	1.041	7.261	6 058	.987	.079	170	47
48	0.268	6.372	4 628	.997	.091	190	48
49	39.484	5.469	3 174	60.008	.103	210	49
50	38.688	44.552	71 698	60.019	69.115	111 229	50
51	7.880	3.621	0 200	.029	.127	249	51
52	7.060	2.676	68 680	.039	.139	268	52
53	6.229	1.719	7 140	.050	.151	287	53
54	5.386	0.749	5 578	.060	.163	306	54
55	34.532	39.766	63 996	60.070	69.175	111 325	55
56	3.668	8.771	2 395	.080	.186	343	56
57	2.794	7.764	0 774	.090	.197	362	57
58	1.909	6.745	59 135	.100	.209	380	58
59	1.015	5.716	7 478	.109	.220	397	59
60	30.110	34.674	55 802	60.118	69.230	111 415	60
61	29.197	3.623	4 110	.128	.241	432	61
62	8.275	2.560	2 400	.137	.251	448	62
63	7.344	1.488	0 675	.145	.261	464	63
64	6.404	0.406	48 934	.154	.271	480	64
65	25.456	29.315	47 177	60.162	69.281	111 496	65
66	4.501	8.215	5 407	.170	.290	511	66
67	3.538	7.106	3 622	.178	.299	525	67
68	2.567	5.988	1 823	.186	.308	539	68
69	1.590	4.862	0 012	.193	.316	553	69
70	20.606	23.729	38 188	60.200	69.324	111 566	70
71	19.616	2.589	6 353	.207	.332	578	71
72	8.619	1.441	4 506	.213	.340	590	72
73	7.617	0.287	2 648	.220	.347	602	73
74	6.609	19.127	0 781	.225	.354	613	74
75	15.596	17.960	28 903	60.231	69.360	111 623	75
76	4.578	6.788	7 017	.236	.366	633	76
77	3.556	5.611	5 123	.241	.372	642	77
78	2.529	4.428	3 220	.246	.377	650	78
79	1.499	3.242	1 311	.250	.382	658	79
80	10.465	12.051	19 394	60.254	69.386	111 665	80
81	9.428	10.857	7 472	.257	.390	671	81
82	8.388	9.659	5 545	.260	.394	677	82
83	7.345	8.458	3 612	.263	.397	682	83
84	6.300	7.255	1 675	.265	.400	687	84
85	5.253	6.049	9 735	60.268	69.402	111 691	85
86	4.205	4.842	7 792	.269	.404	694	86
87	3.154	3.632	5 846	.270	.405	696	87
88	2.103	2.422	3 898	.271	.407	698	88
89	1.052	1.211	1 949	.272	.407	699	89
90	0	0	0	.272	.407	699	90

TABLE 7.

Distance of an Object by Two Bearings.

Difference between the course and second bearing.	Difference between the course and first bearing.													
	20°		22°		24°		26°		28°		30°		32°	
30°	1.97	0.98												
32	1.64	0.87	2.16	1.14										
34	1.41	0.79	1.80	1.01	2.34	1.31								
36	1.24	0.73	1.55	0.91	1.96	1.15	2.52	1.48						
38	1.11	0.68	1.36	0.84	1.68	1.04	2.11	1.30	2.70	1.66				
40	1.00	0.64	1.21	0.78	1.48	0.95	1.81	1.16	2.26	1.45	2.88	1.85		
42	0.91	0.61	1.10	0.73	1.32	0.88	1.59	1.06	1.94	1.30	2.40	1.61	3.05	2.04
44	0.84	0.58	1.00	0.69	1.19	0.83	1.42	0.98	1.70	1.18	2.07	1.44	2.55	1.77
46	0.78	0.56	0.92	0.66	1.09	0.78	1.28	0.92	1.52	1.09	1.81	1.30	2.19	1.58
48	0.73	0.54	0.85	0.64	1.00	0.74	1.17	0.87	1.37	1.02	1.62	1.20	1.92	1.43
50	0.68	0.52	0.80	0.61	0.93	0.71	1.08	0.83	1.25	0.96	1.46	1.12	1.71	1.31
52	0.65	0.51	0.75	0.59	0.87	0.68	1.00	0.79	1.15	0.91	1.33	1.05	1.55	1.22
54	0.61	0.49	0.71	0.57	0.81	0.66	0.93	0.76	1.07	0.87	1.23	0.99	1.41	1.14
56	0.58	0.48	0.67	0.56	0.77	0.64	0.88	0.73	1.00	0.83	1.14	0.95	1.30	1.08
58	0.56	0.47	0.64	0.54	0.73	0.62	0.83	0.70	0.94	0.80	1.07	0.90	1.21	1.03
60	0.53	0.46	0.61	0.53	0.69	0.60	0.78	0.68	0.89	0.77	1.00	0.87	1.13	0.98
62	0.51	0.45	0.58	0.51	0.66	0.58	0.75	0.66	0.84	0.74	0.94	0.83	1.06	0.94
64	0.49	0.44	0.56	0.50	0.63	0.57	0.71	0.64	0.80	0.72	0.89	0.80	1.00	0.90
66	0.48	0.43	0.54	0.49	0.61	0.56	0.68	0.62	0.76	0.70	0.85	0.78	0.95	0.87
68	0.46	0.43	0.52	0.48	0.59	0.54	0.66	0.61	0.73	0.68	0.81	0.75	0.90	0.84
70	0.45	0.42	0.50	0.47	0.57	0.53	0.63	0.59	0.70	0.66	0.78	0.73	0.86	0.81
72	0.43	0.41	0.49	0.47	0.55	0.52	0.61	0.58	0.68	0.64	0.75	0.71	0.82	0.78
74	0.42	0.41	0.48	0.46	0.53	0.51	0.59	0.57	0.65	0.63	0.72	0.69	0.79	0.76
76	0.41	0.40	0.46	0.45	0.52	0.50	0.57	0.56	0.63	0.61	0.70	0.67	0.76	0.74
78	0.40	0.39	0.45	0.44	0.50	0.49	0.56	0.54	0.61	0.60	0.67	0.66	0.74	0.72
80	0.39	0.39	0.44	0.44	0.49	0.48	0.54	0.53	0.60	0.59	0.65	0.64	0.71	0.70
82	0.39	0.38	0.43	0.43	0.48	0.47	0.53	0.52	0.58	0.57	0.63	0.63	0.69	0.69
84	0.38	0.38	0.42	0.42	0.47	0.47	0.52	0.51	0.57	0.56	0.62	0.61	0.67	0.67
86	0.37	0.37	0.42	0.42	0.46	0.46	0.51	0.51	0.55	0.55	0.60	0.60	0.66	0.65
88	0.37	0.37	0.41	0.41	0.45	0.45	0.50	0.50	0.54	0.54	0.59	0.59	0.64	0.64
90	0.36	0.36	0.40	0.40	0.45	0.45	0.49	0.49	0.53	0.53	0.58	0.58	0.62	0.62
92	0.36	0.36	0.40	0.40	0.44	0.44	0.48	0.48	0.52	0.52	0.57	0.57	0.61	0.61
94	0.36	0.35	0.39	0.39	0.43	0.43	0.47	0.47	0.51	0.51	0.56	0.55	0.60	0.60
96	0.35	0.35	0.39	0.39	0.43	0.43	0.47	0.46	0.51	0.50	0.55	0.54	0.59	0.59
98	0.35	0.35	0.39	0.38	0.42	0.42	0.46	0.46	0.50	0.50	0.54	0.53	0.58	0.57
100	0.35	0.34	0.38	0.38	0.42	0.41	0.46	0.45	0.49	0.49	0.53	0.52	0.57	0.56
102	0.35	0.34	0.38	0.37	0.42	0.41	0.45	0.44	0.49	0.48	0.53	0.51	0.56	0.55
104	0.34	0.33	0.38	0.37	0.41	0.40	0.45	0.43	0.48	0.47	0.52	0.50	0.56	0.54
106	0.34	0.33	0.38	0.36	0.41	0.39	0.45	0.43	0.48	0.46	0.52	0.50	0.55	0.53
108	0.34	0.32	0.38	0.36	0.41	0.39	0.44	0.42	0.48	0.45	0.51	0.49	0.55	0.52
110	0.34	0.32	0.37	0.35	0.41	0.38	0.44	0.41	0.47	0.44	0.51	0.48	0.54	0.51
112	0.34	0.32	0.37	0.35	0.41	0.38	0.44	0.41	0.47	0.44	0.50	0.47	0.54	0.50
114	0.34	0.31	0.37	0.34	0.41	0.37	0.44	0.40	0.47	0.43	0.50	0.46	0.54	0.49
116	0.34	0.31	0.38	0.34	0.41	0.37	0.44	0.39	0.47	0.42	0.50	0.45	0.53	0.48
118	0.35	0.31	0.38	0.33	0.41	0.36	0.44	0.39	0.47	0.41	0.50	0.44	0.53	0.47
120	0.35	0.30	0.38	0.33	0.41	0.36	0.44	0.38	0.47	0.41	0.50	0.43	0.53	0.46
122	0.35	0.30	0.38	0.32	0.41	0.35	0.44	0.37	0.47	0.40	0.50	0.42	0.53	0.45
124	0.35	0.29	0.38	0.32	0.41	0.34	0.44	0.37	0.47	0.39	0.50	0.42	0.53	0.44
126	0.36	0.29	0.39	0.31	0.42	0.34	0.45	0.36	0.47	0.38	0.50	0.41	0.53	0.43
128	0.36	0.28	0.39	0.31	0.42	0.33	0.45	0.35	0.48	0.38	0.50	0.40	0.53	0.42
130	0.36	0.28	0.39	0.30	0.42	0.32	0.45	0.35	0.48	0.37	0.51	0.39	0.54	0.41
132	0.37	0.27	0.40	0.30	0.43	0.32	0.46	0.34	0.48	0.36	0.51	0.38	0.54	0.40
134	0.37	0.27	0.40	0.29	0.43	0.31	0.46	0.33	0.49	0.35	0.52	0.37	0.54	0.39
136	0.38	0.26	0.41	0.28	0.44	0.30	0.47	0.32	0.49	0.34	0.52	0.36	0.55	0.38
138	0.39	0.26	0.42	0.28	0.45	0.30	0.47	0.32	0.50	0.33	0.53	0.35	0.55	0.37
140	0.39	0.25	0.42	0.27	0.45	0.29	0.48	0.31	0.51	0.33	0.53	0.34	0.56	0.36
142	0.40	0.25	0.43	0.27	0.46	0.28	0.49	0.30	0.51	0.32	0.54	0.33	0.56	0.35
144	0.41	0.24	0.44	0.26	0.47	0.28	0.50	0.29	0.52	0.31	0.55	0.32	0.57	0.34
146	0.42	0.24	0.45	0.25	0.48	0.27	0.51	0.28	0.53	0.30	0.56	0.31	0.58	0.32
148	0.43	0 23	0.46	0.25	0.49	0.26	0.52	0.27	0.54	0.29	0.57	0.30	0.59	0.31
150	0.45	0.22	0.48	0.24	0.50	0.25	0.53	0.26	0.55	0.28	0.58	0.29	0.60	0.30
152	0.46	0.22	0.49	0.23	0.52	0.24	0.54	0.25	0.57	0.27	0.59	0.28	0.61	0.29
154	0.48	0.21	0.50	0.22	0.53	0.23	0.56	0.24	0.58	0.25	0.60	0 26	0.62	0.27
156	0.49	0.20	0.52	0.21	0.55	0.22	0.57	0.23	0.60	0.24	0.62	0 25	0.64	0.26
158	0.51	0.19	0.54	0.20	0.57	0.21	0.59	0.22	0.61	0.23	0.63	0.24	0.66	0.25
160	0.53	0.18	0.56	0.19	0.59	0.20	0.61	0.21	0.63	0.22	0.65	0.22	0.67	0.23

TABLE 7.

Distance of an Object by Two Bearings.

Difference between the course and second bearing.	Difference between the course and first bearing.													
	34°		36°		38°		40°		42°		44°		46°	
44°	3.22	2.24												
46	2.69	1.93	3.39	2.43										
48	2.31	1.72	2.83	2.10	3.55	2.63								
50	2.03	1.55	2.43	1.86	2.96	2.27	3.70	2.84						
52	1.81	1.43	2.13	1.68	2.54	2.01	3.09	2.44	3.85	3.04				
54	1.63	1.32	1.90	1.54	2.23	1.81	2.66	2.15	3.22	2.60	4.00	3.24		
56	1.49	1.24	1.72	1.42	1.99	1.65	2.33	1.93	2.77	2.29	3.34	2.77	4.14	3.43
58	1.37	1.17	1.57	1.33	1.80	1.53	2.08	1.76	2.43	2.06	2.87	2.44	3.46	2.93
60	1.28	1.10	1.45	1.25	1.64	1.42	1.88	1.63	2.17	1.88	2.52	2.18	2.97	2.57
62	1.19	1.05	1.34	1.18	1.51	1.34	1.72	1.52	1.96	1.73	2.25	1.98	2.61	2.30
64	1.12	1.01	1.25	1.13	1.40	1.26	1.58	1.42	1.79	1.61	2.03	1.83	2.33	2.09
66	1.06	0.96	1.18	1.07	1.31	1.20	1.47	1.34	1.65	1.51	1.85	1.69	2.10	1.92
68	1.00	0.93	1.11	1.03	1.23	1.14	1.37	1.27	1.53	1.42	1.71	1.58	1.92	1.78
70	0.95	0.89	1.05	0.99	1.16	1.09	1.29	1.21	1.43	1.34	1.58	1.49	1.77	1.66
72	0.91	0.86	1.00	0.95	1.10	1.05	1.21	1.15	1.34	1.27	1.48	1.41	1.64	1.56
74	0.87	0.84	0.95	0.92	1.05	1.01	1.15	1.10	1.26	1.21	1.39	1.34	1.53	1.47
76	0.84	0.81	0.91	0.89	1.00	0.97	1.09	1.06	1.20	1.16	1.31	1.27	1.44	1.40
78	0.80	0.79	0.88	0.86	0.96	0.94	1.04	1.02	1.14	1.11	1.24	1.22	1.36	1.33
80	0.78	0.77	0.85	0.83	0.92	0.91	1.00	0.98	1.09	1.07	1.18	1.16	1.28	1.27
82	0.75	0.75	0.82	0.81	0.89	0.88	0.96	0.95	1.04	1.03	1.13	1.12	1.22	1.21
84	0.73	0.73	0.79	0.79	0.86	0.85	0.93	0.92	1.00	0.99	1.08	1.07	1.17	1.16
86	0.71	0.71	0.77	0.77	0.83	0.83	0.89	0.89	0.96	0.96	1.04	1.04	1.12	1.12
88	0.69	0.69	0.75	0.75	0.80	0.80	0.86	0.86	0.93	0.93	1.00	1.00	1.08	1.07
90	0.67	0.67	0.73	0.73	0.78	0.78	0.84	0.84	0.90	0.90	0.97	0.97	1.04	1.04
92	0.66	0.66	0.71	0.71	0.76	0.76	0.82	0.82	0.87	0.87	0.93	0.93	1.00	1.00
94	0.65	0.64	0.69	0.69	0.74	0.74	0.79	0.79	0.85	0.85	0.91	0.90	0.97	0.97
96	0.63	0.63	0.68	0.67	0.73	0.72	0.78	0.77	0.83	0.82	0.88	0.88	0.94	0.93
98	0.62	0.62	0.67	0.66	0.71	0.70	0.76	0.75	0.81	0.80	0.86	0.85	0.91	0.90
100	0.61	0.60	0.65	0.64	0.70	0.69	0.74	0.73	0.79	0.78	0.84	0.83	0.89	0.88
102	0.60	0.59	0.64	0.63	0.68	0.67	0.73	0.71	0.77	0.76	0.82	0.80	0.87	0.85
104	0.60	0.58	0.63	0.61	0.67	0.65	0.72	0.69	0.76	0.74	0.80	0.78	0.85	0.82
106	0.59	0.57	0.63	0.60	0.66	0.64	0.70	0.68	0.74	0.72	0.79	0.76	0.83	0.80
108	0.58	0.55	0.62	0.59	0.66	0.62	0.69	0.66	0.73	0.70	0.77	0.74	0.81	0.77
110	0.58	0.54	0.61	0.57	0.65	0.61	0.68	0.64	0.72	0.68	0.76	0.71	0.80	0.75
112	0.57	0.53	0.61	0.56	0.64	0.59	0.68	0.63	0.71	0.66	0.75	0.69	0.79	0.73
114	0.57	0.52	0.60	0.55	0.63	0.58	0.67	0.61	0.70	0.64	0.74	0.68	0.78	0.71
116	0.56	0.51	0.60	0.54	0.63	0.57	0.66	0.60	0.70	0.63	0.73	0.66	0.77	0.69
118	0.56	0.50	0.59	0.52	0.63	0.55	0.66	0.58	0.69	0.61	0.72	0.64	0.76	0.67
120	0.56	0.49	0.59	0.51	0.62	0.54	0.65	0.57	0.68	0.59	0.72	0.62	0.75	0.65
122	0.56	0.47	0.59	0.50	0.62	0.53	0.65	0.55	0.68	0.58	0.71	0.60	0.74	0.63
124	0.56	0.46	0.59	0.49	0.62	0.51	0.65	0.54	0.68	0.56	0.71	0.58	0.74	0.61
126	0.56	0.45	0.59	0.48	0.62	0.50	0.64	0.52	0.67	0.54	0.70	0.57	0.73	0.59
128	0.56	0.44	0.59	0.46	0.62	0.49	0.64	0.51	0.67	0.53	0.70	0.55	0.73	0.57
130	0.56	0.43	0.59	0.45	0.62	0.47	0.64	0.49	0.67	0.51	0.70	0.53	0.72	0.55
132	0.56	0.42	0.59	0.44	0.62	0.46	0.64	0.48	0.67	0.50	0.70	0.52	0.72	0.54
134	0.57	0.41	0.59	0.43	0.62	0.45	0.64	0.46	0.67	0.48	0.69	0.50	0.72	0.52
136	0.57	0.40	0.60	0.41	0.62	0.43	0.65	0.45	0.67	0.47	0.70	0.48	0.72	0.50
138	0.58	0.39	0.60	0.40	0.63	0.42	0.65	0.43	0.67	0.45	0.70	0.47	0.72	0.48
140	0.58	0.37	0.61	0.39	0.63	0.40	0.65	0.42	0.68	0.43	0.70	0.45	0.72	0.46
142	0.59	0.36	0.61	0.38	0.63	0.39	0.66	0.41	0.68	0.42	0.70	0.43	0.72	0.45
144	0.60	0.35	0.62	0.36	0.64	0.38	0.66	0.39	0.68	0.40	0.71	0.41	0.73	0.43
146	0.60	0.34	0.63	0.35	0.65	0.36	0.67	0.37	0.69	0.39	0.71	0.40	0.73	0.41
148	0.61	0.32	0.63	0.34	0.66	0.35	0.68	0.36	0.70	0.37	0.72	0.38	0.74	0.39
150	0.62	0.31	0.64	0.32	0.66	0.33	0.68	0.34	0.70	0.35	0.72	0.36	0.74	0.37
152	0.63	0.30	0.65	0.31	0.67	0.32	0.69	0.33	0.71	0.33	0.73	0.34	0.75	0.35
154	0.65	0.28	0.67	0.29	0.68	0.30	0.70	0.31	0.72	0.32	0.74	0.32	0.76	0.33
156	0.66	0.27	0.68	0.28	0.70	0.28	0.72	0.29	0.73	0.30	0.75	0.30	0.77	0.31
158	0.67	0.25	0.69	0.26	0.71	0.27	0.73	0.27	0.74	0.28	0.76	0.28	0.78	0.29
160	0.69	0.24	0.71	0.24	0.73	0.25	0.74	0.25	0.76	0.26	0.77	0.26	0.79	0.27

TABLE 7.

Distance of an Object by Two Bearings.

Difference between the course and second bearing.	Difference between the course and first bearing.													
	48°		50°		52°		54°		56°		58°		60°	
58°	4.28	3.63												
60	3.57	3.10	4.41	3.82										
62	3.07	2.71	3.68	3.25	4.54	4.01								
64	2.70	2.42	3.17	2.85	3.79	3.41	4.66	4.19						
66	2.40	2.20	2.78	2.54	3.26	2.98	3.89	3.55	4.77	4.36				
68	2.17	2.01	2.48	2.30	2.86	2.65	3.34	3.10	3.99	3.71	4.88	4.53		
70	1.98	1.86	2.24	2.10	2.55	2.39	2.94	2.76	3.43	3.22	4.08	3.83	4.99	4.69
72	1.83	1.74	2.04	1.94	2.30	2.19	2.62	2.49	3.01	2.86	3.51	3.33	4.17	3.96
74	1.70	1.63	1.88	1.81	2.10	2.02	2.37	2.27	2.68	2.58	3.08	2.96	3.58	3.44
76	1.58	1.54	1.75	1.70	1.94	1.88	2.16	2.10	2.42	2.35	2.74	2.66	3.14	3.05
78	1.49	1.45	1.63	1.60	1.80	1.76	1.99	1.95	2.21	2.16	2.48	2.43	2.80	2.74
80	1.40	1.38	1.53	1.51	1.68	1.65	1.85	1.82	2.04	2.01	2.26	2.23	2.53	2.49
82	1.33	1.32	1.45	1.43	1.58	1.56	1.72	1.71	1.89	1.87	2.08	2.06	2.31	2.29
84	1.26	1.26	1.37	1.36	1.49	1.48	1.62	1.61	1.77	1.76	1.93	1.92	2.13	2.12
86	1.21	1.20	1.30	1.30	1.41	1.41	1.53	1.52	1.66	1.65	1.81	1.80	1.98	1.97
88	1.16	1.16	1.24	1.24	1.34	1.34	1.45	1.45	1.56	1.56	1.70	1.70	1.84	1.84
90	1.11	1.11	1.19	1.19	1.28	1.28	1.38	1.38	1.48	1.48	1.60	1.60	1.73	1.73
92	1.07	1.07	1.14	1.14	1.23	1.23	1.31	1.31	1.41	1.41	1.52	1.52	1.63	1.63
94	1.03	1.03	1.10	1.10	1.18	1.17	1.26	1.26	1.35	1.34	1.44	1.44	1.55	1.54
96	1.00	0.99	1.06	1.06	1.13	1.13	1.21	1.20	1.29	1.28	1.38	1.37	1.47	1.47
98	0.97	0.96	1.03	1.02	1.10	1.08	1.16	1.15	1.24	1.23	1.32	1.31	1.41	1.39
100	0.94	0.93	1.00	0.98	1.06	1.04	1.12	1.11	1.19	1.18	1.27	1.25	1.35	1.33
102	0.92	0.90	0.97	0.95	1.03	1.01	1.09	1.06	1.15	1.13	1.22	1.19	1.29	1.27
104	0.90	0.87	0.95	0.92	1.00	0.97	1.06	1.02	1.12	1.08	1.18	1.14	1.25	1.21
106	0.88	0.84	0.92	0.89	0.97	0.94	1.03	0.99	1.09	1.04	1.14	1.10	1.20	1.16
108	0.86	0.82	0.90	0.86	0.95	0.90	1.00	0.95	1.05	1.00	1.11	1.05	1.17	1.11
110	0.84	0.79	0.88	0.83	0.93	0.87	0.98	0.92	1.02	0.96	1.08	1.01	1.13	1.06
112	0.83	0.77	0.87	0.80	0.91	0.84	0.95	0.88	1.00	0.93	1.05	0.97	1.10	1.02
114	0.81	0.74	0.85	0.78	0.89	0.82	0.93	0.85	0.98	0.89	1.02	0.93	1.07	0.98
116	0.80	0.72	0.84	0.75	0.88	0.79	0.92	0.82	0.96	0.85	1.00	0.90	1.04	0.94
118	0.79	0.70	0.83	0.73	0.86	0.76	0.90	0.79	0.94	0.83	0.98	0.86	1.02	0.90
120	0.78	0.68	0.82	0.71	0.85	0.74	0.89	0.77	0.91	0.80	0.96	0.83	1.00	0.87
122	0.77	0.66	0.81	0.68	0.84	0.71	0.87	0.74	0.90	0.77	0.95	0.80	0.98	0.83
124	0.77	0.63	0.80	0.66	0.83	0.69	0.86	0.71	0.90	0.74	0.93	0.77	0.96	0.80
126	0.76	0.61	0.79	0.64	0.82	0.66	0.85	0.69	0.88	0.71	0.91	0.74	0.95	0.77
128	0.75	0.59	0.78	0.62	0.81	0.64	0.84	0.66	0.87	0.69	0.90	0.71	0.93	0.74
130	0.75	0.57	0.78	0.60	0.81	0.62	0.83	0.64	0.86	0.66	0.89	0.68	0.92	0.71
132	0.75	0.56	0.77	0.57	0.80	0.59	0.83	0.61	0.85	0.64	0.88	0.66	0.91	0.68
134	0.74	0.54	0.77	0.55	0.80	0.57	0.82	0.59	0.85	0.61	0.87	0.63	0.90	0.65
136	0.74	0.52	0.77	0.53	0.80	0.55	0.82	0.57	0.84	0.58	0.87	0.60	0.89	0.62
138	0.74	0.50	0.77	0.51	0.79	0.53	0.81	0.54	0.84	0.56	0.86	0.58	0.89	0.59
140	0.74	0.48	0.77	0.49	0.79	0.51	0.81	0.52	0.83	0.54	0.86	0.55	0.88	0.57
142	0.74	0.46	0.77	0.47	0.79	0.49	0.81	0.50	0.83	0.51	0.85	0.52	0.87	0.54
144	0.75	0.44	0.77	0.45	0.79	0.46	0.81	0.48	0.83	0.49	0.85	0.50	0.87	0.51
146	0.75	0.42	0.77	0.43	0.79	0.44	0.81	0.45	0.83	0.46	0.85	0.47	0.87	0.49
148	0.76	0.40	0.77	0.41	0.79	0.42	0.81	0.43	0.83	0.44	0.85	0.45	0.87	0.46
150	0.76	0.38	0.78	0.39	0.80	0.40	0.81	0.41	0.83	0.42	0.85	0.42	0.87	0.43
152	0.77	0.36	0.78	0.37	0.80	0.38	0.82	0.38	0.83	0.39	0.85	0.40	0.87	0.41
154	0.77	0.34	0.79	0.35	0.81	0.35	0.82	0.36	0.84	0.37	0.85	0.37	0.87	0.38
156	0.78	0.32	0.80	0.32	0.81	0.33	0.83	0.34	0.84	0.34	0.86	0.35	0.87	0.35
158	0.79	0.30	0.81	0.30	0.82	0.31	0.83	0.31	0.85	0.32	0.86	0.32	0.87	0.33
160	0.80	0.27	0.82	0.28	0.83	0.28	0.84	0.29	0.85	0.29	0.86	0.30	0.88	0.30

TABLE 7.

Distance of an Object by Two Bearings.

Difference between the course and second bearing.	Difference between the course and first bearing.															
	62°		64°		66°		68°		70°		72°		74°		76°	
72°	5.08	4.84														
74	4.25	4.08	5.18	4.98												
76	3.65	3.54	4.32	4.19	5.26	5.10										
78	3.20	3.13	3.72	3.63	4.39	4.30	5.34	5.22								
80	2.86	2.81	3.26	3.21	3.78	3.72	4.46	4.39	5.41	5.33						
82	2.58	2.56	2.91	2.88	3.31	3.28	3.83	3.80	4.52	4.48	5.48	5.42				
84	2.36	2.34	2.63	2.61	2.96	2.94	3.36	3.35	3.88	3.86	4.57	4.55	5.54	5.51		
86	2.17	2.17	2.40	2.39	2.67	2.66	3.00	2.99	3.41	3.40	3.93	3.92	4.62	4.61	5.59	5.57
88	2.01	2.01	2.21	2.21	2.44	2.44	2.71	2.71	3.04	3.04	3.45	3.45	3.97	3.97	4.67	4.66
90	1.88	1.88	2.05	2.05	2.25	2.25	2.48	2.48	2.75	2.75	3.08	3.08	3.49	3.49	4.01	4.01
92	1.77	1.76	1.91	1.91	2.08	2.08	2.28	2.28	2.51	2.51	2.78	2.78	3.11	3.11	3.52	3.52
94	1.67	1.66	1.80	1.79	1.95	1.94	2.12	2.11	2.31	2.30	2.54	2.53	2.81	2.80	3.14	3.13
96	1.58	1.57	1.70	1.69	1.83	1.82	1.97	1.96	2.14	2.13	2.34	2.33	2.57	2.55	2.84	2.82
98	1.50	1.49	1.61	1.59	1.72	1.71	1.85	1.84	2.00	1.98	2.17	2.15	2.36	2.34	2.59	2.56
100	1.43	1.41	1.53	1.51	1.63	1.61	1.75	1.72	1.88	1.85	2.03	2.00	2.19	2.16	2.39	2.35
102	1.37	1.34	1.46	1.43	1.55	1.52	1.66	1.62	1.77	1.73	1.90	1.86	2.05	2.00	2.21	2.16
104	1.32	1.28	1.40	1.36	1.48	1.44	1.58	1.53	1.68	1.63	1.79	1.74	1.92	1.87	2.07	2.01
106	1.27	1.22	1.34	1.29	1.42	1.37	1.51	1.45	1.60	1.54	1.70	1.63	1.81	1.74	1.94	1.87
108	1.23	1.17	1.29	1.23	1.37	1.30	1.44	1.37	1.53	1.45	1.62	1.54	1.72	1.63	1.83	1.74
110	1.19	1.12	1.25	1.17	1.32	1.24	1.39	1.30	1.46	1.37	1.54	1.45	1.64	1.54	1.74	1.63
112	1.15	1.07	1.21	1.12	1.27	1.18	1.33	1.24	1.40	1.30	1.48	1.37	1.56	1.45	1.65	1.53
114	1.12	1.02	1.17	1.07	1.23	1.12	1.29	1.18	1.35	1.24	1.42	1.30	1.50	1.37	1.58	1.44
116	1.09	0.98	1.14	1.03	1.19	1.07	1.25	1.12	1.31	1.17	1.37	1.23	1.44	1.29	1.51	1.36
118	1.07	0.94	1.11	0.98	1.16	1.02	1.21	1.07	1.26	1.12	1.32	1.17	1.38	1.22	1.45	1.28
120	1.04	0.90	1.08	0.94	1.13	0.98	1.18	1.02	1.23	1.06	1.28	1.11	1.34	1.16	1.40	1.21
122	1.02	0.86	1.06	0.90	1.10	0.93	1.15	0.97	1.19	1.01	1.24	1.05	1.29	1.10	1.35	1.14
124	1.00	0.83	1.04	0.86	1.08	0.89	1.12	0.93	1.16	0.96	1.21	1.00	1.25	1.04	1.31	1.08
126	0.98	0.79	1.02	0.82	1.05	0.85	1.09	0.88	1.13	0.92	1.18	0.95	1.22	0.99	1.27	1.02
128	0.97	0.76	1.00	0.79	1.03	0.82	1.07	0.84	1.11	0.87	1.15	0.90	1.19	0.94	1.23	0.97
130	0.95	0.73	0.98	0.75	1.02	0.78	1.05	0.80	1.09	0.83	1.12	0.86	1.16	0.89	1.20	0.92
132	0.94	0.70	0.97	0.72	1.00	0.74	1.03	0.77	1.06	0.79	1.10	0.82	1.13	0.84	1.17	0.87
134	0.93	0.67	0.96	0.69	0.99	0.71	1.01	0.73	1.04	0.75	1.08	0.77	1.11	0.80	1.14	0.82
136	0.92	0.64	0.95	0.66	0.97	0.68	1.00	0.69	1.03	0.71	1.06	0.74	1.09	0.76	1.12	0.78
138	0.91	0.61	0.94	0.63	0.96	0.64	0.99	0.66	1.01	0.68	1.04	0.70	1.07	0.72	1.10	0.74
140	0.90	0.58	0.93	0.60	0.95	0.61	0.97	0.63	1.00	0.64	1.03	0.66	1.05	0.68	1.08	0.70
142	0.90	0.55	0.92	0.57	0.94	0.58	0.96	0.59	0.99	0.61	1.01	0.62	1.04	0.64	1.06	0.65
144	0.89	0.52	0.91	0.54	0.93	0.55	0.96	0.56	0.98	0.57	1.00	0.59	1.02	0.60	1.05	0.62
146	0.89	0.50	0.91	0.51	0.93	0.52	0.95	0.53	0.97	0.54	0.99	0.55	1.01	0.57	1.03	0.58
148	0.89	0.47	0.90	0.48	0.92	0.49	0.94	0.50	0.96	0.51	0.98	0.52	1.00	0.53	1.02	0.54
150	0.88	0.44	0.90	0.45	0.92	0.46	0.94	0.47	0.95	0.48	0.97	0.49	0.99	0.50	1.01	0.50
152	0.88	0.41	0.90	0.42	0.92	0.43	0.93	0.44	0.95	0.45	0.97	0.45	0.98	0.46	1.00	0.47
154	0.88	0.39	0.90	0.39	0.91	0.40	0.93	0.41	0.94	0.41	0.96	0.42	0.98	0.43	0.99	0.43
156	0.89	0.36	0.90	0.37	0.91	0.37	0.93	0.38	0.94	0.38	0.96	0.39	0.97	0.39	0.99	0.40
158	0.89	0.33	0.90	0.34	0.91	0.34	0.93	0.35	0.94	0.35	0.95	0.36	0.97	0.36	0.98	0.37
160	0.89	0.30	0.90	0.31	0.91	0.31	0.93	0.32	0.94	0.32	0.95	0.33	0.96	0.33	0.98	0.33

TABLE 7.

Distance of an Object by Two Bearings.

Difference between the course and second bearing.	Difference between the course and first bearing.															
	78°		80°		82°		84°		86°		88°		90°		92°	
88°	5.63	5.63														
90	4.70	4.70	5.67	5.67												
92	4.04	4.04	4.74	4.73	5.70	5.70										
94	3.55	3.54	4.07	4.06	4.76	4.75	5.73	5.71								
96	3.17	3.15	3.57	3.55	4.09	4.07	4.78	4.76	5.74	5.71						
98	2.86	2.83	3.19	3.16	3.59	3.56	4.11	4.07	4.80	4.75	5.73	5.70				
100	2.61	2.57	2.88	2.84	3.20	3.16	3.61	3.55	4.12	4.06	4.81	4.73	5.76	5.67		
102	2.40	2.35	2.63	2.57	2.90	2.83	3.22	3.15	3.62	3.54	4.13	4.04	4.81	4.70	5.76	5.63
104	2.23	2.16	2.42	2.35	2.64	2.56	2.91	2.82	3.23	3.13	3.63	3.52	4.13	4.01	4.81	4.66
106	2.08	2.00	2.25	2.16	2.43	2.34	2.65	2.55	2.92	2.80	3.23	3.11	3.63	3.49	4.13	3.97
108	1.96	1.86	2.10	2.00	2.26	2.15	2.45	2.33	2.66	2.53	2.92	2.78	3.24	3.08	3.63	3.45
110	1.85	1.73	1.97	1.85	2.11	1.98	2.27	2.13	2.45	2.31	2.67	2.51	2.92	2.75	3.23	3.04
112	1.75	1.62	1.86	1.72	1.98	1.83	2.12	1.96	2.28	2.11	2.46	2.28	2.67	2.48	2.92	2.71
114	1.66	1.52	1.76	1.61	1.87	1.71	1.99	1.82	2.12	1.94	2.28	2.08	2.46	2.25	2.67	2.44
116	1.59	1.43	1.68	1.51	1.77	1.59	1.88	1.69	2.00	1.79	2.13	1.91	2.28	2.05	2.46	2.21
118	1.52	1.34	1.60	1.41	1.68	1.49	1.78	1.57	1.88	1.66	2.00	1.76	2.13	1.88	2.28	2.01
120	1.46	1.27	1.53	1.33	1.61	1.39	1.69	1.47	1.78	1.54	1.89	1.63	2.00	1.73	2.13	1.84
122	1.41	1.19	1.47	1.25	1.54	1.31	1.62	1.37	1.70	1.44	1.79	1.52	1.89	1.60	2.00	1.70
124	1.36	1.13	1.42	1.18	1.48	1.23	1.55	1.28	1.62	1.34	1.70	1.41	1.79	1.48	1.89	1.56
126	1.32	1.06	1.37	1.11	1.43	1.15	1.48	1.20	1.55	1.26	1.62	1.31	1.70	1.38	1.79	1.45
128	1.28	1.01	1.33	1.04	1.38	1.08	1.43	1.13	1.49	1.17	1.55	1.23	1.62	1.28	1.70	1.34
130	1.24	0.95	1.29	0.98	1.33	1.02	1.38	1.06	1.44	1.10	1.49	1.14	1.56	1.19	1.62	1.24
132	1.21	0.90	1.25	0.93	1.29	0.96	1.34	0.99	1.39	1.03	1.44	1.07	1.49	1.11	1.55	1.16
134	1.18	0.85	1.22	0.88	1.26	0.90	1.30	0.93	1.34	0.97	1.39	1.00	1.44	1.04	1.49	1.07
136	1.15	0.80	1.19	0.83	1.22	0.85	1.26	0.88	1.30	0.90	1.34	0.93	1.39	0.97	1.44	1.00
138	1.13	0.76	1.16	0.78	1.19	0.80	1.23	0.82	1.27	0.85	1.30	0.87	1.35	0.90	1.39	0.93
140	1.11	0.71	1.14	0.73	1.17	0.75	1.20	0.77	1.23	0.79	1.27	0.82	1.31	0.84	1.34	0.86
142	1.09	0.67	1.12	0.69	1.14	0.70	1.17	0.72	1.20	0.74	1.24	0.76	1.27	0.78	1.30	0.80
144	1.07	0.63	1.10	0.64	1.12	0.66	1.15	0.67	1.18	0.69	1.21	0.71	1.24	0.73	1.27	0.75
146	1.05	0.59	1.08	0.60	1.10	0.62	1.13	0.63	1.15	0.64	1.18	0.66	1.21	0.67	1.24	0.69
148	1.04	0.55	1.06	0.56	1.08	0.57	1.11	0.59	1.13	0.60	1.15	0.61	1.18	0.62	1.21	0.64
150	1.03	0.51	1.05	0.52	1.07	0.53	1.09	0.54	1.11	0.55	1.13	0.57	1.15	0.58	1.18	0.59
152	1.02	0.48	1.04	0.49	1.05	0.49	1.07	0.50	1.09	0.51	1.11	0.52	1.13	0.53	1.15	0.54
154	1.01	0.44	1.02	0.45	1.04	0.46	1.06	0.46	1.08	0.47	1.09	0.48	1.11	0.49	1.13	0.50
156	1.00	0.41	1.01	0.41	1.03	0.42	1.05	0.43	1.06	0.43	1.08	0.44	1.09	0.45	1.11	0.45
158	0.99	0.37	1.01	0.38	1.02	0.38	1.03	0.39	1.05	0.39	1.06	0.40	1.08	0.40	1.09	0.41
160	0.99	0.34	1.00	0.34	1.01	0.35	1.02	0.35	1.04	0.35	1.05	0.36	1.06	0.36	1.08	0.37
	94°		96°		98°		100°		102°		104°		106°		108°	
104°	5.74	5.57														
106	4.80	4.61	5.78	5.51												
108	4.12	3.92	4.78	4.55	5.70	5.42										
110	3.62	3.40	4.11	3.86	4.76	4.48	5.67	5.33								
112	3.23	2.99	3.61	3.35	4.09	3.80	4.74	4.40	5.63	5.22						
114	2.92	2.66	3.22	2.94	3.59	3.28	4.07	3.72	4.70	4.30	5.59	5.10				
116	2.66	2.39	2.91	2.61	3.20	2.88	3.57	3.21	4.04	3.63	4.67	4.19	5.54	4.98		
118	2.45	2.17	2.65	2.34	2.90	2.56	3.19	2.81	3.55	3.13	4.01	3.54	4.62	4.08	5.48	4.84
120	2.28	1.97	2.45	2.12	2.64	2.29	2.88	2.49	3.17	2.74	3.52	3.05	3.97	3.44	4.57	3.96
122	2.12	1.80	2.27	1.92	2.43	2.06	2.63	2.23	2.86	2.43	3.14	2.66	3.49	2.96	3.93	3.33
124	2.00	1.65	2.12	1.76	2.26	1.87	2.42	2.01	2.61	2.16	2.84	2.35	3.11	2.58	3.45	2.86
126	1.88	1.52	1.99	1.61	2.11	1.71	2.25	1.82	2.40	1.95	2.59	2.10	2.81	2.27	3.08	2.49
128	1.78	1.41	1.88	1.48	1.98	1.56	2.10	1.65	2.23	1.76	2.39	1.88	2.57	2.02	2.78	2.19
130	1.70	1.30	1.78	1.36	1.87	1.43	1.97	1.51	2.08	1.60	2.21	1.70	2.36	1.81	2.54	1.94
132	1.62	1.20	1.69	1.26	1.77	1.32	1.86	1.38	1.96	1.45	2.07	1.54	2.19	1.63	2.34	1.74
134	1.55	1.12	1.62	1.16	1.68	1.21	1.76	1.27	1.85	1.33	1.94	1.40	2.05	1.47	2.17	1.56
136	1.49	1.04	1.55	1.07	1.61	1.12	1.68	1.16	1.75	1.22	1.83	1.27	1.92	1.34	2.03	1.41
138	1.44	0.96	1.49	0.99	1.54	1.03	1.60	1.07	1.66	1.11	1.74	1.16	1.81	1.21	1.90	1.27
140	1.39	0.89	1.43	0.92	1.48	0.95	1.53	0.98	1.59	1.02	1.65	1.06	1.72	1.10	1.79	1.15
142	1.34	0.83	1.38	0.85	1.43	0.88	1.47	0.91	1.52	0.94	1.58	0.97	1.64	1.01	1.70	1.05
144	1.30	0.77	1.34	0.79	1.38	0.81	1.42	0.83	1.46	0.86	1.51	0.89	1.56	0.92	1.62	0.95
146	1.27	0.71	1.30	0.73	1.33	0.75	1.37	0.77	1.41	0.79	1.45	0.81	1.50	0.84	1.54	0.86
148	1.23	0.65	1.26	0.67	1.29	0.69	1.33	0.70	1.36	0.72	1.40	0.74	1.44	0.76	1.48	0.78
150	1.20	0.60	1.23	0.61	1.26	0.63	1.29	0.64	1.32	0.66	1.35	0.67	1.38	0.69	1.42	0.71
152	1.18	0.55	1.20	0.56	1.22	0.57	1.25	0.59	1.28	0.60	1.31	0.61	1.34	0.63	1.37	0.64
154	1.15	0.50	1.17	0.51	1.19	0.52	1.22	0.53	1.24	0.54	1.27	0.56	1.29	0.57	1.32	0.58
156	1.13	0.46	1.15	0.47	1.17	0.47	1.19	0.48	1.21	0.49	1.23	0.50	1.25	0.51	1.28	0.52
158	1.11	0.42	1.13	0.42	1.14	0.43	1.16	0.44	1.18	0.44	1.20	0.45	1.22	0.46	1.24	0.47
160	1.09	0.37	1.11	0.38	1.12	0.38	1.14	0.39	1.15	0.39	1.17	0.40	1.19	0.41	1.21	0.41

TABLE 7.

Distance of an Object by Two Bearings.

Difference between the course and second bearing.	Difference between the course and first bearing.													
	110°		112°		114°		116°		118°		120°		122°	
120°	5.41	4.69												
122	4.52	3.83	5.34	4.53										
124	3.88	3.22	4.46	3.70	5.26	4.36								
126	3.41	2.76	3.83	3.10	4.39	3.55	5.18	4.19						
128	3.04	2.40	3.36	2.65	3.78	2.98	4.32	3.41	5.08	4.01				
130	2.75	2.10	3.00	2.30	3.31	2.54	3.72	2.85	4.25	3.25	4.99	3.82		
132	2.51	1.86	2.71	2.01	2.96	2.20	3.26	2.42	3.65	2.71	4.17	3.10	4.88	3.63
134	2.31	1.66	2.48	1.78	2.67	1.92	2.91	2.09	3.20	2.30	3.58	2.57	4.08	2.93
136	2.14	1.49	2.28	1.58	2.44	1.69	2.63	1.83	2.86	1.98	3.14	2.18	3.51	2.44
138	2.00	1.34	2.12	1.42	2.25	1.50	2.40	1.61	2.58	1.73	2.80	1.88	3.08	2.06
140	1.88	1.21	1.97	1.27	2.08	1.34	2.21	1.42	2.36	1.52	2.53	1.63	2.74	1.76
142	1.77	1.09	1.85	1.14	1.95	1.20	2.05	1.26	2.17	1.34	2.31	1.42	2.48	1.53
144	1.68	0.99	1.75	1.03	1.83	1.07	1.91	1.13	2.01	1.18	2.13	1.25	2.26	1.33
146	1.60	0.89	1.66	0.93	1.72	0.96	1.80	1.01	1.88	1.05	1.98	1.10	2.08	1.17
148	1.53	0.81	1.58	0.84	1.63	0.87	1.70	0.90	1.77	0.94	1.84	0.98	1.93	1.03
150	1.46	0.73	1.51	0.75	1.55	0.78	1.61	0.80	1.67	0.83	1.73	0.87	1.81	0.90
152	1.40	0.66	1.44	0.68	1.48	0.70	1.53	0.72	1.58	0.74	1.63	0.77	1.70	0.80
154	1.35	0.59	1.39	0.61	1.42	0.62	1.46	0.64	1.50	0.66	1.55	0.68	1.60	0.70
156	1.31	0.53	1.33	0.54	1.37	0.56	1.40	0.57	1.43	0.58	1.47	0.60	1.52	0.62
158	1.26	0.47	1.29	0.48	1.32	0.49	1.34	0.50	1.37	0.51	1.41	0.53	1.44	0.54
160	1.23	0.42	1.25	0.43	1.27	0.43	1.29	0.44	1.32	0.45	1.35	0.46	1.38	0.47

	124°		126°		128°		130°		132°		134°		136°	
134°	4.77	3.43												
136	3.99	2.77	4.66	3.23										
138	3.43	2.29	3.89	2.60	4.54	3.04								
140	3.01	1.93	3.34	2.15	3.79	2.44	4.41	2.84						
142	2.68	1.65	2.94	1.81	3.26	2.01	3.63	2.27	4.28	2.63				
144	2.42	1.42	2.62	1.54	2.86	1.68	3.17	1.86	3.57	2.10	4.14	2.43		
146	2.21	1.24	2.37	1.32	2.55	1.43	2.78	1.55	3.07	1.72	3.46	1.93	4.00	2.24
148	2.04	1.08	2.16	1.14	2.30	1.22	2.48	1.31	2.70	1.43	2.97	1.58	3.34	1.77
150	1.89	0.95	1.99	0.99	2.10	1.05	2.24	1.12	2.40	1.20	2.61	1.30	2.87	1.44
152	1.77	0.83	1.85	0.87	1.94	0.91	2.04	0.96	2.17	1.02	2.33	1.09	2.52	1.18
154	1.66	0.73	1.72	0.76	1.80	0.79	1.88	0.83	1.98	0.87	2.10	0.92	2.25	0.99
156	1.56	0.64	1.62	0.66	1.68	0.68	1.75	0.71	1.83	0.74	1.92	0.78	2.03	0.83
158	1.48	0.56	1.53	0.57	1.58	0.59	1.63	0.61	1.70	0.64	1.77	0.66	1.85	0.69
160	1.41	0.48	1.45	0.49	1.49	0.51	1.53	0.52	1.58	0.54	1.64	0.56	1.71	0.58

	138°		140°		142°		144°		146°		148°		150°	
148°	3.85	2.04												
150	3.22	1.61	3.70	1.85										
152	2.77	1.30	3.09	1.45	3.55	1.66								
154	2.43	1.06	2.66	1.16	2.96	1.30	3.38	1.48						
156	2.17	0.88	2.33	0.95	2.54	1.04	2.83	1.15	3.22	1.31				
158	1.96	0.73	2.08	0.78	2.23	0.84	2.43	0.91	2.69	1.01	3.05	1.14		
160	1.79	0.61	1.88	0.64	1.99	0.68	2.13	0.73	2.31	0.79	2.55	0.87	2.88	0.98

TABLE 8.

Distance of Visibility of Objects at Sea.

Height, feet.	Nautical miles.	Statute miles.	Height, feet.	Nautical miles.	Statute miles.	Height, feet.	Nautical miles.	Statute miles.
1	1.1	1.3	100	11.5	13.2	760	31.6	36.4
2	1.7	1.9	105	11.7	13.5	780	32.0	36.9
3	2.0	2.3	110	12.0	13.8	800	32.4	37.3
4	2.3	2.6	115	12.3	14.1	820	32.8	37.8
5	2.5	2.9	120	12.6	14.5	840	33.2	38.3
6	2.8	3.2	125	12.9	14.8	860	33.6	38.7
7	2.9	3.5	130	13.1	15.1	880	34.0	39.2
8	3.1	3.7	135	13.3	15.3	900	34.4	39.6
9	3.5	4.0	140	13.6	15.6	920	34.7	40.0
10	3.6	4.2	145	13.8	15.9	940	35.2	40.5
11	3.8	4.4	150	14.1	16.2	960	35.5	40.9
12	4.0	4.6	160	14.5	16.7	980	35.9	41.3
13	4.2	4.8	170	14.9	17.2	1,000	36.2	41.7
14	4.3	4.9	180	15.4	17.7	1,100	38.0	43.8
15	4.4	5.1	190	15.8	18.2	1,200	39.6	45.6
16	4.6	5.3	200	16.2	18.7	1,300	41.3	47.6
17	4.7	5.4	210	16.6	19.1	1,400	42.9	49.4
18	4.9	5.6	220	17.0	19.6	1,500	44.4	51.1
19	5.0	5.8	230	17.4	20.0	1,600	45.8	52.8
20	5.1	5.9	240	17.7	20.4	1,700	47.2	54.4
21	5.3	6.1	250	18.2	20.9	1,800	48.6	56.0
22	5.4	6.2	260	18.5	21.3	1,900	49.9	57.5
23	5.5	6.3	270	18.9	21.7	2,000	51.2	59.0
24	5.6	6.5	280	19.2	22.1	2,100	52.5	60.5
25	5.7	6.6	290	19.6	22.5	2,200	53.8	61.9
26	5.8	6.7	300	19.9	22.9	2,300	55.0	63.3
27	6.0	6.9	310	20.1	23.2	2,400	56.2	64.7
28	6.1	7.0	320	20.5	23.6	2,500	57.3	66.0
29	6.2	7.1	330	20.8	24.0	2,600	58.5	67.3
30	6.3	7.2	340	21.1	24.3	2,700	59.6	68.6
31	6.4	7.3	350	21.5	24.7	2,800	60.6	69.8
32	6.5	7.5	360	21.7	25.0	2,900	61.8	71.1
33	6.6	7.6	370	22.1	25.4	3,000	62.8	72.3
34	6.7	7.7	380	22.3	25.7	3,100	63.8	73.5
35	6.8	7.8	390	22.7	26.1	3,200	64.9	74.7
36	6.9	7.9	400	22.9	26.4	3,300	65.9	75.9
37	6.9	8.0	410	23.2	26.7	3,400	66.9	77.0
38	7.0	8.1	420	23.5	27.1	3,500	67.8	78.1
39	7.1	8.2	430	23.8	27.4	3,600	68.8	79.2
40	7.2	8.3	440	24.1	27.7	3,700	69.7	80.3
41	7.3	8.4	450	24.3	28.0	3,800	70.7	81.4
42	7.4	8.5	460	24.6	28.3	3,900	71.6	82.4
43	7.5	8.7	470	24.8	28.6	4,000	72.5	83.5
44	7.6	8.8	480	25.1	28.9	4,100	73.4	84.5
45	7.7	8.9	490	25.4	29.2	4,200	74.3	85.6
46	7.8	9.0	500	25.6	29.5	4,300	75.2	86.6
47	7.9	9.0	520	26.1	30.1	4,400	76.1	87.6
48	7.9	9.1	540	26.7	30.7	4,500	76.9	88.5
49	8.0	9.2	560	27.1	31.2	4,600	77.7	89.5
50	8.1	9.3	580	27.6	31.8	4,700	78.6	90.5
55	8.5	9.8	600	28.0	32.3	4,800	79.4	91.4
60	8.9	10.2	620	28.6	32.9	4,900	80.2	92.4
65	9.2	10.6	640	29.0	33.4	5,000	81.0	93.3
70	9.6	11.0	660	29.4	33.9	6,000	88.8	102.2
75	9.9	11.4	680	29.9	34.4	7,000	96.0	110.5
80	10.3	11.8	700	30.3	34.9	8,000	102.6	118.1
85	10.6	12.2	720	30.7	35.4	9,000	108.7	125.2
90	10.9	12.5	740	31.1	35.9	10,000	114.6	132.0
95	11.2	12.9						

TABLE 9.

Distance by Vertical Angle (Distance less than 5 miles).

Dist., nautical miles.	Heights in feet.																	
	40	45	50	55	60	65	70	75	80	85	90	95	100	110	120	130	140	150
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0.1	3 46	4 14	4 42	5 10	5 38	6 06	6 34	7 02	7 30	7 58	8 25	8 53	9 20	10 15	11 10	12 04	12 58	13 52
2	1 53	2 07	2 21	2 35	2 49	3 04	3 18	3 32	3 46	4 00	4 14	4 28	4 42	5 10	5 38	6 06	6 34	7 02
.3	1 15	1 25	1 34	1 44	1 53	2 02	2 12	2 21	2 31	2 40	2 49	2 59	3 08	3 27	3 46	4 05	4 23	4 42
.4	0 57	1 04	1 11	1 18	1 25	1 32	1 39	1 46	1 53	2 00	2 07	2 14	2 21	2 35	2 49	3 04	3 18	3 32
0.5	0 45	0 51	0 57	1 02	1 08	1 14	1 19	1 25	1 30	1 36	1 42	1 47	1 53	2 04	2 16	2 27	2 38	2 49
.6	0 38	0 42	0 47	0 52	0 57	1 01	1 06	1 11	1 15	1 20	1 25	1 30	1 34	1 44	1 53	2 02	2 12	2 21
.7	0 32	0 36	0 40	0 44	0 48	0 53	0 57	1 01	1 05	1 09	1 13	1 17	1 21	1 29	1 37	1 45	1 53	2 01
.8	0 28	0 32	0 35	0 39	0 42	0 46	0 49	0 53	0 57	1 00	1 04	1 07	1 11	1 18	1 25	1 32	1 39	1 46
.9	0 25	0 28	0 31	0 35	0 38	0 41	0 44	0 47	0 50	0 53	0 57	1 00	1 03	1 09	1 15	1 22	1 28	1 34
1.0	0 23	0 25	0 28	0 31	0 34	0 37	0 40	0 42	0 45	0 48	0 51	0 54	0 57	1 02	1 08	1 14	1 19	1 25
.1	0 21	0 23	0 26	0 28	0 31	0 33	0 36	0 39	0 41	0 44	0 46	0 49	0 51	0 57	1 02	1 07	1 12	1 17
.2	0 19	0 21	0 24	0 26	0 28	0 31	0 33	0 35	0 38	0 40	0 42	0 45	0 47	0 52	0 57	1 01	1 06	1 11
.3	0 17	0 20	0 22	0 24	0 26	0 28	0 30	0 33	0 35	0 37	0 39	0 41	0 44	0 48	0 52	0 57	1 01	1 05
.4	0 16	0 18	0 20	0 22	0 24	0 26	0 28	0 30	0 32	0 34	0 36	0 38	0 40	0 44	0 48	0 53	0 57	1 01
1.5	0 15	0 17	0 19	0 21	0 23	0 25	0 26	0 28	0 30	0 32	0 34	0 36	0 38	0 41	0 45	0 49	0 53	0 57
.6	0 14	0 16	0 18	0 19	0 21	0 23	0 25	0 27	0 28	0 30	0 32	0 34	0 35	0 39	0 42	0 46	0 49	0 53
.7	0 13	0 15	0 17	0 18	0 20	0 22	0 23	0 25	0 27	0 28	0 30	0 32	0 33	0 37	0 40	0 43	0 47	0 50
.8	0 13	0 14	0 16	0 17	0 19	0 20	0 22	0 24	0 25	0 27	0 28	0 30	0 31	0 35	0 38	0 41	0 44	0 47
.9	0 12	0 13	0 15	0 16	0 18	0 19	0 21	0 22	0 24	0 25	0 27	0 28	0 30	0 33	0 36	0 39	0 42	0 45
2.0	0 11	0 13	0 14	0 16	0 17	0 18	0 20	0 21	0 23	0 24	0 25	0 27	0 28	0 31	0 34	0 37	0 40	0 42
.1	0 11	0 13	0 14	0 15	0 16	0 18	0 19	0 20	0 22	0 23	0 24	0 26	0 27	0 30	0 32	0 35	0 38	0 40
.2	0 10	0 12	0 13	0 14	0 15	0 17	0 18	0 19	0 21	0 22	0 23	0 24	0 26	0 28	0 31	0 33	0 36	0 39
.3	0 10	0 12	0 12	0 14	0 14	0 16	0 17	0 18	0 20	0 21	0 22	0 23	0 25	0 27	0 30	0 32	0 34	0 37
.4	0 10	0 11	0 12	0 13	0 14	0 15	0 17	0 18	0 19	0 20	0 21	0 22	0 24	0 26	0 28	0 31	0 33	0 35
2.5	0 9	0 11	0 11	0 12	0 13	0 15	0 16	0 17	0 18	0 19	0 20	0 21	0 23	0 25	0 27	0 29	0 32	0 34
.6	0 9	0 10	0 11	0 12	0 13	0 14	0 15	0 16	0 17	0 18	0 20	0 21	0 22	0 24	0 26	0 28	0 30	0 33
.7	0 9	0 10	0 10	0 11	0 12	0 14	0 15	0 16	0 17	0 18	0 19	0 20	0 21	0 23	0 25	0 27	0 29	0 31
.8	0 8	0 9	0 10	0 11	0 12	0 13	0 14	0 15	0 16	0 17	0 18	0 19	0 20	0 22	0 24	0 26	0 28	0 30
.9	0 8	0 9	0 10	0 10	0 11	0 13	0 14	0 15	0 16	0 17	0 18	0 19	0 20	0 21	0 23	0 25	0 27	0 29
3.0	0 8	0 9	0 9	0 10	0 10	0 12	0 13	0 14	0 15	0 16	0 17	0 18	0 19	0 21	0 23	0 25	0 26	0 28
.2							0 12	0 13	0 14	0 15	0 16	0 17	0 18	0 19	0 21	0 23	0 25	0 27
.4							0 12	0 12	0 13	0 14	0 15	0 16	0 17	0 18	0 20	0 22	0 23	0 25
.6							0 11	0 12	0 13	0 13	0 14	0 15	0 16	0 17	0 19	0 20	0 22	0 24
.8							0 10	0 11	0 12	0 13	0 13	0 14	0 15	0 16	0 18	0 19	0 21	0 22
4.0							0 10	0 11	0 11	0 12	0 13	0 13	0 14	0 16	0 17	0 18	0 20	0 21
.2										0 11	0 12	0 13	0 14	0 15	0 16	0 17	0 19	0 20
.4										0 11	0 12	0 12	0 13	0 14	0 15	0 17	0 18	0 19
.6										0 10	0 11	0 12	0 13	0 14	0 15	0 16	0 17	0 18
.8										0 10	0 11	0 11	0 12	0 13	0 14	0 15	0 16	0 18
5.0										0 10	0 10	0 11	0 11	0 12	0 14	0 15	0 16	0 17

TABLE 9.

Distance by Vertical Angle (Distance less than 5 miles).

Dist., nautical miles.	Heights in feet.																	
	160	170	180	190	200	300	400	500	600	700	800	900	1,000	1,200	1,400	1,600	1,800	2,000
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0.1	14 45	15 37	16 29	17 21	18 13	26 16												
.2	7 30	7 58	8 25	8 53	9 20	13 52	18 13	22 21	26 16	29 56								
.3	5 01	5 19	5 38	5 57	6 15	9 20	12 22	15 20	18 13	21 00	23 41	26 16	28 44					
.4	3 46	4 00	4 14	4 28	4 42	7 02	9 20	11 37	13 52	16 03	18 13	20 18	22 21	26 16	29 56			
0.5	3 01	3 12	3 23	3 35	3 46	5 38	7 30	9 20	11 10	12 58	14 45	16 30	18 13	21 32	24 44	27 46	30 38	
.6	2 31	2 40	2 49	2 59	3 08	4 42	6 15	7 48	9 20	10 52	12 22	13 52	15 20	18 13	21 00	23 41	26 16	28 44
.7	2 09	2 17	2 25	2 33	2 41	4 02	5 22	6 42	8 01	9 20	10 39	11 56	13 13	15 45	18 13	20 36	22 56	25 10
.8	1 53	2 00	2 07	2 14	2 21	3 32	4 42	5 52	7 02	8 11	9 20	10 29	11 37	13 52	16 03	18 13	20 18	22 21
.9	1 40	1 47	1 53	1 59	2 06	3 08	4 11	5 13	6 15	7 17	8 19	9 20	10 21	12 22	14 21	16 18	18 13	20 05
1.0	1 30	1 36	1 42	1 47	1 53	2 49	3 46	4 42	5 38	6 34	7 30	8 25	9 20	11 10	12 58	14 45	16 29	18 13
.1	1 22	1 27	1 33	1 38	1 43	2 34	3 25	4 17	5 08	5 59	6 49	7 40	8 30	10 10	11 49	13 27	15 04	16 39
.2	1 15	1 20	1 25	1 30	1 34	2 21	3 08	3 55	4 42	5 29	6 15	7 02	7 48	9 20	10 52	12 22	13 52	15 20
.3	1 10	1 14	1 18	1 23	1 27	2 10	2 54	3 37	4 20	5 04	5 47	6 30	7 13	8 38	10 03	11 27	12 50	14 12
.4	1 05	1 09	1 13	1 17	1 21	2 01	2 41	3 22	4 02	4 42	5 22	6 02	6 42	8 01	9 20	10 39	11 56	13 13
1.5	1 00	1 04	1 08	1 12	1 15	1 53	2 31	3 08	3 46	4 23	5 01	5 38	6 15	7 30	8 44	9 57	11 10	12 22
.6	0 57	1 00	1 04	1 07	1 11	1 46	2 21	2 57	3 32	4 07	4 42	5 17	5 52	7 02	8 11	9 20	10 29	11 37
.7	0 53	0 57	1 00	1 03	1 07	1 40	2 13	2 46	3 19	3 52	4 26	4 59	5 32	6 38	7 43	8 48	9 53	10 57
.8	0 50	0 53	0 57	1 00	1 03	1 34	2 06	2 37	3 08	3 40	4 11	4 42	5 13	6 15	7 17	8 19	9 20	10 21
.9	0 48	0 51	0 54	0 57	1 00	1 29	1 59	2 29	2 58	3 28	3 58	4 27	4 57	5 56	6 55	7 54	8 52	9 50
2.0	0 45	0 48	0 51	0 54	0 57	1 25	1 53	2 21	2 49	3 18	3 46	4 14	4 42	5 38	6 34	7 30	8 25	9 20
.1	0 43	0 46	0 48	0 51	0 54	1 21	1 48	2 15	2 41	3 08	3 35	4 02	4 29	5 22	6 15	7 08	8 01	8 53
.2	0 41	0 44	0 46	0 49	0 51	1 17	1 43	2 08	2 34	3 00	3 25	3 51	4 17	5 08	5 59	6 49	7 40	8 30
.3	0 39	0 42	0 44	0 47	0 49	1 14	1 38	2 03	2 27	2 52	3 16	3 41	4 05	4 55	5 44	6 32	7 21	8 09
.4	0 38	0 40	0 42	0 45	0 47	1 11	1 34	1 58	2 21	2 45	3 08	3 32	3 55	4 42	5 29	6 15	7 02	7 48
2.5	0 36	0 38	0 41	0 43	0 45	1 08	1 30	1 53	2 16	2 38	3 01	3 23	3 46	4 31	5 16	6 01	6 45	7 30
.6	0 35	0 37	0 39	0 41	0 44	1 05	1 27	1 49	2 10	2 32	2 54	3 16	3 37	4 20	5 04	5 47	6 30	7 13
.7	0 34	0 36	0 38	0 40	0 42	1 03	1 24	1 45	2 06	2 27	2 47	3 08	3 29	4 11	4 53	5 34	6 15	6 57
.8	0 32	0 34	0 36	0 38	0 40	1 01	1 21	1 41	2 01	2 21	2 41	3 02	3 22	4 02	4 42	5 22	6 02	6 42
.9	0 31	0 33	0 35	0 37	0 39	0 58	1 18	1 37	1 57	2 16	2 36	2 55	3 15	3 54	4 32	5 11	5 50	6 28
3.0	0 30	0 32	0 34	0 36	0 38	0 57	1 15	1 34	1 53	2 12	2 31	2 49	3 08	3 46	4 23	5 01	5 38	6 15
.2	0 28	0 30	0 32	0 34	0 35	0 53	1 11	1 28	1 46	2 04	2 21	2 39	2 57	3 32	4 07	4 42	5 17	5 52
.4	0 27	0 28	0 30	0 32	0 33	0 50	1 07	1 23	1 40	1 56	2 13	2 30	2 46	3 19	3 52	4 26	4 59	5 32
.6	0 25	0 27	0 28	0 30	0 31	0 47	1 03	1 19	1 34	1 50	2 06	2 21	2 37	3 08	3 40	4 11	4 42	5 13
.8	0 24	0 25	0 27	0 28	0 30	0 45	1 00	1 14	1 29	1 44	1 59	2 14	2 29	2 58	3 28	3 58	4 27	4 57
4.0	0 23	0 24	0 25	0 27	0 28	0 42	0 57	1 11	1 25	1 39	1 53	2 07	2 21	2 49	3 18	3 46	4 14	4 42
.2	0 22	0 23	0 24	0 26	0 27	0 40	0 54	1 07	1 21	1 34	1 48	2 01	2 15	2 41	3 08	3 35	4 02	4 29
.4	0 21	0 22	0 23	0 24	0 26	0 39	0 51	1 04	1 17	1 30	1 43	1 56	2 08	2 34	3 00	3 25	3 51	4 17
.6	0 20	0 21	0 22	0 23	0 25	0 37	0 49	1 01	1 14	1 26	1 38	1 51	2 03	2 27	2 52	3 16	3 41	4 05
.8	0 19	0 20	0 21	0 22	0 24	0 35	0 47	0 59	1 11	1 22	1 34	1 46	1 58	2 21	2 45	3 08	3 32	3 55
5.0	0 18	0 19	0 20	0 21	0 23	0 34	0 45	0 57	1 08	1 19	1 30	1 42	1 53	2 16	2 38	3 01	3 23	3 46

TABLE 10.

Distance by Vertical Angle (Distance greater than 5 miles).

(1) Surface craft correct observed vertical angle for Refraction and Dip.
(2) Aircraft (using bubble sextant) correct observed vertical angle for Refraction only.

Correction for Refraction.

Est. Dist.	Corr.	Est. Dist.	Corr.
	′		′
5	−0. 4	55	−4. 0
10	−0. 8	60	−4. 4
15	−1. 1	65	−4. 7
20	−1. 5	70	−5. 1
25	−1. 9	75	−5. 5
30	−2. 2	80	−5. 8
35	−2. 5	85	−6. 2
40	−2. 9	90	−6. 6
45	−3. 3	95	−7. 0
50	−3. 6	100	−7. 5

Correction for Dip.

Ht. of eye	Corr.	Ht. of eye	Corr.
	′		′
10	−3. 1	60	−7. 6
15	−3. 8	65	−7. 9
20	−4. 4	70	−8. 2
25	−4. 9	75	−8. 5
30	−5. 4	80	−8. 8
35	−5. 8	85	−9. 0
40	−6. 2	90	−9. 3
45	−6. 6	95	−9. 5
50	−6. 9	100	−9. 8
55	−7. 3	105	−10. 1

Distance in nautical miles	Difference in feet between height of object and height of eye.												Distance in nautical miles
	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
6	0 35	0 54	1 12	1 31	1 50	2 09	2 28	2 46	3 05	3 23	3 42	4 00	6
7	0 29	0 45	1 01	1 17	1 34	1 50	2 06	2 22	2 38	2 54	3 10	3 26	7
8	0 24	0 39	0 53	1 07	1 21	1 35	1 49	2 03	2 18	2 32	2 46	3 00	8
9	0 21	0 33	0 46	0 58	1 11	1 24	1 36	1 48	2 01	2 14	2 26	2 39	9
10	0 18	0 29	0 40	0 52	1 03	1 14	1 26	1 37	1 48	1 59	2 11	2 22	10
11	0 15	0 25	0 36	0 46	0 56	1 06	1 17	1 27	1 37	1 48	1 58	2 08	11
12	0 13	0 22	0 32	0 41	0 51	1 00	1 09	1 19	1 28	1 38	1 47	1 56	12
13	0 11	0 20	0 28	0 37	0 46	0 54	1 03	1 12	1 21	1 29	1 38	1 47	13
14		0 17	0 25	0 33	0 41	0 49	0 57	1 06	1 14	1 22	1 30	1 38	14
15		0 15	0 22	0 30	0 38	0 45	0 53	1 00	1 08	1 15	1 23	1 30	15
16		0 13	0 20	0 27	0 34	0 41	0 48	0 56	1 03	1 10	1 17	1 24	16
17		0 11	0 18	0 25	0 31	0 38	0 45	0 52	0 58	1 04	1 11	1 18	17
18		0 10	0 16	0 22	0 29	0 35	0 41	0 48	0 54	1 00	1 06	1 12	18
19			0 14	0 20	0 26	0 32	0 38	0 44	0 50	0 56	1 02	1 08	19
20			0 12	0 18	0 24	0 29	0 35	0 41	0 46	0 52	0 58	1 04	20
21			0 11	0 16	0 22	0 27	0 32	0 38	0 43	0 49	0 54	1 00	21
22			0 10	0 15	0 20	0 25	0 30	0 35	0 41	0 46	0 51	0 56	22
23				0 13	0 18	0 23	0 28	0 33	0 38	0 43	0 47	0 52	23
24				0 11	0 16	0 21	0 26	0 30	0 35	0 40	0 45	0 49	24
25				0 10	0 15	0 19	0 24	0 28	0 33	0 37	0 42	0 46	25
26					0 13	0 17	0 22	0 26	0 30	0 35	0 39	0 44	26
27					0 11	0 16	0 20	0 24	0 28	0 33	0 37	0 41	27
28					0 10	0 14	0 18	0 22	0 26	0 30	0 35	0 39	28
29						0 13	0 17	0 21	0 25	0 28	0 32	0 36	29
30						0 11	0 15	0 19	0 23	0 26	0 30	0 34	30
31						0 10	0 14	0 17	0 21	0 25	0 28	0 32	31
32							0 12	0 16	0 19	0 23	0 26	0 30	32
33							0 11	0 14	0 18	0 21	0 25	0 28	33
34							0 10	0 13	0 16	0 20	0 23	0 26	34
35								0 12	0 15	0 18	0 21	0 25	35
36								0 10	0 13	0 17	0 20	0 23	36
37									0 12	0 15	0 18	0 21	37
38									0 11	0 14	0 17	0 20	38
39									0 10	0 12	0 15	0 18	39
40										0 11	0 14	0 17	40
41										0 10	0 12	0 15	41
42											0 11	0 14	42
43											0 10	0 13	43
44												0 11	44
45												0 10	45

TABLE 10.

Distance by Vertical Angle (Distance greater than 5 miles).

Distance in nautical miles.	Difference in feet between height of object and height of eye.												Distance in nautical miles.
	2,800	3,000	3,200	3,400	3,600	3,800	4,000	4,200	4,400	4,600	4,800	5,000	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
6	4 20	4 39	4 48	5 17	5 35	5 54	6 13	6 31	6 50	7 08	7 27	7 46	6
7	3 42	3 59	4 15	4 31	4 46	5 02	5 19	5 35	5 50	6 06	6 22	6 38	7
8	3 14	3 28	3 42	3 56	4 10	4 24	4 38	4 52	5 06	5 20	5 34	5 47	8
9	2 51	3 04	3 16	3 29	3 41	3 54	4 07	4 19	4 32	4 44	4 56	5 08	9
10	2 33	2 45	2 56	3 07	3 18	3 29	3 40	3 52	4 03	4 15	4 26	4 37	10
11	2 18	2 29	2 39	2 49	2 59	3 10	3 20	3 30	3 40	3 51	4 01	4 11	11
12	2 06	2 15	2 25	2 34	2 44	2 53	3 02	3 12	3 21	3 30	3 40	3 49	12
13	1 55	2 04	2 12	2 22	2 30	2 39	2 48	2 56	3 05	3 14	3 22	3 30	13
14	1 46	1 54	2 02	2 10	2 18	2 26	2 35	2 43	2 51	2 59	3 07	3 15	14
15	1 38	1 45	1 53	2 01	2 08	2 16	2 23	2 31	2 38	2 46	2 53	3 01	15
16	1 31	1 38	1 45	1 52	1 59	2 06	2 13	2 20	2 27	2 34	2 42	2 49	16
17	1 25	1 31	1 38	1 44	1 51	1 58	2 04	2 11	2 18	2 24	2 31	2 38	17
18	1 19	1 25	1 31	1 38	1 44	1 50	1 56	2 03	2 09	2 15	2 22	2 28	18
19	1 14	1 20	1 26	1 32	1 37	1 43	1 49	1 55	2 01	2 07	2 13	2 19	19
20	1 09	1 15	1 20	1 26	1 32	1 37	1 43	1 49	1 55	2 00	2 05	2 11	20
21	1 05	1 10	1 16	1 21	1 26	1 32	1 37	1 43	1 48	1 53	1 59	2 04	21
22	1 01	1 06	1 11	1 16	1 22	1 27	1 32	1 37	1 42	1 47	1 52	1 57	22
23	0 57	1 02	1 07	1 12	1 17	1 22	1 27	1 32	1 36	1 41	1 46	1 51	23
24	0 54	0 59	1 03	1 08	1 13	1 18	1 22	1 27	1 32	1 36	1 41	1 46	24
25	0 51	0 55	1 00	1 04	1 09	1 13	1 18	1 22	1 27	1 32	1 36	1 40	25
26	0 48	0 52	0 57	1 01	1 05	1 10	1 14	1 18	1 23	1 27	1 32	1 36	26
27	0 45	0 49	0 54	0 58	1 02	1 06	1 10	1 14	1 18	1 23	1 27	1 32	27
28	0 43	0 47	0 51	0 55	0 59	1 03	1 07	1 11	1 15	1 19	1 23	1 27	28
29	0 40	0 44	0 48	0 52	0 56	0 59	1 03	1 07	1 11	1 15	1 19	1 23	29
30	0 38	0 41	0 45	0 49	0 53	0 57	1 00	1 04	1 08	1 12	1 16	1 19	30
31	0 36	0 39	0 43	0 46	0 50	0 54	0 57	1 01	1 05	1 08	1 12	1 16	31
32	0 34	0 37	0 40	0 44	0 47	0 51	0 55	0 58	1 02	1 05	1 09	1 12	32
33	0 31	0 35	0 38	0 42	0 45	0 49	0 52	0 55	0 59	1 02	1 06	1 09	33
34	0 29	0 33	0 36	0 39	0 43	0 46	0 49	0 53	0 56	0 59	1 03	1 06	34
35	0 28	0 31	0 34	0 37	0 41	0 44	0 47	0 50	0 53	0 57	1 00	1 04	35
36	0 26	0 29	0 32	0 35	0 39	0 42	0 45	0 48	0 51	0 54	0 57	1 01	36
37	0 24	0 27	0 30	0 33	0 37	0 40	0 43	0 46	0 49	0 52	0 55	0 58	37
38	0 23	0 26	0 29	0 32	0 35	0 38	0 40	0 43	0 46	0 49	0 53	0 55	38
39	0 21	0 24	0 27	0 30	0 33	0 36	0 38	0 41	0 44	0 47	0 50	0 53	39
40	0 20	0 22	0 25	0 28	0 31	0 34	0 36	0 39	0 42	0 45	0 48	0 51	40
41	0 18	0 21	0 24	0 26	0 29	0 32	0 35	0 37	0 40	0 43	0 46	0 49	41
42	0 17	0 19	0 22	0 25	0 27	0 30	0 33	0 35	0 38	0 41	0 44	0 46	42
43	0 15	0 18	0 21	0 23	0 26	0 28	0 31	0 34	0 36	0 39	0 42	0 44	43
44	0 14	0 17	0 19	0 22	0 24	0 27	0 29	0 32	0 34	0 37	0 40	0 42	44
45	0 13	0 15	0 18	0 20	0 23	0 25	0 28	0 30	0 33	0 35	0 38	0 40	45
46	0 11	0 13	0 16	0 19	0 21	0 24	0 26	0 29	0 31	0 33	0 36	0 38	46
47	0 10	0 12	0 15	0 17	0 20	0 22	0 25	0 27	0 29	0 32	0 34	0 37	47
48		0 11	0 14	0 16	0 18	0 21	0 23	0 25	0 28	0 30	0 32	0 35	48
49		0 10	0 12	0 15	0 17	0 19	0 22	0 24	0 26	0 29	0 31	0 33	49
50			0 11	0 13	0 16	0 18	0 20	0 22	0 25	0 27	0 29	0 31	50
51			0 10	0 12	0 14	0 17	0 19	0 21	0 23	0 26	0 28	0 30	51
52				0 11	0 13	0 15	0 17	0 20	0 22	0 24	0 26	0 28	52
53				0 10	0 12	0 14	0 16	0 18	0 20	0 23	0 25	0 27	53
54					0 11	0 13	0 15	0 17	0 19	0 21	0 23	0 25	54
55					0 10	0 12	0 14	0 16	0 18	0 20	0 22	0 24	55
56						0 10	0 12	0 14	0 16	0 18	0 20	0 22	56
57							0 11	0 13	0 15	0 17	0 19	0 21	57
58							0 10	0 12	0 14	0 16	0 18	0 20	58
59								0 11	0 13	0 14	0 17	0 18	59
60								0 10	0 11	0 13	0 16	0 17	60
61									0 10	0 12	0 14	0 16	61
62										0 11	0 13	0 15	62
63										0 10	0 12	0 13	63
64											0 10	0 12	64
65												0 11	65

Distance by Vertical Angle (Distance greater than 5 miles).

Distance in nautical miles.	Difference in feet between height of object and height of eye.												Distance in nautical miles.
	5,200	5,400	5,600	5,800	6,000	6,200	6,400	6,600	6,800	7,000	7,200	7,400	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
11	4 22	4 32	4 42	4 53	5 03	5 13	5 23	5 33	5 43	5 53	6 03	6 13	11
12	3 59	4 08	4 17	4 27	4 36	4 45	4 55	5 05	5 14	5 23	5 33	5 42	12
13	3 39	3 48	3 57	4 05	4 14	4 23	4 31	4 40	4 48	4 57	5 06	5 15	13
14	3 23	3 31	3 39	3 47	3 55	4 03	4 11	4 19	4 27	4 35	4 43	4 51	14
15	3 08	3 16	3 23	3 31	3 38	3 46	3 54	4 01	4 08	4 16	4 23	4 31	15
16	2 56	3 03	3 10	3 17	3 24	3 31	3 38	3 45	3 52	3 59	4 06	4 13	16
17	2 44	2 51	2 58	3 04	3 11	3 17	3 24	3 31	3 38	3 44	3 51	3 57	17
18	2 34	2 41	2 47	2 53	2 59	3 06	3 12	3 18	3 24	3 31	3 37	3 43	18
19	2 25	2 31	2 37	2 43	2 49	2 55	3 01	3 07	3 13	3 19	3 25	3 30	19
20	2 17	2 23	2 29	2 34	2 40	2 45	2 51	2 57	3 02	3 08	3 13	3 19	20
21	2 09	2 15	2 20	2 25	2 31	2 36	2 42	2 47	2 52	2 58	3 03	3 09	21
22	2 03	2 08	2 13	2 18	2 23	2 28	2 33	2 38	2 44	2 49	2 54	2 59	22
23	1 56	2 01	2 06	2 11	2 16	2 21	2 26	2 31	2 36	2 41	2 46	2 50	23
24	1 50	1 55	2 00	2 05	2 09	2 14	2 19	2 23	2 28	2 33	2 38	2 42	24
25	1 45	1 50	1 54	1 58	2 03	2 08	2 12	2 17	2 21	2 26	2 31	2 35	25
26	1 40	1 44	1 48	1 53	1 57	2 02	2 06	2 11	2 15	2 19	2 24	2 28	26
27	1 36	1 40	1 44	1 48	1 52	1 56	2 00	2 04	2 09	2 13	2 17	2 21	27
28	1 31	1 35	1 39	1 43	1 47	1 51	1 55	1 59	2 03	2 07	2 11	2 15	28
29	1 27	1 31	1 34	1 38	1 42	1 46	1 50	1 54	1 58	2 02	2 06	2 10	29
30	1 23	1 27	1 30	1 34	1 38	1 42	1 46	1 49	1 53	1 57	2 01	2 04	30
31	1 20	1 23	1 27	1 30	1 34	1 38	1 41	1 45	1 48	1 52	1 56	2 00	31
32	1 16	1 19	1 23	1 26	1 30	1 34	1 37	1 40	1 44	1 48	1 51	1 54	32
33	1 12	1 16	1 19	1 23	1 26	1 30	1 33	1 36	1 40	1 43	1 47	1 50	33
34	1 09	1 13	1 16	1 19	1 23	1 26	1 29	1 33	1 36	1 39	1 42	1 46	34
35	1 07	1 10	1 13	1 16	1 19	1 23	1 26	1 29	1 32	1 36	1 39	1 42	35
36	1 04	1 07	1 10	1 13	1 16	1 19	1 23	1 26	1 29	1 32	1 35	1 38	36
37	1 01	1 04	1 07	1 10	1 13	1 16	1 19	1 22	1 25	1 29	1 31	1 34	37
38	0 58	1 01	1 04	1 07	1 10	1 13	1 16	1 19	1 22	1 25	1 28	1 31	38
39	0 56	0 59	1 02	1 05	1 08	1 10	1 13	1 16	1 19	1 22	1 25	1 28	39
40	0 54	0 56	0 59	1 02	1 05	1 08	1 11	1 13	1 16	1 19	1 22	1 25	40
41	0 51	0 54	0 57	1 00	1 02	1 05	1 08	1 11	1 13	1 16	1 19	1 21	41
42	0 49	0 52	0 54	0 57	1 00	1 03	1 05	1 08	1 10	1 13	1 16	1 19	42
43	0 47	0 49	0 52	0 55	0 57	1 00	1 03	1 05	1 08	1 10	1 13	1 16	43
44	0 45	0 47	0 50	0 53	0 55	0 58	1 00	1 03	1 05	1 08	1 10	1 13	44
45	0 43	0 45	0 48	0 50	0 53	0 55	0 58	1 00	1 03	1 05	1 08	1 10	45
46	0 41	0 43	0 46	0 48	0 51	0 53	0 56	0 58	1 01	1 03	1 05	1 08	46
47	0 39	0 42	0 44	0 46	0 49	0 51	0 53	0 56	0 58	1 01	1 03	1 05	47
48	0 37	0 40	0 42	0 44	0 47	0 49	0 51	0 54	0 56	0 58	1 01	1 03	48
49	0 36	0 38	0 40	0 42	0 45	0 47	0 49	0 52	0 54	0 56	0 59	1 01	49
50	0 34	0 36	0 38	0 40	0 43	0 45	0 47	0 50	0 52	0 54	0 56	0 59	50
51	0 32	0 34	0 37	0 39	0 41	0 43	0 45	0 48	0 50	0 52	0 54	0 56	51
52	0 31	0 33	0 35	0 37	0 39	0 41	0 43	0 46	0 48	0 50	0 52	0 54	52
53	0 29	0 31	0 33	0 35	0 37	0 40	0 42	0 44	0 46	0 48	0 50	0 52	53
54	0 27	0 30	0 32	0 34	0 36	0 38	0 40	0 42	0 44	0 46	0 48	0 50	54
55	0 26	0 28	0 30	0 32	0 34	0 36	0 38	0 40	0 42	0 44	0 46	0 49	55
56	0 24	0 26	0 28	0 31	0 33	0 35	0 37	0 39	0 41	0 43	0 45	0 47	56
57	0 23	0 25	0 27	0 29	0 31	0 33	0 35	0 37	0 39	0 41	0 43	0 45	57
58	0 22	0 24	0 26	0 28	0 29	0 31	0 33	0 35	0 37	0 39	0 41	0 43	58
59	0 20	0 22	0 24	0 26	0 28	0 30	0 32	0 34	0 36	0 38	0 39	0 41	59
60	0 19	0 21	0 23	0 25	0 27	0 28	0 30	0 32	0 34	0 36	0 38	0 40	60
61	0 18	0 19	0 21	0 23	0 25	0 27	0 29	0 31	0 32	0 34	0 36	0 38	61
62	0 16	0 18	0 20	0 22	0 24	0 25	0 27	0 29	0 31	0 33	0 35	0 36	62
63	0 15	0 17	0 19	0 21	0 22	0 24	0 26	0 28	0 29	0 31	0 33	0 35	63
64	0 14	0 16	0 17	0 19	0 21	0 23	0 25	0 26	0 28	0 30	0 32	0 33	64
65	0 13	0 14	0 16	0 18	0 20	0 21	0 23	0 25	0 27	0 28	0 30	0 32	65
66	0 12	0 13	0 15	0 17	0 18	0 20	0 22	0 23	0 25	0 27	0 29	0 30	66
67	0 10	0 12	0 14	0 15	0 17	0 19	0 21	0 22	0 24	0 25	0 27	0 29	67
68		0 11	0 13	0 14	0 16	0 17	0 19	0 21	0 22	0 24	0 26	0 27	68
69		0 10	0 11	0 13	0 15	0 16	0 18	0 20	0 21	0 23	0 24	0 26	69
70			0 10	0 12	0 13	0 15	0 17	0 18	0 20	0 22	0 23	0 25	70

TABLE 10.

Distance by Vertical Angle (Distance greater than 5 miles)

Distance in nautical miles	Difference in feet between height of object and height of eye												Distance in nautical miles
	7,600	7,800	8,000	8,200	8,400	8,600	8,800	9,000	9,200	9,400	9,600	9,800	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	°	° ′	° ′	° ′	° ′	
16	4 20	4 27	4 34	4 41	4 48	4 55	5 02	5 09	5 16	5 23	5 30	5 37	16
17	4 04	4 11	4 17	4 24	4 30	4 37	4 44	4 50	4 57	5 03	5 10	5 16	17
18	3 49	3 56	4 02	4 08	4 15	4 21	4 27	4 33	4 39	4 46	4 52	4 58	18
19	3 36	3 42	3 48	3 54	4 00	4 06	4 12	4 18	4 24	4 30	4 36	4 42	19
20	3 25	3 30	3 36	3 41	3 47	3 53	3 58	4 04	4 09	4 15	4 20	4 26	20
21	3 14	3 19	3 25	3 30	3 35	3 41	3 46	3 51	3 57	4 02	4 08	4 13	21
22	3 04	3 09	3 14	3 20	3 25	3 30	3 35	3 40	3 45	3 50	3 56	4 01	22
23	2 55	3 00	3 05	3 10	3 15	3 20	3 25	3 30	3 34	3 39	3 44	3 49	23
24	2 48	2 52	2 56	3 01	3 06	3 10	3 15	3 20	3 25	3 29	3 34	3 39	24
25	2 40	2 44	2 49	2 53	2 57	3 02	3 06	3 11	3 15	3 20	3 24	3 29	25
26	2 32	2 36	2 41	2 45	2 49	2 54	2 58	3 02	3 07	3 11	3 16	3 20	26
27	2 26	2 30	2 34	2 38	2 42	2 46	2 51	2 55	2 59	3 03	3 07	3 12	27
28	2 20	2 24	2 27	2 31	2 35	2 39	2 43	2 47	2 51	2 55	2 59	3 03	28
29	2 14	2 18	2 21	2 25	2 29	2 33	2 37	2 41	2 45	2 49	2 53	2 56	29
30	2 08	2 12	2 16	2 19	2 23	2 27	2 31	2 34	2 38	2 42	2 46	2 49	30
31	2 03	2 06	2 10	2 14	2 18	2 21	2 25	2 28	2 32	2 36	2 40	2 43	31
32	1 58	2 02	2 05	2 08	2 12	2 16	2 20	2 23	2 27	2 30	2 33	2 37	32
33	1 54	1 57	2 00	2 04	2 07	2 11	2 14	2 18	2 21	2 24	2 28	2 31	33
34	1 49	1 53	1 56	1 59	2 02	2 06	2 10	2 13	2 16	2 19	2 23	2 26	34
35	1 45	1 48	1 52	1 55	1 58	2 01	2 05	2 08	2 11	2 14	2 17	2 20	35
36	1 41	1 44	1 48	1 51	1 54	1 57	2 00	2 03	2 06	2 10	2 13	2 16	36
37	1 38	1 41	1 44	1 47	1 50	1 53	1 56	1 59	2 02	2 05	2 08	2 11	37
38	1 34	1 37	1 40	1 43	1 46	1 49	1 52	1 55	1 58	2 01	2 04	2 07	38
39	1 31	1 34	1 36	1 39	1 42	1 45	1 48	1 51	1 54	1 57	2 00	2 02	39
40	1 27	1 30	1 33	1 36	1 39	1 41	1 44	1 47	1 50	1 53	1 56	1 58	40
41	1 24	1 27	1 30	1 32	1 35	1 38	1 41	1 43	1 46	1 49	1 52	1 54	41
42	1 21	1 24	1 27	1 29	1 32	1 35	1 37	1 40	1 43	1 45	1 48	1 51	42
43	1 19	1 21	1 24	1 26	1 29	1 31	1 34	1 37	1 39	1 42	1 45	1 47	43
44	1 16	1 18	1 21	1 23	1 26	1 28	1 31	1 33	1 36	1 39	1 41	1 44	44
45	1 13	1 15	1 18	1 21	1 23	1 25	1 28	1 30	1 33	1 35	1 38	1 40	45
46	1 10	1 13	1 15	1 18	1 20	1 23	1 25	1 27	1 30	1 32	1 35	1 37	46
47	1 08	1 10	1 13	1 15	1 18	1 20	1 22	1 25	1 27	1 29	1 32	1 34	47
48	1 05	1 08	1 10	1 12	1 15	1 17	1 19	1 22	1 24	1 26	1 29	1 31	48
49	1 03	1 05	1 08	1 10	1 12	1 15	1 17	1 19	1 21	1 24	1 26	1 29	49
50	1 01	1 03	1 05	1 08	1 10	1 12	1 14	1 17	1 19	1 21	1 23	1 26	50
51	0 59	1 01	1 03	1 05	1 08	1 10	1 12	1 14	1 16	1 19	1 21	1 23	51
52	0 57	0 59	1 01	1 03	1 05	1 08	1 09	1 12	1 14	1 16	1 18	1 20	52
53	0 54	0 57	0 59	1 01	1 03	1 05	1 07	1 09	1 12	1 14	1 16	1 18	53
54	0 52	0 55	0 57	0 59	1 01	1 03	1 05	1 07	1 10	1 11	1 13	1 15	54
55	0 51	0 53	0 55	0 57	0 59	1 01	1 03	1 05	1 07	1 09	1 11	1 13	55
56	0 49	0 51	0 53	0 55	0 57	0 59	1 01	1 03	1 05	1 07	1 09	1 11	56
57	0 47	0 49	0 51	0 53	0 55	0 57	0 59	1 01	1 03	1 05	1 07	1 09	57
58	0 45	0 47	0 49	0 51	0 53	0 55	0 57	0 59	1 01	1 03	1 05	1 06	58
59	0 43	0 45	0 47	0 49	0 51	0 53	0 55	0 57	0 59	1 01	1 03	1 04	59
60	0 42	0 43	0 45	0 47	0 49	0 51	0 53	0 55	0 57	0 59	1 00	1 02	60
61	0 40	0 42	0 43	0 45	0 47	0 49	0 51	0 53	0 55	0 57	0 58	1 00	61
62	0 38	0 40	0 42	0 44	0 45	0 47	0 49	0 51	0 53	0 55	0 56	0 58	62
63	0 37	0 38	0 40	0 42	0 44	0 46	0 47	0 49	0 51	0 53	0 55	0 56	63
64	0 35	0 37	0 38	0 40	0 42	0 44	0 46	0 47	0 49	0 51	0 53	0 55	64
65	0 33	0 35	0 37	0 39	0 40	0 42	0 44	0 46	0 47	0 49	0 51	0 53	65
66	0 32	0 34	0 35	0 37	0 39	0 41	0 42	0 44	0 46	0 47	0 49	0 51	66
67	0 31	0 32	0 34	0 36	0 37	0 39	0 41	0 42	0 44	0 46	0 47	0 49	67
68	0 29	0 31	0 32	0 34	0 36	0 37	0 39	0 41	0 42	0 44	0 46	0 47	68
69	0 28	0 29	0 31	0 33	0 34	0 36	0 37	0 39	0 41	0 42	0 44	0 46	69
70	0 26	0 28	0 30	0 31	0 33	0 34	0 36	0 38	0 39	0 41	0 42	0 44	70
71	0 25	0 27	0 28	0 30	0 31	0 33	0 34	0 36	0 38	0 39	0 41	0 42	71
72	0 24	0 25	0 27	0 28	0 30	0 31	0 33	0 35	0 36	0 38	0 39	0 41	72
73	0 22	0 24	0 25	0 27	0 28	0 30	0 32	0 33	0 35	0 36	0 38	0 39	73
74	0 21	0 23	0 24	0 26	0 27	0 29	0 30	0 32	0 33	0 35	0 36	0 38	74
75	0 20	0 21	0 23	0 24	0 26	0 27	0 29	0 30	0 32	0 33	0 35	0 36	75

Distance by Vertical Angle (Distance Greater than 5 miles).

Distance in nautical miles	Difference in feet between height of object and height of eye.												Distance in nautical miles
	10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	14,500	15,000	15,500	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
21	4 18	4 32	4 45	4 58	5 12	5 25	5 38	5 52	6 05	6 18	6 32	6 45	21
22	4 06	4 18	4 31	4 44	4 57	5 09	5 22	5 35	5 47	6 00	6 13	6 26	22
23	3 54	4 06	4 19	4 31	4 43	4 55	5 07	5 19	5 31	5 43	5 56	6 08	23
24	3 43	3 55	4 07	4 19	4 30	4 42	4 54	5 05	5 17	5 29	5 40	5 52	24
25	3 33	3 45	3 56	4 07	4 18	4 30	4 41	4 52	5 03	5 15	5 26	5 37	25
26	3 24	3 35	3 46	3 57	4 08	4 18	4 29	4 40	4 51	5 01	5 12	5 23	26
27	3 16	3 26	3 37	3 47	3 57	4 08	4 18	4 29	4 39	4 49	5 00	5 10	27
28	3 08	3 18	3 28	3 38	3 48	3 58	4 08	4 18	4 28	4 38	4 48	4 58	28
29	3 00	3 10	3 20	3 30	3 39	3 49	3 59	4 08	4 18	4 28	4 37	4 47	29
30	2 53	3 03	3 12	3 22	3 31	3 40	3 50	3 59	4 08	4 17	4 27	4 37	30
31	2 47	2 56	3 05	3 14	3 23	3 32	3 41	3 50	3 59	4 08	4 18	4 27	31
32	2 41	2 50	2 58	3 07	3 16	3 25	3 33	3 42	3 51	4 00	4 09	4 17	32
33	2 35	2 44	2 52	3 00	3 09	3 17	3 26	3 34	3 43	3 51	4 00	4 09	33
34	2 29	2 38	2 46	2 54	3 02	3 10	3 19	3 27	3 35	3 43	3 52	4 00	34
35	2 24	2 32	2 40	2 48	2 56	3 04	3 12	3 20	3 28	3 36	3 44	3 53	35
36	2 19	2 27	2 34	2 42	2 50	2 58	3 06	3 13	3 21	3 29	3 37	3 45	36
37	2 14	2 22	2 29	2 37	2 45	2 52	3 00	3 07	3 15	3 22	3 30	3 38	37
38	2 10	2 17	2 24	2 32	2 40	2 47	2 54	3 01	3 09	3 16	3 24	3 31	38
39	2 05	2 13	2 20	2 27	2 35	2 42	2 49	2 56	3 03	3 10	3 17	3 25	39
40	2 01	2 08	2 15	2 22	2 29	2 36	2 43	2 50	2 57	3 05	3 12	3 19	40
41	1 57	2 04	2 11	2 18	2 25	2 32	2 38	2 45	2 52	2 59	3 06	3 13	41
42	1 53	2 00	2 07	2 14	2 20	2 27	2 34	2 40	2 47	2 54	3 00	3 07	42
43	1 50	1 57	2 03	2 10	2 16	2 22	2 29	2 36	2 42	2 49	2 55	3 02	43
44	1 46	1 53	1 59	2 06	2 12	2 18	2 24	2 31	2 38	2 44	2 50	2 56	44
45	1 43	1 49	1 56	2 02	2 08	2 14	2 20	2 27	2 33	2 39	2 46	2 52	45
46	1 40	1 46	1 52	1 58	2 04	2 10	2 16	2 23	2 29	2 35	2 41	2 47	46
47	1 37	1 43	1 49	1 55	2 01	2 07	2 13	2 19	2 24	2 30	2 36	2 42	47
48	1 34	1 40	1 45	1 51	1 57	2 03	2 09	2 15	2 20	2 26	2 32	2 38	48
49	1 31	1 37	1 42	1 48	1 54	1 59	2 05	2 11	2 17	2 23	2 28	2 34	49
50	1 28	1 34	1 39	1 45	1 50	1 56	2 02	2 07	2 13	2 19	2 24	2 30	50
51	1 25	1 31	1 36	1 42	1 48	1 53	1 58	2 04	2 09	2 15	2 20	2 26	51
52	1 23	1 28	1 33	1 39	1 44	1 50	1 55	2 01	2 06	2 11	2 17	2 22	52
53	1 20	1 25	1 31	1 36	1 41	1 47	1 52	1 57	2 03	2 08	2 13	2 18	53
54	1 17	1 23	1 28	1 33	1 38	1 44	1 49	1 54	1 59	2 05	2 10	2 15	54
55	1 15	1 20	1 25	1 30	1 36	1 41	1 46	1 51	1 56	2 01	2 06	2 12	55
56	1 13	1 18	1 23	1 28	1 33	1 38	1 43	1 48	1 53	1 58	2 03	2 08	56
57	1 11	1 16	1 20	1 25	1 30	1 35	1 40	1 45	1 50	1 55	2 00	2 05	57
58	1 08	1 13	1 18	1 23	1 28	1 32	1 37	1 42	1 47	1 52	1 57	2 02	58
59	1 06	1 11	1 16	1 21	1 25	1 30	1 35	1 39	1 44	1 49	1 54	1 59	59
60	1 04	1 09	1 14	1 18	1 23	1 28	1 32	1 37	1 42	1 47	1 51	1 56	60
61	1 02	1 07	1 11	1 16	1 21	1 25	1 30	1 34	1 39	1 44	1 48	1 53	61
62	1 00	1 05	1 09	1 14	1 18	1 23	1 27	1 32	1 36	1 41	1 45	1 50	62
63	0 58	1 03	1 07	1 12	1 16	1 20	1 25	1 29	1 34	1 38	1 43	1 47	63
64	0 56	1 01	1 05	1 10	1 14	1 18	1 23	1 27	1 31	1 36	1 40	1 45	64
65	0 54	0 59	1 03	1 07	1 12	1 16	1 20	1 25	1 29	1 34	1 38	1 42	65
66	0 53	0 57	1 01	1 05	1 10	1 14	1 18	1 22	1 27	1 31	1 35	1 40	66
67	0 51	0 55	0 59	1 03	1 08	1 12	1 16	1 20	1 24	1 29	1 33	1 37	67
68	0 49	0 53	0 57	1 01	1 06	1 10	1 14	1 18	1 22	1 26	1 30	1 34	68
69	0 47	0 51	0 56	1 00	1 04	1 08	1 12	1 16	1 20	1 24	1 28	1 32	69
70	0 46	0 50	0 54	0 58	1 02	1 06	1 10	1 14	1 18	1 22	1 26	1 30	70
71	0 44	0 48	0 52	0 56	1 00	1 04	1 08	1 12	1 16	1 20	1 24	1 28	71
72	0 42	0 46	0 50	0 54	0 58	1 02	1 06	1 10	1 14	1 18	1 22	1 26	72
73	0 41	0 45	0 49	0 52	0 56	1 00	1 04	1 08	1 12	1 16	1 20	1 24	73
74	0 39	0 43	0 47	0 51	0 55	0 58	1 02	1 06	1 10	1 14	1 18	1 22	74
75	0 38	0 42	0 45	0 49	0 53	0 56	1 00	1 04	1 08	1 12	1 16	1 19	75
76	0 36	0 40	0 44	0 47	0 51	0 55	0 58	1 02	1 06	1 10	1 14	1 17	76
77	0 35	0 39	0 42	0 46	0 49	0 53	0 57	1 00	1 04	1 08	1 12	1 15	77
78	0 33	0 37	0 41	0 44	0 48	0 51	0 55	0 59	1 02	1 06	1 10	1 13	78
79	0 32	0 36	0 39	0 43	0 46	0 50	0 53	0 57	1 00	1 04	1 07	1 11	79
80	0 31	0 34	0 38	0 41	0 45	0 48	0 52	0 55	0 59	1 02	1 06	1 09	80
81	0 29	0 33	0 36	0 40	0 43	0 47	0 50	0 54	0 57	1 01	1 04	1 07	81
82	0 28	0 31	0 35	0 38	0 42	0 45	0 49	0 52	0 55	0 59	1 02	1 06	82
83	0 27	0 30	0 33	0 37	0 40	0 43	0 47	0 50	0 54	0 57	1 00	1 04	83
84	0 25	0 29	0 32	0 35	0 39	0 42	0 45	0 49	0 52	0 56	0 59	1 02	84
85	0 24	0 27	0 31	0 34	0 37	0 41	0 44	0 47	0 50	0 54	0 57	1 00	85

TABLE 11.

For finding the distance of an object by an angle, measured from an elevated position, between the object and the horizon beyond.

Dist., yards.	Height of the Eye Above the Level of the Sea, in Feet.											Dist., yards.
	20	30	40	50	60	70	80	90	100	110	120	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
100	3 44	5 37	7 29	9 21	11 11	13 00	14 47	16 34	18 16	19 58	21 37	100
200	1 50	2 46	3 43	4 39	5 35	6 31	7 27	8 23	9 18	10 13	11 08	200
300	1 12	1 49	2 26	3 04	3 41	4 19	4 56	5 33	6 11	6 48	7 25	300
400	52	1 21	1 48	2 16	2 44	3 12	3 40	4 08	4 36	5 04	5 32	400
500	41	1 03	1 25	1 48	2 10	2 32	2 54	3 17	3 39	4 01	4 24	500
600	34	52	1 10	1 29	1 47	2 05	2 24	2 42	3 01	3 20	3 38	600
700	28	44	1 01	1 15	1 31	1 46	2 01	2 18	2 34	2 50	3 05	700
800	24	38	51	1 05	1 18	1 32	1 46	2 00	2 13	2 27	2 41	800
900	21	33	45	57	1 09	1 22	1 33	1 45	1 57	2 10	2 22	900
1,000	18	29	40	50	1 01	1 12	1 23	1 34	1 45	1 56	2 07	1,000
1,100	16	26	35	45	55	1 05	1 15	1 24	1 34	1 44	1 54	1,100
1,200	15	23	32	41	50	59	1 08	1 17	1 26	1 35	1 44	1,200
1,300	13	21	29	37	45	53	1 02	1 10	1 18	1 27	1 35	1,300
1,400	12	19	27	34	41	49	57	1 04	1 12	1 20	1 27	1,400
1,500	11	18	24	31	38	45	52	59	1 07	1 14	1 21	1,500
1,600	10	16	22	29	35	42	48	55	1 02	1 08	1 15	1,600
1,700		15	21	27	33	39	45	51	58	1 04	1 10	1,700
1,800		14	19	25	31	36	42	48	54	1 00	1 06	1,800
1,900		13	18	23	29	34	39	45	50	56	1 02	1,900
2,000		12	17	22	27	32	37	42	47	53	58	2,000
2,100		11	16	20	25	30	35	40	45	50	55	2,100
2,200		10	15	19	24	28	33	38	42	47	52	2,200
2,300			14	18	22	27	31	36	40	45	49	2,300
2,400			13	17	21	25	29	34	38	42	47	2,400
2,500			12	16	20	24	28	32	36	40	44	2,500
2,600			11	15	19	23	26	30	34	38	42	2,600
2,700			11	14	18	22	25	29	33	36	40	2,700
2,800			10	14	17	20	24	28	31	35	38	2,800
2,900				13	16	19	23	26	30	33	37	2,900
3,000				12	15	19	22	25	28	32	35	3,000
3,100				12	15	18	21	24	27	30	34	3,100
3,200				11	14	17	20	23	26	29	32	3,200
3,300				10	13	16	19	22	25	28	31	3,300
3,400					13	15	18	21	24	27	30	3,400
3,500					12	15	17	20	23	26	29	3,500
3,600					12	14	17	19	22	25	27	3,600
3,700					11	13	16	19	21	24	26	3,700
3,800					11	13	15	18	20	23	25	3,800
3,900					10	12	15	17	20	22	25	3,900
4,000						12	14	16	19	21	24	4,000
4,100						11	14	16	18	20	23	4,100
4,200						11	13	15	17	20	22	4,200
4,300						10	13	15	17	19	21	4,300
4,400							12	14	16	18	21	4,400
4,500							12	14	16	18	20	4,500
4,600							11	13	15	17	19	4,600
4,700							11	13	15	17	19	4,700
4,800							10	12	14	16	18	4,800
4,900								12	14	15	17	4,900
5,000								11	13	15	17	5,000

Speed in knots developed by a vessel traversing a measured nautical mile in any given number of minutes and seconds.

Sec.	Number of minutes.												Sec.
	1	2	3	4	5	6	7	8	9	10	11	12	
	Knots.	*Knots.*	*Knots.*	*Knots.*	*Knots.*	*Knots.*	*Knots.*	*Knots.*	*Knots.*	*Knots.*	*Knots.*	*Knots.*	
0	60.000	30.000	20.000	15.000	12.000	10.000	8.571	7.500	6.666	6.000	5.455	5.000	0
1	59.016	29.752	19.890	14.938	11.960	9.972	8.551	7.484	6.654	5.990	5.446	4.993	1
2	58.065	29.508	19.780	14.876	11.920	9.944	8.530	7.468	6.642	5.980	5.438	4.986	2
3	57.143	29.268	19.672	14.815	11.880	9.917	8.510	7.453	6.629	5.970	5.429	4.979	3
4	56.250	29.032	19.565	14.754	11.841	9.890	8.490	7.438	6.617	5.960	5.421	4.972	4
5	55.385	28.800	19.460	14.694	11.803	9.863	8.470	7.422	6.605	5.950	5.413	4.965	5
6	54.545	28.571	19.355	14.634	11.764	9.836	8.450	7.407	6.593	5.940	5.405	4.958	6
7	53.731	28.346	19.251	14.575	11.726	9.809	8.430	7.392	6.581	5.930	5.397	4.951	7
8	52.941	28.125	19.149	14.516	11.688	9.783	8.411	7.377	6.569	5.921	5.389	4.945	8
9	52.174	27.907	19.048	14.458	11.650	9.756	8.392	7.362	6.557	5.911	5.381	4.938	9
10	51.429	27.692	18.947	14.400	11.613	9.729	8.372	7.346	6.545	5.902	5.373	4.932	10
11	50.704	27.481	18.848	14.342	11.575	9.703	8.353	7.331	6.533	5.892	5.365	4.924	11
12	50.000	27.273	18.750	14.286	11.538	9.677	8.334	7.317	6.521	5.882	5.357	4.918	12
13	49.315	27.068	18.652	14.229	11.501	9.651	8.315	7.302	6.509	5.872	5.349	4.911	13
14	48.649	26.866	18.556	14.173	11.465	9.625	8.295	7.287	6.498	5.863	5.341	4.904	14
15	48.000	26.667	18.461	14.118	11.428	9.600	8.276	7.272	6.486	5.853	5.333	4.897	15
16	47.368	26.471	18.367	14.063	11.392	9.574	8.257	7.258	6.474	5.844	5.325	4.891	16
17	46.753	26.277	18.274	14.008	11.356	9.549	8.238	7.243	6.463	5.834	5.317	4.884	17
18	46.154	26.087	18.182	13.953	11.321	9.524	8.219	7.229	6.451	5.825	5.309	4.878	18
19	45.570	25.899	18.090	13.900	11.285	9.499	8.200	7.214	6.440	5.815	5.301	4.871	19
20	45.000	25.714	18.000	13.846	11.250	9.473	8.181	7.200	6.428	5.806	5.294	4.865	20
21	44.444	25.532	17.910	13.793	11.214	9.448	8.163	7.185	6.417	5.797	5.286	4.858	21
22	43.902	25.352	17.822	13.740	11.180	9.424	8.144	7.171	6.405	5.787	5.278	4.851	22
23	43.373	25.175	17.734	13.688	11.146	9.399	8.126	7.157	6.394	5.778	5.270	4.845	23
24	42.857	25.000	17.647	13.636	11.111	9.375	8.108	7.142	6.383	5.769	5.263	4.838	24
25	42.353	24.828	17.560	13.584	11.077	9.350	8.090	7.128	6.371	5.760	5.255	4.832	25
26	41.860	24.658	17.475	13.533	11.043	9.326	8.071	7.114	6.360	5.750	5.247	4.825	26
27	41.379	24.490	17.391	13.483	11.009	9.302	8.053	7.100	6.349	5.741	5.240	4.819	27
28	40.909	24.324	17.307	13.433	10.975	9.278	8.035	7.086	6.338	5.732	5.232	4.812	28
29	40.449	24.161	17.225	13.383	10.942	9.254	8.017	7.072	6.327	5.723	5.224	4.806	29
30	40.000	24.000	17.143	13.333	10.909	9.230	8.000	7.059	6.315	5.714	5.217	4.800	30
31	39.560	23.841	17.061	13.284	10.876	9.207	7.982	7.045	6.304	5.705	5.210	4.793	31
32	39.130	23.684	16.981	13.235	10.843	9.183	7.964	7.031	6.293	5.696	5.202	4.787	32
33	38.710	23.529	16.901	13.186	10.810	9.160	7.947	7.017	6.282	5.687	5.195	4.780	33
34	38.298	23.377	16.822	13.138	10.778	9.137	7.929	7.004	6.271	5.678	5.187	4.774	34
35	37.895	23.226	16.744	13.091	10.746	9.113	7.912	6.990	6.260	5.669	5.179	4.768	35
36	37.500	23.077	16.667	13.043	10.714	9.090	7.895	6.977	6.250	5.660	5.172	4.761	36
37	37.113	22.930	16.590	12.996	10.682	9.068	7.877	6.963	6.239	5.651	5.164	4.755	37
38	36.735	22.785	16.514	12.950	10.651	9.045	7.860	6.950	6.228	5.642	5.157	4.749	38
39	36.364	22.642	16.438	12.903	10.619	9.022	7.843	6.936	6.217	5.633	5.150	4.743	39
40	36.000	22.500	16.363	12.857	10.588	9.000	7.826	6.923	6.207	5.625	5.143	4.737	40
41	35.644	22.360	16.289	12.811	10.557	8.977	7.809	6.909	6.196	5.616	5.135	4.731	41
42	35.294	22.222	16.216	12.766	10.526	8.955	7.792	6.896	6.185	5.607	5.128	4.724	42
43	34.951	22.086	16.143	12.721	10.495	8.933	7.775	6.883	6.174	5.598	5.121	4.718	43
44	34.615	21.951	16.071	12.676	10.465	8.911	7.758	6.870	6.164	5.590	5.114	4.712	44
45	34.286	21.818	16.000	12.631	10.434	8.889	7.741	6.857	6.153	5.581	5.106	4.706	45
46	33.962	21.687	15.929	12.587	10.404	8.867	7.725	6.844	6.143	5.572	5.099	4.700	46
47	33.645	21.557	15.859	12.543	10.375	8.845	7.708	6.831	6.132	5.564	5.091	4.693	47
48	33.333	21.429	15.789	12.500	10.345	8.823	7.692	6.818	6.122	5.555	5.084	4.687	48
49	33.028	21.302	15.721	12.456	10.315	8.801	7.675	6.805	6.112	5.547	5.077	4.681	49
50	32.727	21.176	15.652	12.413	10.286	8.780	7.659	6.792	6.101	5.538	5.070	4.675	50
51	32.432	21.053	15.584	12.371	10.256	8.759	7.643	6.779	6.091	5.530	5.063	4.669	51
52	32.143	20.930	15.517	12.329	10.227	8.737	7.627	6.766	6.081	5.521	5.056	4.663	52
53	31.858	20.809	15.450	12.287	10.198	8.716	7.611	6.754	6.071	5.513	5.049	4.657	53
54	31.579	20.690	15.384	12.245	10.169	8.695	7.595	6.741	6.060	5.504	5.042	4.651	54
55	31.304	20.571	15.319	12.203	10.140	8.675	7.579	6.739	6.050	5.496	5.035	4.645	55
56	31.034	20.455	15.254	12.162	10.112	8.654	7.563	6.716	6.040	5.487	5.028	4.639	56
57	30.769	20.339	15.190	12.121	10.084	8.633	7.547	6.704	6.030	5.479	5.020	4.633	57
58	30.508	20.225	15.126	12.080	10.055	8.612	7.531	6.691	6.020	5.471	5.013	4.627	58
59	30.252	20.112	15.062	12.040	10.027	8.591	7.515	6.679	6.010	5.463	5.006	4.621	59
Sec.	1	2	3	4	5	6	7	8	9	10	11	12	Sec.

TABLE 13.

Time Speed and Distance.

Minutes.	Speed in knots.															
	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	.2	.2	.2	.2	.2	.3	.3	.3	.3	.3	.3	.4	.4	.4	.4	.4
3	.3	.3	.3	.3	.4	.4	.4	.4	.5	.5	.5	.5	.6	.6	.6	.6
4	.3	.4	.4	.4	.5	.5	.5	.6	.6	.6	.7	.7	.7	.8	.8	.8
5	.4	.5	.5	.5	.6	.6	.7	.7	.8	.8	.8	.9	.9	1.0	1.0	1.0
6	.5	.6	.6	.7	.7	.8	.8	.9	.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3
7	.6	.6	.7	.8	.8	.9	.9	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.5
8	.7	.7	.8	.9	.9	1.0	1.1	1.1	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.7
9	.8	.8	.9	1.0	1.1	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9
10	.8	.9	1.0	1.1	1.2	1.3	1.3	1.4	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.1
11	.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.1	2.2	2.3
12	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
13	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7
14	1.2	1.3	1.4	1.5	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.5	2.6	2.7	2.8	2.9
15	1.3	1.4	1.5	1.6	1.8	1.9	2.0	2.1	2.3	2.4	2.5	2.6	2.8	2.9	3.0	3.1
16	1.3	1.5	1.6	1.7	1.9	2.0	2.1	2.3	2.4	2.5	2.7	2.8	2.9	3.1	3.2	3.3
17	1.4	1.6	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.8	3.0	3.1	3.3	3.4	3.5
18	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	3.0	3.2	3.3	3.5	3.6	3.8
19	1.6	1.8	1.9	2.1	2.2	2.4	2.5	2.7	2.9	3.0	3.2	3.3	3.5	3.6	3.8	4.0
20	1.7	1.8	2.0	2.2	2.3	2.5	2.7	2.8	3.0	3.2	3.3	3.5	3.7	3.8	4.0	4.2
21	1.8	1.9	2.1	2.3	2.5	2.6	2.8	3.0	3.2	3.3	3.5	3.7	3.9	4.0	4.2	4.4
22	1.8	2.0	2.2	2.4	2.6	2.8	2.9	3.1	3.3	3.5	3.7	3.9	4.0	4.2	4.4	4.6
23	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.6	3.8	4.0	4.2	4.4	4.6	4.8
24	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0
25	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2
26	2.2	2.4	2.6	2.8	3.0	3.3	3.5	3.7	3.9	4.1	4.3	4.6	4.8	5.0	5.2	5.4
27	2.3	2.5	2.7	2.9	3.2	3.4	3.6	3.8	4.1	4.3	4.5	4.7	5.0	5.2	5.4	5.6
28	2.3	2.6	2.8	3.0	3.3	3.5	3.7	4.0	4.2	4.4	4.7	4.9	5.1	5.4	5.6	5.8
29	2.4	2.7	2.9	3.1	3.4	3.6	3.9	4.1	4.4	4.6	4.8	5.1	5.3	5.6	5.8	6.0
30	2.5	2.8	3.0	3.3	3.5	3.8	4.0	4.3	4.5	4.8	5.0	5.3	5.5	5.8	6.0	6.3
31	2.6	2.8	3.1	3.4	3.6	3.9	4.1	4.4	4.7	4.9	5.2	5.4	5.7	5.9	6.2	6.5
32	2.7	2.9	3.2	3.5	3.7	4.0	4.3	4.5	4.8	5.1	5.3	5.6	5.9	6.1	6.4	6.7
33	2.8	3.0	3.3	3.6	3.9	4.1	4.4	4.7	5.0	5.2	5.5	5.8	6.1	6.3	6.6	6.9
34	2.8	3.1	3.4	3.7	4.0	4.3	4.5	4.8	5.1	5.4	5.7	6.0	6.2	6.5	6.8	7.1
35	2.9	3.2	3.5	3.8	4.1	4.4	4.7	5.0	5.3	5.5	5.8	6.1	6.4	6.7	7.0	7.3
36	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6.0	6.3	6.6	6.9	7.2	7.5
37	3.1	3.4	3.7	4.0	4.3	4.6	4.9	5.2	5.6	5.9	6.2	6.5	6.8	7.1	7.4	7.7
38	3.2	3.5	3.8	4.1	4.4	4.8	5.1	5.4	5.7	6.0	6.3	6.7	7.0	7.3	7.6	7.9
39	3.3	3.6	3.9	4.2	4.6	4.9	5.2	5.5	5.9	6.2	6.5	6.8	7.2	7.5	7.8	8.1
40	3.3	3.7	4.0	4.3	4.7	5.0	5.3	5.7	6.0	6.3	6.7	7.0	7.3	7.7	8.0	8.3
41	3.4	3.8	4.1	4.4	4.8	5.1	5.5	5.8	6.2	6.5	6.8	7.2	7.5	7.9	8.2	8.5
42	3.5	3.9	4.2	4.6	4.9	5.3	5.6	6.0	6.3	6.7	7.0	7.4	7.7	8.1	8.4	8.8
43	3.6	3.9	4.3	4.7	5.0	5.4	5.7	6.1	6.5	6.8	7.2	7.5	7.9	8.2	8.6	9.0
44	3.7	4.0	4.4	4.8	5.1	5.5	5.9	6.2	6.6	7.0	7.3	7.7	8.1	8.4	8.8	9.2
45	3.8	4.1	4.5	4.9	5.3	5.6	6.0	6.4	6.8	7.1	7.5	7.9	8.3	8.6	9.0	9.4
46	3.8	4.2	4.6	5.0	5.4	5.8	6.1	6.5	6.9	7.3	7.7	8.1	8.4	8.8	9.2	9.6
47	3.9	4.3	4.7	5.1	5.5	5.9	6.3	6.7	7.1	7.4	7.8	8.2	8.6	9.0	9.4	9.8
48	4.0	4.4	4.8	5.2	5.6	6.0	6.4	6.8	7.2	7.6	8.0	8.4	8.8	9.2	9.6	10.0
49	4.1	4.5	4.9	5.3	5.7	6.1	6.5	6.9	7.4	7.8	8.2	8.6	9.0	9.4	9.8	10.2
50	4.2	4.6	5.0	5.4	5.8	6.3	6.7	7.1	7.5	7.9	8.3	8.8	9.2	9.6	10.0	10.4
51	4.3	4.7	5.1	5.5	6.0	6.4	6.8	7.2	7.7	8.1	8.5	8.9	9.4	9.8	10.2	10.6
52	4.3	4.8	5.2	5.6	6.1	6.5	6.9	7.4	7.8	8.2	8.7	9.1	9.5	10.0	10.4	10.8
53	4.4	4.9	5.3	5.7	6.2	6.6	7.1	7.5	8.0	8.4	8.8	9.3	9.7	10.2	10.6	11.0
54	4.5	5.0	5.4	5.9	6.3	6.8	7.2	7.7	8.1	8.6	9.0	9.5	9.9	10.4	10.8	11.3
55	4.6	5.0	5.5	6.0	6.4	6.9	7.3	7.8	8.3	8.7	9.2	9.6	10.1	10.5	11.0	11.5
56	4.7	5.1	5.6	6.1	6.5	7.0	7.5	7.9	8.4	8.9	9.3	9.8	10.3	10.7	11.2	11.7
57	4.8	5.2	5.7	6.2	6.7	7.1	7.6	8.1	8.6	9.0	9.5	10.0	10.5	10.9	11.4	11.9
58	4.8	5.3	5.8	6.3	6.8	7.3	7.7	8.2	8.7	9.2	9.7	10.2	10.6	11.1	11.6	12.1
59	4.9	5.4	5.9	6.4	6.9	7.4	7.9	8.4	8.9	9.3	9.8	10.3	10.8	11.3	11.8	12.3
60	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5

TABLE 13.

Time Speed and Distance.

Minutes.	Speed in knots.															
	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19	19.5	20	20.5
1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
2	.4	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.6	.6	.7	.7	.7
3	.7	.7	.7	.7	.8	.8	.8	.8	.9	.9	.9	.9	1.0	1.0	1.0	1.0
4	.9	.9	.9	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.4
5	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.7	1.7
6	1.3	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9	1.9	2.0	2.0	2.1
7	1.5	1.6	1.6	1.7	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.3	2.4
8	1.7	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.5	2.5	2.6	2.7	2.7
9	2.0	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	2.9	3.0	3.1
10	2.2	2.3	2.3	2.4	2.5	2.6	2.7	2.8	2.8	2.9	3.0	3.1	3.2	3.3	3.3	3.4
11	2.4	2.5	2.6	2.7	2.8	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8
12	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1
13	2.8	2.9	3.0	3.1	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4
14	3.0	3.2	3.3	3.4	3.5	3.6	3.7	3.9	4.0	4.1	4.2	4.3	4.4	4.6	4.7	4.8
15	3.3	3.4	3.5	3.6	3.8	3.9	4.0	4.1	4.3	4.4	4.5	4.6	4.8	4.9	5.0	5.1
16	3.5	3.6	3.7	3.9	4.0	4.1	4.3	4.4	4.5	4.7	4.8	4.9	5.1	5.2	5.3	5.5
17	3.7	3.8	4.0	4.1	4.3	4.4	4.5	4.7	4.8	5.0	5.1	5.2	5.4	5.5	5.7	5.8
18	3.9	4.1	4.2	4.4	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	6.0	6.2
19	4.1	4.3	4.4	4.6	4.8	4.9	5.1	5.2	5.4	5.5	5.7	5.9	6.0	6.2	6.3	6.5
20	4.3	4.5	4.7	4.8	5.0	5.2	5.3	5.5	5.7	5.8	6.0	6.2	6.3	6.5	6.7	6.8
21	4.6	4.7	4.9	5.1	5.3	5.4	5.6	5.8	6.0	6.1	6.3	6.5	6.7	6.8	7.0	7.2
22	4.8	5.0	5.1	5.3	5.5	5.7	5.9	6.1	6.2	6.4	6.6	6.8	7.0	7.2	7.3	7.5
23	5.0	5.2	5.4	5.6	5.8	5.9	6.1	6.3	6.5	6.7	6.9	7.1	7.3	7.5	7.7	7.9
24	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2
25	5.4	5.6	5.8	6.0	6.3	6.5	6.7	6.9	7.1	7.3	7.5	7.7	7.9	8.1	8.3	8.5
26	5.6	5.9	6.1	6.3	6.5	6.7	6.9	7.2	7.4	7.6	7.8	8.0	8.2	8.5	8.7	8.9
27	5.9	6.1	6.3	6.5	6.8	7.0	7.2	7.4	7.7	7.9	8.1	8.3	8.6	8.8	9.0	9.2
28	6.1	6.3	6.5	6.8	7.0	7.2	7.5	7.7	7.9	8.2	8.4	8.6	8.9	9.1	9.3	9.6
29	6.3	6.5	6.8	7.0	7.3	7.5	7.7	8.0	8.2	8.5	8.7	8.9	9.2	9.4	9.7	9.9
30	6.5	6.8	7.0	7.3	7.5	7.8	8.0	8.3	8.5	8.8	9.0	9.3	9.5	9.8	10.0	10.3
31	6.7	7.0	7.2	7.5	7.8	8.0	8.3	8.5	8.8	9.0	9.3	9.6	9.8	10.1	10.3	10.6
32	6.9	7.2	7.5	7.7	8.0	8.3	8.5	8.8	9.1	9.3	9.6	9.9	10.1	10.4	10.7	10.9
33	7.2	7.4	7.7	8.0	8.3	8.5	8.8	9.1	9.4	9.6	9.9	10.2	10.5	10.7	11.0	11.3
34	7.4	7.7	7.9	8.2	8.5	8.8	9.1	9.4	9.6	9.9	10.2	10.5	10.8	11.1	11.3	11.6
35	7.6	7.9	8.2	8.5	8.8	9.0	9.3	9.6	9.9	10.2	10.5	10.8	11.1	11.4	11.7	12.0
36	7.8	8.1	8.4	8.7	9.0	9.3	9.6	9.9	10.2	10.5	10.8	11.1	11.4	11.7	12.0	12.3
37	8.0	8.3	8.6	8.9	9.3	9.6	9.9	10.2	10.5	10.8	11.1	11.4	11.7	12.0	12.3	12.6
38	8.2	8.6	8.9	9.2	9.5	9.8	10.1	10.5	10.8	11.1	11.4	11.7	12.0	12.4	12.7	13.0
39	8.5	8.8	9.1	9.4	9.8	10.1	10.4	10.7	11.1	11.4	11.7	12.0	12.4	12.7	13.0	13.3
40	8.7	9.0	9.3	9.7	10.0	10.3	10.7	11.0	11.3	11.7	12.0	12.3	12.7	13.0	13.3	13.7
41	8.9	9.2	9.6	9.9	10.3	10.6	10.9	11.3	11.6	12.0	12.3	12.6	13.0	13.3	13.7	14.0
42	9.1	9.5	9.8	10.2	10.5	10.9	11.2	11.6	11.9	12.3	12.6	13.0	13.3	13.7	14.0	14.4
43	9.3	9.7	10.0	10.4	10.8	11.1	11.5	11.8	12.2	12.5	12.9	13.3	13.6	14.0	14.3	14.7
44	9.5	9.9	10.3	10.6	11.0	11.4	11.7	12.1	12.5	12.8	13.2	13.6	13.9	14.3	14.7	15.0
45	9.8	10.1	10.5	10.9	11.3	11.6	12.0	12.4	12.8	13.1	13.5	13.9	14.3	14.6	15.0	15.4
46	10.0	10.4	10.7	11.1	11.5	11.9	12.3	12.7	13.0	13.4	13.8	14.2	14.6	15.0	15.3	15.7
47	10.2	10.6	11.0	11.4	11.8	12.1	12.5	12.9	13.3	13.7	14.1	14.5	14.9	15.3	15.7	16.1
48	10.4	10.8	11.2	11.6	12.0	12.4	12.8	13.2	13.6	14.0	14.4	14.8	15.2	15.6	16.0	16.4
49	10.6	11.0	11.4	11.8	12.3	12.7	13.1	13.5	13.9	14.3	14.7	15.1	15.5	15.9	16.3	16.7
50	10.8	11.3	11.7	12.1	12.5	12.9	13.3	13.8	14.2	14.6	15.0	15.4	15.8	16.3	16.7	17.1
51	11.1	11.5	11.9	12.3	12.8	13.2	13.6	14.0	14.5	14.9	15.3	15.7	16.2	16.6	17.0	17.4
52	11.3	11.7	12.1	12.6	13.0	13.4	13.9	14.3	14.7	15.2	15.6	16.0	16.5	16.9	17.3	17.8
53	11.5	11.9	12.4	12.8	13.3	13.7	14.1	14.6	15.0	15.5	15.9	16.3	16.8	17.2	17.7	18.1
54	11.7	12.2	12.6	13.1	13.5	14.0	14.4	14.9	15.3	15.8	16.2	16.7	17.1	17.6	18.0	18.5
55	11.9	12.4	12.8	13.3	13.8	14.2	14.7	15.1	15.6	16.0	16.5	17.0	17.4	17.9	18.3	18.8
56	12.1	12.6	13.1	13.5	14.0	14.5	14.9	15.4	15.9	16.3	16.8	17.3	17.7	18.2	18.7	19.1
57	12.4	12.8	13.3	13.8	14.3	14.7	15.2	15.7	16.2	16.6	17.1	17.6	18.1	18.5	19.0	19.5
58	12.6	13.1	13.5	14.0	14.5	15.0	15.5	16.0	16.4	16.9	17.4	17.9	18.4	18.9	19.3	19.8
59	12.8	13.3	13.8	14.3	14.8	15.2	15.7	16.2	16.7	17.2	17.7	18.2	18.7	19.2	19.7	20.2
60	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	19.5	20.0	20.5

TABLE 13.

Time Speed and Distance.

Minutes.	Speed in knots.															
	21	21.5	22	22.5	23	23.5	24	24.5	25	25.5	26	26.5	27	27.5	28	28.5
1	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5
2	.7	.7	.7	.8	.8	.8	.8	.8	.8	.9	.9	.9	.9	.9	.9	1.0
3	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4
4	1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.9	1.9
5	1.8	1.8	1.8	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.3	2.3	2.4
6	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.5	2.6	2.6	2.7	2.7	2.8	2.8	2.9
7	2.5	2.5	2.6	2.6	2.7	2.7	2.8	2.9	2.9	3.0	3.0	3.1	3.2	3.2	3.3	3.3
8	2.8	2.9	2.9	3.0	3.1	3.1	3.2	3.3	3.3	3.4	3.5	3.5	3.6	3.7	3.7	3.8
9	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.8	3.9	4.0	4.1	4.1	4.2	4.3
10	3.5	3.6	3.7	3.8	3.8	3.9	4.0	4.1	4.2	4.3	4.3	4.4	4.5	4.6	4.7	4.8
11	3.9	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.0	5.1	5.2
12	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7
13	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.9	6.0	6.1	6.2
14	4.9	5.0	5.1	5.3	5.4	5.5	5.6	5.7	5.8	6.0	6.1	6.2	6.3	6.4	6.5	6.7
15	5.3	5.4	5.5	5.6	5.8	5.9	6.0	6.1	6.3	6.4	6.5	6.6	6.8	6.9	7.0	7.1
16	5.6	5.7	5.9	6.0	6.1	6.3	6.4	6.5	6.7	6.8	6.9	7.1	7.2	7.3	7.5	7.6
17	6.0	6.1	6.2	6.4	6.5	6.7	6.8	6.9	7.1	7.2	7.4	7.5	7.7	7.8	7.9	8.1
18	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6
19	6.7	6.8	7.0	7.1	7.3	7.4	7.6	7.8	7.9	8.1	8.2	8.4	8.6	8.7	8.9	9.0
20	7.0	7.2	7.3	7.5	7.7	7.8	8.0	8.2	8.3	8.5	8.7	8.8	9.0	9.2	9.3	9.5
21	7.4	7.5	7.7	7.9	8.1	8.2	8.4	8.6	8.8	8.9	9.1	9.3	9.5	9.6	9.8	10.0
22	7.7	7.9	8.1	8.3	8.4	8.6	8.8	9.0	9.2	9.4	9.5	9.7	9.9	10.1	10.3	10.5
23	8.1	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0	10.2	10.4	10.5	10.7	10.9
24	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0	10.2	10.4	10.6	10.8	11.0	11.2	11.4
25	8.8	9.0	9.2	9.4	9.6	9.8	10.0	10.2	10.4	10.6	10.8	11.0	11.3	11.5	11.7	11.9
26	9.1	9.3	9.5	9.8	10.0	10.2	10.4	10.6	10.8	11.1	11.3	11.5	11.7	11.9	12.1	12.4
27	9.5	9.7	9.9	10.1	10.4	10.6	10.8	11.0	11.3	11.5	11.7	11.9	12.2	12.4	12.6	12.8
28	9.8	10.0	10.3	10.5	10.7	11.0	11.2	11.4	11.7	11.9	12.1	12.4	12.6	12.8	13.1	13.3
29	10.2	10.4	10.6	10.9	11.1	11.4	11.6	11.8	12.1	12.3	12.6	12.8	13.1	13.3	13.5	13.8
30	10.5	10.8	11.0	11.3	11.5	11.8	12.0	12.3	12.5	12.8	13.0	13.3	13.5	13.8	14.0	14.3
31	10.9	11.1	11.4	11.6	11.9	12.1	12.4	12.7	12.9	13.2	13.4	13.7	14.0	14.2	14.5	14.7
32	11.2	11.5	11.7	12.0	12.3	12.5	12.8	13.1	13.3	13.6	13.9	14.1	14.4	14.7	14.9	15.2
33	11.6	11.8	12.1	12.4	12.7	12.9	13.2	13.5	13.8	14.0	14.3	14.6	14.9	15.1	15.4	15.7
34	11.9	12.2	12.5	12.8	13.0	13.3	13.6	13.9	14.2	14.5	14.7	15.0	15.3	15.6	15.9	16.2
35	12.3	12.5	12.8	13.1	13.4	13.7	14.0	14.3	14.6	14.9	15.2	15.5	15.8	16.0	16.3	16.6
36	12.6	12.9	13.2	13.5	13.8	14.1	14.4	14.7	15.0	15.3	15.6	15.9	16.2	16.5	16.8	17.1
37	13.0	13.3	13.6	13.9	14.2	14.5	14.8	15.1	15.4	15.7	16.0	16.3	16.7	17.0	17.3	17.6
38	13.3	13.6	13.9	14.3	14.6	14.9	15.2	15.5	15.8	16.2	16.5	16.8	17.1	17.4	17.7	18.1
39	13.7	14.0	14.3	14.6	15.0	15.3	15.6	15.9	16.3	16.6	16.9	17.2	17.6	17.9	18.2	18.5
40	14.0	14.3	14.7	15.0	15.3	15.7	16.0	16.3	16.7	17.0	17.3	17.7	18.0	18.3	18.7	19.0
41	14.4	14.7	15.0	15.4	15.7	16.1	16.4	16.7	17.1	17.4	17.8	18.1	18.5	18.8	19.1	19.5
42	14.7	15.1	15.4	15.8	16.1	16.5	16.8	17.2	17.5	17.9	18.2	18.6	18.9	19.3	19.6	20.0
43	15.1	15.4	15.8	16.1	16.5	16.8	17.2	17.6	17.9	18.3	18.6	19.0	19.4	19.7	20.1	20.4
44	15.4	15.8	16.1	16.5	16.9	17.2	17.6	18.0	18.3	18.7	19.1	19.4	19.8	20.2	20.5	20.9
45	15.8	16.1	16.5	16.9	17.3	17.6	18.0	18.4	18.8	19.1	19.5	19.9	20.3	20.6	21.0	21.4
46	16.1	16.5	16.9	17.3	17.6	18.0	18.4	18.8	19.2	19.6	19.9	20.3	20.7	21.1	21.5	21.9
47	16.5	16.8	17.2	17.6	18.0	18.4	18.8	19.2	19.6	20.0	20.4	20.8	21.2	21.5	21.9	22.3
48	16.8	17.2	17.6	18.0	18.4	18.8	19.2	19.6	20.0	20.4	20.8	21.2	21.6	22.0	22.4	22.8
49	17.2	17.6	18.0	18.4	18.8	19.2	19.6	20.0	20.4	20.8	21.2	21.6	22.1	22.5	22.9	23.3
50	17.5	17.9	18.3	18.8	19.2	19.6	20.0	20.4	20.8	21.3	21.7	22.1	22.5	22.9	23.3	23.8
51	17.9	18.3	18.7	19.1	19.6	20.0	20.4	20.8	21.3	21.7	22.1	22.5	23.0	23.4	23.8	24.2
52	18.2	18.6	19.1	19.5	19.9	20.4	20.8	21.2	21.7	22.1	22.5	23.0	23.4	23.8	24.3	24.7
53	18.6	19.0	19.4	19.9	20.3	20.8	21.2	21.6	22.1	22.5	23.0	23.4	23.9	24.3	24.7	25.2
54	18.9	19.4	19.8	20.3	20.7	21.2	21.6	22.1	22.5	23.0	23.4	23.9	24.3	24.8	25.2	25.7
55	19.3	19.7	20.2	20.6	21.1	21.5	22.0	22.5	22.9	23.4	23.8	24.3	24.8	25.2	25.7	26.1
56	19.6	20.1	20.5	21.0	21.5	21.9	22.4	22.9	23.3	23.8	24.3	24.7	25.2	25.7	26.1	26.6
57	20.0	20.4	20.9	21.4	21.9	22.3	22.8	23.3	23.8	24.2	24.7	25.2	25.7	26.1	26.6	27.1
58	20.3	20.8	21.3	21.8	22.2	22.7	23.2	23.7	24.2	24.7	25.1	25.6	26.1	26.6	27.1	27.6
59	20.7	21.1	21.6	22.1	22.6	23.1	23.6	24.1	24.6	25.1	25.6	26.1	26.6	27.0	27.5	28.0
60	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0	28.5

TABLE 13.

Time Speed and Distance.

Minutes.	Speed in knots.															
	29	29.5	30	30.5	31	31.5	32	32.5	33	33.5	34	34.5	35	35.5	36	36.5
1	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6
2	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2
3	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8
4	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.4
5	2.4	2.5	2.5	2.5	2.6	2.6	2.7	2.7	2.8	2.8	2.8	2.9	2.9	3.0	3.0	3.0
6	2.9	3.0	3.0	3.1	3.1	3.2	3.2	3.3	3.3	3.4	3.4	3.5	3.5	3.6	3.6	3.7
7	3.4	3.4	3.5	3.6	3.6	3.7	3.7	3.8	3.9	3.9	4.0	4.0	4.1	4.1	4.2	4.3
8	3.9	3.9	4.0	4.1	4.1	4.2	4.3	4.3	4.4	4.5	4.5	4.6	4.7	4.7	4.8	4.9
9	4.4	4.4	4.5	4.6	4.7	4.7	4.8	4.9	5.0	5.0	5.1	5.2	5.3	5.3	5.4	5.5
10	4.8	4.9	5.0	5.1	5.2	5.3	5.3	5.4	5.5	5.6	5.7	5.8	5.8	5.9	6.0	6.1
11	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.1	6.2	6.3	6.4	6.5	6.6	6.7
12	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3
13	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9
14	6.8	6.9	7.0	7.1	7.2	7.4	7.5	7.6	7.7	7.8	7.9	8.1	8.2	8.3	8.4	8.5
15	7.3	7.4	7.5	7.6	7.8	7.9	8.0	8.1	8.3	8.4	8.5	8.6	8.8	8.9	9.0	9.1
16	7.7	7.9	8.0	8.1	8.3	8.4	8.5	8.7	8.8	8.9	9.1	9.2	9.3	9.5	9.6	9.7
17	8.2	8.4	8.5	8.6	8.8	8.9	9.1	9.2	9.4	9.5	9.6	9.8	9.9	10.1	10.2	10.3
18	8.7	8.9	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	10.5	10.7	10.8	11.0
19	9.2	9.3	9.5	9.7	9.8	10.0	10.1	10.3	10.5	10.6	10.8	10.9	11.1	11.2	11.4	11.6
20	9.7	9.8	10.0	10.2	10.3	10.5	10.7	10.8	11.0	11.2	11.3	11.5	11.7	11.8	12.0	12.2
21	10.2	10.3	10.5	10.7	10.9	11.0	11.2	11.4	11.6	11.7	11.9	12.1	12.3	12.4	12.6	12.8
22	10.6	10.8	11.0	11.2	11.4	11.6	11.7	11.9	12.1	12.3	12.5	12.7	12.8	13.0	13.2	13.4
23	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5	12.7	12.8	13.0	13.2	13.4	13.6	13.8	14.0
24	11.6	11.8	12.0	12.2	12.4	12.6	12.8	13.0	13.2	13.4	13.6	13.8	14.0	14.2	14.4	14.6
25	12.1	12.3	12.5	12.7	12.9	13.1	13.3	13.5	13.8	14.0	14.2	14.4	14.6	14.8	15.0	15.2
26	12.6	12.8	13.0	13.2	13.4	13.7	13.9	14.1	14.3	14.5	14.7	15.0	15.2	15.4	15.6	15.8
27	13.1	13.3	13.5	13.7	14.0	14.2	14.4	14.6	14.9	15.1	15.3	15.5	15.8	16.0	16.2	16.4
28	13.5	13.8	14.0	14.2	14.5	14.7	14.9	15.2	15.4	15.6	15.9	16.1	16.3	16.6	16.8	17.0
29	14.0	14.3	14.5	14.7	15.0	15.2	15.5	15.7	16.0	16.2	16.4	16.7	16.9	17.2	17.4	17.6
30	14.5	14.8	15.0	15.3	15.5	15.8	16.0	16.3	16.5	16.8	17.0	17.3	17.5	17.8	18.0	18.3
31	15.0	15.2	15.5	15.8	16.0	16.3	16.5	16.8	17.1	17.3	17.6	17.8	18.1	18.3	18.6	18.9
32	15.5	15.7	16.0	16.3	16.5	16.8	17.1	17.3	17.6	17.9	18.1	18.4	18.7	18.9	19.2	19.5
33	16.0	16.2	16.5	16.8	17.1	17.3	17.6	17.9	18.2	18.4	18.7	19.0	19.3	19.5	19.8	20.1
34	16.4	16.7	17.0	17.3	17.6	17.9	18.1	18.4	18.7	19.0	19.3	19.6	19.8	20.1	20.4	20.7
35	16.9	17.2	17.5	17.8	18.1	18.4	18.7	19.0	19.3	19.5	19.8	20.1	20.4	20.7	21.0	21.3
36	17.4	17.7	18.0	18.3	18.6	18.9	19.2	19.5	19.8	20.1	20.4	20.7	21.0	21.3	21.6	21.9
37	17.9	18.2	18.5	18.8	19.1	19.4	19.7	20.0	20.4	20.7	21.0	21.3	21.6	21.9	22.2	22.5
38	18.4	18.7	19.0	19.3	19.6	20.0	20.3	20.6	20.9	21.2	21.5	21.9	22.2	22.5	22.8	23.1
39	18.9	19.2	19.5	19.8	20.2	20.5	20.8	21.1	21.5	21.8	22.1	22.4	22.8	23.1	23.4	23.7
40	19.3	19.7	20.0	20.3	20.7	21.0	21.3	21.7	22.0	22.3	22.7	23.0	23.3	23.7	24.0	24.3
41	19.8	20.2	20.5	20.8	21.2	21.5	21.9	22.2	22.6	22.9	23.2	23.6	23.9	24.3	24.6	24.9
42	20.3	20.7	21.0	21.4	21.7	22.1	22.4	22.8	23.1	23.5	23.8	24.2	24.5	24.9	25.2	25.6
43	20.8	21.1	21.5	21.9	22.2	22.6	22.9	23.3	23.7	24.0	24.4	24.7	25.1	25.4	25.8	26.2
44	21.3	21.6	22.0	22.4	22.7	23.1	23.5	23.8	24.2	24.6	24.9	25.3	25.7	26.0	26.4	26.8
45	21.8	22.1	22.5	22.9	23.3	23.6	24.0	24.4	24.8	25.1	25.5	25.9	26.3	26.6	27.0	27.4
46	22.2	22.6	23.0	23.4	23.8	24.2	24.5	24.9	25.3	25.7	26.1	26.5	26.8	27.2	27.6	28.0
47	22.7	23.1	23.5	23.9	24.3	24.7	25.1	25.5	25.9	26.2	26.6	27.0	27.4	27.8	28.2	28.6
48	23.2	23.6	24.0	24.4	24.8	25.2	25.6	26.0	26.4	26.8	27.2	27.6	28.0	28.4	28.8	29.2
49	23.7	24.1	24.5	24.9	25.3	25.7	26.1	26.5	27.0	27.4	27.8	28.2	28.6	29.0	29.4	29.8
50	24.2	24.6	25.0	25.4	25.8	26.3	26.7	27.1	27.5	27.9	28.3	28.8	29.2	29.6	30.0	30.4
51	24.7	25.1	25.5	25.9	26.4	26.8	27.2	27.6	28.1	28.5	28.9	29.3	29.8	30.2	30.6	31.0
52	25.1	25.6	26.0	26.4	26.9	27.3	27.7	28.2	28.6	29.0	29.5	29.9	30.3	30.8	31.2	31.6
53	25.6	26.1	26.5	26.9	27.4	27.8	28.3	28.7	29.2	29.6	30.0	30.5	30.9	31.4	31.8	32.2
54	26.1	26.6	27.0	27.5	27.9	28.4	28.8	29.3	29.7	30.2	30.6	31.1	31.5	32.0	32.4	32.9
55	26.6	27.0	27.5	28.0	28.4	28.9	29.3	29.8	30.3	30.7	31.2	31.6	32.1	32.5	33.0	33.5
56	27.1	27.5	28.0	28.5	28.9	29.4	29.9	30.3	30.8	31.3	31.7	32.2	32.7	33.1	33.6	34.1
57	27.6	28.0	28.5	29.0	29.5	29.9	30.4	30.9	31.4	31.8	32.3	32.8	33.3	33.7	34.2	34.7
58	28.0	28.5	29.0	29.5	30.0	30.5	30.9	31.4	31.9	32.4	32.9	33.4	33.8	34.3	34.8	35.3
59	28.5	29.0	29.5	30.0	30.5	31.0	31.5	32.0	32.5	32.9	33.4	33.9	34.4	34.9	35.4	35.9
60	29.0	29.5	30.0	30.5	31.0	31.5	32.0	32.5	33.0	33.5	34.0	34.5	35.0	35.5	36.0	36.5

TABLE 14.

Conversion Tables for Nautical and Statute Miles.

Nautical miles into statute miles.

1 nautical mile or knot=6,080.20 feet.
1 statute mile =5,280 feet.

Nautical miles.	Statute miles.	Nautical miles.	Statute miles.
1	1.15	51	58.729
2	2.30	52	59.881
3	3.45	53	61.032
4	4.61	54	62.184
5	5.76	55	63.335
6	6.91	56	64.487
7	8.06	57	65.639
8	9.21	58	66.790
9	10.36	59	67.942
10	11.52	60	69.093
11	12.667	61	70.245
12	13.819	62	71.396
13	14.970	63	72.548
14	16.122	64	73.699
15	17.273	65	74.851
16	18.425	66	76.003
17	19.576	67	77.154
18	20.728	68	78.306
19	21.880	69	79.457
20	23.031	70	80.609
21	24.183	71	81.760
22	25.334	72	82.912
23	26.486	73	84.063
24	27.637	74	85.215
25	28.789	75	86.366
26	29.940	76	87.518
27	31.092	77	88.670
28	32.243	78	89.821
29	33.395	79	90.973
30	34.547	80	92.124
31	35.698	81	93.276
32	36.850	82	94.427
33	38.001	83	95.579
34	39.153	84	96.730
35	40.304	85	97.882
36	41.456	86	99.034
37	42.607	87	100.185
38	43.759	88	101.337
39	44.911	89	102.488
40	46.062	90	103.640
41	47.214	91	104.791
42	48.365	92	105.942
43	49.517	93	107.094
44	50.668	94	108.246
45	51.820	95	109.397
46	52.971	96	110.549
47	54.123	97	111.701
48	55.275	98	112.852
49	56.426	99	114.004
50	57.578	100	115.155

Statute miles into nautical miles.

1 statute mile =5,280 feet
1 nautical mile or knot=6,080.20 feet.

Statute miles.	Nautical miles.	Statute miles.	Nautical miles.
1	0.87	51	44.288
2	1.74	52	45.156
3	2.61	53	46.025
4	3.47	54	46.893
5	4.34	55	47.762
6	5.21	56	48.630
7	6.08	57	49.498
8	6.95	58	50.367
9	7.82	59	51.235
10	8.68	60	52.104
11	9.552	61	52.972
12	10.421	62	53.840
13	11.289	63	54.709
14	12.158	64	55.577
15	13.026	65	56.445
16	13.894	66	57.314
17	14.763	67	58.182
18	15.631	68	59.051
19	16.499	69	59.919
20	17.368	70	60.787
21	18.236	71	61.656
22	19.105	72	62.524
23	19.973	73	63.393
24	20.841	74	64.261
25	21.710	75	65.129
26	22.578	76	65.998
27	23.447	77	66.866
28	24.315	78	67.735
29	25.183	79	68.603
30	26.052	80	69.471
31	26.920	81	70.340
32	27.789	82	71.208
33	28.657	83	72.077
34	29.525	84	72.945
35	30.394	85	73.813
36	31.262	86	74.682
37	32.131	87	75.550
38	32.999	88	76.419
39	33.867	89	77.287
40	34.736	90	78.155
41	35.604	91	79.024
42	36.473	92	79.892
43	37.341	93	80.760
44	38.209	94	81.629
45	39.078	95	82.497
46	39.946	96	83.366
47	40.814	97	84.234
48	41.683	98	85.102
49	42.551	99	85.971
50	43.420	100	86.839

TABLE 15.

Conversion Tables for Metric and English Linear Measure.

Metric to English.

Meters.	Feet.	Yards.	Statute miles.	Nautical miles.
1	3.280 833 3	1.093 611 1	0.000 621 370	0.000 539 593
2	6.561 666 7	2.187 222 2	.001 242 740	.001 079 185
3	9.842 500 0	3.280 833 3	.001 864 110	.001 618 778
4	13.123 333 3	4.374 444 4	.002 485 480	.002 158 370
5	16.404 166 7	5.468 055 6	.003 106 850	.002 697 963
6	19.685 000 0	6.561 666 7	.003 728 220	.003 237 556
7	22.965 833 3	7.655 277 8	.004 349 590	.003 777 148
8	26.246 666 7	8.748 888 9	.004 970 960	.004 316 741
9	29.527 500 0	9.842 500 0	.005 592 330	.004 856 333

English to metric.

No.	Feet to meters.	Yards to meters.	Statute miles to meters.	Nautical miles to meters.
1	0.304 800 6	0.914 401 8	1,609.35	1,853.25
2	0.609 601 2	1.828 803 7	3,218.69	3,706.50
3	0.914 401 8	2.743 205 5	4,828.04	5,559.75
4	1.219 202 4	3.657 607 3	6,437.39	7,413.00
5	1.524 003 0	4.572 009 1	8,046.74	9,266.25
6	1.828 803 7	5.486 411 0	9,656.08	11,119.50
7	2.133 604 3	6.400 812 8	11,265.43	12,972.75
8	2.438 404 9	7.315 214 6	12,874.78	14,826.00
9	2.743 205 5	8.229 616 5	14,484.13	16,679.25

Millimeters.	Inches
1	0.03937
2	.07874
3	.11811
4	.15748
5	.19685
6	.23622
7	.27559
8	.31496
9	.35433

Statute miles.	Kilometers
1	1.60935
2	3.21869
3	4.82804
4	6.43739
5	8.04674
6	9.65608
7	11.26543
8	12.87478
9	14.48413

Inches.	Centimeters.	Meters
1	2.54001	0.02540
2	5.08002	.05080
3	7.62003	.07620
4	10.16004	.10160
5	12.70005	.12700
6	15.24006	.15240
7	17.78007	.17780
8	20.32008	.20320
9	22.86009	.22860

TABLE 16.

Conversion Tables for Thermometer Scales.

[F°=Fahrenheit temperature; C°=Centigrade temperature; R°=Réaumur temperature.]

Equivalent temperatures—Fahr., Cent., Réau

$R^\circ = \frac{4}{5} C^\circ = \frac{4}{9} (F^\circ - 32^\circ)$.
$C^\circ = \frac{5}{4} R^\circ = \frac{5}{9} (F^\circ - 32^\circ)$.

F°.	C°.	R°.	F°.	C°.	R°.
1	−17.2	−13.8	51	+10.6	+ 8.4
2	16.7	13.3	52	11.1	8.9
3	16.1	12.9	53	11.7	9.3
4	15.6	12.4	54	12.2	9.8
5	15.0	12.0	55	12.8	10.2
6	14.4	11.6	56	13.3	10.7
7	13.9	11.1	57	13.9	11.1
8	13.3	10.7	58	14.4	11.6
9	12.8	10.2	59	15.0	12.0
10	12.2	9.8	60	15.6	12.4
11	11.7	9.3	61	16.1	12.9
12	11.1	8.9	62	16.7	13.3
13	10.6	8.4	63	17.2	13.8
14	10.0	8.0	64	17.8	14.2
15	9.4	7.6	65	18.3	14.7
16	8.9	7.1	66	18.9	15.1
17	8.3	6.7	67	19.4	15.6
18	7.8	6.2	68	20.0	16.0
19	7.2	5.8	69	20.6	16.4
20	6.7	5.3	70	21.1	16.9
21	6.1	4.9	71	21.7	17.3
22	5.6	4.4	72	22.2	17.8
23	5.0	4.0	73	22.8	18.2
24	4.4	3.6	74	23.3	18.7
25	3.9	3.1	75	23.9	19.1
26	3.3	2.7	76	24.4	19.6
27	2.8	2.2	77	25.0	20.0
28	2.2	1.8	78	25.6	20.4
29	1.7	1.3	79	26.1	20.9
30	1.1	0.9	80	26.7	21.3
31	− 0.6	− 0.4	81	27.2	21.8
32	0.0	0.0	82	27.8	22.2
33	+ 0.6	+ 0.4	83	28.3	22.7
34	1.1	0.9	84	28.9	23.1
35	1.7	1.3	85	29.4	23.6
36	2.2	1.8	86	30.0	24.0
37	2.8	2.2	87	30.6	24.4
38	3.3	2.7	88	31.1	24.9
39	3.9	3.1	89	31.7	25.3
40	4.4	3.6	90	32.2	25.8
41	5.0	4.0	91	32.8	26.2
42	5.6	4.4	92	33.3	26.7
43	6.1	4.9	93	33.9	27.1
44	6.7	5.3	94	34.4	27.6
45	7.2	5.8	95	35.0	28.0
46	7.8	6.2	96	35.6	28.4
47	8.3	6.7	97	36.1	28.9
48	8.9	7.1	98	36.7	29.3
49	9.4	7.6	99	37.2	29.8
50	+10.0	+ 8.0	100	+37.8	+30.2

Equivalent temperatures—Centigrade and Fahrenheit.

$F^\circ = \frac{9}{5} C^\circ + 32^\circ$.

C°.	F°.	C°.	F°.	C°.	F°.	C°.	F°.	C°.	F°.
−10	14.0	0	32.0	10	50.0	20	68.0	30	86.0
− 9	15.8	1	33.8	11	51.8	21	69.8	31	87.8
− 8	17.6	2	35.6	12	53.6	22	71.6	32	89.6
− 7	19.4	3	37.4	13	55.4	23	73.4	33	91.4
− 6	21.2	4	39.2	14	57.2	24	75.2	34	93.2
− 5	23.0	5	41.0	15	59.0	25	77.0	35	95.0
− 4	24.8	6	42.8	16	60.8	26	78.8	36	96.8
− 3	26.6	7	44.6	17	62.6	27	80.6	37	98.6
− 2	28.4	8	46.4	18	64.4	28	82.4	38	100.4
− 1	30.2	9	48.2	19	66.2	29	84.2	39	102.2

Equivalent temperatures—Réaumur and Fahrenheit.

$F^\circ = \frac{9}{4} R^\circ + 32^\circ$.

R°.	F°.	R°.	F°.	R°.	F°.	R°.	F°.
−10	9.5	0	32.0	10	54.5	20	77.0
− 9	11.8	1	34.2	11	56.8	21	79.2
− 8	14.0	2	36.5	12	59.0	22	81.5
− 7	16.2	3	38.8	13	61.2	23	83.8
− 6	18.5	4	41.0	14	63.5	24	86.0
− 5	20.8	5	43.2	15	65.8	25	88.2
− 4	23.0	6	45.5	16	68.0	26	90.5
− 3	25.2	7	47.8	17	70.2	27	92.8
− 2	27.5	8	50.0	18	72.5	28	95.0
− 1	29.8	9	52.2	19	74.8	29	97.2

Reduction of Local Civil Time to Standard Meridian Time, and the reverse.

[If local meridian is east of standard meridian, subtract from local civil time, or add to standard meridian time. If local meridian is west of standard meridian, add to local civil time, or subtract from standard meridian time.]

Difference of longitude between local meridian and standard meridian.	Reduction to be applied to local civil time	Difference of longitude between local meridian and standard meridian.	Reduction to be applied to local civil time.
° ′ ° ′	*Minutes.*	° ′ ° ′	*Minutes.*
0 00 to 0 07	0	7 23 to 7 37	30
0 08 to 0 22	1	7 38 to 7 52	31
0 23 to 0 37	2	7 53 to 8 07	32
0 38 to 0 52	3	8 08 to 8 22	33
0 53 to 1 07	4	8 23 to 8 37	34
1 08 to 1 22	5	8 38 to 8 52	35
1 23 to 1 37	6	8 53 to 9 07	36
1 38 to 1 52	7	9 08 to 9 22	37
1 53 to 2 07	8	9 23 to 9 37	38
2 08 to 2 22	9	9 38 to 9 52	39
2 23 to 2 37	10	9 53 to 10 07	40
2 38 to 2 52	11	10 08 to 10 22	41
2 53 to 3 07	12	10 23 to 10 37	42
3 08 to 3 22	13	10 38 to 10 52	43
3 23 to 3 37	14	10 53 to 11 07	44
3 38 to 3 52	15	11 08 to 11 22	45
3 53 to 4 07	16	11 23 to 11 37	46
4 08 to 4 22	17	11 38 to 11 52	47
4 23 to 4 37	18	11 53 to 12 07	48
4 38 to 4 52	19	12 08 to 12 22	49
4 53 to 5 07	20	12 23 to 12 37	50
5 08 to 5 22	21	12 38 to 12 52	51
5 23 to 5 37	22	12 53 to 13 07	52
5 38 to 5 52	23	13 08 to 13 22	53
5 53 to 6 07	24	13 23 to 13 37	54
6 08 to 6 22	25	13 38 to 13 52	55
6 23 to 6 37	26	13 53 to 14 07	56
6 38 to 6 52	27	14 08 to 14 22	57
6 53 to 7 07	28	14 23 to 14 37	58
7 08 to 7 22	29	14 38 to 14 52	59

TABLE 18

Dip of the Sea Horizon.

Height of the Eye.	Dip of the Horizon.
Feet.	′ ″
1	0 59
2	1 23
3	1 42
4	1 58
5	2 11
6	2 24
7	2 36
8	2 46
9	2 56
10	3 06
11	3 15
12	3 24
13	3 32
14	3 40
15	3 48
16	3 55
17	4 02
18	4 09
19	4 16
20	4 23
21	4 29
22	4 36
23	4 42
24	4 48
25	4 54
26	5 00
27	5 06
28	5 11
29	5 17
30	5 22
31	5 27
32	5 33
33	5 38
34	5 43
35	5 48
36	5 53
37	5 58
38	6 02
39	6 07
40	6 12
45	6 36
50	6 56
55	7 16
60	7 35
65	7 54
70	8 12
75	8 29
80	8 46
85	9 02
90	9 18
95	9 33
100	9 48

TABLE 19.

Dip of the Sea at different Distances from the Observer.

Dist. of Land in Sea Miles.	Height of the Eye above the Sea in Feet.							
	5	10	15	20	25	30	35	40
	′	′	′	′	′	′	′	′
¼	11	23	34	45	57	68	79	91
½	6	12	17	23	28	34	40	45
¾	4	8	12	15	19	23	27	30
1	3	6	9	12	15	17	20	23
1¼	3	5	7	10	12	14	16	19
1½	3	4	6	8	10	12	14	16
2	2	4	5	7	8	9	11	12
2½	2	3	4	6	7	8	9	10
3	2	3	4	5	6	7	8	9
3½	2	3	4	5	6	6	7	8
4	2	3	4	5	5	6	7	7
5	2	3	4	4	5	6	6	7
6	2	3	4	4	5	5	6	6

NOTE TO TABLE 19.—The numbers of this Table below the black lines are the same as are given in Table 18, the visible horizon corresponding to those heights not being so far distant as the land.

TABLE 20.

The Sun's Parallax in Altitude.

Altitude.	Parallax.
°	″
0	9
10	9
20	8
30	8
40	7
50	6
55	5
60	4
65	4
70	3
75	2
80	2
85	1
90	0

TABLE 21.

Parallax in Altitude of a Planet.

Altitude.	Horizontal parallax of planet.																													Altitude.
	1″	2″	3″	4″	5″	6″	7″	8″	9″	10″	11″	12″	13″	14″	15″	16″	17″	18″	19″	20″	21″	22″	23″	24″	25″	26″	27″	28″	30″	35″	
°																															°
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30	35	0
10	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30	35	10
20	1	2	3	4	5	6	7	8	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23	24	25	26	28	33	20
30	1	2	3	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	16	17	18	19	20	21	22	23	23	24	26	30	30
35	1	2	2	3	4	5	6	7	7	8	9	10	11	11	12	13	14	15	16	16	17	18	19	20	20	21	22	23	25	29	35
40	1	2	2	3	4	5	5	6	7	8	8	9	10	11	11	12	13	14	15	15	16	17	18	18	19	20	21	21	23	27	40
43	1	1	2	3	4	4	5	6	7	7	8	9	10	10	11	12	12	13	14	15	15	16	17	18	18	19	20	20	22	26	43
46	1	1	2	3	3	4	5	6	6	7	8	8	9	10	10	11	12	13	13	14	15	15	16	17	17	18	19	19	21	24	46
49	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	10	11	12	12	13	14	14	15	16	16	17	18	18	20	23	49
52	1	1	2	2	3	4	4	5	6	6	7	7	8	9	9	10	10	11	12	12	13	14	14	15	15	16	17	17	18	22	52
55	1	1	2	2	3	3	4	5	5	6	6	7	7	8	9	9	10	10	11	11	12	13	13	14	14	15	15	16	17	20	55
58	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	10	10	11	11	12	12	13	13	14	14	15	16	19	58
61	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	15	17	61
64	0	1	1	2	2	3	3	4	4	4	5	5	6	6	7	7	7	8	8	9	9	10	10	11	11	11	12	12	13	15	64
67	0	1	1	2	2	2	3	3	4	4	4	5	5	5	6	6	7	7	7	8	8	9	9	9	10	10	11	11	12	14	67
70	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	8	8	8	9	9	9	10	10	12	70
72	0	1	1	1	2	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	6	7	7	7	8	8	8	9	9	11	72
74	0	1	1	1	1	2	2	2	2	3	3	3	4	4	4	4	5	5	5	6	6	6	6	7	7	7	7	8	8	10	74
76	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	8	76
78	0	0	1	1	1	1	1	2	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	7	78
80	0	0	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	5	5	5	5	6	80
82	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	5	82
84	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	4	84
86	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	86
88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	88
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90

TABLE 22.

Mean Refraction.

[Barometer, 30 inches. Fahrenheit's Thermometer, 50°.]

Apparent Altitude.	Mean Refraction.	Apparent Altitude.	Mean Refraction.	Apparent Altitude.	Mean Refraction.	Apparent Altitude.	Mean Refraction.	Apparent Altitude.	Mean Refraction.
° ′	′ ″	° ′	′ ″	° ′	′ ″	° ′	′ ″	° ′	′ ″
		9 30	5 35.1	15 00	3 34.1	25 00	2 4.4	42 00	1 04.7
0 00	36 29.4	35	5 32.4	10	3 31.7	10	2 3.4	20	1 03.9
1 00	24 53.6	40	5 29.6	20	3 29.4	20	2 2.5	40	1 03.2
2 00	18 25.5	45	5 27.0	30	3 27.1	30	2 1.6	43 00	1 02.4
3 00	14 25.1	50	5 24.3	40	3 24.8	40	2 0.7	20	1 01.7
4 00	11 44.4	55	5 21.7	50	3 22.6	50	1 59.8	40	1 01.0
5 00	9 52.0	10 00	5 19.2	16 00	3 20.5	26 00	1 58.9	44 00	1 00.3
05	9 44.0	05	5 16.7	10	3 18.4	10	1 58.1	20	0 59.6
10	9 36.2	10	5 14.2	20	3 16.3	20	1 57.2	40	0 58.9
15	9 28.6	15	5 11.7	30	3 14.2	30	1 56.4	45 00	0 58.2
20	9 21.2	20	5 9.3	40	3 12.2	40	1 55.5	20	0 57.6
25	9 14.0	25	5 6.9	50	3 10.3	50	1 54.7	40	0 56.9
5 30	9 7.0	10 30	5 4.6	17 00	3 8.3	27 00	1 53.9	46 00	0 56.2
35	9 0.1	35	5 2.3	10	3 6.4	10	1 53.1	20	0 55.6
40	8 53.4	40	5 0.0	20	3 4.6	20	1 52.3	40	0 55.0
45	8 46.8	45	4 57.8	30	3 2.8	30	1 51.5	47 00	0 54.3
50	8 40.4	50	4 55.6	40	3 1.0	40	1 50.7	20	0 53.7
55	8 34.2	55	4 53.4	50	2 59.2	50	1 50.0	40	0 53.1
6 00	8 28.0	11 00	4 51.2	18 00	2 57.5	28 00	1 49.2	48 00	0 52.5
05	8 22.1	05	4 49.1	10	2 55.8	20	1 47.7	49 00	0 50.6
10	8 16.2	10	4 47.0	20	2 54.1	40	1 46.2	50 00	0 48.9
15	8 10.5	15	4 44.9	30	2 52.4	29 00	1 44.8	51 00	0 47.2
20	8 4.8	20	4 42.9	40	2 50.8	20	1 43.4	52 00	0 45.5
25	7 59.3	25	4 40.9	50	2 49.2	40	1 42.0	53 00	0 43.9
6 30	7 53.9	11 30	4 38.9	19 00	2 47.7	30 00	1 40.6	54 00	0 42.3
35	7 48.7	35	4 36.9	10	2 46.1	20	1 39.3	55 00	0 40.8
40	7 43.5	40	4 35.0	20	2 44.6	40	1 38.0	56 00	0 39.3
45	7 38.4	45	4 33.1	30	2 43.1	31 00	1 36.7	57 00	0 37.8
50	7 33.5	50	4 31.2	40	2 41.6	20	1 35.5	58 00	0 36.4
55	7 28.6	55	4 29.4	50	2 40.2	40	1 34.2	59 00	0 35.0
7 00	7 23.8	12 00	4 27.5	20 00	2 38.8	32 00	1 33.0	60 00	0 33.6
05	7 19.2	05	4 25.7	10	2 37.4	20	1 31.8	61 00	0 32.3
10	7 14.6	10	4 23.9	20	2 36.0	40	1 30.7	62 00	0 31.0
15	7 10.1	15	4 22.2	30	2 34.6	33 00	1 29.5	63 00	0 29.7
20	7 5.7	20	4 20.4	40	2 33.3	20	1 28.4	64 00	0 28.4
25	7 1.4	25	4 18.7	50	2 32.0	40	1 27.3	65 00	0 27.2
7 30	6 57.1	12 30	4 17.0	21 00	2 30.7	34 00	1 26.2	66 00	0 25.9
35	6 53.0	35	4 15.3	10	2 29.4	20	1 25.1	67 00	0 24.7
40	6 48.9	40	4 13.6	20	2 28.1	40	1 24.1	68 00	0 23.6
45	6 44.9	45	4 12.0	30	2 26.9	35 00	1 23.1	69 00	0 22.4
50	6 41.0	50	4 10.4	40	2 25.7	20	1 22.0	70 00	0 21.2
55	6 37.1	55	4 8.8	50	2 24.5	40	1 21.0	71 00	0 20.1
8 00	6 33.3	13 00	4 7.2	22 00	2 23.3	36 00	1 20.1	72 00	0 18.9
05	6 29.6	05	4 5.6	10	2 22.1	20	1 19.1	73 00	0 17.8
10	6 25.9	10	4 4.1	20	2 20.9	40	1 18.2	74 00	0 16.7
15	6 22.3	15	4 2.6	30	2 19.8	37 00	1 17.2	75 00	0 15.6
20	6 18.8	20	4 1.0	40	2 18.7	20	1 16.3	76 00	0 14.5
25	6 15.3	25	3 59.6	50	2 17.5	40	1 15.4	77 00	0 13.5
8 30	6 11.9	13 30	3 58.1	23 00	2 16.4	38 00	1 14.5	78 00	0 12.4
35	6 8.5	35	3 56.6	10	2 15.4	20	1 13.6	79 00	0 11.3
40	6 5.2	40	3 55.2	20	2 14.3	40	1 12.7	80 00	0 10.3
45	6 2.0	45	3 53.7	30	2 13.3	39 00	1 11.9	81 00	0 9.2
50	5 58.8	50	3 52.3	40	2 12.2	20	1 11.0	82 00	0 8.2
55	5 55.7	55	3 50.9	50	2 11.2	40	1 10.2	83 00	0 7.2
9 00	5 52.6	14 00	3 49.5	24 00	2 10.2	40 00	1 9.4	84 00	0 6.1
05	5 49.6	10	3 46.8	10	2 9.2	20	1 8.6	85 00	0 5.1
10	5 46.6	20	3 44.2	20	2 8.2	40	1 7.8	86 00	0 4.1
15	5 43.6	30	3 41.6	30	2 7.2	41 00	1 7.0	87 00	0 3.1
20	5 40.7	40	3 39.0	40	2 6.2	20	1 6.2	88 00	0 2.0
25	5 37.9	50	3 36.5	50	2 5.3	40	1 5.4	89 00	0 1.0
9 30	5 35.1	15 00	3 34.1	25 00	2 4.4	42 00	1 4.7	90 00	0 0.0

TABLE 23.

Correction of the Sun's Apparent Altitude for Refraction and Parallax.

[Barometer, 30 inches. Fahrenheit's Thermometer, 50°.]

Apparent Altitude.	Mean Refraction and Parallax ☉.	Apparent Altitude.	Mean Refraction and Parallax ☉.	Apparent Altitude.	Mean Refraction and Parallax ☉.	Apparent Altitude.	Mean Refraction and Parallax ☉.	Apparent Altitude.	Mean Refraction and Parallax ☉.
° ′	′ ″	° ′	′ ″	° ′	′ ″	° ′	′ ″	° ′	′ ″
		9 30	5 26	15 00	3 25	25 00	1 56	42 00	0 58
0 00	36 20	35	5 23	10	3 24	10	1 55	20	0 57
1 00	24 45	40	5 21	20	3 21	20	1 55	40	0 56
2 00	18 17	45	5 18	30	3 19	30	1 54	43 00	0 55
3 00	14 16	50	5 15	40	3 17	40	1 53	20	0 55
4 00	11 35	55	5 13	50	3 15	50	1 52	40	0 54
5 00	9 43	10 00	5 10	16 00	3 13	26 00	1 51	44 00	0 53
05	9 35	05	5 8	10	3 10	10	1 50	20	0 53
10	9 27	10	5 5	20	3 8	20	1 49	40	0 52
15	9 20	15	5 3	30	3 6	30	1 48	45 00	0 52
20	9 12	20	5 0	40	3 4	40	1 48	20	0 52
25	9 5	25	4 58	50	3 2	50	1 47	40	0 51
5 30	8 58	10 30	4 56	17 00	3 0	27 00	1 46	46 00	0 50
35	8 51	35	4 53	10	2 58	10	1 45	20	0 50
40	8 44	40	4 51	20	2 57	20	1 44	40	0 49
45	8 38	45	4 49	30	2 55	30	1 44	47 00	0 48
50	8 31	50	4 47	40	2 53	40	1 43	20	0 48
55	8 25	55	4 44	50	2 51	50	1 42	40	0 47
6 00	8 19	11 00	4 42	18 00	2 50	28 00	1 41	48 00	0 47
05	8 13	05	4 40	10	2 48	20	1 40	49 00	0 45
10	8 7	10	4 38	20	2 46	40	1 38	50 00	0 43
15	8 2	15	4 36	30	2 44	29 00	1 37	51 00	0 41
20	7 56	20	4 34	40	2 43	20	1 35	52 00	0 40
25	7 50	25	4 32	50	2 41	40	1 34	53 00	0 39
6 30	7 45	11 30	4 30	19 00	2 40	30 00	1 33	54 00	0 37
35	7 40	35	4 28	10	2 38	20	1 31	55 00	0 36
40	7 35	40	4 26	20	2 37	40	1 30	56 00	0 34
45	7 29	45	4 24	30	2 35	31 00	1 29	57 00	0 33
50	7 25	50	4 22	40	2 34	20	1 28	58 00	0 32
55	7 20	55	4 20	50	2 32	40	1 26	59 00	0 31
7 00	7 15	12 00	4 19	20 00	2 31	32 00	1 25	60 00	0 30
05	7 10	05	4 17	10	2 29	20	1 24	61 00	0 28
10	7 6	10	4 15	20	2 28	40	1 23	62 00	0 27
15	7 1	15	4 13	30	2 27	33 00	1 22	63 00	0 26
20	6 57	20	4 11	40	2 25	20	1 20	64 00	0 24
25	6 52	25	4 10	50	2 24	40	1 19	65 00	0 23
7 30	6 48	12 30	4 8	21 00	2 23	34 00	1 18	66 00	0 22
35	6 44	35	4 6	10	2 21	20	1 17	67 00	0 21
40	6 40	40	4 5	20	2 20	40	1 16	68 00	0 21
45	6 36	45	4 3	30	2 19	35 00	1 15	69 00	0 19
50	6 32	50	4 1	40	2 18	20	1 15	70 00	0 18
55	6 28	55	4 0	50	2 17	40	1 14	71 00	0 17
8 00	6 24	13 00	3 58	22 00	2 15	36 00	1 13	72 00	0 16
05	6 21	05	3 57	10	2 14	20	1 12	73 00	0 16
10	6 17	10	3 55	20	2 13	40	1 11	74 00	0 15
15	6 13	15	3 54	30	2 12	37 00	1 10	75 00	0 14
20	6 10	20	3 52	40	2 11	20	1 9	76 00	0 13
25	6 6	25	3 51	50	2 10	40	1 8	77 00	0 12
8 30	6 3	13 30	3 49	23 00	2 8	38 00	1 8	78 00	0 10
35	6 0	35	3 48	10	2 7	20	1 7	79 00	0 9
40	5 56	40	3 46	20	2 6	40	1 6	80 00	0 8
45	5 53	45	3 45	30	2 5	39 00	1 5	81 00	0 7
50	5 50	50	3 43	40	2 4	20	1 4	82 00	0 6
55	5 47	55	3 42	50	2 3	40	1 3	83 00	0 6
9 00	5 44	14 00	3 41	24 00	2 2	40 00	1 2	84 00	0 5
05	5 41	10	3 38	10	2 1	20	1 2	85 00	0 4
10	5 38	20	3 35	20	2 0	40	1 1	86 00	0 3
15	5 35	30	3 33	30	1 59	41 00	1 0	87 00	0 2
20	5 32	40	3 30	40	1 58	20	0 59	88 00	0 2
25	5 29	50	3 28	50	1 57	40	0 58	89 00	0 1
9 30	5 26	15 00	3 25	25 00	1 56	42 00	0 58	90 00	0 0

TABLE 24.

Correction of the Mean Refraction for the Height of the Barometer.

Barom.	Mean refraction.																					Barom.
	0′		1′		2′		3′		4′		5′		6′		7′		8′		9′		10′	
Subtract.	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	Add.
	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	
27.50	0	2	5	7	10	12	15	17	20	23	25	28	30	33	35	38	40	43	45	48	51	
27.55	0	2	5	7	10	12	15	17	20	22	25	27	30	32	35	37	40	42	45	47	50	
27.60	0	2	5	7	10	12	14	17	19	22	24	27	29	31	34	36	39	41	44	46	49	
27.65	0	2	5	7	9	12	14	16	19	21	24	26	28	31	33	36	38	40	43	45	48	
27.70	0	2	5	7	9	11	14	16	18	21	23	25	28	30	32	35	37	39	42	44	47	
27.75	0	2	4	7	9	11	13	16	18	20	23	25	27	29	32	34	36	39	41	43	46	
27.80	0	2	4	7	9	11	13	15	18	20	22	24	27	29	31	33	35	38	40	42	45	
27.85	0	2	4	6	9	11	13	15	17	19	22	24	26	28	30	32	35	37	39	41	44	
27.90	0	2	4	6	8	10	13	15	17	19	21	23	25	27	30	32	34	36	38	40	43	
27.95	0	2	4	6	8	10	12	14	16	18	21	23	25	27	29	31	33	35	37	39	42	
28.00	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	41	
28.05	0	2	4	6	8	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37	39	
28.10	0	2	4	6	8	9	11	13	15	17	19	21	23	25	27	29	31	33	34	36	38	
28.15	0	2	4	6	7	9	11	13	15	17	19	20	22	24	26	28	30	32	34	36	37	
28.20	0	2	4	5	7	9	11	13	14	16	18	20	22	24	25	27	29	31	33	35	36	
28.25	0	2	3	5	7	9	10	12	14	16	18	19	21	23	25	26	28	30	32	34	35	
28.30	0	2	3	5	7	8	10	12	14	15	17	19	21	22	24	26	27	29	31	33	34	
28.35	0	2	3	5	7	8	10	12	13	15	17	18	20	22	23	25	27	28	30	32	33	
28.40	0	2	3	5	6	8	10	11	13	14	16	18	19	21	23	24	26	27	29	31	32	
28.45	0	2	3	5	6	8	9	11	12	14	16	17	19	20	22	23	25	27	28	30	31	
28.50	0	1	3	4	6	7	9	10	12	14	15	17	18	20	21	23	24	26	27	29	30	31.50
28.55	0	1	3	4	6	7	9	10	12	13	15	16	17	19	20	22	23	25	26	28	29	31.45
28.60	0	1	3	4	6	7	8	10	11	13	14	15	17	18	20	21	23	24	25	27	28	31.40
28.65	0	1	3	4	5	7	8	9	11	12	14	15	16	18	19	20	22	23	25	26	27	31.35
28.70	0	1	3	4	5	6	8	9	10	12	13	14	16	17	18	20	21	22	24	25	26	31.30
28.75	0	1	2	4	5	6	7	9	10	11	13	14	15	16	18	19	20	21	23	24	25	31.25
28.80	0	1	2	4	5	6	7	8	10	11	12	13	14	16	17	18	19	21	22	23	24	31.20
28.85	0	1	2	3	5	6	7	8	9	10	12	13	14	15	16	17	19	20	21	22	23	31.15
28.90	0	1	2	3	4	5	7	8	9	10	11	12	13	14	16	17	18	19	20	21	22	31.10
28.95	0	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17	18	19	20	21	31.05
29.00	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	31.00
29.05	0	1	2	3	4	5	6	7	8	9	10	11	11	12	13	14	15	16	17	18	19	30.95
29.10	0	1	2	3	4	4	5	6	7	8	9	10	11	12	13	14	15	15	16	17	18	30.90
29.15	0	1	2	3	3	4	5	6	7	8	9	9	10	11	12	13	14	15	15	16	17	30.85
29.20	0	1	2	2	3	4	5	6	6	7	8	9	10	10	11	12	13	14	15	15	16	30.80
29.25	0	1	1	2	3	4	4	5	6	7	8	8	9	10	11	11	12	13	14	14	15	30.75
29.30	0	1	1	2	3	3	4	5	6	6	7	8	8	9	10	11	11	12	13	13	14	30.70
29.35	0	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	10	11	12	13	13	30.65
29.40	0	1	1	2	2	3	4	4	5	5	6	7	7	8	8	9	10	10	11	12	12	30.60
29.45	0	1	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9	9	10	11	11	30.55
29.50	0	0	1	1	2	2	3	3	4	5	5	6	6	7	7	8	8	9	9	10	10	30.50
29.55	0	0	1	1	2	2	3	3	4	4	5	5	5	6	6	7	7	8	8	9	9	30.45
29.60	0	0	1	1	2	2	2	3	3	4	4	4	5	5	6	6	6	7	7	8	8	30.40
29.65	0	0	1	1	1	2	2	2	3	3	4	4	4	5	5	5	6	6	6	7	7	30.35
29.70	0	0	1	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	5	6	6	30.30
29.75	0	0	0	1	1	1	1	2	2	2	3	3	3	3	4	4	4	4	5	5	5	30.25
29.80	0	0	0	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	30.20
29.85	0	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	30.15
29.90	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	30.10
29.95	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	30.05
30.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.00
Subtract.	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	Add.
	0′		1′		2′		3′		4′		5′		6′		7′		8′		9′		10′	
Barom.	Mean refraction.																					Barom.

TABLE 25.

Correction of the Mean Refraction for the Height of the Thermometer.

Ther. Add.	Mean refraction. 0′ 0″	0′ 30″	1′ 0″	1′ 30″	2′ 0″	2′ 30″	3′ 0″	3′ 30″	4′ 0″	4′ 30″	5′ 0″	5′ 30″	6′ 0′	6′ 30″	7′ 0″	7′ 30″	8′ 0″	8′ 30″	9′ 0″	9′ 30″	10′ 0″	Ther. Add.
°	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	°
—10	0	4	8	12	16	20	24	28	33	37	41	46	50	55	60	65	70	75	80	85	90	—10
— 8	0	4	8	12	15	19	23	27	31	36	40	44	48	53	58	62	67	72	77	82	87	— 8
— 6	0	4	7	11	15	19	22	26	30	34	38	42	47	51	55	60	64	69	74	79	84	— 6
— 4	0	4	7	11	14	18	22	25	29	33	37	41	45	49	53	57	62	66	71	76	80	— 4
— 2	0	3	7	10	14	17	21	24	28	31	35	39	43	47	51	55	59	64	68	72	77	— 2
0	0	3	7	10	13	16	20	23	27	30	34	37	41	45	49	53	57	61	65	69	74	0
2	0	3	6	9	12	16	19	22	25	29	32	36	39	43	47	50	54	58	62	66	70	2
4	0	3	6	9	12	15	18	21	24	28	31	34	37	41	44	48	52	55	59	63	67	4
6	0	3	6	8	11	14	17	20	23	26	29	32	36	39	42	46	49	53	56	60	64	6
8	0	3	5	8	11	14	16	19	22	25	28	31	34	37	40	43	47	50	54	57	61	8
10	0	3	5	8	10	13	15	18	21	24	26	29	32	35	38	41	44	48	51	54	58	10
11	0	2	5	7	10	13	15	18	20	23	26	28	31	34	37	40	43	46	49	53	56	11
12	0	2	5	7	10	12	15	17	20	22	25	28	30	33	36	39	42	45	48	51	54	12
13	0	2	5	7	9	12	14	17	19	22	24	27	30	32	35	38	41	44	47	50	53	13
14	0	2	5	7	9	11	14	16	19	21	24	26	29	31	34	37	40	42	45	48	51	14
15	0	2	4	7	9	11	13	16	18	20	23	25	28	30	33	36	38	41	44	47	50	15
16	0	2	4	6	9	11	13	15	18	20	22	25	27	29	32	35	37	40	43	45	48	16
17	0	2	4	6	8	10	13	15	17	19	21	24	26	29	31	33	36	39	41	44	47	17
18	0	2	4	6	8	10	12	14	16	19	21	23	25	28	30	32	35	37	40	43	45	18
19	0	2	4	6	8	10	12	14	16	18	20	22	24	27	29	31	34	36	39	41	44	19
20	0	2	4	6	8	9	11	13	15	17	19	22	24	26	28	30	33	35	37	40	42	20
21	0	2	4	5	7	9	11	13	15	17	19	21	23	25	27	29	31	34	36	38	41	21
22	0	2	3	5	7	9	11	12	14	16	18	20	22	24	26	28	30	32	35	37	39	22
23	0	2	3	5	7	8	10	12	14	15	17	19	21	23	25	27	29	31	33	36	38	23
24	0	2	3	5	6	8	10	11	13	15	17	18	20	22	24	26	28	30	32	34	36	24
25	0	2	3	5	6	8	9	11	13	14	16	18	19	21	23	25	27	29	31	33	35	25
26	0	1	3	4	6	7	9	11	12	14	15	17	19	20	22	24	26	28	29	31	33	26
27	0	1	3	4	6	7	9	10	12	13	15	16	18	19	21	23	25	26	28	30	32	27
28	0	1	3	4	5	7	8	10	11	12	14	15	17	19	20	22	23	25	27	29	30	28
29	0	1	3	4	5	6	8	9	11	12	13	15	16	18	19	21	22	24	26	27	29	29
30	0	1	2	4	5	6	7	9	10	11	13	14	15	17	18	20	21	23	24	26	28	30
31	0	1	2	3	5	6	7	8	9	11	12	13	15	16	17	19	20	22	23	25	26	31
32	0	1	2	3	4	6	7	8	9	10	11	13	14	15	16	18	19	20	22	23	25	32
33	0	1	2	3	4	5	6	7	8	10	11	12	13	14	15	17	18	19	21	22	23	33
34	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	19	21	22	34
35	0	1	2	3	4	5	6	6	7	8	9	10	11	13	14	15	16	17	18	19	20	35
36	0	1	2	3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	36
37	0	1	2	2	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	17	18	37
38	0	1	1	2	3	4	4	5	6	7	7	8	9	10	11	12	13	13	14	15	16	38
39	0	1	1	2	3	3	4	5	5	6	7	8	8	9	10	11	11	12	13	14	15	39
40	0	1	1	2	2	3	4	4	5	6	6	7	8	8	9	10	10	11	12	13	13	40
41	0	1	1	2	2	3	3	4	4	5	6	6	7	7	8	9	9	10	11	11	12	41
42	0	0	1	1	2	2	3	3	4	4	5	5	6	7	7	8	8	9	9	10	11	42
43	0	0	1	1	2	2	3	3	3	4	4	5	5	6	6	7	7	8	8	9	9	43
44	0	0	1	1	1	2	2	3	3	3	4	4	4	5	5	6	6	7	7	8	8	44
45	0	0	1	1	1	1	2	2	2	3	3	3	4	4	4	5	5	6	6	6	7	45
46	0	0	0	1	1	1	1	2	2	2	2	2	3	3	4	4	4	4	5	5	5	46
47	0	0	0	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	4	4	4	47
48	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	48
49	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	49
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
Add.	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	Add.
Ther.	0′		1′		2′		3′		4′		5′		6′		7′		8′		9′		10′	Ther.
	Mean refraction.																					

TABLE 25.

Correction of the Mean Refraction for the Height of the Thermometer.

Ther.	Mean refraction.																					Ther.
Subt.	0′		1′		2′		3′		4′		5′		6′		7′		8′		9′		10′	Subt.
	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	
°	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	°
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
51	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	51
52	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	52
53	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	4	4	53
54	0	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	5	5	5	54
55	0	0	1	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	55
56	0	0	1	1	1	2	2	2	3	3	4	4	4	5	5	6	6	6	7	7	8	56
57	0	0	1	1	2	2	2	3	3	4	4	5	5	6	6	6	7	8	8	8	9	57
58	0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	9	9	10	10	58
59	0	1	1	2	2	3	3	4	4	5	5	6	6	7	8	8	9	10	10	11	12	59
60	0	1	1	2	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	13	60
61	0	1	1	2	3	3	4	4	5	6	7	7	8	9	9	10	11	12	12	13	14	61
62	0	1	1	2	3	3	4	5	6	6	7	8	9	9	10	11	12	13	14	15	15	62
63	0	1	1	2	3	4	5	5	6	7	8	8	9	10	11	12	13	14	15	16	17	63
64	0	1	2	2	3	4	5	6	7	7	8	9	10	11	12	13	14	15	16	17	18	64
65	0	1	2	3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	65
66	0	1	2	3	4	5	6	6	7	8	9	10	11	12	14	15	16	17	18	19	20	66
67	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	19	20	22	67
68	0	1	2	3	4	5	6	7	8	9	11	11	13	14	15	16	18	19	20	22	23	68
69	0	1	2	3	4	5	7	8	9	10	11	12	13	15	16	17	19	20	21	23	24	69
70	0	1	2	3	5	6	7	8	9	10	12	12	14	16	17	18	20	21	22	24	25	70
71	0	1	2	4	5	6	7	8	10	11	12	13	15	16	18	19	20	22	23	25	27	71
72	0	1	2	4	5	6	8	9	10	11	13	14	16	17	18	20	21	23	25	26	28	72
73	0	1	3	4	5	7	8	9	11	12	13	14	16	18	19	21	22	24	26	27	29	73
74	0	1	3	4	5	7	8	10	11	12	14	15	17	18	20	22	23	25	27	28	30	74
75	0	1	3	4	6	7	8	10	11	13	14	16	18	19	21	22	24	26	28	29	31	75
76	0	1	3	4	6	7	9	10	12	13	15	16	18	20	22	23	25	27	29	31	32	76
77	0	1	3	5	6	8	9	11	12	14	16	17	19	21	22	24	26	28	30	32	34	77
78	0	2	3	5	6	8	9	11	13	14	16	18	20	21	23	25	27	29	31	33	35	78
79	0	2	3	5	6	8	10	11	13	15	17	18	20	22	24	26	28	30	32	34	36	79
80	0	2	3	5	7	8	10	12	14	15	17	19	21	23	25	27	29	31	33	35	37	80
81	0	2	3	5	7	9	10	12	14	16	18	20	21	24	26	28	30	32	34	36	38	81
82	0	2	4	5	7	9	11	13	14	16	18	20	22	24	26	28	31	33	35	37	40	82
83	0	2	4	5	7	9	11	13	15	17	19	21	23	25	27	29	31	34	36	38	41	83
84	0	2	4	6	8	9	11	13	15	17	19	21	23	26	28	30	32	35	37	39	42	84
85	0	2	4	6	8	10	12	14	16	18	20	22	24	26	29	31	33	36	38	40	43	85
86	0	2	4	6	8	10	12	14	16	18	20	23	25	27	29	32	34	37	39	42	44	86
87	0	2	4	6	8	10	12	14	17	19	21	23	25	28	30	32	35	38	40	43	45	87
88	0	2	4	6	8	10	13	15	17	19	21	24	26	28	31	33	36	38	41	44	46	88
89	0	2	4	6	9	11	13	15	17	20	22	24	27	29	32	34	37	39	42	45	48	89
90	0	2	4	7	9	11	13	16	18	20	23	25	27	30	32	35	38	40	43	46	49	90
91	0	2	4	7	9	11	14	16	18	21	23	25	28	31	33	36	39	41	44	47	50	91
92	0	2	5	7	9	11	14	16	19	21	24	26	29	31	34	37	39	42	45	48	51	92
93	0	2	5	7	9	12	14	17	19	22	24	27	29	32	35	37	40	43	46	49	52	93
94	0	2	5	7	10	12	14	17	19	22	25	27	30	33	35	38	41	44	47	50	53	94
95	0	2	5	7	10	12	15	17	20	22	25	28	30	33	36	39	42	45	48	51	54	95
96	0	2	5	7	10	12	15	18	20	23	26	28	31	34	37	40	43	46	49	52	55	96
97	0	3	5	8	10	13	15	18	21	23	26	29	32	35	38	41	44	47	50	53	56	97
98	0	3	5	8	10	13	16	18	21	24	27	29	32	35	38	41	44	48	51	54	58	98
99	0	3	5	8	11	13	16	19	21	24	27	30	33	36	39	42	45	49	52	55	59	99
100	0	3	5	8	11	13	16	19	22	25	28	31	34	37	40	43	46	50	53	56	60	100
Subt.	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	30″	0″	Subt.
	0′		1′		2′		3′		4′		5′		6′		7′		8′		9′		10′	
Ther.	Mean refraction.																					Ther.

TABLE 26.

For reducing the Time of the Moon's passage over the Meridian of Greenwich to the Time of its passage over any other Meridian. The numbers taken from this Table are to be added to the Time at Greenwich in West Longitude, subtracted in East Longitude.

Longitude.	Daily variation of the moon's passing the meridian.														Longitude.
	40m	42m	44m	46m	48m	50m	52m	54m	56m	58m	60m	62m	64m	66m	
°	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	m.	°
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5
10	1	1	1	1	1	1	1	1	2	2	2	2	2	2	10
15	2	2	2	2	2	2	2	2	2	2	2	3	3	3	15
20	2	2	2	3	3	3	3	3	3	3	3	3	4	4	20
25	3	3	3	3	3	3	4	4	4	4	4	4	4	5	25
30	3	3	4	4	4	4	4	4	5	5	5	5	5	5	30
35	4	4	4	4	5	5	5	5	5	6	6	6	6	6	35
40	4	5	5	5	5	6	6	6	6	6	7	7	7	7	40
45	5	5	5	6	6	6	6	7	7	7	7	8	8	8	45
50	6	6	6	6	7	7	7	7	8	8	8	9	9	9	50
55	6	6	7	7	7	8	8	8	9	9	9	9	10	10	55
60	7	7	7	8	8	8	9	9	9	10	10	10	11	11	60
65	7	8	8	8	9	9	9	10	10	10	11	11	12	12	65
70	8	8	9	9	9	10	10	10	11	11	12	12	12	13	70
75	8	9	9	10	10	10	11	11	12	12	12	13	13	14	75
80	9	9	10	10	11	11	12	12	12	13	13	14	14	15	80
85	9	10	10	11	11	12	12	13	13	14	14	15	15	16	85
90	10	10	11	11	12	12	13	13	14	14	15	15	16	16	90
95	11	11	12	12	13	13	14	14	15	15	16	16	17	17	95
100	11	12	12	13	13	14	14	15	16	16	17	17	18	18	100
105	12	12	13	13	14	15	15	16	16	17	17	18	19	19	105
110	12	13	13	14	15	15	16	16	17	18	18	19	20	20	110
115	13	13	14	15	15	16	17	17	18	19	19	20	20	21	115
120	13	14	15	15	16	17	17	18	19	19	20	21	21	22	120
125	14	15	15	16	17	17	18	19	19	20	21	22	22	23	125
130	14	15	16	17	17	18	19	19	20	21	22	22	23	24	130
135	15	16	16	17	18	19	19	20	21	22	22	23	24	25	135
140	16	16	17	18	19	19	20	21	22	23	23	24	25	26	140
145	16	17	18	19	19	20	21	22	23	23	24	25	26	27	145
150	17	17	18	19	20	21	22	22	23	24	25	26	27	27	150
155	17	18	19	20	21	22	22	23	24	25	26	27	28	28	155
160	18	19	20	20	21	22	23	24	25	26	27	28	28	29	160
165	18	19	20	21	22	23	24	25	26	27	27	28	29	30	165
170	19	20	21	22	23	24	25	25	26	27	28	29	30	31	170
175	19	20	21	22	23	24	25	26	27	28	29	30	31	32	175
180	20	21	22	23	24	25	26	27	28	29	30	31	32	33	180
	40m	42m	44m	46m	48m	50m	52m	54m	56m	58m	60m	62m	64m	66m	

TABLE 27.

Amplitudes.

Latitude.	Declination. 0°.0	0°.5	1°.0	1°.5	2°.0	2°.5	3°.0	3°.5	4°.0	4°.5	5°.0	5°.5	6°.0	Latitude.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	0
10	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.1	4.6	5.1	5.6	6.1	10
15	0.0	0.5	1.0	1.5	2.1	2.6	3.1	3.6	4.2	4.7	5.2	5.7	6.2	15
20	0.0	0.5	1.1	1.6	2.1	2.7	3.2	3.7	4.3	4.8	5.3	5.8	6.4	20
25	0.0	0.5	1.1	1.6	2.2	2.8	3.3	3.8	4.4	5.0	5.5	6.0	6.6	25
30	0.0	0.6	1.2	1.7	2.3	2.9	3.4	4.0	4.6	5.2	5.8	6.3	6.9	30
32	0.0	0.6	1.2	1.8	2.4	2.9	3.5	4.1	4.7	5.3	5.9	6.5	7.0	32
34	0.0	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	7.2	34
36	0.0	0.6	1.2	1.8	2.5	3.1	3.7	4.3	4.9	5.6	6.1	6.8	7.4	36
38	0.0	0.6	1.3	1.9	2.5	3.2	3.8	4.4	5.1	5.7	6.3	7.0	7.6	38
40	0.0	0.7	1.3	2.0	2.6	3.3	3.9	4.6	5.2	5.9	6.5	7.2	7.8	40
42	0.0	0.7	1.3	2.0	2.7	3.4	4.0	4.7	5.4	6.1	6.7	7.4	8.0	42
44	0.0	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	6.9	7.6	8.3	44
46	0.0	0.7	1.4	2.2	2.9	3.6	4.3	5.0	5.8	6.5	7.2	7.9	8.6	46
48	0.0	0.7	1.5	2.2	3.0	3.7	4.5	5.2	6.0	6.7	7.5	8.2	9.0	48
50	0.0	0.8	1.5	2.3	3.1	3.9	4.7	5.4	6.2	7.0	7.8	8.6	9.3	50
51	0.0	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.8	9.5	51
52	0.0	0.8	1.6	2.4	3.3	4.1	4.9	5.7	6.5	7.3	8.1	9.0	9.7	52
53	0.0	0.8	1.6	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3	9.2	10.0	53
54	0.0	0.9	1.7	2.5	3.4	4.3	5.1	6.0	6.8	7.7	8.5	9.4	0.2	54
55	0.0	0.9	1.7	2.6	3.5	4.4	5.2	6.1	7.0	7.9	8.7	9.6	10.5	55
56	0.0	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.0	9.9	0.8	56
57	0.0	0.9	1.8	2.7	3.7	4.6	5.5	6.4	7.4	8.3	9.2	10.1	1.1	57
58	0.0	0.9	1.9	2.8	3.8	4.7	5.7	6.6	7.6	8.5	9.5	0.4	1.4	58
59	0.0	1.0	1.9	2.9	3.9	4.9	5.8	6.8	7.8	8.8	9.7	0.7	1.7	59
60	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.1	60
61	0.0	1.0	2.1	3.1	4.1	5.2	6.2	7.2	8.3	9.3	0.3	1.4	2.5	61
62	0.0	1.1	2.1	3.2	4.3	5.3	6.4	7.5	8.5	9.6	0.7	1.8	2.9	62
63	0.0	1.1	2.2	3.3	4.5	5.5	6.6	7.7	8.8	9.9	1.1	2.2	3.4	63
64	0.0	1.1	2.3	3.4	4.6	5.7	6.9	8.0	9.2	10.3	1.5	2.6	3.9	64
65.0	0.0	1.2	2.4	3.5	4.8	5.9	7.1	8.3	9.5	10.7	11.9	13.1	14.4	65.0
5.5	0.0	1.2	2.4	3.6	4.8	6.0	7.2	8.5	9.7	0.9	2.1	3.4	4.6	5.5
6.0	0.0	1.2	2.5	3.7	4.9	6.1	7.4	8.6	9.9	1.1	2.4	3.6	4.9	6.0
6.5	0.0	1.2	2.5	3.8	5.0	6.3	7.5	8.8	10.1	1.3	2.6	3.9	5.2	6.5
7.0	0.0	1.3	2.6	3.8	5.1	6.4	7.7	9.0	0.3	1.6	2.9	4.2	5.5	7.0
67.5	0.0	1.3	2.6	3.9	5.2	6.5	7.9	9.2	10.5	11.8	13.2	14.5	15.9	67.5
8.0	0.0	1.3	2.7	4.0	5.3	6.7	8.0	9.4	0.7	2.1	3.5	4.8	6.2	8.0
8.5	0.0	1.4	2.7	4.1	5.4	6.8	8.2	9.6	1.0	2.4	3.8	5.2	6.6	8.5
9.0	0.0	1.4	2.8	4.2	5.5	7.0	8.4	9.8	1.2	2.6	4.1	5.5	7.0	9.0
9.5	0.0	1.4	2.9	4.3	5.7	7.2	8.6	10.0	1.5	2.9	4.4	5.9	7.4	9.5
70.0	0.0	1.5	2.9	4.4	5.8	7.3	8.8	10.3	11.8	13.3	14.8	16.3	17.8	70.0
0.5	0.0	1.5	3.0	4.5	6.0	7.5	9.0	0.5	2.1	3.6	5.1	6.7	8.2	0.5
1.0	0.0	1.5	3.1	4.6	6.2	7.7	9.3	0.8	2.4	3.9	5.5	7.1	8.7	1.0
1.5	0.0	1.6	3.2	4.7	6.3	7.9	9.5	1.1	2.7	4.3	5.9	7.8	9.2	1.5
2.0	0.0	1.6	3.2	4.9	6.5	8.1	9.8	1.4	3.0	4.7	6.4	8.1	9.8	2.0
72.5	0.0	1.7	3.3	5.0	6.7	8.3	10.0	11.7	13.4	15.1	16.9	18.6	20.3	72.5
3.0	0.0	1.7	3.4	5.1	6.9	8.6	0.3	2.0	3.8	5.5	7.4	9.1	0.9	3.0
3.5	0.0	1.8	3.5	5.2	7.1	8.8	0.6	2.4	4.2	6.0	7.9	9.7	1.6	3.5
4.0	0.0	1.8	3.6	5.4	7.3	9.1	0.9	2.8	4.6	6.5	8.4	20.3	2.3	4.0
4.5	0.0	1.9	3.7	5.6	7.5	9.4	1.3	3.2	5.1	7.1	9.0	1.0	3.0	4.5
75.0	0.0	1.9	3.8	5.8	7.7	9.7	11.7	13.6	15.6	17.7	19.7	21.7	23.8	75.0
5.5	0.0	2.0	3.9	6.0	8.0	10.0	2.1	4.1	6.2	8.3	20.4	2.5	4.7	5.5
6.0	0.0	2.1	4.0	6.2	8.3	0.4	2.5	4.6	6.8	8.9	1.1	3.3	5.6	6.0
6.5	0.0	2.1	4.2	6.4	8.6	0.8	3.0	5.2	7.4	9.6	1.9	4.2	6.6	6.5
7.0	0.0	2.2	4.4	6.6	8.9	1.2	3.5	5.8	8.1	20.4	2.8	5.2	.7	7.0

TABLE 27.

Amplitudes.

Latitude.	Declination. 6°.0	6°.5	7°.0	7°.5	8°.0	8°.5	9°.0	9°.5	10°.0	10°.5	11°.0	11°.5	12°.0	Latitude.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	0
10	6.1	6.6	7.1	7.6	8.1	8.6	9.1	9.7	0.1	0.7	1.2	1.7	2.2	10
15	6.2	6.7	7.2	7.8	8.3	8.8	9.3	9.8	0.4	0.9	1.4	1.9	2.5	15
20	6.4	6.9	7.4	8.0	8.5	9.1	9.6	10.1	0.7	1.2	1.7	2.3	2.8	20
25	6.6	7.1	7.7	8.3	8.8	9.4	9.9	0.5	1.1	1.6	2.2	2.8	3.3	25
30	6.9	7.5	8.1	8.7	9.3	9.8	10.4	11.0	11.5	12.1	12.7	13.3	13.9	30
32	7.0	7.7	8.3	8.8	9.5	10.0	0.6	1.2	1.8	2.4	3.0	3.6	4.2	32
34	7.2	7.8	8.5	9.0	9.7	0.3	0.8	1.5	2.1	2.7	3.3	3.9	4.5	34
36	7.4	8.0	8.7	9.3	9.9	0.5	1.1	1.8	2.4	3.0	3.6	4.3	4.9	36
38	7.6	8.2	8.9	9.5	10.2	0.8	1.4	2.1	2.7	3.4	4.0	4.7	5.3	38
40	7.8	8.5	9.1	9.8	10.5	11.1	11.7	12.4	13.1	13.8	14.4	15.1	15.7	40
42	8.0	8.8	9.4	10.1	0.8	1.5	2.1	2.8	3.5	4.2	4.8	5.6	6.2	42
44	8.3	9.1	9.7	0.5	1.1	1.9	2.5	3.3	4.0	4.7	5.3	6.1	6.8	44
46	8.6	9.4	10.1	0.8	1.5	2.3	3.0	3.8	4.5	5.2	5.9	6.7	7.4	46
48	9.0	9.7	0.5	1.2	2.0	2.8	3.5	4.3	5.0	5.8	6.6	7.3	8.1	48
50	9.3	10.1	10.9	11.7	12.5	13.3	14.1	14.9	15.7	16.5	17.3	18.1	18.9	50
51	9.5	0.4	1.2	2.0	2.8	3.6	4.4	5.2	6.0	6.8	7.7	8.5	9.3	51
52	9.7	0.6	1.4	2.2	3.1	3.9	4.7	5.6	6.4	7.2	8.1	8.9	9.7	52
53	10.0	0.8	1.7	2.5	3.4	4.2	5.1	5.9	6.8	7.6	8.5	9.4	20.2	53
54	0.2	1.1	2.0	2.8	3.7	4.6	5.4	6.3	7.2	8.1	8.9	9.8	0.7	54
55	10.5	11.4	12.3	13.1	14.0	14.9	15.8	16.7	17.6	18.5	19.4	20.3	21.2	55
56	0.8	1.7	2.6	3.5	4.4	5.3	6.2	7.2	8.1	9.0	9.9	0.9	1.8	56
57	1.1	2.0	2.9	3.9	4.8	5.8	6.7	7.7	8.6	9.6	20.5	1.5	2.4	57
58	1.4	2.3	3.3	4.3	5.2	6.2	7.2	8.2	9.1	20.1	1.1	2.1	3.1	58
59	1.7	2.7	3.7	4.7	5.7	6.7	7.7	8.7	9.7	0.7	1.7	2.8	3.8	59
60	12.1	13.1	14.1	15.1	16.2	17.2	18.2	19.3	20.3	21.4	22.4	23.5	24.6	60
61	2.5	3.5	4.6	5.6	6.7	7.8	8.8	9.9	1.0	2.1	3.1	4.3	5.4	61
62	2.9	3.9	5.1	6.1	7.3	8.4	9.4	20.6	1.7	2.9	3.9	5.2	6.3	62
63	3.4	4.4	5.6	6.7	7.9	9.0	20.1	1.3	2.5	3.7	4.8	6.1	7.2	63
64	3.9	5.0	6.2	7.3	8.5	9.7	0.9	2.1	3.3	4.6	5.7	7.1	8.3	64
65.0	14.4	15.5	16.8	18.0	19.3	20.5	21.7	23.0	24.2	25.6	26.8	28.2	29.5	65.0
5.5	4.6	5.8	7.1	8.3	9.6	0.9	2.2	3.5	4.7	6.1	7.4	8.7	30.1	5.5
6.0	4.9	6.2	7.4	8.7	20.0	1.3	2.6	3.9	5.3	6.6	8.0	9.3	0.7	6.0
6.5	5.2	6.5	7.8	9.1	0.4	1.8	3.1	4.4	5.8	7.2	8.6	30.0	1.4	6.5
7.0	5.5	6.8	8.2	9.5	0.9	2.2	3.6	5.0	6.4	7.8	9.2	0.7	2.1	7.0
67.5	15.9	17.2	18.6	19.9	21.3	22.7	24.1	25.5	27.0	28.4	29.9	31.4	32.9	67.5
8.0	6.2	7.6	9.0	20.4	1.8	3.2	4.7	6.1	7.6	9.1	30.6	2.2	3.7	8.0
8.5	6.6	8.0	9.4	0.9	2.3	3.8	5.3	6.8	8.3	9.8	1.4	3.0	4.6	8.5
9.0	7.0	8.4	9.9	1.4	2.8	4.4	5.9	7.4	9.0	30.6	2.2	3.8	5.5	9.0
9.5	7.4	8.9	20.4	1.9	3.4	5.0	6.5	8.1	9.7	1.4	3.0	4.7	6.4	9.5
70.0	17.8	19.3	20.9	22.4	24.0	25.6	27.2	28.8	30.5	32.2	33.9	35.7	37.4	70.0
0.5	8.2	9.8	1.4	3.0	4.6	6.3	7.9	9.6	1.3	3.1	4.9	6.7	8.5	0.5
1.0	8.7	20.3	2.0	3.6	5.3	7.0	8.7	30.5	2.2	4.0	5.9	7.8	9.7	1.0
1.5	9.2	0.9	2.6	4.3	6.0	7.8	9.5	1.4	3.2	5.0	7.0	8.9	40.9	1.5
2.0	9.8	1.5	3.2	5.0	6.8	8.6	30.4	2.3	4.2	6.1	8.1	40.2	2.3	2.0
72.5	20.3	22.1	23.9	25.7	27.6	29.5	31.4	33.3	35.3	37.3	39.4	41.5	43.7	72.5
3.0	0.9	2.8	4.6	6.5	8.4	30.4	2.4	4.4	6.5	8.6	40.8	3.0	5.3	3.0
3.5	1.6	3.5	5.4	7.4	9.3	1.4	3.4	5.5	7.7	9.9	2.2	4.6	7.0	3.5
4.0	2.3	4.3	6.2	8.3	30.3	2.5	4.6	6.8	9.1	41.4	3.8	6.3	8.9	4.0
4.5	3.0	5.1	7.1	9.3	1.4	3.6	5.8	8.2	40.5	3.0	5.6	8.2	51.1	4.5
75.0	23.8	26.0	28.1	30.3	32.5	34.8	37.2	39.6	42.1	44.8	47.5	50.4	53.5	75.0
5.5	4.7	6.9	9.1	1.4	3.8	6.2	8.7	41.2	3.9	6.7	9.6	2.8	6.2	5.5
6.0	5.6	7.9	30.2	2.6	5.1	7.7	40.3	3.0	5.9	8.9	52.1	5.5	9.3	6.0
6.5	6.6	9.0	1.4	4.0	6.6	9.3	2.1	5.0	8.1	51.3	4.8	8.7	63.0	6.5
7.0	7.7	30.2	2.8	5.5	8.2	41.1	4.1	7.2	50.5	4.1	8.0	62.4	7.6	7.0

TABLE 27.

Amplitudes.

Latitude.	Declination.													Latitude.
	12°.0	12°.5	13°.0	13°.5	14°.0	14°.5	15°.0	15°.5	16°.0	16°.5	17°.0	17°.5	18°.0	
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	0
10	2.2	2.7	3.2	3.7	4.2	4.7	5.3	5.8	6.3	6.8	7.3	7.9	8.3	10
15	2.5	2.9	3.5	4.0	4.5	5.0	5.6	6.1	6.6	7.1	7.7	8.2	8.7	15
20	2.8	3.3	3.8	4.4	4.9	5.5	6.0	6.5	7.1	7.6	8.1	8.7	9.2	20
25	3.3	3.8	4.4	4.9	5.5	6.1	6.6	7.1	7.7	8.3	8.8	9.4	9.9	25
30	13.9	14.5	15.0	15.6	16.2	16.8	17.4	18.0	18.6	19.2	19.7	20.3	20.9	30
32	4.2	4.8	5.3	6.0	6.6	7.2	7.8	8.4	9.0	9.6	20.2	0.8	1.4	32
34	4.5	5.1	5.7	6.4	7.0	7.6	8.2	8.8	9.5	20.0	0.7	1.3	1.9	34
36	4.9	5.5	6.1	6.8	7.4	8.0	8.7	9.3	20.0	0.5	1.2	1.8	2.5	36
38	5.3	6.0	6.6	7.2	7.9	8.5	9.2	9.8	0.5	1.1	1.8	2.4	3.1	38
40	15.7	16.4	17.1	17.8	18.4	19.1	19.7	20.4	21.1	21.8	22.4	23.1	23.8	40
41	6.0	6.7	7.3	8.0	8.7	9.4	20.0	0.8	1.4	2.1	2.8	3.5	4.2	41
42	6.2	6.9	7.6	8.3	9.0	9.7	0.4	1.1	1.8	2.5	3.2	3.9	4.6	42
43	6.5	7.2	7.9	8.6	9.3	20.0	0.7	1.4	2.2	2.9	3.6	4.3	5.0	43
44	6.8	7.5	8.2	8.9	9.6	0.4	1.1	1.8	2.6	3.3	4.0	4.7	5.4	44
45	17.1	17.8	18.5	19.3	20.0	20.7	21.5	22.2	23.0	23.7	24.4	25.2	25.9	45
46	7.4	8.2	8.9	9.6	0.4	1.1	1.9	2.6	3.4	4.1	4.9	5.7	6.4	46
47	7.7	8.5	9.3	20.0	0.8	1.5	2.3	3.1	3.8	4.6	5.4	6.2	6.9	47
48	8.1	8.9	9.7	0.4	1.2	2.0	2.8	3.6	4.3	5.1	5.9	6.7	7.5	48
49	8.5	9.3	20.1	0.8	1.6	2.4	3.2	4.1	4.9	5.7	6.5	7.3	8.1	49
50	18.9	19.7	20.5	21.3	22.1	22.9	23.7	24.6	25.4	26.2	27.0	27.9	28.7	50
51	9.3	20.1	0.9	1.8	2.6	3.5	4.3	5.1	6.0	6.8	7.6	8.5	9.4	51
52	9.7	0.6	1.4	2.3	3.1	4.0	4.9	5.7	6.6	7.5	8.3	9.2	30.1	52
53	20.2	1.1	1.9	2.8	3.7	4.6	5.5	6.4	7.3	8.2	9.0	30.0	0.9	53
54	0.7	1.6	2.5	3.4	4.3	5.2	6.1	7.1	8.0	8.9	9.8	0.8	1.7	54
55	21.2	22.2	23.1	24.0	24.9	25.9	26.8	27.8	28.7	29.7	30.6	31.6	32.6	55
56	1.8	2.8	3.7	4.7	5.6	6.6	7.6	8.6	9.5	30.5	1.5	2.5	3.6	56
57	2.4	3.4	4.4	5.4	6.4	7.4	8.4	9.4	30.4	1.4	2.5	3.5	4.6	57
58	3.1	4.1	5.1	6.1	7.2	8.2	9.2	30.3	1.3	2.4	3.5	4.6	5.7	58
59	3.8	4.8	5.9	6.9	8.0	9.1	30.2	1.3	2.3	3.5	4.6	5.7	6.9	59
60	24.6	25.6	26.7	27.8	28.9	30.1	31.2	32.3	33.4	34.6	35.8	36.9	38.2	60
61	5.4	6.5	7.6	8.8	9.9	1.1	2.2	3.5	4.6	5.8	7.1	8.3	9.6	61
62	6.3	7.5	8.6	9.8	31.0	2.2	3.4	4.7	5.9	7.2	8.5	9.8	41.2	62
63	7.2	8.5	9.7	31.0	2.2	3.5	4.7	6.1	7.4	8.7	40.1	41.5	2.9	63
64	8.3	9.6	30.9	2.2	3.5	4.8	6.2	7.6	9.0	40.4	1.8	3.3	4.8	64
65.0	29.5	30.8	32.2	33.5	34.9	36.3	37.8	39.2	40.7	42.2	43.8	45.4	47.0	65.0
5.5	30.1	1.5	2.9	4.3	5.7	7.1	8.6	40.1	1.6	3.2	4.8	6.5	8.2	5.5
6.0	0.7	2.2	3.6	5.0	6.5	8.0	9.5	1.1	2.7	4.3	5.9	7.7	9.4	6.0
6.5	1.4	2.9	4.3	5.8	7.3	8.9	40.5	2.1	3.8	5.4	7.1	8.9	50.8	6.5
7.0	2.1	3.6	5.1	6.7	8.2	9.8	1.5	3.2	4.9	6.6	8.4	50.3	2.3	7.0
67.5	32.9	34.4	36.0	37.6	39.2	40.8	42.6	44.3	46.1	47.9	49.8	51.8	53.9	67.5
8.0	3.7	5.3	6.9	8.6	40.2	1.9	3.7	5.5	7.4	9.3	51.3	3.4	5.6	8.0
8.5	4.6	6.2	7.9	9.6	1.3	3.1	4.9	6.8	8.8	50.8	2.9	5.1	7.5	8.5
9.0	5.5	7.2	8.9	40.7	2.5	4.3	6.2	8.2	50.3	2.4	4.6	7.0	9.6	9.0
9.5	6.4	8.2	40.0	1.8	3.7	5.6	7.6	9.7	1.9	4.2	6.5	9.1	61.9	9.5
70.0	37.4	39.3	41.1	43.0	45.0	47.0	49.2	51.4	53.7	56.1	58.7	61.5	64.6	70.0
0.5	8.5	40.4	2.4	4.4	6.4	8.6	50.8	3.2	5.7	8.3	61.1	4.3	7.8	0.5
1.0	9.7	1.7	3.7	5.8	8.0	50.3	2.6	5.2	7.9	60.7	3.9	7.5	71.7	1.0
1.5	40.9	3.0	5.1	7.4	9.7	2.1	4.6	7.4	60.3	3.5	7.1	71.4	6.9	1.5
2.0	2.3	4.4	6.7	9.1	51.5	4.1	6.9	9.9	3.1	6.8	71.1	6.7	90.0	2.0
72.5	43.7	46.0	48.4	50.9	53.6	56.4	59.4	62.7	66.4	70.9	76.5	90.0		72.5
3.0	5.3	7.7	50.3	3.0	5.9	8.9	62.2	6.1	70.6	6.3	90.0			3.0
3.5	7.0	9.6	2.3	5.3	8.4	61.8	5.6	70.3	6.1	90.0				3.5
4.0	8.9	51.7	4.7	7.9	61.4	5.3	9.8	75.9	90.0					4.0
4.5	51.1	4.1	7.3	60.9	4.9	9.5	75.5	90.0						4.5

TABLE 27.

Amplitudes.

Latitude.	Declination. 18°.0	18°.5	19°.0	19°.5	20°.0	20°.5	21°.0	21°.5	22°.0	22°.5	23°.0	23°.5	24°.0	Latitude.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	18.0	18.5	19.0	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	0
10	8.3	8.8	9.3	9.8	0.3	0.8	1.3	1.8	2.3	2.9	3.4	3.9	4.4	10
15	8.7	9.2	9.7	20.2	0.7	1.3	1.8	2.3	2.8	3.3	3.9	4.4	4.9	15
20	9.2	9.7	20.3	0.8	1.4	1.9	2.4	3.0	3.5	4.0	4.6	5.1	5.7	20
25	9.9	20.5	1.1	1.6	2.2	2.7	3.3	3.9	4.4	5.0	5.5	6.1	6.7	25
30	20.9	21.5	22.1	22.7	23.3	23.8	24.4	25.0	25.6	26.2	26.8	27.4	28.0	30
32	1.4	2.0	2.6	3.2	3.8	4.4	5.0	5.6	6.2	6.8	7.4	8.0	8.7	32
34	1.9	2.5	3.1	3.8	4.4	5.0	5.6	6.2	6.9	7.5	8.1	8.7	9.4	34
36	2.5	3.1	3.7	4.4	5.0	5.7	6.3	6.9	7.6	8.2	8.9	9.5	30.2	36
38	3.1	3.8	4.4	5.1	5.7	6.4	7.0	7.7	8.4	9.1	9.7	30.4	1.1	38
40	23.9	24.4	25.1	25.8	26.5	27.2	27.9	28.6	29.3	30.0	30.7	31.3	32.1	40
41	4.2	4.8	5.5	6.2	6.9	7.7	8.3	9.1	9.8	0.5	1.2	1.8	2.6	41
42	4.6	5.3	6.0	6.7	7.4	8.1	8.8	9.6	30.3	1.0	1.7	2.4	3.2	42
43	5.0	5.7	6.4	7.2	7.9	8.6	9.3	30.1	0.8	1.6	2.3	3.0	3.8	43
44	5.4	6.2	6.9	7.7	8.4	9.1	9.8	0.6	1.4	2.2	2.9	3.6	4.4	44
45	25.9	26.7	27.4	28.2	28.9	29.7	30.4	31.2	32.0	32.8	33.5	34.3	35.1	45
46	6.4	7.2	7.9	8.7	9.5	30.3	1.0	1.8	2.6	3.4	4.2	5.0	5.8	46
47	6.9	7.7	8.5	9.3	30.1	0.9	1.7	2.5	3.3	4.1	4.9	5.7	6.6	47
48	7.5	8.3	9.1	9.9	0.7	1.6	2.4	3.2	4.0	4.9	5.7	6.5	7.4	48
49	8.1	8.9	9.7	30.6	1.4	2.3	3.1	4.0	4.8	5.7	6.5	7.4	8.3	49
50	28.7	29.6	30.4	31.3	32.1	33.0	33.9	34.8	35.6	36.5	37.4	38.3	39.2	50
51	9.4	30.3	1.1	2.0	2.9	3.8	4.7	5.6	6.5	7.4	8.4	9.3	40.2	51
52	30.1	1.0	1.9	2.8	3.7	4.7	5.6	6.5	7.5	8.4	9.4	40.3	1.3	52
53	0.9	1.8	2.7	3.7	4.6	5.6	6.6	7.5	8.5	9.5	40.5	1.4	2.5	53
54	1.7	2.7	3.6	4.6	5.6	6.6	7.6	8.6	9.6	40.6	1.7	2.6	3.8	54
55	32.6	33.6	34.6	35.6	36.6	37.6	38.7	39.7	40.8	41.9	42.9	44.0	45.2	55
56	3.6	4.6	5.6	6.7	7.7	8.8	9.8	41.0	2.1	3.2	4.3	5.4	6.7	56
57	4.6	5.6	6.7	7.8	8.9	40.0	41.1	2.3	3.5	4.6	5.8	7.0	8.3	57
58	5.7	6.8	7.9	9.1	40.2	1.4	2.5	3.8	5.0	6.2	7.5	8.8	50.1	58
59	6.9	8.0	9.2	40.4	1.6	2.8	4.1	5.4	6.7	8.0	9.3	50.7	2.2	59
60.0	38.2	39.4	40.6	41.9	43.2	44.5	45.8	47.2	48.6	49.9	51.4	52.9	54.4	60.0
0.5	8.9	40.1	1.4	2.7	4.0	5.4	6.7	8.1	9.6	51.0	2.5	4.1	5.7	0.5
1.0	9.6	0.9	2.2	3.5	4.9	6.3	7.7	9.1	50.6	2.1	3.7	5.3	7.0	1.0
1.5	40.4	1.7	3.0	4.4	5.8	7.3	8.7	50.2	1.7	3.3	5.0	6.7	8.5	1.5
2.0	1.2	2.5	3.9	5.3	6.8	8.3	9.8	1.3	2.9	4.6	6.3	8.1	60.0	2.0
62.5	42.0	43.4	44.9	46.3	47.8	49.4	51.0	52.6	54.2	56.0	57.8	59.7	61.7	62.5
3.0	2.9	4.3	5.9	7.4	8.9	50.5	2.2	3.9	5.6	7.5	9.4	61.4	3.6	3.0
3.5	3.8	5.3	6.9	8.5	50.1	1.7	3.5	5.3	7.1	9.1	61.1	3.4	5.7	3.5
4.0	4.8	6.4	8.0	9.7	1.3	3.0	4.9	6.7	8.7	60.7	3.0	5.5	8.1	4.0
4.5	5.9	7.5	9.2	50.9	2.6	4.5	6.4	8.4	60.5	2.8	5.2	7.8	70.9	4.5
65.0	47.0	48.7	50.4	52.2	54.0	56.0	58.0	60.2	62.5	64.9	67.6	70.6	74.4	65.0
5.5	8.2	50.0	1.8	3.6	5.6	7.6	9.8	2.2	4.7	7.3	70.4	4.1	8.9	5.5
6.0	9.4	1.3	3.2	5.1	7.3	9.4	61.8	4.4	7.1	70.2	3.8	8.6	90.0	6.0
6.5	50.8	2.7	4.7	6.8	9.1	61.4	4.0	6.8	70.0	3.7	8.4	90.0		6.5
7.0	2.3	4.3	6.4	8.7	61.1	3.7	6.5	9.8	3.5	8.3	90.0			7.0
67.5	53.9	56.0	58.3	60.7	63.4	66.2	69.5	73.3	78.2	90.0				67.5
8.0	5.6	7.9	60.3	3.0	5.9	9.2	73.0	8.1	90.0					8.0
8.5	7.5	60.0	2.6	5.6	8.9	72.8	7.9	90.0						8.5
9.0	9.6	2.3	5.3	8.7	72.7	7.7	90.0							9.0
9.5	61.9	5.0	8.4	72.4	7.6	90.0								9.5
70.0	64.6	69.1	72.2	77.4	90.0									70.0
0.5	7.8	71.9	7.2	90.0										0.5
1.0	71.7	7.1	90.0											1.0
1.5	6.9	90.0												1.5
2.0	90.0													2.0

TABLE 27.

Amplitudes.

Latitude.	Declination. 24°.0	24°.5	25°.0	25°.5	26°.0	26°.5	27°.0	27°.5	28°.0	28°.5	29°.0	29°.5	30°.0	Latitude.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0	28.5	29.0	29.5	30.0	0
4	4.1	4.6	5.1	5.6	6.1	6.6	7.1	7.6	8.1	8.6	9.1	9.6	0.1	4
8	4.3	4.8	5.3	5.8	6.3	6.8	7.3	7.8	8.3	8.8	9.3	9.8	0.3	8
12	4.6	5.1	5.6	6.1	6.6	7.1	7.6	8.1	8.7	9.2	9.7	30.2	0.7	12
16	5.0	5.6	6.1	6.6	7.1	7.6	8.2	8.7	9.2	9.8	30.3	0.8	1.3	16
20	25.7	26.2	26.7	27.3	27.8	28.3	28.9	29.4	30.0	30.5	31.1	31.6	32.1	20
22	6.0	6.6	7.1	7.7	8.2	8.8	9.3	9.9	0.4	1.0	1.5	2.1	2.6	22
24	6.4	7.0	7.6	8.1	8.7	9.2	9.8	30.4	0.9	1.5	2.0	2.6	3.2	24
26	6.9	7.5	8.1	8.6	9.2	9.7	30.3	0.9	1.5	2.1	2.6	3.2	3.8	26
28	7.4	8.0	8.6	9.2	9.8	30.3	0.9	1.5	2.1	2.7	3.3	3.9	4.5	28
30	28.0	28.6	29.2	29.8	30.4	31.0	31.6	32.2	32.8	33.4	34.0	34.7	35.3	30
31	8.3	8.9	9.5	30.1	0.8	1.4	2.0	2.6	3.2	3.8	4.5	5.1	5.7	31
32	8.7	9.3	9.9	0.5	1.1	1.7	2.4	3.0	3.6	4.2	4.9	5.5	6.1	32
33	9.0	9.6	30.2	0.9	1.5	2.1	2.8	3.4	4.0	4.7	5.3	6.0	6.6	33
34	9.4	30.0	0.6	31.3	1.9	2.6	3.2	3.8	4.5	5.1	5.8	6.4	7.1	34
35	29.8	30.4	31.1	31.7	32.3	33.0	33.6	34.3	35.0	35.6	36.3	36.9	37.6	35
36	30.2	0.8	1.5	2.1	2.8	3.5	4.1	4.8	5.5	6.1	6.8	7.5	8.2	36
37	0.6	1.3	1.9	2.6	3.3	4.0	4.6	5.3	6.0	6.7	7.4	8.1	8.8	37
38	1.1	1.7	2.4	3.1	3.8	4.5	5.2	5.9	6.6	7.3	8.0	8.7	9.4	38
39	1.6	2.2	2.9	3.6	4.3	5.0	5.7	6.5	7.2	7.9	8.6	9.3	40.0	39
40	32.1	32.8	33.5	34.2	34.9	35.6	36.3	37.1	37.8	38.5	39.3	40.0	40.7	40
41	2.6	3.3	4.1	4.8	5.5	6.2	7.0	7.7	8.5	9.2	40.0	0.7	1.5	41
42	3.2	3.9	4.7	5.4	6.1	6.9	7.7	8.4	9.2	9.9	0.7	1.5	2.3	42
43	3.8	4.5	5.3	6.1	6.8	7.6	8.4	9.2	9.9	40.7	1.5	2.3	3.1	43
44	4.4	5.2	6.0	6.8	7.5	8.3	9.1	40.0	40.7	1.6	2.4	3.2	4.0	44
45	35.1	35.9	36.7	37.5	38.3	39.1	39.9	40.8	41.6	42.5	43.3	44.1	45.0	45
46	5.8	6.6	7.5	8.3	9.1	40.0	40.8	1.7	2.5	3.4	4.3	5.1	6.0	46
47	6.6	7.4	8.3	9.1	40.0	0.9	1.7	2.6	3.5	4.4	5.3	6.2	7.1	47
48	7.4	8.3	9.2	40.0	0.9	1.8	2.7	3.6	4.6	5.5	6.4	7.4	8.3	48
49	8.3	9.2	40.1	1.0	1.9	2.8	3.8	4.7	5.7	6.7	7.6	8.6	9.6	49
50	39.2	40.2	41.1	42.0	43.0	43.9	44.9	45.9	46.9	47.9	48.9	50.0	51.1	50
51	40.2	1.2	2.2	3.2	4.1	5.1	6.2	7.2	8.2	9.3	50.4	1.5	2.6	51
52	1.3	2.3	3.3	4.4	5.4	6.4	7.5	8.6	9.7	50.8	2.0	3.1	4.3	52
53	2.5	3.5	4.6	5.7	6.7	7.8	9.0	50.1	51.3	2.5	3.7	4.9	6.2	53
54	3.8	4.9	6.0	7.1	8.2	9.4	50.6	1.8	3.0	4.3	5.6	6.9	8.3	54
55.0	45.2	46.3	47.5	48.6	49.8	51.1	52.3	53.6	54.9	56.3	57.7	59.1	60.7	55.0
5.5	5.9	7.1	8.3	9.5	50.7	2.0	3.3	4.6	6.0	7.4	8.9	60.4	2.0	5.5
6.0	6.7	7.9	9.1	50.4	1.6	2.9	4.3	5.7	7.1	8.6	60.1	1.7	3.4	6.0
6.5	7.5	8.8	50.0	1.3	2.6	3.9	5.4	6.8	8.3	9.9	1.5	3.2	5.0	6.5
7.0	8.3	9.6	0.9	2.2	3.6	5.0	6.5	8.0	9.5	61.2	2.9	4.7	6.6	7.0
57.5	49.2	50.5	51.9	53.2	54.7	56.2	57.7	59.3	60.9	62.6	64.5	66.4	68.5	57.5
8.0	50.1	1.5	2.9	4.3	5.8	7.4	8.9	60.6	2.4	4.2	6.2	8.3	70.7	8.0
8.5	1.1	2.5	4.0	5.5	7.0	8.6	60.3	2.1	3.9	6.0	8.1	70.4	3.1	8.5
9.0	2.2	3.6	5.1	6.7	8.3	60.0	1.8	3.7	5.7	7.9	70.3	3.0	6.2	9.0
9.5	3.3	4.8	6.4	8.0	9.7	1.5	3.4	5.5	7.7	70.1	2.8	5.9	80.1	9.5
60.0	54.4	56.0	57.7	59.4	61.2	63.2	65.2	67.4	69.9	72.6	75.8	80.0	90.0	60.0
0.5	5.7	7.4	9.1	61.0	2.9	5.0	7.2	9.6	72.4	5.8	9.9	90.0		0.5
1.0	7.0	8.8	60.7	2.6	4.7	7.0	9.5	72.3	5.5	9.8	90.0			1.0
1.5	8.5	60.3	2.3	4.4	6.7	9.2	72.0	5.4	9.7	90.0				1.5
2.0	60.0	2.0	4.2	6.5	9.0	71.9	5.2	9.6	90.0					2.0
62.5	61.7	63.9	66.2	68.8	71.7	75.1	9.5	90.0						62.5
3.0	3.6	6.0	8.6	71.5	4.9	9.4	90.0							3.0
3.5	5.7	8.3	71.3	4.8	9.3	90.0								3.5
4.0	8.1	71.1	4.6	9.2	90.0									4.0
4.5	70.9	4.4	9.0	90.0										4.5

TABLE 28.

Correction of the Amplitude as observed on the Apparent Horizon.

Latitude.	Declination. 0°	5°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	Latitude.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
5	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	5
10	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	10
15	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	15
20	.2	.2	.2	.2	.2	.2	.3	.3	.3	.3	.3	.3	.3	20
24	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	24
28	.3	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4	28
32	.4	.4	.4	.4	.4	.4	.4	.5	.5	.5	.5	.5	.5	32
36	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.6	36
38	.5	.5	.5	.5	.6	.6	.6	.6	.6	.6	.6	.7	.7	38
40	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	40
42	.6	.6	.6	.6	.6	.7	.7	.7	.7	.7	.8	.8	.8	42
44	.6	.6	.7	.7	.7	.7	.7	.7	.8	.8	.8	.9	.9	44
46	.7	.7	.7	.7	.7	.8	.8	.8	.8	.9	.9	.9	1.0	46
48	.7	.8	.8	.8	.8	.8	.8	.9	.9	1.0	1.0	1.0	.1	48
50	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	1.0	1.1	1.1	1.1	1.3	50
52	.8	.9	.9	.9	.9	1.0	1.0	1.0	.1	.2	.2	.3	.5	52
54	.9	.9	1.0	1.0	1.0	.1	.1	.1	.2	.3	.4	.5	.8	54
56	1.0	1.0	.1	.1	.1	.2	.2	.2	.3	.5	.6	.8	2.2	56
58	.1	.1	.2	.2	.2	.3	.3	.4	.5	.7	.9	2.3	3.2	58
60	1.2	1.2	1.3	1.3	1.3	1.4	1.5	1.6	1.7	2.0	2.4	3.4		60
62	.3	.3	.4	.4	.4	.6	.7	.8	2.1	.5	3.5			62
64	.4	.4	.5	.5	.6	.8	.9	2.2	.6	3.7				64
66	.5	.5	.7	.7	.9	2.0	2.3	.8	3.8					66
68	.6	.7	.9	2.0	2.2	.4	.9	4.0						68
70	1.8	1.9	2.1	2.3	2.6	3.1	4.3							70
72	2.0	2.1	.5	.8	3.3	4.6								72
74	.2	.5	3.0	3.5	4.8									74
76	.6	3.0	.8	5.2										76
78	3.1	.6	5.7											78
80	3.8	4.4												80

66806°—38——11

TABLE 29.

Variation of Altitude in one minute from meridian passage.

Latitude.	Declination of the same name as the latitude; upper transit; reduction additive.												Latitude.
	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	
°	″	″	″	″	″	″	″	″	″	″	″	″	°
0					28.1	22.4	18.7	16.0	14.0	12.4	11.1	10.1	0
1						28.0	22.4	18.6	16.0	13.9	12.4	11.1	1
2							28.0	22.3	18.6	15.9	13.9	12.3	2
3								27.9	22.3	18.5	15.8	13.8	3
4	28.1								27.8	22.2	18.5	15.8	4
5	22.4	28.0								27.7	22.1	18.4	5
6	18.7	22.4	28.0								27.6	22.0	6
7	16.0	18.6	22.3	27.9								27.4	7
8	14.0	16.0	18.6	22.3	27.8								8
9	12.4	13.9	15.9	18.5	22.2	27.7							9
10	11.1	12.4	13.9	15.8	18.5	22.1	27.6						10
11	10.1	11.1	12.3	13.8	15.8	18.4	22.0	27.4					11
12	9.2	10.1	11.1	12.3	13.8	15.7	18.3	21.9	27.3				12
13	8.5	9.2	10.0	11.0	12.2	13.7	15.6	18.2	21.7	27.1			13
14	7.9	8.5	9.2	10.0	10.9	12.1	13.6	15.5	18.0	21.6	26.9		14
15	7.3	7.8	8.4	9.1	9.9	10.9	12.1	13.5	15.4	17.9	21.4	26.7	15
16	6.8	7.3	7.8	8.4	9.1	9.8	10.8	12.0	13.4	15.3	17.8	21.3	16
17	6.4	6.8	7.2	7.8	8.3	9.0	9.8	10.7	11.9	13.3	15.2	17.6	17
18	6.0	6.4	6.8	7.2	7.7	8.3	8.9	9.7	10.6	11.8	13.2	15.0	18
19	5.7	6.0	6.3	6.7	7.2	7.6	8.2	8.9	9.6	10.6	11.7	13.1	19
20	5.4	5.7	6.0	6.3	6.7	7.1	7.6	8.1	8.8	9.5	10.5	11.6	20
21	5.1	5.4	5.6	5.9	6.3	6.6	7.0	7.5	8.1	8.7	9.5	10.4	21
22	4.9	5.1	5.3	5.6	5.9	6.2	6.6	7.0	7.5	8.0	8.6	9.4	22
23	4.6	4.8	5.0	5.3	5.5	5.8	6.1	6.5	6.9	7.4	7.9	8.5	23
24	4.4	4.6	4.8	5.0	5.2	5.5	5.8	6.1	6.4	6.8	7.3	7.8	24
25	4.2	4.4	4.6	4.7	5.0	5.2	5.4	5.7	6.0	6.4	6.8	7.2	25
26	4.0	4.2	4.3	4.5	4.7	4.9	5.1	5.4	5.7	6.0	6.3	6.7	26
27	3.9	4.0	4.1	4.3	4.5	4.7	4.9	5.1	5.3	5.6	5.9	6.2	27
28	3.7	3.8	4.0	4.1	4.3	4.4	4.6	4.8	5.0	5.3	5.5	5.8	28
29	3.5	3.7	3.8	3.9	4.1	4.2	4.4	4.6	4.7	5.0	5.2	5.5	29
30	3.4	3.5	3.6	3.7	3.9	4.0	4.2	4.3	4.5	4.7	4.9	5.1	30
31	3.3	3.4	3.5	3.6	3.7	3.8	4.0	4.1	4.3	4.4	4.6	4.8	31
32	3.1	3.2	3.3	3.4	3.5	3.7	3.8	3.9	4.1	4.2	4.4	4.6	32
33	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.9	4.0	4.2	4.3	33
34	2.9	3.0	3.1	3.2	3.2	3.3	3.4	3.6	3.7	3.8	3.9	4.1	34
35	2.8	2.9	3.0	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.9	35
36	2.7	2.8	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	36
37	2.6	2.7	2.7	2.8	2.9	2.9	3.0	3.1	3.2	3.3	3.4	3.5	37
38	2.5	2.6	2.6	2.7	2.8	2.8	2.9	3.0	3.0	3.2	3.2	3.3	38
39	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.9	2.9	3.0	3.1	3.2	39
40	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9	3.0	3.0	40
41	2.3	2.3	2.4	2.4	2.5	2.5	2.6	2.6	2.7	2.8	2.8	2.9	41
42	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.5	2.6	2.6	2.7	2.8	42
43	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.5	2.6	2.7	43
44	2.0	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.5	44
45	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.4	2.4	45
46	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.3	2.3	46
47	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.2	47
48	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.1	48
49	1.7	1.7	1.8	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.1	49
50	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.9	1.9	1.9	2.0	50
51	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.9	1.9	51
52	1.5	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.8	52
53	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	53
54	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.7	54
55	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	55
56	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	56
57	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.5	57
58	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	58
59	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	59
60	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	60
	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	
	Declination of the same name as the latitude; upper transit; reduction additive.												

TABLE 29.

Variation of Altitude in one minute from meridian passage.

Latitude.	Declination of the **same** name as the latitude; **upper** transit; reduction **additive.**													Latitude.
	12°	**13°**	**14°**	**15°**	**16°**	**17°**	**18°**	**19°**	**20°**	**21°**	**22°**	**23°**	**24°**	
°	′	′	′	′	′	′	′	′	′	′	′	′	′	°
0	9.2	8.5	7.9	7.3	6.8	6.4	6.0	5.7	5.4	5.1	4.9	4.6	4.4	0
1	10.1	9.2	8.5	7.8	7.3	6.8	6.4	6.0	5.7	5.4	5.1	4.8	4.6	1
2	11.1	10.0	9.2	8.4	7.8	7.2	6.8	6.3	6.0	5.6	5.3	5.0	4.8	2
3	12.3	11.0	10.0	9.1	8.4	7.8	7.2	6.7	6.3	5.9	5.6	5.3	5.0	3
4	13.8	12.2	10.9	9.9	9.1	8.3	7.7	7.2	6.7	6.3	5.9	5.5	5.2	4
5	15.7	13.7	12.1	10.9	9.8	9.0	8.3	7.6	7.1	6.6	6.2	5.8	5.5	5
6	18.3	15.6	13.6	12.1	10.8	9.8	8.9	8.2	7.6	7.0	6.6	6.1	5.8	6
7	21.9	18.2	15.5	13.5	12.0	10.7	9.7	8.9	8.1	7.5	7.0	6.5	6.1	7
8	27.3	21.7	18.0	15.4	13.4	11.9	10.6	9.6	8.8	8.1	7.5	6.9	6.4	8
9		27.1	21.6	17.9	15.3	13.3	11.8	10.6	9.5	8.7	8.0	7.4	6.8	9
10			26.9	21.4	17.8	15.2	13.2	11.7	10.5	9.5	8.6	7.9	7.3	10
11				26.7	21.3	17.6	15.0	13.1	11.6	10.4	9.4	8.5	7.8	11
12					26.5	21.1	17.5	14.9	13.0	11.5	10.3	9.3	8.4	12
13						26.2	20.9	17.3	14.8	12.8	11.3	10.1	9.2	13
14							26.0	20.7	17.1	14.6	12.7	11.2	10.0	14
15								25.7	20.4	16.9	14.4	12.5	11.1	15
16	26.5								25.4	20.2	16.7	14.3	12.4	16
17	21.1	26.2								25.1	20.0	16.5	14.1	17
18	17.5	20.9	26.0								24.8	19.7	16.3	18
19	14.9	17.3	20.7	25.7								24.5	19.5	19
20	13.0	14.8	17.1	20.4	25.4								24.2	20
21	11.5	12.8	14.6	16.9	20.2	25.1								21
22	10.3	11.3	12.7	14.4	16.7	20.0	24.8							22
23	9.3	10.1	11.2	12.5	14.3	16.5	19.7	24.5						23
24	8.4	9.2	10.0	11.1	12.4	14.1	16.3	19.5	24.2					24
25	7.7	8.3	9.0	9.9	10.9	12.2	13.9	16.1	19.2	23.8				25
26	7.1	7.6	8.2	8.9	9.8	10.8	12.1	13.7	15.9	18.9	23.5			26
27	6.6	7.0	7.5	8.1	8.8	9.6	10.6	11.9	13.5	15.6	18.6	23.1		27
28	6.2	6.5	7.0	7.4	8.0	8.7	9.5	10.5	11.7	13.3	15.4	18.3	22.7	28
29	5.7	6.1	6.4	6.9	7.3	7.9	8.6	9.4	10.3	11.5	13.1	15.1	18.0	29
30	5.4	5.7	6.0	6.4	6.8	7.2	7.8	8.4	9.2	10.1	11.3	12.8	14.9	30
31	5.1	5.3	5.6	5.9	6.3	6.7	7.1	7.7	8.3	9.0	10.0	11.1	12.6	31
32	4.8	5.0	5.2	5.5	5.8	6.2	6.5	7.0	7.5	8.1	8.9	9.8	10.9	32
33	4.5	4.7	4.9	5.1	5.4	5.7	6.1	6.4	6.9	7.4	8.0	8.7	9.6	33
34	4.3	4.4	4.6	4.8	5.1	5.3	5.6	5.9	6.3	6.8	7.3	7.8	8.6	34
35	4.0	4.2	4.4	4.5	4.7	5.0	5.2	5.5	5.8	6.2	6.6	7.1	7.7	35
36	3.8	4.0	4.1	4.3	4.5	4.7	4.9	5.1	5.4	5.7	6.1	6.5	7.0	36
37	3.6	3.8	3.9	4.0	4.2	4.4	4.6	4.8	5.0	5.3	5.6	6.0	6.4	37
38	3.4	3.6	3.7	3.8	4.0	4.1	4.3	4.5	4.7	4.9	5.2	5.5	5.8	38
39	3.3	3.4	3.5	3.6	3.8	3.9	4.0	4.2	4.4	4.6	4.8	5.1	5.4	39
40	3.1	3.2	3.3	3.4	3.6	3.7	3.8	4.0	4.1	4.3	4.5	4.7	5.0	40
41	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.9	4.0	4.2	4.4	4.6	41
42	2.9	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.7	3.8	4.0	4.1	4.3	42
43	2.7	2.8	2.9	3.0	3.0	3.1	3.2	3.3	3.5	3.6	3.7	3.9	4.0	43
44	2.6	2.7	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.8	44
45	2.5	2.6	2.6	2.7	2.8	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	45
46	2.4	2.4	2.5	2.6	2.6	2.7	2.8	2.8	2.9	3.0	3.1	3.2	3.3	46
47	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	2.9	2.9	3.0	3.1	47
48	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0	48
49	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	49
50	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	50
51	1.9	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	51
52	1.8	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.2	2.2	2.3	2.4	52
53	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.2	2.2	53
54	1.7	1.7	1.7	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.1	2.1	54
55	1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0	55
56	1.5	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.9	1.9	56
57	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.8	1.8	57
58	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.7	1.7	58
59	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	59
60	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	60
	12°	**13°**	**14°**	**15°**	**16°**	**17°**	**18°**	**19°**	**20°**	**21°**	**22°**	**23°**	**24°**	
	Declination of the **same** name as the latitude; **upper** transit; reduction **additive.**													

TABLE 29.

Variation of Altitude in one minute from meridian passage.

Latitude.	Declination of the same name as the latitude; upper transit; reduction additive.													Latitude.
	25°	26°	27°	28°	29°	30°	31°	32°	33°	34°	35°	36°	37°	
°	″	″	″	″	″	″	″	″	″	″	″	″	″	°
0	4.2	4.0	3.9	3.7	3.5	3.4	3.3	3.1	3.0	2.9	2.8	2.7	2.6	0
1	4.4	4.2	4.0	3.8	3.7	3.5	3.4	3.2	3.1	3.0	2.9	2.8	2.7	1
2	4.6	4.3	4.1	4.0	3.8	3.6	3.5	3.3	3.2	3.1	3.0	2.8	2.7	2
3	4.7	4.5	4.3	4.1	3.9	3.7	3.6	3.4	3.3	3.2	3.0	2.9	2.8	3
4	5.0	4.7	4.5	4.3	4.1	3.9	3.7	3.5	3.4	3.3	3.1	3.0	2.9	4
5	5.2	4.9	4.7	4.4	4.2	4.0	3.8	3.7	3.5	3.3	3.2	3.1	3.0	5
6	5.4	5.1	4.9	4.6	4.4	4.2	4.0	3.8	3.6	3.5	3.3	3.2	3.0	6
7	5.7	5.4	5.1	4.8	4.6	4.3	4.1	3.9	3.7	3.6	3.4	3.3	3.1	7
8	6.0	5.7	5.3	5.0	4.8	4.5	4.3	4.1	3.9	3.7	3.5	3.4	3.2	8
9	6.4	6.0	5.6	5.3	5.0	4.7	4.4	4.2	4.0	3.8	3.6	3.5	3.3	9
10	6.8	6.3	5.9	5.5	5.2	4.9	4.6	4.4	4.2	3.9	3.8	3.6	3.4	10
11	7.2	6.7	6.2	5.8	5.5	5.1	4.8	4.6	4.3	4.1	3.9	3.7	3.5	11
12	7.7	7.1	6.6	6.2	5.8	5.4	5.1	4.8	4.5	4.3	4.0	3.8	3.6	12
13	8.3	7.6	7.1	6.5	6.1	5.7	5.3	5.0	4.7	4.4	4.2	4.0	3.8	13
14	9.1	8.2	7.6	7.0	6.4	6.0	5.6	5.2	4.9	4.6	4.4	4.1	3.9	14
15	9.9	8.9	8.1	7.4	6.9	6.4	5.9	5.5	5.2	4.8	4.5	4.3	4.0	15
16	10.9	9.8	8.8	8.0	7.3	6.8	6.3	5.8	5.4	5.1	4.8	4.5	4.2	16
17	12.2	10.8	9.6	8.7	7.9	7.2	6.7	6.2	5.7	5.3	5.0	4.7	4.4	17
18	13.9	12.1	10.6	9.5	8.6	7.8	7.1	6.6	6.1	5.6	5.2	4.9	4.6	18
19	16.1	13.7	11.9	10.5	9.4	8.4	7.7	7.0	6.4	6.0	5.5	5.1	4.8	19
20	19.2	15.9	13.5	11.7	10.3	9.2	8.3	7.5	6.9	6.3	5.8	5.4	5.0	20
21	23.8	18.9	15.6	13.3	11.5	10.2	9.1	8.2	7.4	6.8	6.2	5.7	5.3	21
22		23.5	18.6	15.4	13.1	11.3	10.0	8.9	8.0	7.3	6.6	6.1	5.6	22
23			23.1	18.3	15.1	12.8	11.1	9.8	8.7	7.9	7.1	6.5	6.0	23
24				22.7	18.0	14.9	12.6	10.9	9.6	8.6	7.7	7.0	6.4	24
25					22.3	17.7	14.6	12.4	10.7	9.4	8.4	7.5	6.8	25
26						21.9	17.4	14.3	12.1	10.5	9.2	8.2	7.4	26
27							21.5	17.0	14.0	11.9	10.3	9.1	8.1	27
28								21.1	16.7	13.8	11.7	10.1	8.9	28
29	22.3								20.6	16.3	13.5	11.4	9.9	29
30	17.7	21.9								20.2	16.0	13.2	11.1	30
31	14.6	17.4	21.5								19.8	15.6	12.9	31
32	12.4	14.3	17.0	21.1								19.3	15.3	32
33	10.7	12.1	14.0	16.7	20.6								18.9	33
34	9.4	10.5	11.9	13.8	16.3	20.2								34
35	8.4	9.2	10.3	11.7	13.5	16.0	19.8							35
36	7.5	8.2	9.1	10.1	11.4	13.2	15.6	19.3						36
37	6.8	7.4	8.1	8.9	9.9	11.1	12.9	15.3	18.9					37
38	6.2	6.7	7.2	7.9	8.7	9.6	10.9	12.6	14.9	18.4				38
39	5.7	6.1	6.5	7.1	7.7	8.5	9.4	10.6	12.2	14.5	17.9			39
40	5.3	5.6	6.0	6.4	6.9	7.5	8.2	9.2	10.4	11.9	14.1	17.4		40
41	4.9	5.2	5.5	5.8	6.2	6.7	7.3	8.0	8.9	10.1	11.6	13.8	17.0	41
42	4.5	4.8	5.0	5.3	5.7	6.1	6.6	7.1	7.8	8.7	9.8	11.3	13.4	42
43	4.2	4.4	4.6	4.9	5.2	5.5	5.9	6.4	6.9	7.6	8.5	9.5	11.0	43
44	3.9	4.1	4.3	4.5	4.8	5.1	5.4	5.8	6.2	6.7	7.4	8.2	9.3	44
45	3.7	3.8	4.0	4.2	4.4	4.7	4.9	5.2	5.6	6.0	6.6	7.2	8.0	45
46	3.5	3.6	3.7	3.9	4.1	4.3	4.5	4.8	5.1	5.4	5.9	6.4	7.0	46
47	3.3	3.4	3.5	3.6	3.8	4.0	4.2	4.4	4.6	4.9	5.3	5.7	6.2	47
48	3.1	3.2	3.3	3.4	3.5	3.7	3.9	4.0	4.3	4.5	4.8	5.1	5.5	48
49	2.9	3.0	3.1	3.2	3.3	3.4	3.6	3.7	3.9	4.1	4.4	4.6	5.0	49
50	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.5	3.6	3.8	4.0	4.2	4.5	50
51	2.6	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.4	3.5	3.7	3.9	4.1	51
52	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.4	3.6	3.7	52
53	2.3	2.3	2.4	2.5	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.3	3.4	53
54	2.2	2.2	2.3	2.3	2.4	2.5	2.5	2.6	2.7	2.8	2.9	3.0	3.2	54
55	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.7	2.8	2.9	55
56	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.6	2.7	56
57	1.8	1.9	1.9	2.0	2.0	2.0	2.1	2.2	2.2	2.3	2.3	2.4	2.5	57
58	1.7	1.8	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.3	58
59	1.6	1.7	1.7	1.7	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.1	2.2	59
60	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.9	1.9	2.0	2.0	60
	25°	26°	27°	28°	29°	30°	31°	32°	33°	34°	35°	36°	37°	
	Declination of the same name as the latitude; upper transit; reduction additive.													

TABLE 29.

Variation of Altitude in one minute from meridian passage.

Latitude.	Declination of the same name as the latitude; upper transit; reduction additive.													Latitude.
	38°	39°	40°	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°	
°	″	″	″	″	″	″	″	″	″	″	″	″	″	°
0	2.5	2.4	2.3	2.3	2.2	2.1	2.0	2.0	1.9	1.8	1.8	1.7	1.7	0
1	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2.0	1.9	1.9	1.8	1.7	1.7	1
2	2.6	2.5	2.4	2.4	2.3	2.2	2.1	2.0	2.0	1.9	1.8	1.8	1.7	2
3	2.7	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2.0	1.9	1.9	1.8	1.7	3
4	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0	2.0	1.9	1.8	1.8	4
5	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2.0	1.9	1.9	1.8	5
6	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0	2.0	1.9	1.8	6
7	3.0	2.9	2.7	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2.0	1.9	1.8	7
8	3.1	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.9	8
9	3.2	3.0	2.9	2.8	2.7	2.5	2.4	2.3	2.2	2.2	2.1	2.0	1.9	9
10	3.3	3.1	3.0	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	10
11	3.4	3.2	3.1	2.9	2.8	2.7	2.6	2.4	2.3	2.2	2.1	2.1	2.0	11
12	3.5	3.3	3.1	3.0	2.9	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0	12
13	3.6	3.4	3.2	3.1	2.9	2.8	2.7	2.6	2.4	2.3	2.2	2.1	2.0	13
14	3.7	3.5	3.3	3.2	3.0	2.9	2.7	2.6	2.5	2.4	2.3	2.2	2.1	14
15	3.8	3.6	3.4	3.3	3.1	3.0	2.8	2.7	2.6	2.4	2.3	2.2	2.1	15
16	4.0	3.8	3.6	3.4	3.2	3.0	2.9	2.8	2.6	2.5	2.4	2.3	2.2	16
17	4.1	3.9	3.7	3.5	3.3	3.1	3.0	2.8	2.7	2.6	2.4	2.3	2.2	17
18	4.3	4.1	3.8	3.6	3.4	3.2	3.1	2.9	2.8	2.6	2.5	2.4	2.3	18
19	4.5	4.2	4.0	3.7	3.5	3.3	3.2	3.0	2.8	2.7	2.6	2.4	2.3	19
20	4.7	4.4	4.1	3.9	3.7	3.5	3.3	3.1	2.9	2.8	2.6	2.5	2.4	20
21	4.9	4.6	4.3	4.0	3.8	3.6	3.4	3.2	3.0	2.9	2.7	2.6	2.4	21
22	5.2	4.8	4.5	4.2	4.0	3.7	3.5	3.3	3.1	2.9	2.8	2.6	2.5	22
23	5.5	5.1	4.7	4.4	4.1	3.9	3.6	3.4	3.2	3.0	2.9	2.7	2.6	23
24	5.8	5.4	5.0	4.6	4.3	4.0	3.8	3.5	3.3	3.1	3.0	2.8	2.6	24
25	6.2	5.7	5.3	4.9	4.5	4.2	3.9	3.7	3.5	3.3	3.1	2.9	2.7	25
26	6.7	6.1	5.6	5.2	4.8	4.4	4.1	3.8	3.6	3.4	3.2	3.0	2.8	26
27	7.2	6.5	6.0	5.5	5.0	4.6	4.3	4.0	3.7	3.5	3.3	3.1	2.9	27
28	7.9	7.1	6.4	5.8	5.3	4.9	4.5	4.2	3.9	3.6	3.4	3.2	3.0	28
29	8.7	7.7	6.9	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5	3.3	3.1	29
30	9.6	8.5	7.5	6.7	6.1	5.5	5.1	4.7	4.3	4.0	3.7	3.4	3.2	30
31	10.9	9.4	8.2	7.3	6.6	5.9	5.4	4.9	4.5	4.2	3.9	3.6	3.3	31
32	12.6	10.6	9.2	8.0	7.1	6.4	5.8	5.2	4.8	4.4	4.0	3.7	3.5	32
33	14.9	12.2	10.4	8.9	7.8	6.9	6.2	5.6	5.1	4.6	4.3	3.9	3.6	33
34	18.4	14.5	11.9	10.1	8.7	7.6	6.7	6.0	5.4	4.9	4.5	4.1	3.8	34
35		17.9	14.1	11.6	9.8	8.5	7.4	6.6	5.9	5.3	4.8	4.4	4.0	35
36			17.4	13.8	11.3	9.5	8.2	7.2	6.4	5.7	5.1	4.6	4.2	36
37				17.0	13.4	11.0	9.3	8.0	7.0	6.2	5.5	5.0	4.5	37
38					16.5	13.0	10.7	9.0	7.7	6.8	6.0	5.3	4.8	38
39						16.0	12.6	10.3	8.7	7.5	6.5	5.8	5.1	39
40							15.5	12.2	10.0	8.4	7.2	6.3	5.6	40
41								15.0	11.8	9.7	8.1	7.0	6.1	41
42	16.5								14.5	11.4	9.3	7.9	6.7	42
43	13.0	16.0								14.0	11.0	9.0	7.6	43
44	10.7	12.6	15.5								13.6	10.6	8.7	44
45	9.0	10.3	12.2	15.0								13.1	10.2	45
46	7.7	8.7	10.0	11.8	14.5								12.6	46
47	6.8	7.5	8.4	9.7	11.4	14.0								47
48	6.0	6.5	7.2	8.1	9.3	11.0	13.6							48
49	5.3	5.8	6.3	7.0	7.9	9.0	10.6	13.1						49
50	4.8	5.1	5.6	6.1	6.7	7.6	8.7	10.2	12.6					50
51	4.3	4.6	5.0	5.4	5.9	6.5	7.3	8.4	9.9	12.1				51
52	3.9	4.2	4.5	4.8	5.2	5.7	6.3	7.0	8.0	9.5	11.6			52
53	3.6	3.8	4.0	4.3	4.6	5.0	5.4	6.0	6.7	7.7	9.1	11.1		53
54	3.3	3.5	3.7	3.9	4.1	4.4	4.8	5.2	5.8	6.5	7.4	8.7	10.6	54
55	3.0	3.2	3.3	3.5	3.7	4.0	4.3	4.6	5.0	5.5	6.2	7.1	8.3	55
56	2.8	2.9	3.1	3.2	3.4	3.6	3.8	4.1	4.4	4.8	5.3	5.9	6.8	56
57	2.6	2.7	2.8	2.9	3.1	3.2	3.4	3.6	3.9	4.2	4.6	5.0	5.6	57
58	2.4	2.5	2.6	2.7	2.8	2.9	3.1	3.3	3.5	3.7	4.0	4.4	4.8	58
59	2.2	2.3	2.4	2.5	2.6	2.7	2.8	3.0	3.1	3.3	3.6	3.8	4.2	59
60	2.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	3.0	3.2	3.4	3.6	60
	38°	39°	40°	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°	
	Declination of the same name as the latitude; upper transit; reduction additive.													

TABLE 29.

Variation of Altitude in one minute from meridian passage.

Latitude.	Declination of the **same** name as the latitude; **upper** transit; reduction **additive.**													Latitude.
	51°	**52°**	**53°**	**54°**	**55°**	**56°**	**57°**	**58°**	**59°**	**60°**	**61°**	**62°**	**63°**	
°	″	″	″	″	″	″	″	″	″	″	″	″	″	°
0	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0	1.0	0
1	1.6	1.6	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1
2	1.6	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0	2
3	1.7	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0	3
4	1.7	1.6	1.6	1.5	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0	4
5	1.7	1.7	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.1	1.1	1.1	5
6	1.7	1.7	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	6
7	1.8	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	7
8	1.8	1.7	1.7	1.6	1.5	1.5	1.4	1.4	1.3	1.2	1.2	1.1	1.1	8
9	1.8	1.8	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.3	1.2	1.1	1.1	9
10	1.9	1.8	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	10
11	1.9	1.8	1.7	1.7	1.6	1.5	1.5	1.4	1.3	1.3	1.2	1.2	1.1	11
12	1.9	1.8	1.8	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1	12
13	2.0	1.9	1.8	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.3	1.2	1.1	13
14	2.0	1.9	1.8	1.7	1.7	1.6	1.5	1.5	1.4	1.3	1.3	1.2	1.2	14
15	2.0	1.9	1.9	1.8	1.7	1.6	1.5	1.5	1.4	1.3	1.3	1.2	1.2	15
16	2.1	2.0	1.9	1.8	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.2	1.2	16
17	2.1	2.0	1.9	1.8	1.8	1.7	1.6	1.5	1.5	1.4	1.3	1.3	1.2	17
18	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.5	1.4	1.3	1.3	1.2	18
19	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.2	19
20	2.3	2.1	2.0	1.9	1.9	1.8	1.7	1.6	1.5	1.4	1.4	1.3	1.2	20
21	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.5	1.4	1.3	1.2	21
22	2.4	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.6	1.5	1.4	1.3	1.3	22
23	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.4	1.3	23
24	2.5	2.4	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.5	1.4	1.3	24
25	2.6	2.4	2.3	2.2	2.0	1.9	1.8	1.7	1.6	1.6	1.5	1.4	1.3	25
26	2.6	2.5	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	26
27	2.7	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.4	27
28	2.8	2.6	2.5	2.3	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.5	1.4	28
29	2.9	2.7	2.5	2.4	2.3	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	29
30	3.0	2.8	2.6	2.5	2.3	2.2	2.0	1.9	1.8	1.7	1.6	1.5	1.4	30
31	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.9	1.7	1.6	1.5	1.4	31
32	3.2	3.0	2.8	2.6	2.4	2.3	2.2	2.0	1.9	1.8	1.7	1.6	1.5	32
33	3.4	3.1	2.9	2.7	2.5	2.4	2.2	2.1	1.9	1.8	1.7	1.6	1.5	33
34	3.5	3.2	3.0	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.7	1.6	1.5	34
35	3.7	3.4	3.1	2.9	2.7	2.5	2.3	2.2	2.0	1.9	1.8	1.7	1.6	35
36	3.9	3.6	3.3	3.0	2.8	2.6	2.4	2.3	2.1	2.0	1.8	1.7	1.6	36
37	4.1	3.7	3.4	3.2	2.9	2.7	2.5	2.3	2.2	2.0	1.9	1.7	1.6	37
38	4.3	3.9	3.6	3.3	3.0	2.8	2.6	2.4	2.2	2.1	1.9	1.8	1.7	38
39	4.6	4.2	3.8	3.5	3.2	2.9	2.7	2.5	2.3	2.1	2.0	1.8	1.7	39
40	5.0	4.5	4.0	3.7	3.3	3.1	2.8	2.6	2.4	2.2	2.0	1.9	1.8	40
41	5.4	4.8	4.3	3.9	3.5	3.2	2.9	2.7	2.5	2.3	2.1	1.9	1.8	41
42	5.9	5.2	4.6	4.1	3.7	3.4	3.1	2.8	2.6	2.4	2.2	2.0	1.9	42
43	6.5	5.7	5.0	4.4	4.0	3.6	3.2	2.9	2.7	2.5	2.3	2.1	1.9	43
44	7.3	6.3	5.4	4.8	4.3	3.8	3.4	3.1	2.8	2.6	2.3	2.2	2.0	44
45	8.4	7.0	6.0	5.2	4.6	4.1	3.6	3.3	3.0	2.7	2.4	2.2	2.0	45
46	9.9	8.0	6.7	5.8	5.0	4.4	3.9	3.5	3.1	2.8	2.6	2.3	2.1	46
47	12.1	9.5	7.7	6.5	5.5	4.8	4.2	3.7	3.3	3.0	2.7	2.4	2.2	47
48		11.6	9.1	7.4	6.2	5.3	4.6	4.0	3.6	3.2	2.8	2.6	2.3	48
49			11.1	8.7	7.1	5.9	5.0	4.4	3.8	3.4	3.0	2.7	2.4	49
50				10.6	8.3	6.8	5.6	4.8	4.2	3.6	3.2	2.9	2.6	50
51					10.2	7.9	6.4	5.4	4.6	4.0	3.5	3.0	2.7	51
52						9.7	7.6	6.1	5.1	4.3	3.8	3.3	2.9	52
53							9.2	7.2	5.9	4.9	4.1	3.6	3.1	53
54								8.8	6.8	5.5	4.6	3.9	3.4	54
55	10.2								8.3	6.5	5.3	4.3	3.7	55
56	7.9	9.7								7.9	6.1	5.0	4.1	56
57	6.4	7.6	9.2								7.4	5.8	4.7	57
58	5.4	6.1	7.2	8.8								7.0	5.4	58
59	4.6	5.1	5.9	6.8	8.3								6.6	59
60	4.0	4.3	4.9	5.5	6.5	7.9								60
	51°	**52°**	**53°**	**54°**	**55°**	**56°**	**57°**	**58°**	**59°**	**60°**	**61°**	**62°**	**63°**	

Declination of the **same** name as the latitude; **upper** transit; reduction **additive.**

TABLE 29.

Variation of Altitude in one minute from meridian passage.

Latitude.	Declination of a different name from the latitude; upper transit; reduction additive.												Latitude.
	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	
°	″	″	″	″	″	″	″	″	″	″	″	″	°
0					28.1	22.4	18.7	16.0	14.0	12.4	11.1	10.1	0
1				28.1	22.4	18.7	16.0	14.0	12.4	11.2	10.1	9.3	1
2			28.1	22.4	18.7	16.0	14.0	12.5	11.2	10.2	9.3	8.6	2
3		28.1	22.4	18.7	16.0	14.0	12.5	11.2	10.2	9.3	8.6	8.0	3
4	28.1	22.4	18.7	16.0	14.0	12.5	11.2	10.2	9.3	8.6	8.0	7.4	4
5	22.4	18.7	16.0	14.0	12.5	11.2	10.2	9.3	8.6	8.0	7.4	7.0	5
6	18.7	16.0	14.0	12.5	11.2	10.2	9.3	8.6	8.0	7.5	7.0	6.6	6
7	16.0	14.0	12.4	11.2	10.2	9.3	8.6	8.0	7.5	7.0	6.6	6.2	7
8	14.0	12.4	11.2	10.2	9.3	8.6	8.0	7.5	7.0	6.6	6.2	5.9	8
9	12.4	11.2	10.2	9.3	8.6	8.0	7.5	7.0	6.6	6.2	5.9	5.6	9
10	11.1	10.1	9.3	8.6	8.0	7.4	7.0	6.6	6.2	5.9	5.6	5.3	10
11	10.1	9.3	8.6	8.0	7.4	7.0	6.6	6.2	5.9	5.6	5.3	5.1	11
12	9.2	8.5	7.9	7.4	7.0	6.5	6.2	5.9	5.6	5.3	5.0	4.8	12
13	8.5	7.9	7.4	6.9	6.5	6.2	5.8	5.6	5.3	5.0	4.8	4.6	13
14	7.9	7.4	6.9	6.5	6.2	5.8	5.5	5.3	5.0	4.8	4.6	4.4	14
15	7.3	6.9	6.5	6.1	5.8	5.5	5.3	5.0	4.8	4.6	4.4	4.2	15
16	6.8	6.5	6.1	5.8	5.5	5.2	5.0	4.8	4.6	4.4	4.2	4.1	16
17	6.4	6.1	5.8	5.5	5.2	5.0	4.8	4.6	4.4	4.2	4.1	3.9	17
18	6.0	5.7	5.5	5.2	5.0	4.8	4.6	4.4	4.2	4.1	3.9	3.8	18
19	5.7	5.4	5.2	4.9	4.7	4.5	4.4	4.2	4.0	3.9	3.8	3.6	19
20	5.4	5.1	4.9	4.7	4.5	4.3	4.2	4.0	3.9	3.8	3.6	3.5	20
21	5.1	4.9	4.7	4.5	4.3	4.2	4.0	3.9	3.7	3.6	3.5	3.4	21
22	4.9	4.7	4.5	4.3	4.1	4.0	3.9	3.7	3.6	3.5	3.4	3.3	22
23	4.6	4.4	4.3	4.1	4.0	3.8	3.7	3.6	3.5	3.4	3.3	3.2	23
24	4.4	4.2	4.1	3.9	3.8	3.7	3.6	3.5	3.4	3.3	3.2	3.1	24
25	4.2	4.1	3.9	3.8	3.7	3.5	3.4	3.3	3.2	3.1	3.1	3.0	25
26	4.0	3.9	3.8	3.6	3.5	3.4	3.3	3.2	3.1	3.0	3.0	2.9	26
27	3.9	3.7	3.6	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.9	2.8	27
28	3.7	3.6	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.8	2.7	28
29	3.5	3.4	3.3	3.2	3.1	3.1	3.0	2.9	2.8	2.8	2.7	2.6	29
30	3.4	3.3	3.2	3.1	3.0	3.0	2.9	2.8	2.7	2.7	2.6	2.5	30
31	3.3	3.2	3.1	3.0	2.9	2.9	2.8	2.7	2.6	2.6	2.5	2.5	31
32	3.2	3.1	3.0	2.9	2.8	2.8	2.7	2.6	2.6	2.5	2.5	2.4	32
33	3.0	2.9	2.9	2.8	2.7	2.7	2.6	2.5	2.5	2.4	2.4	2.3	33
34	2.9	2.8	2.8	2.7	2.6	2.6	2.5	2.5	2.4	2.4	2.3	2.3	34
35	2.8	2.7	2.7	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	35
36	2.7	2.6	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.1	36
37	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.2	2.1	2.1	37
38	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.0	38
39	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0	39
40	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.0	1.9	1.9	40
41	2.3	2.2	2.2	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.8	41
42	2.2	2.1	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	42
43	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	43
44	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7	44
45	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.6	45
46	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	46
47	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	47
48	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.5	1.5	48
49	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	49
50	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	50
51	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	51
52	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.3	52
53	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	53
54	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	54
55	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	55
56	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	56
57	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	57
58	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	58
59	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	59
60	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1 0	1.0	1.0	60
	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	
	Declination of a different name from the latitude; upper transit; reduction additive.												

TABLE 29.

Variation of Altitude in one minute from meridian passage.

Latitude.	Declination of a **different** name from the latitude; **upper** transit; reduction **additive.**													Latitude.
	12°	**13°**	**14°**	**15°**	**16°**	**17°**	**18°**	**19°**	**20°**	**21°**	**22°**	**23°**	**24°**	
°	″	″	″	″	″	″	″	″	″	″	″	″	″	°
0	9.2	8.5	7.9	7.3	6.8	6.4	6.0	5.7	5.4	5.1	4.9	4.6	4.4	0
1	8.5	7.9	7.4	6.9	6.5	6.1	5.7	5.4	5.1	4.9	4.7	4.4	4.2	1
2	7.9	7.4	6.9	6.5	6.1	5.8	5.5	5.2	4.9	4.7	4.5	4.3	4.1	2
3	7.4	6.9	6.5	6.1	5.8	5.5	5.2	4.9	4.7	4.5	4.3	4.1	3.9	3
4	7.0	6.5	6.2	5.8	5.5	5.2	5.0	4.7	4.5	4.3	4.1	4.0	3.8	4
5	6.5	6.2	5.8	5.5	5.2	5.0	4.8	4.5	4.3	4.2	4.0	3.8	3.7	5
6	6.2	5.8	5.5	5.3	5.0	4.8	4.6	4.4	4.2	4.0	3.9	3.7	3.6	6
7	5.9	5.6	5.3	5.0	4.8	4.6	4.4	4.2	4.0	3.9	3.7	3.6	3.5	7
8	5.6	5.3	5.0	4.8	4.6	4.4	4.2	4.0	3.9	3.7	3.6	3.5	3.4	8
9	5.3	5.0	4.8	4.6	4.4	4.2	4.1	3.9	3.8	3.6	3.5	3.4	3.3	9
10	5.0	4.8	4.6	4.4	4.2	4.1	3.9	3.8	3.6	3.5	3.4	3.3	3.2	10
11	4.8	4.6	4.4	4.2	4.1	3.9	3.8	3.6	3.5	3.4	3.3	3.2	3.1	11
12	4.6	4.4	4.3	4.1	3.9	3.8	3.7	3.5	3.4	3.3	3.2	3.1	3.0	12
13	4.4	4.3	4.1	3.9	3.8	3.7	3.5	3.4	3.3	3.2	3.1	3.0	2.9	13
14	4.2	4.1	3.9	3.8	3.7	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8	14
15	4.1	3.9	3.8	3.7	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.8	15
16	3.9	3.8	3.7	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.8	2.7	16
17	3.8	3.7	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.8	2.7	2.6	17
18	3.7	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.9	2.8	2.7	2.6	2.5	18
19	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.9	2.8	2.7	2.6	2.6	2.5	19
20	3.4	3.3	3.2	3.1	3.0	2.9	2.9	2.8	2.7	2.6	2.6	2.5	2.4	20
21	3.3	3.2	3.1	3.0	2.9	2.8	2.8	2.7	2.6	2.6	2.5	2.4	2.4	21
22	3.2	3.1	3.0	2.9	2.8	2.8	2.7	2.6	2.6	2.5	2.4	2.4	2.3	22
23	3.1	3.0	2.9	2.8	2.8	2.7	2.6	2.6	2.5	2.4	2.4	2.3	2.3	23
24	3.0	2.9	2.8	2.8	2.7	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.2	24
25	2.9	2.8	2.7	2.7	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	25
26	2.8	2.7	2.7	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.1	2.1	26
27	2.7	2.7	2.6	2.5	2.5	2.4	2.4	2.3	2.2	2.2	2.1	2.1	2.1	27
28	2.6	2.6	2.5	2.5	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.0	28
29	2.6	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.0	2.0	2.0	29
30	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.0	2.0	2.0	1.9	30
31	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.0	2.0	2.0	1.9	1.9	31
32	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.8	32
33	2.3	2.2	2.2	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.8	1.8	33
34	2.2	2.2	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	34
35	2.2	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.8	1.8	1.8	1.7	1.7	35
36	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7	36
37	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7	1.6	37
38	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	38
39	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.6	39
40	1.9	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.5	40
41	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.5	1.5	1.5	41
42	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	42
43	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.4	1.4	43
44	1.7	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	44
45	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	45
46	1.6	1.6	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.3	46
47	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	47
48	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	48
49	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	49
50	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	50
51	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	51
52	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.1	1.1	52
53	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	53
54	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	54
55	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	55
56	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	56
57	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	57
58	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	58
59	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	59
60	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	60
	12°	**13°**	**14°**	**15°**	**16°**	**17°**	**18°**	**19°**	**20°**	**21°**	**22°**	**23°**	**24°**	
	Declination of a **different** name from the latitude; **upper** transit; reduction **additive.**													

TABLE 29.

Variation of Altitude in one minute from meridian passage.

Latitude.	Declination of a **different** name from the latitude; **upper** transit; reduction **additive.**													Latitude.
	25°	26°	27°	28°	29°	30°	31°	32°	33°	34°	35°	36°	37°	
°	″	″	″	″	″	″	″	″	″	″	″	″	″	°
0	4.2	4.0	3.9	3.7	3.5	3.4	3.3	3.1	3.0	2.9	2.8	2.7	2.6	0
1	4.1	3.9	3.7	3.6	3.4	3.3	3.2	3.1	2.9	2.8	2.7	2.6	2.6	1
2	3.9	3.8	3.6	3.5	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2
3	3.8	3.6	3.5	3.4	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4	3
4	3.7	3.5	3.4	3.3	3.2	3.0	2.9	2.8	2.7	2.6	2.6	2.5	2.4	4
5	3.6	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3	5
6	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.4	2.3	6
7	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.5	2.4	2.3	2.2	7
8	3.2	3.1	3.0	2.9	2.8	2.7	2.7	2.6	2.5	2.4	2.3	2.3	2.2	8
9	3.1	3.0	2.9	2.9	2.8	2.7	2.6	2.5	2.4	2.4	2.3	2.2	2.2	9
10	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.5	2.4	2.3	2.2	2.2	2.1	10
11	3.0	2.9	2.8	2.7	2.6	2.5	2.5	2.4	2.3	2.3	2.2	2.1	2.1	11
12	2.9	2.8	2.7	2.6	2.6	2.5	2.4	2.3	2.3	2.2	2.2	2.1	2.0	12
13	2.8	2.7	2.7	2.6	2.5	2.4	2.4	2.3	2.2	2.2	2.1	2.1	2.0	13
14	2.7	2.7	2.6	2.5	2.4	2.4	2.3	2.3	2.2	2.1	2.1	2.0	2.0	14
15	2.7	2.6	2.5	2.5	2.4	2.3	2.3	2.2	2.1	2.1	2.0	2.0	1.9	15
16	2.6	2.5	2.5	2.4	2.3	2.3	2.2	2.2	2.1	2.0	2.0	1.9	1.9	16
17	2.5	2.5	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.9	17
18	2.5	2.4	2.4	2.3	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.8	18
19	2.4	2.4	2.3	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.8	1.8	19
20	2.4	2.3	2.3	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.8	1.8	20
21	2.3	2.3	2.2	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.8	1.8	1.7	21
22	2.3	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.7	22
23	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.8	1.8	1.8	1.7	1.7	23
24	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.6	24
25	2.1	2.1	2.0	2.0	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.6	1.6	25
26	2.1	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.7	1.6	1.6	26
27	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	27
28	2.0	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.5	28
29	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	29
30	1.9	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	30
31	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	31
32	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.4	32
33	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.4	1.4	33
34	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.4	1.4	1.4	34
35	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	35
36	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.3	36
37	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.3	1.3	37
38	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.3	1.3	1.3	38
39	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	39
40	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	40
41	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	41
42	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	42
43	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	43
44	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	44
45	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	45
46	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	46
47	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	47
48	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1		48
49	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1			49
50	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1				50
51	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0					51
52	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0						52
53	1.1	1.1	1.1	1.1	1.0	1.0	1.0							53
54	1.1	1.0	1.0	1.0	1.0	1.0								54
55	1.0	1.0	1.0	1.0	1.0									55
56	1.0	1.0	1.0	1.0										56
57	1.0	1.0	1.0											57
58	1.0	0.9												58
59	0.9												0.8	59
60												0.8	0.8	60
	25°	26°	27°	28°	29°	30°	31°	32°	33°	34°	35°	36°	37°	
	Declination of the **same** name as the latitude; **lower** transit; reduction **subtractive.**													

TABLE 29.

Variation of Altitude in one minute from meridian passage.

Latitude.	Declination of a **different** name from the latitude; **upper** transit; reduction **additive.**													Latitude.
	38°	39°	40°	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°	
°	″	″	″	″	″	″	″	″	″	″	″	″	″	°
0	2.5	2.4	2.3	2.3	2.2	2.1	2.0	2.0	1.9	1.8	1.8	1.7	1.7	0
1	2.5	2.4	2.3	2.2	2.1	2.1	2.0	1.9	1.9	1.8	1.7	1.7	1.6	1
2	2.4	2.3	2.3	2.2	2.1	2.0	2.0	1.9	1.8	1.8	1.7	1.7	1.6	2
3	2.4	2.3	2.2	2.1	2.1	2.0	1.9	1.9	1.8	1.8	1.7	1.6	1.6	3
4	2.3	2.2	2.2	2.1	2.0	2.0	1.9	1.8	1.8	1.7	1.7	1.6	1.6	4
5	2.3	2.2	2.1	2.1	2.0	1.9	1.9	1.8	1.8	1.7	1.6	1.6	1.5	5
6	2.2	2.2	2.1	2.0	2.0	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.5	6
7	2.2	2.1	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.6	1.6	1.5	1.5	7
8	2.1	2.1	2.0	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.5	8
9	2.1	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.6	1.6	1.6	1.5	1.5	9
10	2.1	2.0	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.4	10
11	2.0	2.0	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.4	11
12	2.0	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	12
13	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.4	1.4	13
14	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.4	14
15	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.4	15
16	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	16
17	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.3	17
18	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	18
19	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	19
20	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	20
21	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	21
22	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	22
23	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.2	23
24	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	24
25	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	25
26	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	26
27	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.2	27
28	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1	28
29	1.5	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	29
30	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	30
31	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	31
32	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	32
33	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	33
34	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	34
35	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1		35
36	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1			36
37	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1				37
38	1.3	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1					38
39	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1						39
40	1.2	1.2	1.2	1.2	1.1	1.1	1.1							40
41	1.2	1.2	1.2	1.1	1.1	1.1								41
42	1.2	1.2	1.1	1.1	1.1									42
43	1.2	1.1	1.1	1.1										43
44	1.1	1.1	1.1											44
45	1.1	1.1												45
46	1.1												0.9	46
47												0.9	0.9	47
48											0.9	0.9	0.9	48
49										0.9	0.9	0.9	0.8	49
50									0.9	0.9	0.8	0.8	0.8	50
51								0.9	0.9	0.9	0.8	0.8	0.8	51
52							0.9	0.9	0.9	0.8	0.8	0.8	0.8	52
53						0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	53
54					0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	54
55				0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	55
56			0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	56
57		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	57
58	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	58
59	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	59
60	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	60
	38°	39°	40°	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°	
	Declination of the **same** name as the latitude; **lower** transit; reduction **subtractive.**													

TABLE 29.

Variation of Altitude in one minute from meridian passage.

Latitude.	Declination of a **different** name from the latitude; **upper** transit; reduction **additive.**													Latitude.
	51°	**52°**	**53°**	**54°**	**55°**	**56°**	**57°**	**58°**	**59°**	**60°**	**61°**	**62°**	**63°**	
°	″	″	″	″	″	″	″	″	″	″	″	″	″	°
0	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0	1.0	0
1	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0	1.0	1
2	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.1	1.1	1.0	1.0	2
3	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	3
4	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	4
5	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.1	1.1	1.0	1.0	1.0	5
6	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0	1.0	6
7	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	0.9	7
8	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	0.9	8
9	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0	1.0	0.9	9
10	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	10
11	1.4	1.3	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	11
12	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	0.9	0.9	12
13	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0	1.0	0.9	0.9	13
14	1.3	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	14
15	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	15
16	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	16
17	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	17
18	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	18
19	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.9	0.9	0.9	19
20	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.8	20
21	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.8	21
22	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.9	0.9	0.9		22
23	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9			23
24	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9				24
25	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.9					25
26	1.1	1.1	1.1	1.1	1.0	1.0	1.0	0.9						26
27	1.1	1.1	1.1	1.0	1.0	1.0	1.0							27
28	1.1	1.1	1.1	1.0	1.0	1.0								28
29	1.1	1.1	1.0	1.0	1.0									29
30	1.1	1.1	1.0	1.0										30
31	1.1	1.0	1.0											31
32	1.1	1.0												32
33	1.1												0.8	33
34												0.8	0.7	34
35											0.8	0.8	0.7	35
36										0.8	0.8	0.8	0.7	36
37									0.8	0.8	0.8	0.7	0.7	37
38								0.8	0.8	0.8	0.8	0.7	0.7	38
39							0.8	0.8	0.8	0.8	0.8	0.7	0.7	39
40						0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	40
41					0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	41
42				0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	42
43			0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	43
44		0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	44
45	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	45
46	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	46
47	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.6	47
48	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	48
49	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	49
50	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	50
51	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	51
52	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	52
53	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	53
54	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	54
55	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	55
56	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	56
57	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	57
58	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	58
59	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	59
60	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	60
	51°	**52°**	**53°**	**54°**	**55°**	**56°**	**57°**	**58°**	**59°**	**60°**	**61°**	**62°**	**63°**	
	Declination of the **same** name as the latitude; **lower** transit; reduction **subtractive.**													

TABLE 30.

Reduction to be Applied to Altitudes Near the Meridian.

Var. 1 min. (table 29).	Arc or Time from Meridian Passage														Var. 1 min. (table 29).
	5′	10′	15′	20′	25′	30′	35′	40′	45′	50′	55′	1°00′	1°05′	1°10′	
	m s 0 20	m s 0 40	m s 1 00	m s 1 20	m s 1 40	m s 2 00	m s 2 20	m s 2 40	m s 3 00	m s 3 20	m s 3 40	m s 4 00	m s 4 20	m s 4 40	
″	′	′	′	′	′	′	′	′	′	′	′	′	′	′	″
.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1
.2									0.0	0.0	0.0	0.1	0.1	0.1	.2
.3									0.1	0.1	0.1	0.1	0.1	0.1	.3
.4								0.1	0.1	0.1	0.1	0.1	0.1	0.1	.4
.5							0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	.5
.6							0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	.6
.7						0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	.7
.8						0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	.8
.9	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	.9
1.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	1.0
2.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.7	2.0
3.0	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.1	3.0
4.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.1	1.2	1.4	4.0
5.0	0.0	0.0	0.1	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.3	1.6	1.8	5.0
6.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.1	1.3	1.6	1.9	2.2	6.0
7.0	0.0	0.1	0.1	0.2	0.3	0.5	0.6	0.8	1.1	1.3	1.6	1.9	2.2	2.5	7.0
8.0	0.0	0.1	0.1	0.2	0.4	0.5	0.7	0.9	1.2	1.5	1.8	2.1	2.5	2.9	8.0
9.0	0.0	0.1	0.2	0.3	0.4	0.6	0.8	1.1	1.4	1.7	2.0	2.4	2.8	3.3	9.0
10.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.2	1.5	1.9	2.2	2.7	3.1	3.6	10.0
11.0	0.0	0.1	0.2	0.3	0.5	0.7	1.0	1.3	1.7	2.0	2.5	2.9	3.4	4.0	11.0
12.0	0.0	0.1	0.2	0.4	0.6	0.8	1.1	1.4	1.8	2.2	2.7	3.2	3.8	4.4	12.0
13.0	0.0	0.1	0.2	0.4	0.6	0.9	1.2	1.5	2.0	2.4	2.9	3.5	4.1	4.7	13.0
14.0	0.0	0.1	0.2	0.4	0.6	0.9	1.3	1.7	2.1	2.6	3.1	3.7	4.4	5.1	14.0
15.0	0.0	0.1	0.3	0.5	0.7	1.0	1.4	1.8	2.3	2.8	3.4	4.0	4.7	5.4	15.0
16.0	0.0	0.1	0.3	0.5	0.7	1.1	1.5	1.9	2.4	3.0	3.6	4.3	5.0	5.8	16.0
17.0	0.0	0.1	0.3	0.5	0.8	1.1	1.5	2.0	2.6	3.1	3.8	4.5	5.3	6.2	17.0
18.0	0.0	0.2	0.3	0.6	0.8	1.2	1.6	2.1	2.7	3.3	4.0	4.8	5.6	6.5	18.0
19.0	0.1	0.2	0.3	0.6	0.9	1.2	1.7	2.3	2.9	3.5	4.3	5.1	5.9	6.9	19.0
20.0	0.1	0.2	0.3	0.6	0.9	1.3	1.8	2.4	3.0	3.7	4.5	5.3	6.3	7.3	20.0
21.0	0.1	0.2	0.4	0.7	1.0	1.4	1.9	2.5	3.1	3.9	4.7	5.6	6.6	7.6	21.0
22.0	0.1	0.2	0.4	0.7	1.0	1.5	2.0	2.6	3.3	4.1	4.9	5.9	6.9	8.0	22.0
23.0	0.1	0.2	0.4	0.7	1.1	1.5	2.1	2.7	3.5	4.3	5.2	6.1	7.2	8.3	23.0
24.0	0.1	0.2	0.4	0.8	1.1	1.6	2.2	2.8	3.6	4.4	5.4	6.4	7.5	8.7	24.0
25.0	0.1	0.2	0.4	0.8	1.2	1.7	2.3	3.0	3.8	4.6	5.6	6.7	7.8	9.1	25.0
26.0	0.1	0.2	0.4	0.8	1.2	1.7	2.4	3.1	3.9	4.8	5.8	6.9	8.1	9.4	26.0
27.0	0.1	0.2	0.5	0.8	1.2	1.8	2.4	3.2	4.1	5.0	6.0	7.2	8.4	9.8	27.0
28.0	0.1	0.2	0.5	0.9	1.3	1.9	2.5	3.3	4.2	5.2	6.3	7.5	8.8	10.2	28.0

TABLE 30.

Reduction to be Applied to Altitudes Near the Meridian.

Var. 1 min. (Table 29).	Arc or Time from Meridian Passage.														Var. 1 min. (Table 29).
	1°15′	1°20′	1°25′	1°30′	1°35′	1°40′	1°45′	1°50′	1°55′	2°00′	2°05′	2°10′	2°15′	2°20′	
	m s 5 00	m s 5 20	m s 5 40	m s 6 00	m s 6 20	m s 6 40	m s 7 00	m s 7 20	m s 7 40	m s 8 00	m s 8 20	m s 8 40	m s 9 00	m s 9 20	
″	′	′	′	′	′	′	′	′	′	′	′	′	′	′	″
.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	.1
.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	.2
.3	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	.3
.4	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.6	.4
.5	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.7	0.7	.5
.6	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.8	0.8	0.9	.6
.7	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.8	0.8	0.9	1.0	1.0	.7
.8	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.9	0.9	1.0	1.1	1.2	.8
.9	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.3	.9
1.0	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.0
2.0	0.8	0.9	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.1	2.3	2.5	2.7	2.9	2.0
3.0	1.3	1.4	1.6	1.8	2.0	2.2	2.5	2.7	2.9	3.2	3.5	3.8	4.1	4.4	3.0
4.0	1.7	1.9	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.0	5.4	5.8	4.0
5.0	2.1	2.4	2.7	3.0	3.3	3.7	4.1	4.5	4.9	5.3	5.8	6.3	6.8	7.3	5.0
6.0	2.5	2.8	3.2	3.6	4.0	4.4	4.9	5.4	5.9	6.4	6.9	7.5	8.1	8.7	6.0
7.0	2.9	3.3	3.7	4.2	4.7	5.2	5.7	6.3	6.9	7.5	8.1	8.8	9.5	10.2	7.0
8.0	3.3	3.8	4.3	4.8	5.3	5.9	6.5	7.2	7.8	8.5	9.2	10.0	10.8	11.6	8.0
9.0	3.8	4.3	4.8	5.4	6.0	6.7	7.4	8.1	8.8	9.6	10.4	11.3	12.2	13.1	9.0
10.0	4.2	4.7	5.4	6.0	6.7	7.4	8.2	9.0	9.8	10.7	11.6	12.5	13.5	14.5	10.0
11.0	4.6	5.2	5.9	6.6	7.4	8.1	9.0	9.9	10.8	11.7	12.7	13.8	14.9	16.0	11.0
12.0	5.0	5.7	6.4	7.2	8.0	8.9	9.8	10.8	11.8	12.8	13.9	15.0	16.2	17.4	12.0
13.0	5.4	6.2	7.0	7.8	8.7	9.6	10.6	11.7	12.7	13.9	15.0	16.3	17.6	18.9	13.0
14.0	5.8	6.6	7.5	8.4	9.4	10.4	11.4	12.5	13.7	14.9	16.2	17.5	18.9	20.3	14.0
15.0	6.3	7.1	8.0	9.0	10.0	11.1	12.3	13.4	14.7	16.0	17.4	18.8	20.3	21.8	15.0
16.0	6.7	7.6	8.6	9.6	10.7	11.9	13.1	14.3	15.7	17.1	18.5	20.0	21.6	23.2	16.0
17.0	7.1	8.1	9.1	10.2	11.4	12.6	13.9	15.2	16.7	18.1	19.7	21.3	23.0	24.7	17.0
18.0	7.5	8.5	9.6	10.8	12.0	13.3	14.7	16.1	17.6	19.2	20.8	22.5	24.3	26.1	18.0
19.0	7.9	9.0	10.2	11.4	12.7	14.1	15.5	17.0	18.6	20.3	22.0	23.8			19.0
20.0	8.3	9.5	10.7	12.0	13.4	14.8	16.3	17.9	19.6	21.4	23.1				20.0
21.0	8.8	10.0	11.2	12.6	14.0	15.6	17.2	18.8	20.6						21.0
22.0	9.2	10.4	11.8	13.2	14.7	16.3	18.0	19.7	21.6						22.0
23.0	9.6	10.9	12.3	13.8	15.4	17.0	18.8	20.6							23.0
24.0	10.0	11.4	12.8	14.4	16.0	17.8	19.6	21.5							24.0
25.0	10.4	11.9	13.4	15.0	16.7	18.5	20.4								25.0
26.0	10.8	12.3	13.9	15.6	17.4	19.3									26.0
27.0	11.3	12.8	14.5	16.2	18.1	20.0									27.0

TABLE 30.

Reduction to be applied to Altitudes near the Meridian.

Var. 1 min. (Table 29).	Arc or Time from Meridian Passage.														Var. 1 min. (Table 29).
	2°25′	2°30′	2°35′	2°40′	2°45′	2°50′	2°55′	3°00′	3°05′	3°10′	3°15′	3°20′	3°25′	3°30′	
	m s 9 40	m s 10 00	m s 10 20	m s 10 40	m s 11 00	m s 11 20	m s 11 40	m s 12 00	m s 12 20	m s 12 40	m s 13 00	m s 13 20	m s 13 40	m s 14 00	
″	′	′	′	′	′	′	′	′	′	′	′	′	′	′	″
.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	.1
.2	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.7	.2
.3	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.7	0.8	0.8	0.9	0.9	0.9	1.0	.3
.4	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.3	.4
.5	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.3	1.4	1.5	1.6	1.6	.5
.6	0.9	1.0	1.1	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.8	1.9	2.0	.6
.7	1.1	1.2	1.3	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	.7
.8	1.3	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.3	2.4	2.5	2.6	.8
.9	1.4	1.5	1.6	1.7	1.8	1.9	2.1	2.2	2.3	2.4	2.5	2.7	2.8	2.9	.9
1.0	1.6	1.7	1.8	1.9	2.0	2.1	2.3	2.4	2.5	2.7	2.8	2.9	3.1	3.3	1.0
2.0	3.1	3.3	3.5	3.8	4.0	4.2	4.5	4.8	5.1	5.3	5.6	5.9	6.2	6.5	2.0
3.0	4.7	5.0	5.3	5.7	6.1	6.5	6.9	7.2	7.6	8.0	8.5	8.9	9.4	9.8	3.0
4.0	6.2	6.7	7.1	7.6	8.1	8.6	9.1	9.6	10.1	10.7	11.3	11.9	12.5	13.2	4.0
5.0	7.8	8.3	8.9	9.5	10.1	10.7	11.4	12.0	12.7	13.4	14.1	14.8	15.6	16.3	5.0
6.0	9.3	10.0	10.7	11.4	12.1	12.8	13.6	14.4	15.2	16.0	16.9	17.8	18.7	19.6	6.0
7.0	10.9	11.7	12.5	13.3	14.1	14.9	15.8	16.8	17.7	18.7	19.7	20.7	21.8	22.9	7.0
8.0	12.5	13.3	14.2	15.1	16.1	17.1	18.1	19.2	20.3	21.4	22.5	23.7	24.9	26.1	8.0
9.0	14.1	15.0	16.0	17.1	18.2	19.3	20.5	21.6	22.8	24.1	25.3	26.7	28.0	29.4	9.0
10.0	15.6	16.7	17.8	19.0	20.2	21.4	22.7	24.0	25.4	26.8	28.2	29.7			10.0
11.0	17.1	18.3	19.6	20.9	22.2	23.5	25.0	26.4	28.0	29.5					11.0
12.0	18.7	20.0	21.4	22.8	24.2	25.7	27.2	28.8							12.0
13.0	20.2	21.7	23.1	24.7	26.2	27.8	29.5								13.0
14.0	21.8	23.3	24.9	26.5	28.2	30.0									14.0
15.0	23.4	25.0	26.7	28.4	30.2										15.0
16.0	24.9	26.7	28.5	30.3											16.0
17.0	26.5	27.4	30.3												17.0

Var. 1 min. (Table 29).	Arc or Time from Meridian Passage.														Var. 1 min. (Table 29).
	3°35′	3°40′	3°45′	3°50′	3°55′	4°00′	4°05′	4°10′	4°15′	4°20′	4°25′	4°30′	4°35′	4°40′	
	m s 14 20	m s 14 40	m s 15 00	m s 15 20	m s 15 40	m s 16 00	m s 16 20	m s 16 40	m s 17 00	m s 17 20	m s 17 40	m s 18 00	m s 18 20	m s 18 40	
″	′	′	′	′	′	′	′	′	′	′	′	′	′	′	″
.1	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	.1
.2	0.7	0.7	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.2	.2
.3	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.7	.3
.4	1.4	1.4	1.5	1.6	1.6	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.2	2.3	.4
.5	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	.5
.6	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.4	3.5	.6
.7	2.4	2.5	2.6	2.8	2.9	3.0	3.1	3.2	3.4	3.5	3.6	3.8	3.9	4.1	.7
.8	2.7	2.9	3.0	3.1	3.3	3.4	3.6	3.7	3.9	4.0	4.2	4.3	4.5	4.7	.8
.9	3.1	3.2	3.4	3.5	3.7	3.8	4.0	4.2	4.3	4.5	4.7	4.9	5.0	5.2	.9
1.0	3.5	3.6	3.8	4.0	4.1	4.3	4.5	4.7	4.8	5.0	5.2	5.4	5.6	5.8	1.0
2.0	6.8	7.1	7.5	7.8	8.2	8.5	8.9	9.2	9.6	10.0	10.4	10.8	11.2	11.6	2.0
3.0	10.3	10.8	11.3	11.8	12.3	12.8	13.3	13.9	14.5	15.1	15.7	16.2	16.8	17.4	3.0
4.0	13.7	14.4	15.0	15.7	16.4	17.1	17.8	18.5	19.3	20.1	20.8	21.6	22.4	23.2	4.0
5.0	17.1	17.9	18.8	19.6	20.5	21.3	22.2	23.1	24.1	25.1	26.0	27.0	28.0	29.0	5.0
6.0	20.5	21.5	22.5	23.5	24.5	25.6	26.7	27.8							6.0
7.0	24.0	28.7	26.3	27.5											7.0
8.0	27.4	32.3	30.0												8.0

TABLE 30.

Reduction to be Applied to Altitudes near the Meridian.

Var. 1 min. (Table 29).	Arc or Time from Meridian Passage.														Var. 1 min. (Table 29).
	4°45′	4°50′	4°55′	5°00′	5°05′	5°10′	5°15′	5°20′	5°25′	5°30′	5°35′	5°40′	5°45′	5°50′	
	m s 19 00	m s 19 20	m s 19 40	m s 20 00	m s 20 20	m s 20 40	m s 21 00	m s 21 20	m s 21 40	m s 22 00	m s 22 20	m s 22 40	m s 23 00	m s 23 20	
″	′	′	′	′	′	′	′	′	′	′	′	′	′	′	″
.1	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	.1
.2	1.2	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.8	.2
.3	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.4	2.5	2.6	2.7	2.7	.3
.4	2.4	2.5	2.6	2.7	2.8	2.9	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	.4
.5	3.0	3.1	3.2	3.3	3.4	3.6	3.7	3.8	3.9	4.0	4.2	4.3	4.4	4.5	.5
.6	3.6	3.7	3.9	4.0	4.1	4.3	4.4	4.6	4.7	4.8	5.0	5.1	5.3	5.4	.6
.7	4.2	4.4	4.5	4.7	4.8	5.0	5.2	5.3	5.5	5.7	5.8	6.0	6.2	6.4	.7
.8	4.8	5.0	5.2	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.7	6.9	7.1	7.3	.8
.9	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.1	7.3	7.5	7.7	7.9	8.2	.9
1.0	6.0	6.2	6.4	6.7	6.9	7.2	7.4	7.6	7.9	8.1	8.3	8.6	8.8	9.1	1.0
2.0	12.0	12.4	12.9	13.3	13.7	14.2	14.7	15.2	15.6	16.1	16.6	17.1	17.6	18.1	2.0
3.0	18.1	18.7	19.4	20.0	20.7	21.4	22.1	22.8	23.5	24.2	24.9	25.7	26.5	27.3	3.0
4.0	24.1	24.9	25.7	26.7	27.6	28.5	29.4	30.3	31.3						4.0

Var. 1 min. (Table 29).	Arc or Time from Meridian Passage.														Var. 1 min. (Table 29).
	5°55′	6°00′	6°05′	6°10′	6°15′	6°20′	6°25′	6°30′	6°35′	6°40′	6°45′	6°50′	6°55′	7°00′	
	m s 23 40	m s 24 00	m s 24 20	m s 24 40	m s 25 00	m s 25 20	m s 25 40	m s 26 00	m s 26 20	m s 26 40	m s 27 00	m s 27 20	m s 27 40	m s 28 00	
″	′	′	′	′	′	′	′	′	′	′	′	′	′	′	″
.1	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	.1
.2	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	.2
.3	2.8	2.9	3.0	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.7	3.8	3.9	.3
.4	3.7	3.8	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.9	5.0	5.1	5.2	.4
.5	4.7	4.8	4.9	5.1	5.2	5.4	5.5	5.6	5.8	5.9	6.1	6.2	6.4	6.5	.5
.6	5.6	5.8	5.9	6.1	6.3	6.4	6.6	6.8	6.9	7.1	7.3	7.5	7.7	7.8	.6
.7	6.5	6.7	6.9	7.1	7.3	7.5	7.7	7.9	8.1	8.3	8.5	8.7	8.9	9.2	.7
.8	7.5	7.7	7.9	8.1	8.3	8.6	8.8	9.0	9.2	9.5	9.7	10.0	10.2	10.5	.8
.9	8.4	8.6	8.9	9.1	9.4	9.6	9.9	10.1	10.4	10.7	10.9	11.2	11.5	11.8	.9
1.0	9.3	9.6	9.9	10.1	10.4	10.7	11.0	11.3	11.6	11.9	12.2	12.5	12.8	13.1	1.0
2.0	18.6	19.2	19.7	20.3	20.8	21.4	21.9	22.5	23.1	23.7	24.3	24.9	25.5	26.1	2.0
3.0	28.1	28.8	29.6	30.4											3.0

TABLE 31.

Natural Trigonometric Functions.

0°

′	sin	tan	cot	cos	
0	.00000	.00000	∞	1.0000	60
1	029	029	3437.7	000	59
2	058	058	1718.9	000	58
3	087	087	1145.9	000	57
4	116	116	859.44	000	56
5	145	145	687.55	000	55
6	175	175	572.96	000	54
7	204	204	491.11	000	53
8	.00233	.00233	429.72	000	52
9	262	262	381.97	000	51
10	291	291	343.77	1.0000	50
11	320	320	312.52	.99999	49
12	349	349	286.48	999	48
13	378	378	264.44	999	47
14	407	407	245.55	999	46
15	436	436	229.18	999	45
16	465	465	214.86	999	44
17	.00495	.00495	202.22	999	43
18	524	524	190.98	999	42
19	553	553	180.93	998	41
20	582	582	171.89	.99998	40
21	611	611	163.70	998	39
22	640	640	156.26	998	38
23	669	669	149.47	998	37
24	698	698	143.24	998	36
25	.00727	.00727	137.51	997	35
26	756	756	132.22	997	34
27	785	785	127.32	997	33
28	814	815	122.77	997	32
29	844	844	118.54	996	31
30	873	873	114.59	.99996	30
31	902	902	110.89	996	29
32	931	931	107.43	996	28
33	960	960	104.17	995	27
34	.00989	.00989	101.11	995	26
35	.01018	.01018	98.218	995	25
36	047	047	95.489	995	24
37	076	076	92.908	994	23
38	105	105	90.463	994	22
39	134	135	88.144	994	21
40	164	164	85.940	.99993	20
41	193	193	83.844	993	19
42	222	222	81.847	993	18
43	.01251	251	79.943	992	17
44	280	.01280	78.126	992	16
45	309	309	76.390	991	15
46	338	338	74.729	991	14
47	367	367	73.139	991	13
48	396	396	71.615	990	12
49	425	425	70.153	990	11
50	454	455	68.750	.99989	10
51	483	484	67.402	989	9
52	.01513	.01513	66.105	989	8
53	542	542	64.858	988	7
54	571	571	63.657	988	6
55	600	600	62.499	987	5
56	629	629	61.383	987	4
57	658	658	60.306	986	3
58	687	687	59.266	986	2
59	716	716	58.261	985	1
60	.01745	.01746	57.290	.99985	0
	cos	cot	tan	sin	′

89°

1°

′	sin	tan	cot	cos	
0	.01745	.01746	57.290	.99985	60
1	774	775	56.351	984	59
2	803	804	55.442	984	58
3	832	833	54.561	983	57
4	862	862	53.709	983	56
5	891	891	52.882	982	55
6	920	920	52.081	982	54
7	949	949	51.303	981	53
8	.01978	.01978	50.549	980	52
9	.02007	.02007	49.816	980	51
10	036	036	49.104	.99979	50
11	065	066	48.412	979	49
12	094	095	47.740	978	48
13	123	124	47.085	977	47
14	152	153	46.449	977	46
15	181	182	45.829	976	45
16	211	211	45.226	976	44
17	240	.02240	44.639	975	43
18	269	269	44.066	974	42
19	298	298	43.508	974	41
20	.02327	328	42.964	.99973	40
21	356	357	42.433	972	39
22	385	386	41.916	972	38
23	414	415	41.411	971	37
24	443	444	40.917	970	36
25	472	473	40.436	969	35
26	501	.02502	39.965	969	34
27	530	531	39.506	968	33
28	560	560	39.057	967	32
29	589	589	38.618	966	31
30	.02618	619	38.188	.99966	30
31	647	648	37.769	965	29
32	676	677	37.358	964	28
33	705	706	36.956	963	27
34	734	735	36.563	963	26
35	763	.02764	36.178	962	25
36	792	793	35.801	961	24
37	.02821	822	35.431	960	23
38	850	851	35.070	959	22
39	879	881	34.715	959	21
40	908	910	34.368	.99958	20
41	938	939	34.027	957	19
42	967	968	33.694	956	18
43	.02996	.02997	33.366	955	17
44	.03025	.03026	33.045	954	16
45	054	055	32.730	953	15
46	083	084	32.421	952	14
47	112	114	32.118	952	13
48	141	143	31.821	951	12
49	170	172	31.528	950	11
50	199	201	31.242	.99949	10
51	228	230	30.960	948	9
52	.03257	.03259	30.683	947	8
53	286	288	30.412	946	7
54	316	317	30.145	945	6
55	345	346	29.882	944	5
56	374	376	29.624	943	4
57	403	405	29.371	942	3
58	432	434	29.122	941	2
59	461	463	28.877	940	1
60	.03490	.03492	28.636	.99939	0
	cos	cot	tan	sin	′

88°

Natural Trigonometric Functions.

2°

′	sin	tan	cot	cos	
0	**.03490**	**.03492**	**28.636**	**.99939**	**60**
1	519	521	.399	938	59
2	548	550	**28.166**	937	58
3	577	579	**27.937**	936	57
4	606	609	.712	935	56
5	635	638	.490	934	55
6	664	667	.271	933	54
7	693	696	**27.057**	932	53
8	723	.03725	**26.845**	931	52
9	.03752	754	.637	930	51
10	781	783	.432	.99929	**50**
11	810	812	.230	927	49
12	839	842	**26.031**	926	48
13	868	871	**25.835**	925	47
14	897	900	.642	924	46
15	926	929	.452	923	45
16	955	958	.264	922	44
17	**.03984**	**.03987**	**25.080**	921	43
18	**.04013**	**.04016**	**24.898**	919	42
19	042	046	.719	918	41
20	071	075	.542	.99917	**40**
21	100	104	.368	916	39
22	129	133	.196	915	38
23	159	162	**24.026**	913	37
24	188	191	**23.859**	912	36
25	217	220	.695	911	35
26	246	.04250	.532	910	34
27	.04275	279	.372	909	33
28	304	308	.214	907	32
29	333	337	**23.058**	906	31
30	362	366	**22.904**	.99905	**30**
31	391	395	.752	904	29
32	420	424	.602	902	28
33	449	454	.454	901	27
34	478	.04483	.308	900	26
35	.04507	512	.164	898	25
36	536	541	**22.022**	897	24
37	565	570	**21.881**	896	23
38	594	599	.743	894	22
39	623	628	.606	893	21
40	653	658	.470	.99892	**20**
41	682	687	.337	890	19
42	.04711	.04716	.205	889	18
43	740	745	**21.075**	888	17
44	769	774	**20.946**	886	16
45	798	803	.819	885	15
46	827	833	.693	883	14
47	856	862	.569	882	13
48	885	891	.446	881	12
49	914	920	.325	879	11
50	943	949	.206	.99878	**10**
51	**.04972**	**.04978**	**20.087**	876	9
52	**.05001**	**.05007**	**19.970**	875	8
53	030	037	.855	873	7
54	059	066	.740	872	6
55	088	095	.627	870	5
56	117	124	.516	869	4
57	146	153	.405	867	3
58	175	182	.296	866	2
59	205	212	.188	864	1
60	**.05234**	**.05241**	**19.081**	**.99863**	**0**
	cos	cot	tan	sin	′

87°

3°

′	sin	tan	cot	cos	
0	**.05234**	**.05241**	**19.081**	**.99863**	**60**
1	263	270	**18.976**	861	59
2	292	299	.871	860	58
3	321	328	.768	858	57
4	350	357	.666	857	56
5	379	387	.564	855	55
6	408	416	.464	854	54
7	437	445	.366	852	53
8	466	474	.268	851	52
9	.05495	.05503	.171	849	51
10	524	533	**18.075**	.99847	**50**
11	553	562	**17.980**	846	49
12	582	591	.886	844	48
13	611	620	.793	842	47
14	640	649	.702	841	46
15	669	678	.611	839	45
16	698	708	.521	838	44
17	.05727	737	.431	836	43
18	756	.05766	.343	834	42
19	785	795	.256	833	41
20	814	824	.169	.99831	**40**
21	844	854	**17.084**	829	39
22	873	883	**16.999**	827	38
23	902	912	.915	826	37
24	931	941	.832	824	36
25	960	970	.750	822	35
26	**.05989**	**.05999**	.668	821	34
27	**.06018**	**.06029**	.587	819	33
28	047	058	16.507	817	32
29	076	087	.428	815	31
30	105	116	.350	.99813	**30**
31	134	145	.272	812	29
32	163	175	.195	810	28
33	192	204	.119	808	27
34	221	233	**16.043**	806	26
35	.06250	262	**15.969**	804	25
36	279	.06291	.895	803	24
37	308	321	.821	801	23
38	337	350	.748	799	22
39	366	379	.676	797	21
40	395	408	.605	.99795	**20**
41	424	438	.534	793	19
42	453	467	15.464	792	18
43	.06482	496	.394	790	17
44	511	.06525	.325	788	16
45	540	554	.257	786	15
46	569	584	.189	784	14
47	598	613	.122	782	13
48	627	642	**15.056**	780	12
49	656	671	**14.990**	778	11
50	685	700	.924	.99776	**10**
51	.06714	730	.860	774	9
52	743	.06759	.795	772	8
53	773	788	.732	770	7
54	802	817	.669	768	6
55	831	847	.606	766	5
56	860	876	.544	764	4
57	889	905	.482	762	3
58	918	934	.421	760	2
59	947	963	.361	758	1
60	**.06976**	**.06993**	**14.301**	**.99756**	**0**
	cos	cot	tan	sin	′

86°

66806°—38——12

TABLE 31.

Natural Trigonometric Functions.

4°

′	sin	tan	cot	cos	
0	.06976	.06993	14.301	.99756	60
1	.07005	.07022	.241	754	59
2	034	051	.182	752	58
3	063	080	.124	750	57
4	092	110	.065	748	56
5	121	139	14.008	746	55
6	150	168	13.951	744	54
7	179	197	.894	742	53
8	208	227	.838	740	52
9	237	.07256	.782	738	51
10	.07266	285	.727	.99736	50
11	295	314	.672	734	49
12	324	344	.617	731	48
13	353	373	.563	729	47
14	382	402	13.510	727	46
15	411	431	.457	725	45
16	440	461	.404	723	44
17	469	490	.352	721	43
18	.07498	.07519	.300	719	42
19	527	548	.248	716	41
20	556	578	.197	.99714	40
21	585	607	.146	712	39
22	614	636	.096	710	38
23	643	665	13.046	708	37
24	672	695	12.996	705	36
25	701	724	.947	703	35
26	.07730	.07753	.898	701	34
27	759	782	.850	699	33
28	788	812	.801	696	32
29	817	841	.754	694	31
30	846	870	.706	.99692	30
31	875	899	.659	689	29
32	904	929	12.612	687	28
33	933	958	.566	685	27
34	962	.07987	.520	683	26
35	.07991	.08017	.474	680	25
36	.08020	046	.429	678	24
37	049	075	.384	676	23
38	078	104	12.339	673	22
39	107	134	.295	671	21
40	136	163	.251	.99668	20
41	165	192	.207	666	19
42	194	221	.163	664	18
43	223	.08251	.120	661	17
44	.08252	280	.077	659	16
45	281	309	12.035	657	15
46	310	339	11.992	654	14
47	339	368	.950	652	13
48	368	397	.909	649	12
49	397	427	.867	647	11
50	426	456	.826	.99644	10
51	455	485	.785	642	9
52	.08484	.08514	.745	639	8
53	513	544	.705	637	7
54	542	573	11.664	635	6
55	571	602	.625	632	5
56	600	632	.585	630	4
57	629	661	.546	627	3
58	658	690	.507	625	2
59	687	720	.468	622	1
60	.08716	.08749	11.430	.99619	0
	cos	cot	tan	sin	′

85°

5°

′	sin	tan	cot	cos	
0	.08716	.08749	11.430	.99619	60
1	745	778	.392	617	59
2	774	807	.354	614	58
3	803	837	.316	612	57
4	831	866	.279	609	56
5	860	895	.242	607	55
6	889	925	.205	604	54
7	918	954	.168	602	53
8	947	.08983	.132	599	52
9	.08976	.09013	.095	596	51
10	.09005	042	.059	.99594	50
11	034	071	11.024	591	49
12	063	101	10.988	588	48
13	092	130	.953	586	47
14	121	159	.918	583	46
15	150	189	.883	580	45
16	179	218	.848	578	44
17	208	.09247	.814	575	43
18	.09237	277	.780	572	42
19	266	306	.746	570	41
20	295	335	.712	.99567	40
21	324	365	.678	564	39
22	353	394	10.645	562	38
23	382	423	.612	559	37
24	411	453	.579	556	36
25	440	.09482	.546	553	35
26	.09469	511	.514	551	34
27	498	541	.481	548	33
28	527	570	.449	545	32
29	556	600	.417	542	31
30	585	629	.385	.99540	30
31	614	658	.354	537	29
32	642	688	10.322	534	28
33	671	.09717	.291	531	27
34	700	746	.260	528	26
35	.09729	776	.229	526	25
36	758	805	.199	523	24
37	787	834	.168	520	23
38	816	864	.138	517	22
39	845	893	.108	514	21
40	874	923	.078	.99511	20
41	903	952	.048	508	19
42	932	.09981	10.019	506	18
43	961	.10011	9.9893	503	17
44	.09990	040	.9601	500	16
45	.10019	069	.9310	497	15
46	048	099	.9021	494	14
47	077	128	.8734	491	13
48	106	158	.8448	488	12
49	135	187	.8164	485	11
50	164	216	.7882	.99482	10
51	192	.10246	.7601	479	9
52	221	275	9.7322	476	8
53	.10250	305	.7044	473	7
54	279	334	.6768	470	6
55	308	363	.6493	467	5
56	337	393	.6220	464	4
57	366	422	.5949	461	3
58	395	452	.5679	458	2
59	424	481	.5411	455	1
60	.10453	.10510	9.5144	.99452	0
	cos	cot	tan	sin	′

84°

Natural Trigonometric Functions.

6°

′	sin	tan	cot	cos	
0	.10453	.10510	9.5144	.99452	60
1	482	540	.4878	449	59
2	511	569	.4614	446	58
3	540	599	.4352	443	57
4	569	628	.4090	440	56
5	597	657	.3831	437	55
6	626	687	.3572	434	54
7	655	716	.3315	431	53
8	684	.10746	.3060	428	52
9	.10713	775	.2806	424	51
10	742	805	9.2553	.99421	50
11	771	834	.2302	418	49
12	800	863	.2052	415	48
13	829	893	.1803	412	47
14	858	922	.1555	409	46
15	887	952	.1309	406	45
16	916	.10981	.1065	402	44
17	945	.11011	.0821	399	43
18	.10973	040	.0579	396	42
19	.11002	070	.0338	393	41
20	031	099	9.0098	.99390	40
21	060	128	8.9860	386	39
22	089	158	.9623	383	38
23	118	187	.9387	380	37
24	147	217	.9152	377	36
25	176	.11246	.8919	374	35
26	205	276	.8686	370	34
27	234	305	.8455	367	33
28	.11263	335	.8225	364	32
29	291	364	.7996	360	31
30	320	394	.7769	.99357	30
31	349	423	8.7542	354	29
32	378	452	.7317	351	28
33	407	.11482	.7093	347	27
34	436	511	.6870	344	26
35	465	541	.6648	341	25
36	494	570	.6427	337	24
37	.11523	600	.6208	334	23
38	552	629	.5989	331	22
39	580	659	.5772	327	21
40	609	688	.5555	.99324	20
41	638	.11718	8.5340	320	19
42	667	747	.5126	317	18
43	696	777	.4913	314	17
44	725	806	.4701	310	16
45	.11754	836	.4490	307	15
46	783	865	.4280	303	14
47	812	895	.4071	300	13
48	840	924	.3863	297	12
49	869	954	.3656	293	11
50	898	.11983	.3450	.99290	10
51	927	.12013	8.3245	286	9
52	956	042	.3041	283	8
53	.11985	072	.2838	279	7
54	.12014	101	.2636	276	6
55	043	131	.2434	272	5
56	071	160	.2234	269	4
57	100	190	.2035	265	3
58	129	219	.1837	262	2
59	158	249	.1640	258	1
60	.12187	.12278	8.1443	.99255	0
	cos	cot	tan	sin	′

83°

7°

′	sin	tan	cot	cos	
0	.12187	.12278	8.1443	.99255	60
1	216	308	.1248	251	59
2	245	338	.1054	248	58
3	274	367	.0860	244	57
4	302	397	.0667	240	56
5	331	426	.0476	237	55
6	360	456	.0285	233	54
7	389	485	8.0095	230	53
8	418	.12515	7.9906	226	52
9	.12447	544	.9718	222	51
10	476	574	.9530	.99219	50
11	504	603	.9344	215	49
12	533	633	.9158	211	48
13	562	662	.8973	208	47
14	591	692	.8789	204	46
15	620	722	.8606	200	45
16	649	.12751	7.8424	197	44
17	678	781	.8243	193	43
18	.12706	810	.8062	189	42
19	735	840	.7882	186	41
20	764	869	.7704	.99182	40
21	793	899	.7525	178	39
22	822	929	.7348	175	38
23	851	958	.7171	171	37
24	880	.12988	.6996	167	36
25	908	.13017	7.6821	163	35
26	937	047	.6647	160	34
27	966	076	.6473	156	33
28	.12995	106	.6301	152	32
29	.13024	136	.6129	148	31
30	053	165	.5958	.99144	30
31	081	195	.5787	141	29
32	110	224	.5618	137	28
33	139	.13254	.5449	133	27
34	168	284	7.5281	129	26
35	197	313	.5113	125	25
36	.13226	343	.4947	122	24
37	254	372	.4781	118	23
38	283	402	.4615	114	22
39	312	432	.4451	110	21
40	341	461	.4287	.99106	20
41	370	.13491	.4124	102	19
42	399	521	.3962	098	18
43	427	550	7.3800	094	17
44	.13456	580	.3639	091	16
45	485	609	.3479	087	15
46	514	639	.3319	083	14
47	543	669	.3160	079	13
48	572	698	.3002	075	12
49	600	.13728	.2844	071	11
50	629	758	.2687	.99067	10
51	658	787	7.2531	063	9
52	.13687	817	.2375	059	8
53	716	846	.2220	055	7
54	744	876	.2066	051	6
55	773	906	.1912	047	5
56	802	935	.1759	043	4
57	831	965	.1607	039	3
58	860	.13995	.1455	035	2
59	889	.14024	.1304	031	1
60	.13917	.14054	7.1154	.99027	0
	cos	cot	tan	sin	′

82°

TABLE 31.

Natural Trigonometric Functions.

8°

′	sin	tan	cot	cos	
0	.13917	.14054	7.1154	.99027	**60**
1	946	084	.1004	023	59
2	.13975	113	.0855	019	58
3	.14004	143	.0706	015	57
4	033	173	.0558	011	56
5	061	202	.0410	006	55
6	090	232	.0264	.99002	54
7	119	262	7.0117	.98998	53
8	148	.14291	6.9972	994	52
9	177	321	.9827	990	51
10	205	351	.9682	986	**50**
11	.14234	381	.9538	982	49
12	263	410	.9395	978	48
13	292	440	.9252	973	47
14	320	470	.9110	969	46
15	349	499	.8969	965	45
16	378	.14529	.8828	961	44
17	407	559	6.8687	.98957	43
18	436	588	.8548	953	42
19	464	618	.8408	948	41
20	.14493	648	.8269	944	**40**
21	522	678	.8131	940	39
22	551	707	.7994	936	38
23	580	737	.7856	931	37
24	608	.14767	.7720	927	36
25	637	796	6.7584	.98923	35
26	666	826	.7448	919	34
27	695	856	.7313	914	33
28	.14723	886	.7179	910	32
29	752	915	.7045	906	31
30	781	945	.6912	902	**30**
31	810	.14975	.6779	897	29
32	838	.15005	.6646	893	28
33	867	034	.6514	889	27
34	896	064	6.6383	.98884	26
35	925	094	.6252	880	25
36	954	124	.6122	876	24
37	.14982	153	.5992	871	23
38	.15011	183	.5863	867	22
39	040	213	.5734	863	21
40	069	243	.5606	858	**20**
41	097	.15272	.5478	854	19
42	126	302	.5350	849	18
43	155	332	6.5223	.98845	17
44	184	362	.5097	841	16
45	.15212	391	.4971	836	15
46	241	421	.4846	832	14
47	270	451	.4721	827	13
48	299	481	.4596	823	12
49	327	511	.4472	818	11
50	356	.15540	.4348	814	**10**
51	385	570	.4225	809	9
52	.15414	600	6.4103	.98805	8
53	442	630	.3980	800	7
54	471	660	.3859	796	6
55	500	689	.3737	791	5
56	529	719	.3617	787	4
57	557	749	.3496	782	3
58	586	779	.3376	778	2
59	615	809	.3257	773	1
60	.15643	.15838	6.3138	.98769	**0**
	cos	cot	tan	sin	′

81°

9°

′	sin	tan	cot	cos	
0	.15643	.15838	6.3138	.98769	**60**
1	672	868	.3019	764	59
2	701	898	.2901	760	58
3	730	928	.2783	755	57
4	758	958	.2666	751	56
5	787	.15988	.2549	746	55
6	.15816	.16017	.2432	741	54
7	845	047	.2316	737	53
8	873	077	.2200	732	52
9	902	107	6.2085	728	51
10	931	137	.1970	.98723	**50**
11	959	167	.1856	718	49
12	.15988	196	.1742	714	48
13	.16017	226	.1628	709	47
14	046	.16256	.1515	704	46
15	074	286	.1402	700	45
16	103	316	.1290	695	44
17	132	346	.1178	690	43
18	160	376	6.1066	686	42
19	189	405	.0955	681	41
20	218	435	.0844	.98676	**40**
21	246	465	.0734	671	39
22	.16275	.16495	.0624	667	38
23	304	525	.0514	662	37
24	333	555	.0405	657	36
25	361	585	.0296	652	35
26	390	615	.0188	648	34
27	419	645	6.0080	643	33
28	447	674	5.9972	638	32
29	476	704	.9865	633	31
30	505	.16734	.9758	.98629	**30**
31	.16533	764	.9651	624	29
32	562	794	.9545	619	28
33	591	824	.9439	614	27
34	620	854	.9333	609	26
35	648	884	.9228	604	25
36	677	914	5.9124	600	24
37	706	944	.9019	595	23
38	734	.16974	.8915	590	22
39	.16763	.17004	.8811	585	21
40	792	033	.8708	.98580	**20**
41	820	063	.8605	575	19
42	849	093	.8502	570	18
43	878	123	.8400	565	17
44	906	153	5.8298	561	16
45	935	183	.8197	556	15
46	964	.17213	.8095	551	14
47	.16992	243	.7994	546	13
48	.17021	273	.7894	541	12
49	050	303	.7794	536	11
50	078	333	.7694	.98531	**10**
51	107	363	.7594	526	9
52	136	393	5.7495	521	8
53	164	.17423	.7396	516	7
54	.17193	453	.7297	511	6
55	222	483	.7199	506	5
56	250	513	.7101	501	4
57	279	543	.7004	496	3
58	308	573	.6906	491	2
59	336	603	.6809	486	1
60	.17365	.17633	5.6713	.98481	**0**
	cos	cot	tan	sin	′

80°

Natural Trigonometric Functions.

10°

′	sin	tan	cot	cos	
0	.17365	.17633	5.6713	.98481	60
1	393	663	.6617	476	59
2	422	693	.6521	471	58
3	451	723	.6425	466	57
4	479	753	.6329	461	56
5	508	783	.6234	455	55
6	537	.17813	.6140	450	54
7	.17565	843	.6045	445	53
8	594	873	.5951	440	52
9	623	903	.5857	435	51
10	651	933	5.5764	.98430	50
11	680	963	.5671	425	49
12	708	.17993	.5578	420	48
13	737	.18023	.5485	414	47
14	766	053	.5393	409	46
15	.17794	083	.5301	404	45
16	823	113	.5209	399	44
17	852	143	.5118	394	43
18	880	173	.5026	389	42
19	909	203	.4936	383	41
20	937	233	5.4845	.98378	40
21	966	.18263	.4755	373	39
22	.17995	293	.4665	368	38
23	.18023	323	.4575	362	37
24	052	353	.4486	357	36
25	081	384	.4397	352	35
26	109	414	.4308	347	34
27	138	444	.4219	341	33
28	166	474	.4131	336	32
29	195	.18504	.4043	331	31
30	224	534	5.3955	.98325	30
31	252	564	.3868	320	29
32	.18281	594	.3781	315	28
33	309	624	.3694	310	27
34	338	654	.3607	304	26
35	367	684	.3521	299	25
36	395	714	.3435	294	24
37	424	.18745	.3349	288	23
38	452	775	.3263	283	22
39	481	805	.3178	277	21
40	.18509	835	5.3093	.98272	20
41	538	865	.3008	267	19
42	567	895	.2924	261	18
43	595	925	.2839	256	17
44	624	955	.2755	250	16
45	652	.18986	.2672	245	15
46	681	.19016	.2588	240	14
47	710	046	.2505	234	13
48	738	076	.2422	229	12
49	.18767	106	.2339	223	11
50	795	136	5.2257	.98218	10
51	824	166	.2174	212	9
52	852	197	.2092	207	8
53	881	.19227	.2011	201	7
54	910	257	.1929	196	6
55	938	287	.1848	190	5
56	967	317	.1767	185	4
57	.18995	347	.1686	179	3
58	.19024	378	.1606	174	2
59	052	408	.1526	168	1
60	.19081	.19438	5.1446	.98163	0
	cos	cot	tan	sin	′

79°

11°

′	sin	tan	cot	cos	
0	.19081	.19438	5.1446	.98163	60
1	109	468	.1366	157	59
2	138	498	.1286	152	58
3	167	529	.1207	146	57
4	195	559	.1128	140	56
5	224	589	.1049	135	55
6	252	619	.0970	129	54
7	281	649	.0892	124	53
8	.19309	680	.0814	118	52
9	338	.19710	5.0736	.98112	51
10	366	740	.0658	107	50
11	395	770	.0581	101	49
12	423	801	.0504	096	48
13	452	831	.0427	090	47
14	481	861	.0350	084	46
15	509	891	.0273	079	45
16	.19538	921	.0197	073	44
17	566	952	.0121	067	43
18	595	.19982	5.0045	061	42
19	623	.20012	4.9969	.98056	41
20	652	042	.9894	050	40
21	680	073	.9819	044	39
22	709	103	.9744	039	38
23	737	133	.9669	033	37
24	.19766	164	.9594	027	36
25	794	194	.9520	021	35
26	823	.20224	.9446	016	34
27	851	254	4.9372	010	33
28	880	285	.9298	.98004	32
29	908	315	.9225	.97998	31
30	937	345	.9152	992	30
31	965	376	.9078	987	29
32	.19994	406	.9006	981	28
33	.20022	436	.8933	975	27
34	051	.20466	.8860	969	26
35	079	497	4.8788	963	25
36	108	527	.8716	958	24
37	136	557	.8644	.97952	23
38	165	588	.8573	946	22
39	193	618	.8501	940	21
40	222	648	.8430	934	20
41	250	679	.8359	928	19
42	.20279	709	.8288	922	18
43	307	.20739	.8218	916	17
44	336	770	4.8147	.97910	16
45	364	800	.8077	905	15
46	393	830	.8007	899	14
47	421	861	.7937	893	13
48	450	891	.7867	887	12
49	478	921	.7798	881	11
50	507	952	.7729	875	10
51	.20535	.20982	.7659	869	9
52	563	.21013	4.7591	.97863	8
53	592	043	.7522	857	7
54	620	073	.7453	851	6
55	649	104	.7385	845	5
56	677	134	.7317	839	4
57	706	164	.7249	833	3
58	734	195	.7181	827	2
59	763	225	.7114	821	1
60	.20791	.21256	4.7046	.97815	0
	cos	cot	tan	sin	′

78°

TABLE 31.

Natural Trigonometric Functions.

12°

′	sin	tan	cot	cos	
0	.20791	.21256	4.7046	.97815	**60**
1	820	286	4.6979	809	59
2	848	316	912	803	58
3	877	347	845	797	57
4	905	377	779	791	56
5	933	408	712	784	55
6	962	438	646	778	54
7	.20990	469	580	772	53
8	.21019	.21499	4.6514	766	52
9	047	529	448	760	51
10	076	560	382	.97754	**50**
11	104	590	317	748	49
12	132	621	252	742	48
13	161	651	187	735	47
14	189	682	122	729	46
15	218	712	4.6057	723	45
16	.21246	.21743	4.5993	717	44
17	275	773	928	711	43
18	303	804	864	705	42
19	331	834	800	698	41
20	360	864	736	.97692	**40**
21	388	895	673	686	39
22	417	925	609	680	38
23	445	956	4.5546	673	37
24	474	.21986	483	667	36
25	.21502	.22017	420	661	35
26	530	047	357	655	34
27	559	078	294	648	33
28	587	108	232	642	32
29	616	139	169	636	31
30	644	169	107	.97630	**30**
31	672	200	4.5045	623	29
32	701	231	4.4983	617	28
33	729	.22261	922	611	27
34	.21758	292	860	604	26
35	786	322	799	598	25
36	814	353	737	592	24
37	843	383	676	585	23
38	871	414	615	579	22
39	899	444	555	573	21
40	928	475	4.4494	.97566	**20**
41	956	.22505	434	560	19
42	.21985	536	373	553	18
43	.22013	567	313	547	17
44	041	597	253	541	16
45	070	628	194	534	15
46	098	658	134	528	14
47	126	689	075	521	13
48	155	719	4.4015	515	12
49	183	.22750	4.3956	508	11
50	212	781	897	.97502	**10**
51	240	811	838	496	9
52	.22268	842	779	489	8
53	297	872	721	483	7
54	325	903	662	476	6
55	353	934	604	470	5
56	382	964	546	463	4
57	410	.22995	488	457	3
58	438	.23026	430	450	2
59	467	056	372	444	1
60	.22495	.23087	4.3315	.97437	**0**
	cos	cot	tan	sin	′

77°

13°

′	sin	tan	cot	cos	
0	.22495	.23087	4.3315	.97437	**60**
1	523	117	257	430	59
2	552	148	200	424	58
3	580	179	143	417	57
4	608	209	086	411	56
5	637	240	4.3029	404	55
6	665	271	4.2972	398	54
7	693	23301	916	391	53
8	.22722	332	859	384	52
9	750	363	803	378	51
10	778	393	747	.97371	**50**
11	807	424	691	365	49
12	835	455	635	358	48
13	863	485	580	351	47
14	892	516	4.2524	345	46
15	920	.23547	468	338	45
16	948	578	413	331	44
17	.22977	608	358	325	43
18	.23005	639	303	318	42
19	033	670	248	311	41
20	062	700	193	.97304	**40**
21	090	731	139	298	39
22	118	.23762	084	291	38
23	146	793	4.2030	284	37
24	175	823	4.1976	278	36
25	203	854	922	271	35
26	231	885	868	264	34
27	.23260	916	814	257	33
28	288	946	760	251	32
29	316	.23977	706	244	31
30	345	.24008	653	.97237	**30**
31	373	039	600	230	29
32	401	069	547	223	28
33	429	100	4.1493	217	27
34	458	131	441	210	26
35	.23486	162	388	203	25
36	514	193	335	196	24
37	542	223	282	189	23
38	571	.24254	230	182	22
39	599	285	178	176	21
40	627	316	126	.97169	**20**
41	656	347	074	162	19
42	684	377	4.1022	155	18
43	712	408	4.0970	148	17
44	.23740	439	918	141	16
45	769	.24470	867	134	15
46	797	501	815	127	14
47	825	532	764	120	13
48	853	562	713	113	12
49	882	593	662	106	11
50	910	624	611	.97100	**10**
51	938	655	560	093	9
52	966	.24686	4.0509	086	8
53	.23995	717	459	079	7
54	.24023	747	408	072	6
55	051	778	358	065	5
56	079	809	308	058	4
57	108	840	257	051	3
58	136	871	207	044	2
59	164	902	158	037	1
60	.24192	.24933	4.0108	.97030	**0**
	cos	cot	tan	sin	′

76°

Natural Trigonometric Functions.

14°

′	sin	tan	cot	cos	
0	.24192	.24933	4.0108	.97030	**60**
1	220	964	058	023	59
2	249	.24995	4.0009	015	58
3	277	.25026	3.9959	008	57
4	305	056	910	.97001	56
5	333	087	861	.96994	55
6	362	118	812	987	54
7	390	149	763	980	53
8	418	180	714	973	52
9	.24446	211	665	966	51
10	474	242	617	959	**50**
11	503	.25273	568	952	49
12	531	304	3.9520	945	48
13	559	335	471	.96937	47
14	587	366	423	930	46
15	615	397	375	923	45
16	644	428	327	916	44
17	672	459	279	909	43
18	700	.25490	232	902	42
19	.24728	521	184	894	41
20	756	552	136	887	**40**
21	784	583	089	.96880	39
22	813	614	3.9042	873	38
23	841	645	3.8995	866	37
24	869	676	947	858	36
25	897	707	900	851	35
26	925	.25738	854	844	34
27	954	769	807	837	33
28	.24982	800	760	829	32
29	.25010	831	714	.96822	31
30	038	862	3.8667	815	**30**
31	066	893	621	807	29
32	094	924	575	800	28
33	122	955	528	793	27
34	151	.25986	482	786	26
35	179	.26017	436	778	25
36	207	048	391	771	24
37	.25235	079	3.8345	.96764	23
38	263	110	299	756	22
39	291	141	254	749	21
40	320	172	208	742	**20**
41	348	203	163	734	19
42	376	235	118	727	18
43	404	.26266	073	719	17
44	.25432	297	3.8028	712	16
45	460	328	3.7983	.96705	15
46	488	359	938	697	14
47	516	390	893	690	13
48	545	421	848	682	12
49	573	452	804	675	11
50	601	483	760	667	**10**
51	629	515	715	660	9
52	.25657	.26546	3.7671	653	8
53	685	577	627	.96645	7
54	713	608	583	638	6
55	741	639	539	630	5
56	769	670	495	623	4
57	798	701	451	615	3
58	826	733	408	608	2
59	854	764	364	600	1
60	.25882	.26795	3.7321	.96593	**0**
	cos	cot	tan	sin	′

75°

15°

′	sin	tan	cot	cos	
0	.25882	.26795	3.7321	.96593	**60**
1	910	826	277	585	59
2	938	857	234	578	58
3	966	888	191	570	57
4	.25994	920	148	562	56
5	.26022	951	105	555	**55**
6	050	.26982	062	547	54
7	079	.27013	3.7019	540	53
8	107	044	3.6976	532	52
9	135	076	933	524	51
10	163	107	891	.96517	**50**
11	191	138	848	509	49
12	219	169	806	502	48
13	.26247	201	764	494	47
14	275	232	722	486	46
15	303	.27263	680	479	45
16	331	294	3.6638	471	44
17	359	326	596	463	43
18	387	357	554	456	42
19	415	388	512	448	41
20	443	419	470	.96440	**40**
21	.26471	451	429	433	39
22	500	.27482	387	425	38
23	528	513	346	417	37
24	556	545	3.6305	410	36
25	584	576	264	402	35
26	612	607	222	394	34
27	640	638	181	386	33
28	668	670	140	379	32
29	696	701	100	371	31
30	.26724	.27732	059	.96363	**30**
31	752	764	3.6018	355	29
32	780	795	3.5978	347	28
33	808	826	937	340	27
34	836	858	897	332	26
35	864	889	856	324	25
36	892	921	816	316	24
37	920	952	776	308	23
38	948	.27983	736	301	22
39	.26976	.28015	696	293	21
40	.27004	046	3.5656	.96285	**20**
41	032	077	616	277	19
42	060	109	576	269	18
43	088	140	536	261	17
44	116	172	497	253	16
45	144	203	457	246	15
46	172	.28234	418	238	14
47	200	266	379	230	13
48	228	297	3.5339	222	12
49	256	329	300	214	11
50	.27284	360	261	.96206	**10**
51	312	391	222	198	9
52	340	423	183	190	8
53	368	.28454	144	182	7
54	396	486	105	174	6
55	424	517	067	166	5
56	452	549	3.5028	158	4
57	480	580	3.4989	150	3
58	508	612	951	142	2
59	536	643	912	134	1
60	.27564	.28675	3.4874	.96126	**0**
	cos	cot	tan	sin	′

74°

TABLE 31.

Natural Trigonometric Functions.

16°

′	sin	tan	cot	cos	
0	.27564	.28675	3.4874	.96126	60
1	592	706	836	118	59
2	620	738	798	110	58
3	648	769	760	102	57
4	676	801	722	094	56
5	704	832	684	086	55
6	731	864	646	078	54
7	.27759	895	608	.96070	53
8	787	927	3.4570	062	52
9	815	958	533	054	51
10	843	.28990	495	046	50
11	871	.29021	458	037	49
12	899	053	420	029	48
13	927	084	383	021	47
14	955	116	346	013	46
15	.27983	147	3.4308	.96005	45
16	.28011	179	271	.95997	44
17	039	210	234	989	43
18	067	.29242	197	981	42
19	095	274	160	972	41
20	123	305	124	964	40
21	150	337	087	956	39
22	178	368	050	948	38
23	206	400	3.4014	940	37
24	.28234	432	3.3977	931	36
25	262	.29463	941	.95923	35
26	290	495	904	915	34
27	318	526	868	907	33
28	346	558	832	898	32
29	374	590	796	890	31
30	402	621	759	882	30
31	429	653	723	874	29
32	457	685	687	865	28
33	.28485	.29716	3.3652	.95857	27
34	513	748	616	849	26
35	541	780	580	841	25
36	569	811	544	832	24
37	597	843	509	824	23
38	625	875	473	816	22
39	652	906	438	807	21
40	680	938	402	799	20
41	708	.29970	367	791	19
42	.28736	.30001	3.3332	.95782	18
43	764	033	297	774	17
44	792	065	261	766	16
45	820	097	226	757	15
46	847	128	191	749	14
47	875	160	156	740	13
48	903	192	122	732	12
49	931	224	087	724	11
50	959	255	052	715	10
51	.28987	.30287	3.3017	.95707	9
52	.29015	319	3.2983	698	8
53	042	351	948	690	7
54	070	382	914	681	6
55	098	414	879	673	5
56	126	446	845	664	4
57	154	478	811	656	3
58	182	509	777	647	2
59	209	541	743	639	1
60	.29237	.30573	3.2709	.95630	0
	cos	cot	tan	sin	′

73°

17°

′	sin	tan	cot	cos	
0	.29237	.30573	3.2709	.95630	60
1	265	605	675	622	59
2	293	637	641	613	58
3	321	669	607	605	57
4	348	700	573	596	56
5	376	732	539	588	55
6	404	764	506	579	54
7	432	.30796	3.2472	571	53
8	460	828	438	562	52
9	.29487	860	405	554	51
10	515	891	371	.95545	50
11	543	923	338	536	49
12	571	955	305	528	48
13	599	.30987	272	519	47
14	626	.31019	3.2238	511	46
15	654	051	205	502	45
16	682	083	172	493	44
17	710	115	139	485	43
18	.29737	147	106	476	42
19	765	178	073	467	41
20	793	210	041	.95459	40
21	821	242	3.2008	450	39
22	849	.31274	3.1975	441	38
23	876	306	943	433	37
24	904	338	910	424	36
25	932	370	878	415	35
26	960	402	845	407	34
27	.29987	434	813	398	33
28	.30015	466	780	389	32
29	043	.31498	3.1748	380	31
30	071	530	716	.95372	30
31	098	562	684	363	29
32	126	594	652	354	28
33	154	626	620	345	27
34	182	658	588	337	26
35	209	690	556	328	25
36	237	722	524	319	24
37	.30265	.31754	3.1492	310	23
38	292	786	460	301	22
39	320	818	429	293	21
40	348	850	397	.95284	20
41	376	882	366	275	19
42	403	914	334	260	18
43	431	946	303	257	17
44	459	.31978	3.1271	248	16
45	.30486	.32010	240	240	15
46	514	042	209	231	14
47	542	074	178	222	13
48	570	106	146	213	12
49	597	139	115	204	11
50	625	171	084	.95195	10
51	653	203	053	186	9
52	680	235	3.1022	177	8
53	.30708	.32267	3.0991	168	7
54	736	299	961	159	6
55	763	331	930	150	5
56	791	363	899	142	4
57	819	396	868	133	3
58	846	428	838	124	2
59	874	460	807	115	1
60	.30902	.32492	3.0777	.95106	0
	cos	cot	tan	sin	′

72°

Natural Trigonometric Functions.

18°

′	sin	tan	cot	cos	
0	.30902	.32492	3.0777	.95106	60
1	929	524	746	097	59
2	957	556	716	088	58
3	.30985	588	686	079	57
4	.31012	621	655	070	56
5	040	653	625	061	55
6	068	685	595	.95052	54
7	095	717	565	043	53
8	123	.32749	535	033	52
9	151	782	3.0505	024	51
10	178	814	475	015	50
11	206	846	445	.95006	49
12	233	878	415	.94997	48
13	261	911	385	988	47
14	.31289	943	356	979	46
15	316	.32975	326	970	45
16	344	.33007	296	961	44
17	372	040	3.0267	952	43
18	399	072	237	943	42
19	427	104	208	933	41
20	454	136	178	.94924	40
21	482	169	149	915	39
22	.31510	201	120	906	38
23	537	233	090	897	37
24	565	.33266	061	888	36
25	593	298	032	878	35
26	620	330	3.0003	869	34
27	648	363	2.9974	860	33
28	675	395	945	.94851	32
29	703	427	916	842	31
30	730	460	887	832	30
31	.31758	.33492	858	823	29
32	786	524	829	814	28
33	813	557	800	805	27
34	841	589	772	795	26
35	868	621	2.9743	786	25
36	896	654	714	.94777	24
37	923	686	686	768	23
38	951	.33718	657	758	22
39	.31979	751	629	749	21
40	.32006	783	600	740	20
41	034	816	572	730	19
42	061	848	544	721	18
43	089	881	515	712	17
44	116	913	2.9487	.94702	16
45	144	945	459	693	15
46	171	.33978	431	684	14
47	199	.34010	403	674	13
48	227	043	375	665	12
49	254	075	347	656	11
50	.32282	108	319	646	10
51	309	140	2.9291	637	9
52	337	173	263	.94627	8
53	364	205	235	618	7
54	392	.34238	208	609	6
55	419	270	180	599	5
56	447	303	152	590	4
57	474	335	125	580	3
58	502	368	097	571	2
59	529	400	070	561	1
60	.32557	.34433	2.9042	.94552	0
	cos	cot	tan	sin	′

71°

19°

′	sin	tan	cot	cos	
0	.32557	.34433	2.9042	.94552	60
1	584	465	2.9015	542	59
2	612	498	2.8987	533	58
3	639	530	960	523	57
4	667	563	933	514	56
5	694	596	905	504	55
6	722	628	878	495	54
7	749	661	851	485	53
8	.32777	693	824	476	52
9	804	.34726	797	466	51
10	832	758	770	.94457	50
11	859	791	2.8743	447	49
12	887	824	716	438	48
13	914	856	689	428	47
14	942	889	662	418	46
15	969	922	636	409	45
16	.32997	954	609	399	44
17	.33024	.34987	582	390	43
18	051	.35020	556	380	42
19	079	052	529	370	41
20	106	085	2.8502	.94361	40
21	134	118	476	351	39
22	161	150	449	342	38
23	189	183	423	332	37
24	.33216	216	397	322	36
25	244	.35248	370	313	35
26	271	281	344	303	34
27	298	314	318	293	33
28	326	346	291	284	32
29	353	379	2.8265	274	31
30	381	412	239	.94264	30
31	.33408	.35445	213	254	29
32	436	477	187	245	28
33	463	510	161	235	27
34	490	543	135	225	26
35	518	576	109	215	25
36	545	608	083	206	24
37	573	641	057	196	23
38	.33600	674	032	186	22
39	627	.35707	2.8006	176	21
40	655	740	2.7980	.94167	20
41	682	772	955	157	19
42	710	805	929	147	18
43	737	838	903	137	17
44	764	871	878	127	16
45	.33792	904	852	118	15
46	819	937	2.7827	108	14
47	846	.35969	801	098	13
48	874	.36002	776	.94088	12
49	901	035	751	078	11
50	929	068	725	068	10
51	956	101	700	058	9
52	.33983	134	675	049	8
53	.34011	167	2.7650	039	7
54	038	.36199	625	029	6
55	065	232	600	019	5
56	093	265	575	.94009	4
57	120	298	550	.93999	3
58	147	331	525	989	2
59	175	364	500	979	1
60	.34202	.36397	2.7475	.93969	0
	cos	cot	tan	sin	′

70°

TABLE 31.

Natural Trigonometric Functions.

20°

′	sin	tan	cot	cos	
0	.34202	.36397	2.7475	.93969	60
1	229	430	450	959	59
2	257	463	425	949	58
3	284	496	400	939	57
4	311	529	376	929	56
5	339	562	351	919	55
6	366	595	326	909	54
7	.34393	628	302	899	53
8	421	661	277	889	52
9	448	.36694	2.7253	879	51
10	475	727	228	.93869	50
11	503	760	204	859	49
12	530	793	179	849	48
13	557	826	155	839	47
14	.34584	859	130	829	46
15	612	892	106	819	45
16	639	925	082	809	44
17	666	958	058	799	43
18	694	.36991	034	789	42
19	721	.37024	2.7009	779	41
20	748	057	2.6985	.93769	40
21	.34775	090	961	759	39
22	803	123	937	748	38
23	830	157	913	738	37
24	857	190	889	728	36
25	884	223	865	718	35
26	912	.37256	841	708	34
27	939	289	818	698	33
28	966	322	2.6794	688	32
29	.34993	355	770	677	31
30	.35021	388	746	.93667	30
31	048	422	723	657	29
32	075	455	699	647	28
33	102	.37488	675	637	27
34	130	521	652	626	26
35	157	554	628	616	25
36	184	588	2.6605	606	24
37	.35211	621	581	596	23
38	239	654	558	585	22
39	266	687	534	575	21
40	293	.37720	511	.93565	20
41	320	754	488	555	19
42	347	787	464	544	18
43	375	820	441	534	17
44	.35402	853	2.6418	524	16
45	429	887	395	514	15
46	456	920	371	503	14
47	484	953	348	493	13
48	511	.37986	325	483	12
49	538	.38020	302	472	11
50	565	053	279	.93462	10
51	.35592	086	256	452	9
52	619	120	2.6233	441	8
53	647	153	210	431	7
54	674	186	187	420	6
55	701	220	165	410	5
56	728	253	142	400	4
57	755	286	119	389	3
58	782	320	096	379	2
59	810	353	074	368	1
60	.35837	.38386	2.6051	.93358	0
	cos	cot	tan	sin	′

69°

21°

′	sin	tan	cot	cos	
0	.35837	.38386	2.6051	.93358	60
1	864	420	028	348	59
2	891	453	2.6006	337	58
3	918	487	2.5983	327	57
4	945	520	961	316	56
5	.35973	553	938	306	55
6	.36000	587	916	295	54
7	027	620	893	285	53
8	054	654	871	.93274	52
9	081	.38687	848	264	51
10	108	721	826	253	50
11	135	754	2.5804	243	49
12	162	787	782	232	48
13	190	821	759	222	47
14	217	854	737	211	46
15	.36244	888	715	201	45
16	271	921	693	.93190	44
17	298	955	671	180	43
18	325	.38988	2.5649	169	42
19	352	.39022	627	159	41
20	379	055	605	148	40
21	406	089	583	137	39
22	434	122	561	127	38
23	461	156	539	116	37
24	.36488	190	517	106	36
25	515	223	2.5495	.93095	35
26	542	.39257	473	084	34
27	569	290	452	074	33
28	596	324	430	063	32
29	623	357	408	052	31
30	650	391	386	042	30
31	677	425	365	031	29
32	704	458	2.5343	020	28
33	.36731	.39492	322	.93010	27
34	758	526	300	.92999	26
35	785	559	279	988	25
36	812	593	257	978	24
37	839	626	236	967	23
38	867	660	214	956	22
39	894	694	193	945	21
40	921	.39727	2.5172	935	20
41	948	761	150	924	19
42	.36975	795	129	913	18
43	.37002	829	108	.92902	17
44	029	862	086	892	16
45	056	896	065	881	15
46	083	930	044	870	14
47	110	963	023	859	13
48	137	.39997	2.5002	849	12
49	164	.40031	2.4981	838	11
50	191	065	960	827	10
51	218	098	939	816	9
52	.37245	132	918	.92805	8
53	272	166	897	794	7
54	299	200	876	784	6
55	326	234	2.4855	773	5
56	353	267	834	762	4
57	380	301	813	751	3
58	407	335	792	740	2
59	434	369	772	729	1
60	.37461	.40403	2.4751	.92718	0
	cos	cot	tan	sin	′

68°

TABLE 31.

Natural Trigonometric Functions.

22°

′	sin	tan	cot	cos	
0	.37461	.40403	2.4751	.92718	**60**
1	488	436	730	707	59
2	515	470	709	697	58
3	542	504	689	686	57
4	569	538	668	675	56
5	595	572	648	664	55
6	622	606	627	653	54
7	649	640	606	642	53
8	676	674	586	631	52
9	703	.40707	2.4566	620	51
10	.37730	741	545	.92609	**50**
11	757	775	525	598	49
12	784	809	504	587	48
13	811	843	484	576	47
14	838	877	464	565	46
15	865	911	443	554	45
16	892	945	423	543	44
17	919	.40979	403	532	43
18	946	.41013	2.4383	521	42
19	973	047	362	510	41
20	.37999	081	342	.92499	**40**
21	.38026	115	322	488	39
22	053	149	302	477	38
23	080	183	282	466	37
24	107	217	262	455	36
25	134	.41251	242	444	35
26	161	285	222	432	34
27	188	319	2.4202	421	33
28	215	353	182	410	32
29	241	387	162	399	31
30	.38268	421	142	.92388	**30**
31	295	455	122	377	29
32	322	.41490	102	366	28
33	349	524	083	355	27
34	376	558	063	343	26
35	403	592	043	332	25
36	430	626	023	321	24
37	456	660	2.4004	310	23
38	483	694	2.3984	299	22
39	.38510	.41728	964	287	21
40	537	763	945	.92276	**20**
41	564	797	925	265	19
42	591	831	906	254	18
43	617	865	886	243	17
44	644	899	867	231	16
45	671	933	2.3847	220	15
46	698	.41968	828	209	14
47	725	.42002	808	198	13
48	.38752	036	789	186	12
49	778	070	770	175	11
50	805	105	750	.92164	**10**
51	832	139	731	152	9
52	859	173	2.3712	141	8
53	886	207	693	130	7
54	912	.42242	673	119	6
55	939	276	654	107	5
56	966	310	635	096	4
57	.38993	345	616	085	3
58	.39020	379	597	073	2
59	046	413	578	062	1
60	.39073	.42447	2.3559	.92050	**0**
	cos	cot	tan	sin	′

67°

23°

′	sin	tan	cot	cos	
0	.39073	.42447	2.3559	.92050	**60**
1	100	482	539	039	59
2	127	516	520	028	58
3	153	551	501	016	57
4	180	585	483	.92005	56
5	207	619	464	.91994	55
6	234	654	445	982	54
7	260	688	2.3426	971	53
8	287	.42722	407	959	52
9	.39314	757	388	948	51
10	341	791	369	936	**50**
11	367	826	351	925	49
12	394	860	332	914	48
13	421	894	313	.91902	47
14	448	929	2.3294	891	46
15	474	963	276	879	45
16	501	.42998	257	868	44
17	528	.43032	238	856	43
18	.39555	067	220	845	42
19	581	101	201	833	41
20	608	136	183	822	**40**
21	635	170	2.3164	.91810	39
22	661	205	146	799	38
23	688	239	127	787	37
24	715	274	109	775	36
25	741	308	090	764	35
26	.39768	.43343	072	752	34
27	795	378	053	741	33
28	822	412	035	729	32
29	848	447	2.3017	.91718	31
30	875	481	2.2998	706	**30**
31	902	516	980	694	29
32	928	550	962	683	28
33	955	585	944	671	27
34	.39982	620	925	660	26
35	.40008	.43654	907	648	25
36	035	689	889	636	24
37	062	724	2.2871	.91625	23
38	088	758	853	613	22
39	115	793	835	601	21
40	141	828	817	590	**20**
41	168	862	799	578	19
42	195	897	781	566	18
43	.40221	932	763	555	17
44	248	.43966	745	543	16
45	275	.44001	2.2727	.91531	15
46	301	036	709	519	14
47	328	071	691	508	13
48	355	105	673	496	12
49	381	140	655	484	11
50	408	175	637	472	**10**
51	.40434	210	620	461	9
52	461	.44244	2.2602	.91449	8
53	488	279	584	437	7
54	514	314	566	425	6
55	541	349	549	414	5
56	567	384	531	402	4
57	594	418	513	390	3
58	621	453	496	378	2
59	647	488	478	366	1
60	.40674	.44523	2.2460	.91355	**0**
	cos	cot	tan	sin	′

66°

TABLE 31.

Natural Trigonometric Functions.

24°

′	sin	tan	cot	cos	
0	.40674	.44523	2.2460	.91355	**60**
1	700	558	443	343	59
2	727	593	425	331	58
3	753	627	408	319	57
4	780	662	390	307	56
5	806	697	373	295	55
6	.40833	732	355	283	54
7	860	.44767	338	.91272	53
8	886	802	320	260	52
9	913	837	2.2303	248	51
10	939	872	286	236	**50**
11	966	907	268	224	49
12	.40992	942	251	212	48
13	.41019	.44977	234	200	47
14	045	.45012	216	188	46
15	072	047	199	.91176	45
16	098	082	182	164	44
17	125	117	2.2165	152	43
18	151	152	148	140	42
19	178	187	130	128	41
20	204	222	113	116	**40**
21	231	.45257	096	104	39
22	.41257	292	079	.91092	38
23	284	327	062	080	37
24	310	362	045	068	36
25	337	397	028	056	35
26	363	432	2.2011	044	34
27	390	467	2.1994	032	33
28	416	.45502	977	020	32
29	443	538	960	.91008	31
30	469	573	943	.90996	**30**
31	.41496	608	926	984	29
32	522	643	909	972	28
33	549	678	892	960	27
34	575	713	876	948	26
35	602	.45748	2.1859	936	25
36	628	784	842	924	24
37	655	819	825	.90911	23
38	681	854	808	899	22
39	707	889	792	887	21
40	.41734	924	775	875	**20**
41	760	960	758	863	19
42	787	.45995	742	851	18
43	813	.46030	2.1725	839	17
44	840	065	708	826	16
45	866	101	692	814	15
46	892	136	675	.90802	14
47	919	171	659	790	13
48	945	206	642	778	12
49	972	242	625	766	11
50	.41998	277	609	753	**10**
51	.42024	312	592	741	9
52	051	.46348	2.1576	729	8
53	077	383	560	.90717	7
54	104	418	543	704	6
55	130	454	527	692	5
56	156	489	510	680	4
57	183	525	494	668	3
58	209	560	478	655	2
59	235	595	461	643	1
60	.42262	.46631	2.1445	.90631	**0**
	cos	cot	tan	sin	′

65°

25°

′	sin	tan	cot	cos	
0	.42262	.46631	2.1445	.90631	**60**
1	288	666	429	618	59
2	315	702	413	606	58
3	341	737	396	594	57
4	367	772	380	582	56
5	394	808	364	569	55
6	420	843	348	557	54
7	.42446	879	332	545	53
8	473	914	315	532	52
9	499	950	2.1299	520	51
10	525	.46985	283	.90507	**50**
11	552	.47021	267	495	49
12	578	056	251	483	48
13	604	092	235	470	47
14	.42631	128	219	458	46
15	657	163	203	446	45
16	683	199	187	433	44
17	709	234	171	421	43
18	736	270	2.1155	408	42
19	762	305	139	396	41
20	788	.47341	123	.90383	**40**
21	.42815	377	107	371	39
22	841	412	092	358	38
23	867	448	076	346	37
24	894	483	060	334	36
25	920	519	044	321	35
26	946	555	028	309	34
27	972	590	2.1013	296	33
28	.42999	626	2.0997	284	32
29	.43025	.47662	981	271	31
30	051	698	965	.90259	**30**
31	077	733	950	246	29
32	104	769	934	233	28
33	130	805	918	221	27
34	156	840	903	208	26
35	182	876	887	196	25
36	209	912	2.0872	183	24
37	.43235	948	856	171	23
38	261	.47984	840	158	22
39	287	.48019	825	146	21
40	313	055	809	.90133	**20**
41	340	091	794	120	19
42	366	127	778	108	18
43	392	163	763	095	17
44	.43418	198	2.0748	082	16
45	445	234	732	070	15
46	471	.48270	717	057	14
47	497	306	701	045	13
48	523	342	686	032	12
49	549	378	671	019	11
50	575	414	655	.90007	**10**
51	602	450	640	.89994	9
52	.43628	486	2.0625	981	8
53	654	.48521	609	968	7
54	680	557	594	956	6
55	706	593	579	943	5
56	733	629	564	930	4
57	759	665	549	918	3
58	785	701	533	905	2
59	811	737	518	892	1
60	.43837	.48773	2.0503	.89879	**0**
	cos	cot	tan	sin	′

64°

Natural Trigonometric Functions.

26°

′	sin	tan	cot	cos	
0	.43837	.48773	2.0503	.89879	60
1	863	809	488	867	59
2	889	845	473	854	58
3	916	881	458	841	57
4	942	917	443	828	56
5	968	953	428	816	55
6	.43994	.48989	413	803	54
7	.44020	.49026	398	790	53
8	046	062	2.0383	777	52
9	072	098	368	764	51
10	098	134	353	.89752	50
11	124	170	338	739	49
12	151	206	323	726	48
13	177	242	308	713	47
14	203	278	293	700	46
15	.44229	.49315	2.0278	687	45
16	255	351	263	674	44
17	281	387	248	662	43
18	307	423	233	649	42
19	333	459	219	636	41
20	359	495	204	.89623	40
21	385	532	189	610	39
22	.44411	568	174	597	38
23	437	604	160	584	37
24	464	.49640	2.0145	571	36
25	490	677	130	558	35
26	516	713	115	545	34
27	542	749	101	532	33
28	568	786	086	519	32
29	.44594	822	072	506	31
30	620	858	057	.89493	30
31	646	894	042	480	29
32	672	931	028	467	28
33	698	.49967	2.0013	454	27
34	724	.50004	1.9999	441	26
35	750	040	984	428	25
36	.44776	076	970	415	24
37	802	113	955	402	23
38	828	149	941	389	22
39	854	185	926	376	21
40	880	222	912	.89363	20
41	906	258	897	350	19
42	932	295	883	337	18
43	958	.50331	1.9868	324	17
44	.44984	368	854	311	16
45	.45010	404	840	298	15
46	036	441	825	285	14
47	062	477	811	272	13
48	088	514	797	259	12
49	114	550	782	245	11
50	140	587	768	.89232	10
51	166	623	754	219	9
52	.45192	.50660	1.9740	206	8
53	218	696	725	193	7
54	243	733	711	180	6
55	269	769	697	167	5
56	295	806	683	153	4
57	321	843	669	140	3
58	347	879	654	127	2
59	373	916	640	114	1
60	.45399	.50953	1.9626	.89101	0
	cos	cot	tan	sin	′

63°

27°

′	sin	tan	cot	cos	
0	.45399	.50953	1.9626	.89101	60
1	425	.50989	612	087	59
2	451	.51026	598	074	58
3	477	063	584	061	57
4	503	099	570	048	56
5	529	136	556	035	55
6	554	173	542	021	54
7	.45580	209	528	.89008	53
8	606	246	1.9514	.88995	52
9	632	283	500	981	51
10	658	319	486	968	50
11	684	.51356	472	955	49
12	710	393	458	942	48
13	736	430	444	928	47
14	762	467	430	915	46
15	.45787	503	1.9416	902	45
16	813	540	402	.88888	44
17	839	577	388	875	43
18	865	614	375	862	42
19	891	651	361	848	41
20	917	.51688	347	835	40
21	942	724	333	822	39
22	968	761	1.9319	808	38
23	.45994	798	306	795	37
24	.46020	835	292	.88782	36
25	046	872	278	768	35
26	072	909	265	755	34
27	097	946	251	741	33
28	123	.51983	237	728	32
29	149	.52020	1.9223	715	31
30	175	057	210	701	30
31	201	094	196	.88688	29
32	226	131	183	674	28
33	.46252	168	169	661	27
34	278	205	155	647	26
35	304	242	142	634	25
36	330	279	128	620	24
37	355	316	1.9115	607	23
38	381	.52353	101	.88593	22
39	407	390	088	580	21
40	433	427	074	566	20
41	458	464	061	553	19
42	.46484	501	047	539	18
43	510	538	034	526	17
44	536	575	020	512	16
45	561	613	1.9007	.88499	15
46	587	650	1.8993	485	14
47	613	.52687	980	472	13
48	639	724	967	458	12
49	664	761	953	445	11
50	690	798	940	431	10
51	.46716	836	927	417	9
52	742	873	913	404	8
53	767	910	1.8900	.88390	7
54	793	947	887	377	6
55	819	.52985	873	363	5
56	844	.53022	860	349	4
57	870	059	847	336	3
58	896	096	834	322	2
59	921	134	820	308	1
60	.46947	.53171	1.8807	.88295	0
	cos	cot	tan	sin	′

62°

TABLE 31.

Natural Trigonometric Functions.

28°

′	sin	tan	cot	cos	
0	.46947	.53171	1.8807	.88295	**60**
1	973	208	794	281	59
2	.46999	246	781	267	58
3	.47024	283	768	254	57
4	050	320	755	240	56
5	076	358	741	226	55
6	101	395	728	213	54
7	127	.53432	715	.88199	53
8	153	470	702	185	52
9	178	507	689	172	51
10	.47204	545	1.8676	158	**50**
11	229	582	663	144	49
12	255	620	650	130	48
13	281	657	637	117	47
14	306	694	624	.88103	46
15	332	.53732	611	089	45
16	358	769	598	075	44
17	383	807	585	062	43
18	.47409	844	572	048	42
19	434	882	559	034	41
20	460	920	1.8546	020	**40**
21	486	957	533	.88006	39
22	511	.53995	520	.87993	38
23	537	.54032	507	979	37
24	562	070	495	965	36
25	588	107	482	951	35
26	.47614	145	469	937	34
27	639	183	456	923	33
28	665	220	443	909	32
29	690	258	430	896	31
30	716	296	1.8418	.87882	**30**
31	741	.54333	405	868	29
32	767	371	392	854	28
33	793	409	379	840	27
34	.47818	446	367	826	26
35	844	484	354	812	25
36	869	522	341	798	24
37	895	560	329	.87784	23
38	920	597	316	770	22
39	946	635	303	756	21
40	971	.54673	1.8291	743	**20**
41	.47997	711	278	729	19
42	.48022	748	265	715	18
43	048	786	253	701	17
44	073	824	240	687	16
45	099	862	228	.87673	15
46	124	900	215	659	14
47	150	938	202	645	13
48	175	.54975	190	631	12
49	201	.55013	177	617	11
50	226	051	1.8165	603	**10**
51	.48252	089	152	589	9
52	277	127	140	.87575	8
53	303	165	127	561	7
54	328	203	115	546	6
55	354	241	103	532	5
56	379	279	090	518	4
57	405	317	078	504	3
58	430	355	065	490	2
59	456	393	053	476	1
60	.48481	.55431	1.8040	.87462	**0**
	cos	cot	tan	sin	′

61°

29°

′	sin	tan	cot	cos	
0	.48481	.55431	1.8040	.87462	**60**
1	506	469	028	448	59
2	532	507	016	434	58
3	557	545	1.8003	420	57
4	583	583	1.7991	406	56
5	608	621	979	391	55
6	634	659	966	377	54
7	659	.55697	954	363	53
8	684	736	942	.87349	52
9	710	774	930	335	51
10	.48735	812	917	321	**50**
11	761	850	905	306	49
12	786	888	1.7893	292	48
13	811	926	881	278	47
14	837	.55964	868	264	46
15	862	.56003	856	250	45
16	888	041	844	.87235	44
17	913	079	832	221	43
18	938	117	820	207	42
19	964	156	808	193	41
20	.48989	194	1.7796	178	**40**
21	.49014	232	783	164	39
22	040	270	771	150	38
23	065	.56309	759	136	37
24	090	347	747	.87121	36
25	116	385	735	107	35
26	141	424	723	093	34
27	166	462	711	079	33
28	.49192	501	1.7699	064	32
29	217	539	687	050	31
30	242	.56577	675	036	**30**
31	268	616	663	021	29
32	293	654	651	.87007	28
33	318	693	639	.86993	27
34	344	731	627	978	26
35	369	769	615	964	25
36	.49394	808	1.7603	949	24
37	419	846	591	935	23
38	445	885	579	921	22
39	470	923	567	906	21
40	495	.56962	556	892	**20**
41	521	.57000	544	878	19
42	546	039	532	.86863	18
43	571	078	520	849	17
44	.49596	116	1.7508	834	16
45	622	155	496	820	15
46	647	193	485	805	14
47	672	232	473	791	13
48	697	271	461	777	12
49	723	309	449	762	11
50	748	.57348	437	748	**10**
51	773	386	426	.86733	9
52	.49798	425	1.7414	719	8
53	824	464	402	704	7
54	849	503	391	690	6
55	874	541	379	675	5
56	899	580	367	661	4
57	924	619	355	646	3
58	950	657	344	632	2
59	.49975	696	332	617	1
60	.50000	.57735	1.7321	.86603	**0**
	cos	cot	tan	sin	′

60°

Natural Trigonometric Functions.

30°

′	sin	tan	cot	cos	
0	.50000	.57735	1.7321	.86603	**60**
1	025	774	309	588	59
2	050	813	297	573	58
3	076	851	286	559	57
4	101	890	274	544	56
5	126	929	262	530	55
6	151	.57968	251	515	54
7	176	.58007	239	501	53
8	201	046	228	.86486	52
9	227	085	1.7216	471	51
10	.50252	124	205	457	**50**
11	277	162	193	442	49
12	302	201	182	427	48
13	327	240	170	413	47
14	352	279	159	398	46
15	377	.58318	147	384	45
16	403	357	136	.86369	44
17	428	396	124	354	43
18	453	435	1.7113	340	42
19	478	474	102	325	41
20	.50503	513	090	310	**40**
21	528	552	079	295	39
22	553	591	067	281	38
23	578	631	056	266	37
24	603	.58670	045	.86251	36
25	628	709	033	237	35
26	654	748	022	222	34
27	679	787	1.7011	207	33
28	704	826	1.6999	192	32
29	729	865	988	178	31
30	.50754	905	977	163	**30**
31	779	944	965	148	29
32	804	.58983	954	.86133	28
33	829	.59022	943	119	27
34	854	061	932	104	26
35	879	101	920	089	25
36	904	140	1.6909	074	24
37	929	179	898	059	23
38	954	218	887	045	22
39	.50979	258	875	030	21
40	.51004	297	864	015	**20**
41	029	.59336	853	.86000	19
42	054	376	842	.85985	18
43	079	415	831	970	17
44	104	454	1.6820	956	16
45	129	494	808	941	15
46	154	533	797	926	14
47	179	573	786	911	13
48	204	612	775	896	12
49	229	.59651	764	881	11
50	.51254	691	753	866	**10**
51	279	730	742	.85851	9
52	304	770	1.6731	836	8
53	329	809	720	821	7
54	354	849	709	806	6
55	379	888	698	792	5
56	404	928	687	777	4
57	429	.59967	676	762	3
58	454	.60007	665	747	2
59	479	046	654	732	1
60	.51504	.60086	1.6643	.85717	**0**
	cos	cot	tan	sin	′

59°

31°

′	sin	tan	cot	cos	
0	.51504	.60086	1.6643	.85717	**60**
1	529	126	632	702	59
2	554	165	621	687	58
3	579	205	610	672	57
4	604	245	599	657	56
5	628	284	588	642	55
6	653	324	577	627	54
7	678	.60364	566	.85612	53
8	703	403	555	597	52
9	.51728	443	545	582	51
10	753	483	1.6534	567	**50**
11	778	522	523	551	49
12	803	562	512	536	48
13	828	602	501	521	47
14	852	642	490	506	46
15	877	.60681	479	.85491	45
16	902	721	469	476	44
17	927	761	458	461	43
18	952	801	447	446	42
19	.51977	841	436	431	41
20	.52002	881	1.6426	416	**40**
21	026	921	415	401	39
22	051	.60960	404	385	38
23	076	.61000	393	.85370	37
24	101	040	383	355	36
25	126	080	372	340	35
26	151	120	361	325	34
27	175	160	351	310	33
28	.52200	200	340	294	32
29	225	240	329	279	31
30	250	280	1.6319	264	**30**
31	275	.61320	308	.85249	29
32	299	360	297	234	28
33	324	400	287	218	27
34	349	440	276	203	26
35	374	480	265	188	25
36	.52399	520	255	173	24
37	423	561	244	157	23
38	448	601	234	142	22
39	473	.61641	223	.85127	21
40	498	681	1.6212	112	**20**
41	522	721	202	096	19
42	547	761	191	081	18
43	572	801	181	066	17
44	.52597	842	170	051	16
45	621	882	160	035	15
46	646	922	149	020	14
47	671	.61962	139	.85005	13
48	696	.62003	128	.84989	12
49	720	043	118	974	11
50	745	083	1.6107	959	**10**
51	.52770	124	097	943	9
52	794	164	087	928	8
53	819	204	076	913	7
54	844	.62245	066	.84897	6
55	869	285	055	882	5
56	893	325	045	866	4
57	918	366	034	851	3
58	943	406	024	836	2
59	967	446	014	820	1
60	.52992	.62487	1.6003	.84805	**0**
	cos	cot	tan	sin	′

58°

TABLE 31.

Natural Trigonometric Functions.

32°

′	sin	tan	cot	cos	
0	.52992	.62487	1.6003	.84805	**60**
1	.53017	527	1.5993	789	59
2	041	568	983	774	58
3	066	608	972	759	57
4	091	649	962	743	56
5	115	689	952	728	**55**
6	140	.62730	941	712	54
7	164	770	931	697	53
8	189	811	921	.84681	52
9	.53214	852	911	666	51
10	238	892	1.5900	650	**50**
11	263	933	890	635	49
12	288	.62973	880	619	48
13	312	.63014	869	604	47
14	337	055	859	588	46
15	361	095	849	.84573	45
16	.53386	136	839	557	44
17	411	177	829	542	43
18	435	217	818	526	42
19	460	258	808	511	41
20	484	299	1.5798	495	**40**
21	509	.63340	788	480	39
22	534	380	778	464	38
23	558	421	768	.84448	37
24	.53583	462	757	433	36
25	607	503	747	417	35
26	632	544	737	402	34
27	656	584	727	386	33
28	681	625	717	370	32
29	705	.63666	707	355	31
30	730	707	1.5697	.84339	**30**
31	754	748	687	324	29
32	.53779	789	677	308	28
33	804	830	667	292	27
34	828	871	657	277	26
35	853	912	647	261	25
36	877	953	637	245	24
37	902	.63994	627	230	23
38	926	.64035	617	.84214	22
39	951	076	607	198	21
40	.53975	117	1.5597	182	**20**
41	.54000	158	587	167	19
42	024	199	577	151	18
43	049	240	567	135	17
44	073	281	557	120	16
45	097	.64322	547	.84104	15
46	122	363	537	088	14
47	146	404	527	072	13
48	171	446	517	057	12
49	195	487	507	041	11
50	.54220	528	1.5497	025	**10**
51	244	569	487	.84009	9
52	269	.64610	477	.83994	8
53	293	652	468	978	7
54	317	693	458	962	6
55	342	734	448	946	5
56	366	775	438	930	4
57	391	817	428	915	3
58	415	858	418	899	2
59	440	899	408	883	1
60	.54464	.64941	1.5399	.83867	**0**
	cos	cot	tan	sin	′

57°

33°

′	sin	tan	cot	cos	
0	.54464	.64941	1.5399	.83867	**60**
1	488	.64982	389	851	59
2	513	.65024	379	835	58
3	537	065	369	819	57
4	561	106	359	804	56
5	586	148	350	788	55
6	610	189	340	772	54
7	.54635	231	330	.83756	53
8	659	272	1.5320	740	52
9	683	.65314	311	724	51
10	708	355	301	708	**50**
11	732	397	291	692	49
12	756	438	282	676	48
13	781	480	272	660	47
14	805	521	262	645	46
15	.54829	563	253	.83629	45
16	854	604	1.5243	613	44
17	878	.65646	233	597	43
18	902	688	224	581	42
19	927	729	214	565	41
20	951	771	204	549	**40**
21	975	813	195	533	39
22	.54999	854	185	517	38
23	.55024	896	175	.83501	37
24	048	938	1.5166	485	36
25	072	.65980	156	469	35
26	097	.66021	147	453	34
27	121	063	137	437	33
28	145	105	127	421	32
29	169	147	118	405	31
30	.55194	189	108	389	**30**
31	218	230	099	.83373	29
32	242	272	1.5089	356	28
33	266	314	080	340	27
34	291	.66356	070	324	26
35	315	398	061	308	25
36	339	440	051	292	24
37	.55363	482	042	276	23
38	388	524	032	260	22
39	412	566	023	.83244	21
40	436	608	013	228	**20**
41	460	.66650	1.5004	212	19
42	484	692	1.4994	195	18
43	509	734	985	179	17
44	533	776	975	163	16
45	.55557	818	966	147	15
46	581	860	957	131	14
47	605	902	947	.83115	13
48	630	944	938	098	12
49	654	.66986	928	082	11
50	678	.67028	919	066	**10**
51	702	071	1.4910	050	9
52	.55726	113	900	034	8
53	750	155	891	017	7
54	775	197	882	.83001	6
55	799	239	872	.82985	5
56	823	282	863	969	4
57	847	324	854	953	3
58	871	366	844	936	2
59	895	409	835	920	1
60	.55919	.67451	1.4826	.82904	**0**
	cos	cot	tan	sin	′

56°

Natural Trigonometric Functions.

34°

′	sin	tan	cot	cos	
0	.55919	.67451	1.4826	.82904	**60**
1	943	493	816	887	59
2	968	536	807	871	58
3	.55992	578	798	855	57
4	.56016	620	788	839	56
5	040	663	779	822	55
6	064	.67705	770	806	54
7	088	748	761	790	53
8	112	790	751	773	52
9	136	832	742	.82757	51
10	160	875	1.4733	741	**50**
11	184	917	724	724	49
12	.56208	.67960	715	708	48
13	232	.68002	705	692	47
14	256	045	696	675	46
15	280	088	687	659	45
16	305	130	678	643	44
17	329	173	669	626	43
18	353	215	659	.82610	42
19	377	258	650	593	41
20	.56401	301	1.4641	577	**40**
21	425	.68343	632	561	39
22	449	386	623	544	38
23	473	429	614	528	37
24	497	471	605	511	36
25	521	514	596	495	35
26	545	557	586	478	34
27	569	600	577	.82462	33
28	.56593	.68642	568	446	32
29	617	685	559	429	31
30	641	728	1.4550	413	**30**
31	665	771	541	396	29
32	689	814	532	380	28
33	713	857	523	363	27
34	736	900	514	347	26
35	760	942	505	330	25
36	.56784	.68985	496	.82314	24
37	808	.69028	487	297	23
38	832	071	478	281	22
39	856	114	469	264	21
40	880	157	1.4460	248	**20**
41	904	200	451	231	19
42	928	243	442	214	18
43	952	286	433	198	17
44	.56976	.69329	424	181	16
45	.57000	372	415	165	15
46	024	416	406	.82148	14
47	047	459	397	132	13
48	071	502	388	115	12
49	095	545	379	098	11
50	119	588	1.4370	082	**10**
51	143	631	361	065	9
52	167	.69675	352	048	8
53	.57191	718	344	032	7
54	215	761	335	.82015	6
55	238	804	326	.81999	5
56	262	847	317	982	4
57	286	891	308	965	3
58	310	934	299	949	2
59	334	.69977	290	932	1
60	.57358	.70021	1.4281	.81915	**0**
	cos	cot	tan	sin	′

55°

35°

′	sin	tan	cot	cos	
0	.57358	.70021	1.4281	.81915	**60**
1	381	064	273	899	59
2	405	107	264	882	58
3	429	151	255	865	57
4	453	194	246	848	56
5	477	238	237	832	55
6	501	281	229	815	54
7	524	.70325	220	.81798	53
8	548	368	1.4211	782	52
9	.57572	412	202	765	51
10	596	455	193	748	**50**
11	619	499	185	731	49
12	643	542	176	714	48
13	667	586	167	698	47
14	691	629	158	681	46
15	715	.70673	150	.81664	45
16	738	717	1.4141	647	44
17	762	760	132	631	43
18	.57786	804	124	614	42
19	810	848	115	597	41
20	833	891	106	580	**40**
21	857	935	097	563	39
22	881	.70979	089	546	38
23	904	.71023	080	.81530	37
24	928	066	1.4071	513	36
25	952	110	063	496	35
26	976	154	054	479	34
27	.57999	198	045	462	33
28	.58023	242	037	445	32
29	047	285	028	428	31
30	070	.71329	019	412	**30**
31	094	373	011	.81395	29
32	118	417	1.4002	378	28
33	141	461	1.3994	361	27
34	165	505	985	344	26
35	189	549	976	327	25
36	.58212	593	968	310	24
37	236	637	959	293	23
38	260	.71681	951	276	22
39	283	725	942	.81259	21
40	307	769	934	242	**20**
41	330	813	925	225	19
42	354	857	1.3916	208	18
43	378	901	908	191	17
44	.58401	946	899	174	16
45	425	.71990	891	157	15
46	449	.72034	882	140	14
47	472	078	874	.81123	13
48	496	122	865	106	12
49	519	167	857	089	11
50	543	211	848	072	**10**
51	567	255	1.3840	055	9
52	.58590	299	831	038	8
53	614	.72344	823	021	7
54	637	388	814	.81004	6
55	661	432	806	.80987	5
56	684	477	798	970	4
57	708	521	789	953	3
58	731	565	781	936	2
59	755	610	772	919	1
60	.58779	.72654	1.3764	.80902	**0**
	cos	cot	tan	sin	′

54°

TABLE 31.

Natural Trigonometric Functions.

36°

′	sin	tan	cot	cos	
0	.58779	.72654	1.3764	.80902	**60**
1	802	699	755	885	59
2	826	743	747	867	58
3	849	788	739	850	57
4	873	832	730	833	56
5	896	877	722	816	55
6	920	921	713	799	54
7	943	.72966	705	.80782	53
8	967	.73010	697	765	52
9	.58990	055	688	748	51
10	.59014	100	1.3680	730	**50**
11	037	144	672	713	49
12	061	189	663	696	48
13	084	234	655	679	47
14	108	278	647	662	46
15	131	.73323	638	.80644	45
16	154	368	630	627	44
17	178	413	622	610	43
18	201	457	613	593	42
19	.59225	502	605	576	41
20	248	547	1.3597	558	**40**
21	272	592	588	541	39
22	295	.73637	580	.80524	38
23	318	681	572	507	37
24	342	726	564	489	36
25	365	771	555	472	35
26	389	816	547	455	34
27	.59412	861	539	438	33
28	436	906	531	420	32
29	459	951	522	403	31
30	482	.73996	1.3514	.80386	**30**
31	506	.74041	506	368	29
32	529	086	498	351	28
33	552	131	490	334	27
34	576	176	481	316	26
35	.59599	221	473	299	25
36	622	267	465	282	24
37	646	312	457	.80264	23
38	669	.74357	449	247	22
39	693	402	440	230	21
40	716	447	1.3432	212	**20**
41	739	492	424	195	19
42	763	538	416	178	18
43	.59786	583	408	160	17
44	809	628	400	143	16
45	832	.74674	392	.80125	15
46	856	719	384	108	14
47	879	764	375	091	13
48	902	810	367	073	12
49	926	855	359	056	11
50	949	900	1.3351	038	**10**
51	972	946	343	021	9
52	.59995	.74991	335	.80003	8
53	.60019	.75037	327	.79986	7
54	042	082	319	968	6
55	065	128	311	951	5
56	089	173	303	934	4
57	112	219	295	916	3
58	135	264	287	899	2
59	158	310	278	881	1
60	.60182	.75355	1.3270	.79864	**0**
	cos	cot	tan	sin	′

53°

37°

′	sin	tan	cot	cos	
0	.60182	.75355	1.3270	.79864	**60**
1	205	401	262	846	59
2	228	447	254	829	58
3	251	492	246	811	57
4	274	538	238	793	56
5	298	584	230	776	55
6	321	629	222	758	54
7	344	.75675	214	741	53
8	367	721	206	723	52
9	.60390	767	1.3198	706	51
10	414	812	190	.79688	**50**
11	437	858	182	671	49
12	460	904	175	653	48
13	483	950	167	635	47
14	506	.75996	159	618	46
15	529	.76042	151	600	45
16	553	088	143	583	44
17	.60576	134	1.3135	565	43
18	599	180	127	547	42
19	622	226	119	530	41
20	645	272	111	.79512	**40**
21	668	318	103	494	39
22	691	364	095	477	38
23	714	410	087	459	37
24	738	456	079	441	36
25	761	.76502	072	424	35
26	.60784	548	1.3064	406	34
27	807	594	056	388	33
28	830	640	048	371	32
29	853	686	040	353	31
30	876	733	032	.79335	**30**
31	899	779	024	318	29
32	922	825	017	300	28
33	945	871	009	282	27
34	968	918	1.3001	264	26
35	.60991	.76964	1.2993	247	25
36	.61015	.77010	985	229	24
37	038	057	977	211	23
38	061	103	970	193	22
39	084	149	962	176	21
40	107	196	954	.79158	**20**
41	130	242	946	140	19
42	153	289	938	122	18
43	176	.77335	1.2931	105	17
44	.61199	382	923	087	16
45	222	428	915	069	15
46	245	475	907	051	14
47	268	521	900	033	13
48	291	568	892	.79016	12
49	314	615	884	.78998	11
50	337	.77661	876	980	**10**
51	360	708	869	962	9
52	.61383	754	1.2861	944	8
53	406	801	853	926	7
54	429	848	846	908	6
55	451	895	838	891	5
56	474	941	830	873	4
57	497	.77988	822	855	3
58	520	.78035	815	837	2
59	543	082	807	819	1
60	.61566	.78129	1.2799	.78801	**0**
	cos	cot	tan	sin	′

52°

Natural Trigonometric Functions.

38°

′	sin	tan	cot	cos	
0	.61566	.78129	1.2799	.78801	**60**
1	589	175	792	783	59
2	612	222	784	765	58
3	635	269	776	747	57
4	658	316	769	729	56
5	681	363	761	711	**55**
6	704	410	753	694	54
7	726	457	746	676	53
8	749	504	738	.78658	52
9	.61772	.78551	731	640	51
10	795	598	1.2723	622	**50**
11	818	645	715	604	49
12	841	692	708	586	48
13	864	739	700	568	47
14	887	786	693	550	46
15	909	834	685	.78532	45
16	932	881	677	514	44
17	955	928	670	496	43
18	.61978	.78975	662	478	42
19	.62001	.79022	655	460	41
20	024	070	1.2647	442	**40**
21	046	117	640	424	39
22	069	164	632	.78405	38
23	092	212	624	387	37
24	115	259	617	369	36
25	138	306	609	351	35
26	160	354	602	333	34
27	.62183	401	594	315	33
28	206	449	587	297	32
29	229	.79496	579	.78279	31
30	251	544	1.2572	261	**30**
31	274	591	564	243	29
32	297	639	557	225	28
33	320	686	549	206	27
34	342	734	542	188	26
35	.62365	781	534	170	25
36	388	829	527	.78152	24
37	411	877	519	134	23
38	433	924	512	116	22
39	456	.79972	504	098	21
40	479	.80020	1.2497	079	**20**
41	502	067	489	061	19
42	524	115	482	043	18
43	547	163	475	025	17
44	.62570	211	467	.78007	16
45	592	258	460	.77988	15
46	615	306	452	970	14
47	638	354	445	952	13
48	660	402	437	934	12
49	683	450	430	916	11
50	706	.80498	1.2423	897	**10**
51	728	546	415	879	9
52	.62751	594	408	.77861	8
53	774	642	401	843	7
54	796	690	393	824	6
55	819	738	386	806	5
56	842	786	378	788	4
57	864	834	371	769	3
58	887	882	364	751	2
59	909	930	356	733	1
60	.62932	.80978	1.2349	.77715	**0**
	cos	cot	tan	sin	′

51°

39°

′	sin	tan	cot	cos	
0	.62932	.80978	1.2349	.77715	**60**
1	955	.81027	342	696	59
2	.62977	075	334	678	58
3	.63000	123	327	660	57
4	022	171	320	641	56
5	045	220	312	623	**55**
6	068	268	305	605	54
7	090	316	298	586	53
8	113	364	290	.77568	52
9	135	413	283	550	51
10	.63158	461	1.2276	531	**50**
11	180	.81510	268	513	49
12	203	558	261	494	48
13	225	606	254	476	47
14	248	655	247	458	46
15	271	703	239	439	45
16	293	752	232	.77421	44
17	.63316	800	225	402	43
18	338	849	218	384	42
19	361	898	210	366	41
20	383	946	1.2203	347	**40**
21	406	.81995	196	329	39
22	428	.82044	189	310	38
23	451	092	181	.77292	37
24	.63473	141	174	273	36
25	496	190	167	255	35
26	518	238	160	236	34
27	540	287	153	218	33
28	563	336	145	199	32
29	585	385	138	181	31
30	608	434	1.2131	.77162	**30**
31	.63630	.82483	124	144	29
32	653	531	117	125	28
33	675	580	109	107	27
34	698	629	102	088	26
35	720	678	095	070	25
36	742	727	088	051	24
37	765	776	081	033	23
38	787	825	074	.77014	22
39	.63810	874	066	.76996	21
40	832	923	1.2059	977	**20**
41	854	.82972	052	959	19
42	877	.83022	045	940	18
43	899	071	038	921	17
44	922	120	031	903	16
45	944	169	024	884	15
46	966	218	017	.76866	14
47	.63989	268	009	847	13
48	.64011	317	1.2002	828	12
49	033	366	1.1995	810	11
50	056	415	988	791	**10**
51	078	.83465	981	772	9
52	100	514	974	754	8
53	123	564	967	.76735	7
54	.64145	613	960	717	6
55	167	662	953	698	5
56	190	712	946	679	4
57	212	761	939	661	3
58	234	811	932	642	2
59	256	860	925	623	1
60	.64279	.83910	1.1918	.76604	**0**
	cos	cot	tan	sin	′

50°

TABLE 31.

Natural Trigonometric Functions.

40°

′	sin	tan	cot	cos	
0	.64279	.83910	1.1918	.76604	**60**
1	301	.83960	910	586	59
2	323	.84009	903	567	58
3	346	059	896	548	57
4	368	108	889	530	56
5	390	158	882	511	55
6	412	208	875	492	54
7	435	258	868	473	53
8	.64457	307	861	.76455	52
9	479	357	854	436	51
10	501	407	1.1847	417	**50**
11	524	.84457	840	398	49
12	546	507	833	380	48
13	568	556	826	361	47
14	590	606	819	342	46
15	612	656	812	323	45
16	.64635	706	806	.76304	44
17	657	756	799	286	43
18	679	806	792	267	42
19	701	856	785	248	41
20	723	906	1.1778	229	**40**
21	746	.84956	771	210	39
22	768	.85006	764	192	38
23	790	057	757	173	37
24	.64812	107	750	.76154	36
25	834	157	743	135	35
26	856	207	736	116	34
27	878	257	729	097	33
28	901	308	722	078	32
29	923	358	715	059	31
30	945	408	1.1708	041	**30**
31	967	.85458	702	022	29
32	.64989	509	695	.76003	28
33	.65011	559	688	.75984	27
34	033	609	681	965	26
35	055	660	674	946	25
36	077	710	667	927	24
37	100	761	660	908	23
38	122	811	653	889	22
39	144	862	647	870	21
40	166	912	1.1640	851	**20**
41	188	.85963	633	832	19
42	.65210	.86014	626	.75813	18
43	232	064	619	794	17
44	254	115	612	775	16
45	276	166	606	756	15
46	298	216	599	738	14
47	320	267	592	719	13
48	342	318	585	700	12
49	364	368	578	680	11
50	.65386	419	1.1571	661	**10**
51	408	.86470	565	.75642	9
52	430	521	558	623	8
53	452	572	551	604	7
54	474	623	544	585	6
55	496	674	538	566	5
56	518	725	531	547	4
57	540	776	524	528	3
58	562	827	517	509	2
59	584	878	510	490	1
60	.65606	.86929	1.1504	.75471	**0**
	cos	cot	tan	sin	′

41°

′	sin	tan	cot	cos	
0	.65606	.86929	1.1504	.75471	**60**
1	628	.86980	497	452	59
2	650	.87031	490	433	58
3	672	082	483	414	57
4	694	133	477	395	56
5	716	184	470	375	55
6	738	236	463	356	54
7	759	287	456	337	53
8	781	338	450	.75318	52
9	.65803	389	443	299	51
10	825	441	1.1436	280	**50**
11	847	.87492	430	261	49
12	869	543	423	241	48
13	891	595	416	222	47
14	913	646	410	203	46
15	935	698	403	184	45
16	956	749	396	.75165	44
17	.65978	801	389	146	43
18	.66000	852	383	126	42
19	022	904	376	107	41
20	044	.87955	1.1369	088	**40**
21	066	.88007	363	069	39
22	088	059	356	050	38
23	109	110	349	030	37
24	131	162	343	.75011	36
25	.66153	214	336	.74992	35
26	175	265	329	973	34
27	197	317	323	953	33
28	218	369	316	934	32
29	240	421	310	915	31
30	262	.88473	1.1303	896	**30**
31	284	524	296	876	29
32	.66306	576	290	857	28
33	327	628	283	838	27
34	349	680	276	.74818	26
35	371	732	270	799	25
36	393	784	263	780	24
37	414	836	257	760	23
38	436	888	250	741	22
39	.66458	940	243	722	21
40	480	.88992	1.1237	703	**20**
41	501	.89045	230	683	19
42	523	097	224	664	18
43	545	149	217	.74644	17
44	566	201	211	625	16
45	588	253	204	606	15
46	.66610	306	197	586	14
47	632	358	191	567	13
48	653	410	184	548	12
49	675	463	178	528	11
50	697	.89515	1.1171	509	**10**
51	718	567	165	.74489	9
52	740	620	158	470	8
53	.66762	672	152	451	7
54	783	725	145	431	6
55	805	777	139	412	5
56	827	830	132	392	4
57	848	883	126	373	3
58	870	935	119	353	2
59	891	.89988	113	334	1
60	.66913	.90040	1.1106	.74314	**0**
	cos	cot	tan	sin	′

49° 48°

Natural Trigonometric Functions.

42°

′	sin	tan	cot	cos	
0	.66913	.90040	1.1106	.74314	60
1	935	093	100	295	59
2	956	146	093	276	58
3	978	199	087	256	57
4	.66999	251	080	237	56
5	.67021	304	074	217	55
6	043	357	067	198	54
7	064	410	061	178	53
8	086	463	1.1054	.74159	52
9	107	.90516	048	139	51
10	129	569	041	120	50
11	151	621	035	100	49
12	172	674	028	080	48
13	.67194	727	022	061	47
14	215	781	016	041	46
15	237	834	009	022	45
16	258	887	1.1003	.74002	44
17	280	940	1.0996	.73983	43
18	301	.90993	990	963	42
19	323	.91046	983	944	41
20	.67344	099	977	924	40
21	366	153	971	904	39
22	387	206	964	885	38
23	409	259	958	865	37
24	430	313	951	846	36
25	452	366	1.0945	.73826	35
26	473	419	939	806	34
27	495	473	932	787	33
28	.67516	.91526	926	767	32
29	538	580	919	747	31
30	559	633	913	728	30
31	580	687	907	708	29
32	602	740	900	688	28
33	623	794	894	669	27
34	645	847	1.0888	.73649	26
35	.67666	901	881	629	25
36	688	.91955	875	610	24
37	709	.92008	869	590	23
38	730	062	862	570	22
39	752	116	856	551	21
40	773	170	850	531	20
41	795	224	843	511	19
42	816	277	1.0837	.73491	18
43	.67837	331	831	472	17
44	859	385	824	452	16
45	880	439	818	432	15
46	901	.92493	812	413	14
47	923	547	805	393	13
48	944	601	799	373	12
49	965	655	793	353	11
50	.67987	709	786	333	10
51	.68008	763	1.0780	.73314	9
52	029	817	774	294	8
53	051	872	768	274	7
54	072	926	761	254	6
55	093	.92980	755	234	5
56	115	.93034	749	215	4
57	136	088	742	195	3
58	157	143	736	175	2
59	179	197	730	155	1
60	.68200	.93252	1.0724	.73135	0
	cos	cot	tan	sin	′

47°

43°

′	sin	tan	cot	cos	
0	.68200	.93252	1.0724	.73135	60
1	221	306	717	116	59
2	242	360	711	096	58
3	264	415	705	076	57
4	285	469	699	056	56
5	306	524	692	036	55
6	327	.93578	686	.73016	54
7	349	633	680	.72996	53
8	370	688	674	976	52
9	.68391	742	668	957	51
10	412	797	1.0661	937	50
11	434	852	655	917	49
12	455	906	649	897	48
13	476	.93961	643	877	47
14	497	.94016	637	857	46
15	518	071	630	.72837	45
16	539	125	624	817	44
17	561	180	618	797	43
18	.68582	235	612	777	42
19	603	290	606	757	41
20	624	345	1.0599	737	40
21	645	400	593	717	39
22	666	455	587	697	38
23	688	.94510	581	.72677	37
24	709	565	575	657	36
25	730	620	569	637	35
26	751	676	562	617	34
27	.68772	731	556	597	33
28	793	786	550	577	32
29	814	841	544	557	31
30	835	896	1.0538	537	30
31	857	.94952	532	517	29
32	878	.95007	526	.72497	28
33	899	062	519	477	27
34	920	118	513	457	26
35	941	173	507	437	25
36	962	229	501	417	24
37	.68983	284	495	397	23
38	.69004	340	489	377	22
39	025	395	483	357	21
40	046	451	1.0477	337	20
41	067	.95506	470	.72317	19
42	088	562	464	297	18
43	109	618	458	277	17
44	130	673	452	257	16
45	.69151	729	446	236	15
46	172	785	440	216	14
47	193	841	434	196	13
48	214	897	428	.72176	12
49	235	.95952	422	156	11
50	256	.96008	1.0416	136	10
51	277	064	410	116	9
52	.69298	120	404	095	8
53	319	176	398	075	7
54	340	232	392	055	6
55	361	288	385	035	5
56	382	344	379	.72015	4
57	403	400	373	.71995	3
58	424	457	367	974	2
59	445	513	361	954	1
60	.69466	.96569	1.0355	.71934	0
	cos	cot	tan	sin	′

46°

TABLE 31.

Natural Trigonometric Functions.

44°

′	sin	tan	cot	cos	
0	.69466	.96569	1.0355	.71934	**60**
1	487	625	349	914	59
2	508	681	343	894	58
3	529	738	337	873	57
4	549	794	331	853	56
5	570	850	325	833	55
6	591	907	319	813	54
7	.69612	.96963	313	792	53
8	633	.97020	307	772	52
9	654	076	301	.71752	51
10	675	133	1.0295	732	**50**
11	696	189	289	711	49
12	717	246	283	691	48
13	737	302	277	671	47
14	758	359	271	650	46
15	779	416	265	630	45
16	.69800	.97472	259	610	44
17	821	529	253	590	43
18	842	586	247	.71569	42
19	862	643	241	549	41
20	883	700	1.0235	529	**40**
21	904	756	230	508	39
22	925	813	224	488	38
23	946	870	218	468	37
24	966	927	212	447	36
25	.69987	.97984	206	427	35
26	.70008	.98041	200	407	34
27	029	098	194	.71386	33
28	049	155	188	366	32
29	070	213	182	345	31
30	091	270	1.0176	325	**30**
31	112	327	170	305	29
32	132	384	164	284	28
33	153	441	158	264	27
34	.70174	.98499	152	243	26
35	195	556	147	223	25
36	215	613	141	.71203	24
37	236	671	135	182	23
38	257	728	129	162	22
39	277	786	123	141	21
40	298	843	1.0117	121	**20**
41	319	901	111	100	19
42	.70339	.98958	105	080	18
43	360	.99016	099	059	17
44	381	073	094	039	16
45	401	131	088	.71019	15
46	422	189	082	.70998	14
47	443	247	076	978	13
48	463	304	070	957	12
49	484	362	064	937	11
50	505	420	1.0058	916	**10**
51	.70525	.99478	052	896	9
52	546	536	047	875	8
53	567	594	041	.70855	7
54	587	652	035	834	6
55	608	710	029	813	5
56	628	768	023	793	4
57	649	826	017	772	3
58	670	884	012	752	2
59	690	.99942	006	731	1
60	.70711	1.0000	1.0000	.70711	**0**
	cos	cot	tan	sin	′

45°

Logarithms of Numbers.

100

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
100	00000	43	00043	44	00087	43	00130	43	00173	44	00217	43	00260	43	00303	43	00346	43	00389	43
101	432	43	475	43	518	43	561	43	00604	43	00647	42	00689	43	00732	43	00775	42	00817	43
102	00860	43	00903	42	00945	43	00988	42	01030	42	01072	43	01115	42	01157	42	01199	43	01242	42
103	01284	42	01326	42	01368	42	01410	42	452	42	494	42	536	42	578	42	01620	42	01662	41
104	01703	42	01745	42	01787	41	01828	42	01870	42	01912	41	01953	42	01995	41	02036	42	02078	41
105	02119	41	02160	42	02202	41	02243	41	02284	41	02325	41	02366	41	02407	42	449	41	490	41
106	531	41	572	40	02612	41	02653	41	02694	41	02735	41	02776	40	02816	41	02857	41	02898	40
107	02938	41	02979	40	03019	41	03060	40	03100	41	03141	40	03181	41	03222	40	03262	40	03302	40
108	03342	41	03383	40	423	40	463	40	503	40	543	40	583	40	03623	40	03663	40	03703	40
109	03743	39	03782	40	03822	40	03862	40	03902	39	03941	40	03981	40	04021	39	04060	40	04100	39
110	04139	40	04179	39	04218	40	04258	39	04297	39	04336	40	04376	39	415	39	454	39	493	39
111	532	39	571	39	610	40	04650	39	04689	38	04727	39	04766	39	04805	39	04844	39	04883	39
112	04922	39	04961	38	04999	39	05038	39	05077	38	05115	39	05154	38	05192	39	05231	38	05269	39
113	05308	38	05346	39	05385	38	423	38	461	39	500	38	538	38	576	38	614	38	05652	38
114	05690	39	05729	38	05767	38	05805	38	05843	38	05881	37	05918	38	05956	38	05994	38	06032	38
115	06070	38	06108	37	06145	38	06183	38	06221	37	06258	38	06296	37	06333	38	06371	37	408	38
116	446	37	483	38	521	37	558	37	595	38	06633	37	06670	37	06707	37	06744	37	06781	38
117	06819	37	06856	37	06893	37	06930	37	06967	37	07004	37	07041	37	07078	37	07115	36	07151	37
118	07188	37	07225	37	07262	36	07298	37	07335	37	372	36	408	37	445	37	482	36	518	37
119	555	36	591	37	628	36	07664	36	07700	37	07737	36	07773	36	07809	37	07846	36	07882	36
120	07918	36	07954	36	07990	37	08027	36	08063	36	08099	36	08135	36	08171	36	08207	36	08243	36
121	08279	35	08314	36	08350	36	386	36	422	36	458	35	493	36	529	36	565	35	600	36
122	636	36	08672	35	08707	36	08743	35	08778	36	08814	35	08849	35	08884	36	08920	35	08955	36
123	08991	35	09026	35	09061	35	09096	36	09132	35	09167	35	09202	35	09237	35	09272	35	09307	35
124	09342	35	377	35	412	35	447	35	482	35	517	35	552	35	587	34	621	35	09656	35
125	09691	35	09726	34	09760	35	09795	35	09830	34	09864	35	09899	35	09934	34	09968	35	10003	34
126	10037	35	10072	34	10106	34	10140	35	10175	34	10209	34	10243	35	10278	34	10312	34	346	34
127	380	35	415	34	449	34	483	34	517	34	551	34	585	34	619	34	653	34	10687	34
128	10721	34	10755	34	10789	34	10823	34	10857	33	10890	34	10924	34	10958	34	10992	33	11025	34
129	11059	34	11093	33	11126	34	11160	33	11193	34	11227	34	11261	33	11294	33	11327	34	361	33
130	394	34	428	33	461	33	494	34	528	33	561	33	594	34	628	33	661	33	11694	33
131	11727	33	11760	33	11793	33	11826	34	11860	33	11893	33	11926	33	11959	33	11992	32	12024	33
132	12057	33	12090	33	12123	33	12156	33	12189	33	12222	32	12254	33	12287	33	12320	32	352	33
133	385	33	418	32	450	33	483	33	516	32	548	33	581	32	613	33	646	32	12678	32
134	12710	33	12743	32	12775	33	12808	32	12840	32	12872	33	12905	32	12937	32	12969	32	13001	32
135	13033	33	13066	32	13098	32	13130	32	13162	32	13194	32	13226	32	13258	32	13290	32	322	32
136	354	32	386	32	418	32	450	31	481	32	513	32	545	32	577	32	609	31	640	32
137	672	32	13704	31	13735	32	13767	32	13799	31	13830	32	13862	31	13893	32	13925	31	13956	32
138	13988	31	14019	32	14051	31	14082	32	14114	31	14145	31	14176	32	14208	31	14239	31	14270	31
139	14301	32	333	31	364	31	395	31	426	31	457	32	489	31	520	31	551	31	582	31
140	613	31	644	31	675	31	14706	31	14737	31	14768	31	14799	30	14829	31	14860	31	14891	31
141	14922	31	14953	30	14983	31	15014	31	15045	31	15076	30	15106	31	15137	31	15168	30	15198	31
142	15229	30	15259	31	15290	30	320	31	351	30	381	31	412	30	442	31	473	30	503	31
143	534	30	564	30	594	31	625	30	655	30	685	30	15715	31	15746	30	15776	30	15806	30
144	15836	30	15866	31	15897	30	15927	30	15957	30	15987	30	16017	30	16047	30	16077	30	16107	30
145	16137	30	16167	30	16197	30	16227	29	16256	30	16286	30	316	30	346	30	376	30	406	29
146	435	30	465	30	495	29	524	30	554	30	584	29	613	30	643	30	673	29	702	30
147	16732	29	16761	30	16791	29	16820	30	16850	29	16879	30	16909	29	16938	29	16967	30	16997	29
148	17026	30	17056	29	17085	29	17114	29	17143	30	17173	29	17202	29	17231	29	17260	29	17289	30
149	319	29	348	29	377	29	406	29	435	29	464	29	493	29	522	29	551	29	580	29
150	17609	29	17638	29	17667	29	17696	29	17725	29	17754	28	17782	29	17811	29	17840	29	17869	29
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts		
	43	42
0	0	0
1	4	4
2	9	8
3	13	13
4	17	17
5	22	21
6	26	25
7	30	29
8	34	34
9	39	38
10	43	42
	41	40
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1	4	4
2	8	8
3	12	12
4	16	16
5	21	20
6	25	24
7	29	28
8	33	32
9	37	36
10	41	40
	39	38
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1	4	4
2	8	8
3	12	11
4	16	15
5	20	19
6	23	23
7	27	27
8	31	30
9	35	34
10	39	38
	37	36
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1	4	4
2	7	7
3	11	11
4	15	14
5	19	18
6	22	22
7	26	25
8	30	29
9	33	32
10	37	36
	35	34
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1	4	3
2	7	7
3	11	10
4	14	14
5	18	17
6	21	20
7	25	24
8	28	27
9	32	31
10	35	34
	33	32
0	0	0
1	3	3
2	7	6
3	10	10
4	13	13
5	17	16
6	20	19
7	23	22
8	26	26
9	30	29
10	33	32

TABLE 32.

Logarithms of Numbers.

150

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
150	17609	29	17638	29	17667	29	17696	29	17725	29	17754	28	17782	29	17811	29	17840	29	17869	29
151	17898	28	17926	29	17955	29	17984	29	18013	28	18041	29	18070	29	18099	28	18127	29	18156	28
152	18184	29	18213	28	18241	29	18270	28	298	29	327	28	355	29	384	28	412	29	441	28
153	469	29	498	28	526	28	554	29	583	28	611	28	639	28	667	29	696	28	18724	28
154	18752	28	18780	28	18808	29	18837	28	18865	28	18893	28	18921	28	18949	28	18977	28	19005	28
155	19033	28	19061	28	19089	28	19117	28	19145	28	19173	28	19201	28	19229	28	19257	28	285	27
156	312	28	340	28	368	28	396	28	424	27	451	28	479	28	507	28	535	27	562	28
157	590	28	618	27	645	28	673	27	700	28	19728	28	19756	27	19783	28	19811	27	19838	28
158	19866	27	19893	28	19921	27	19948	28	19976	27	20003	27	20030	28	20058	27	20085	27	20112	28
159	20140	27	20167	27	20194	28	20222	27	20249	27	276	27	303	27	330	28	358	27	385	27
160	412	27	439	27	466	27	493	27	520	28	548	27	575	27	602	27	629	27	656	27
161	683	27	710	27	20737	26	20763	27	20790	27	20817	27	20844	27	20871	27	20898	27	20925	27
162	20952	26	20978	27	21005	27	21032	27	21059	26	21085	27	21112	27	21139	26	21165	27	21192	27
163	21219	26	21245	27	272	27	299	26	325	27	352	26	378	27	405	26	431	27	458	26
164	484	27	511	26	537	27	564	26	590	27	617	26	643	26	669	27	696	26	722	26
165	21748	27	21775	26	21801	26	21827	27	21854	26	21880	26	21906	26	21932	26	21958	27	21985	26
166	22011	26	22037	26	22063	26	22089	26	22115	26	22141	26	22167	27	22194	26	22220	26	22246	26
167	272	26	298	26	324	26	350	26	376	25	401	26	427	26	453	26	479	26	505	26
168	531	26	557	26	583	25	608	26	634	26	660	26	686	26	712	25	737	26	22763	26
169	22789	25	22814	26	22840	26	22866	25	22891	26	22917	26	22943	25	22968	26	22994	25	23019	26
170	23045	25	23070	26	23096	25	23121	26	23147	25	23172	26	23198	25	23223	26	23249	25	274	26
171	300	25	325	25	350	26	376	25	401	25	426	26	452	25	477	25	502	26	528	25
172	553	25	578	25	603	26	629	25	654	25	679	25	704	25	729	25	23754	25	23779	26
173	23805	25	23830	25	23855	25	23880	25	23905	25	23930	25	23955	25	23980	25	24005	25	24030	25
174	24055	25	24080	25	24105	25	24130	25	24155	25	24180	24	24204	25	24229	25	254	25	279	25
175	304	25	329	24	353	25	378	25	403	25	428	24	452	25	477	25	502	25	527	24
176	551	25	576	25	601	24	625	25	650	24	674	25	699	25	724	24	748	25	24773	24
177	24797	25	24822	24	24846	25	24871	24	24895	25	24920	24	24944	25	24969	24	24993	25	25018	24
178	25042	24	25066	25	25091	24	25115	24	25139	25	25164	24	25188	24	25212	25	25237	24	261	24
179	285	25	310	24	334	24	358	24	382	24	406	25	431	24	455	24	479	24	503	24
180	527	24	551	24	575	25	600	24	624	24	648	24	672	24	696	24	720	24	744	24
181	25768	24	25792	24	25816	24	25840	24	25864	24	25888	24	25912	23	25935	24	25959	24	25983	24
182	26007	24	26031	24	26055	24	26079	23	26102	24	26126	24	26150	24	26174	24	26198	23	26221	24
183	245	24	269	24	293	23	316	24	340	24	364	23	387	24	411	24	435	23	458	24
184	482	23	505	24	529	24	553	23	576	24	600	23	623	24	647	23	670	24	694	23
185	717	24	741	23	764	24	26788	23	26811	23	26834	24	26858	23	26881	24	26905	23	26928	23
186	26951	24	26975	23	26998	23	27021	24	27045	23	27068	23	27091	23	27114	24	27138	23	27161	23
187	27184	23	27207	24	27231	23	254	23	277	23	300	23	323	23	346	24	370	23	393	23
188	416	23	439	23	462	23	485	23	508	23	531	23	554	23	577	23	600	23	623	23
189	646	23	669	23	692	23	715	23	738	23	761	23	27784	23	27807	23	27830	22	27852	23
190	27875	23	27898	23	27921	23	27944	23	27967	22	27989	23	28012	23	28035	23	28058	23	28081	22
191	28103	23	28126	23	28149	22	28171	23	28194	23	28217	23	240	22	262	23	285	22	307	23
192	330	23	353	22	375	23	398	23	421	22	443	23	466	22	488	23	511	22	533	23
193	556	22	578	23	601	22	623	23	646	22	668	23	691	22	713	22	735	23	758	22
194	28780	23	28803	22	28825	22	28847	23	28870	22	28892	22	28914	23	28937	22	28959	22	28981	22
195	29003	23	29026	22	29048	22	29070	22	29092	23	29115	22	29137	22	29159	22	29181	22	29203	23
196	226	22	248	22	270	22	292	22	314	22	336	22	358	22	380	23	403	22	425	22
197	447	22	469	22	491	22	513	22	535	22	557	22	579	22	601	22	623	22	645	22
198	667	21	688	22	710	22	732	22	754	22	776	22	29798	22	29820	22	29842	21	29863	22
199	29885	22	29907	22	29929	22	29951	22	29973	21	29994	22	30016	22	30038	22	30060	21	30081	22
200	30103	22	30125	21	30146	22	30168	22	30190	21	30211	22	30233	22	30255	21	30276	22	30298	22
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts

	31	30
0	0	0
1	3	3
2	6	6
3	9	9
4	12	12
5	16	15
6	19	18
7	22	21
8	25	24
9	28	27
10	31	30

	29	28
0	0	0
1	3	3
2	6	6
3	9	8
4	12	11
5	15	14
6	17	17
7	20	20
8	23	22
9	26	25
10	29	28

	27	26
0	0	0
1	3	3
2	5	5
3	8	8
4	11	10
5	14	13
6	16	16
7	19	18
8	22	21
9	24	23
10	27	26

	25	24
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1	3	2
2	5	5
3	8	7
4	10	10
5	13	12
6	15	14
7	18	17
8	20	19
9	23	22
10	25	24

	23	22
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1	2	2
2	5	4
3	7	7
4	9	9
5	12	11
6	14	13
7	16	15
8	18	18
9	21	20
10	23	22

	21
0	0
1	2
2	4
3	6
4	8
5	11
6	13
7	15
8	17
9	19
10	21

Logarithms of Numbers.

200

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
200	30103	22	30125	21	30146	22	30168	22	30190	21	30211	22	30233	22	30255	21	30276	22	30298	22
201	320	21	341	22	363	21	384	22	406	22	428	21	449	22	471	21	492	22	514	21
202	535	22	557	21	578	22	600	21	621	22	643	21	664	21	685	22	707	21	728	22
203	750	21	771	21	30792	22	30814	21	30835	21	30856	22	30878	21	30899	21	30920	22	30942	21
204	30963	21	30984	22	31006	21	31027	21	31048	21	31069	22	31091	21	31112	21	31133	21	31154	21
205	31175	22	31197	21	218	21	239	21	260	21	281	21	302	21	323	22	345	21	366	21
206	387	21	408	21	429	21	450	21	471	21	492	21	513	21	534	21	555	21	576	21
207	597	21	618	21	639	21	660	21	681	21	702	21	723	21	744	21	765	20	785	21
208	31806	21	31827	21	31848	21	31869	21	31890	21	31911	20	31931	21	31952	21	31973	21	31994	21
209	32015	20	32035	21	32056	21	32077	21	32098	20	32118	21	32139	21	32160	21	32181	20	32201	21
210	222	21	243	20	263	21	284	21	305	20	325	21	346	20	366	21	387	21	408	20
211	428	21	449	20	469	21	490	20	510	21	531	21	552	20	572	21	593	20	613	21
212	634	20	654	21	675	20	695	20	715	21	736	20	756	21	777	20	32797	21	32818	20
213	32838	20	32858	21	32879	20	32899	20	32919	21	32940	20	32960	20	32980	21	33001	20	33021	20
214	33041	21	33062	20	33082	20	33102	20	33122	21	33143	20	33163	20	33183	20	203	21	224	20
215	244	20	264	20	284	20	304	21	325	20	345	20	365	20	385	20	405	20	425	20
216	445	20	465	21	486	20	506	20	526	20	546	20	566	20	586	20	606	20	626	20
217	646	20	666	20	686	20	706	20	726	20	746	20	766	20	786	20	33806	20	33826	20
218	33846	20	33866	19	33885	20	33905	20	33925	20	33945	20	33965	20	33985	20	34005	20	34025	19
219	34044	20	34064	20	34084	20	34104	20	34124	19	34143	20	34163	20	34183	20	203	20	223	19
220	242	20	262	20	282	19	301	20	321	20	341	20	361	19	380	20	400	20	420	19
221	439	20	459	20	479	19	498	20	518	19	537	20	557	20	577	19	596	20	616	19
222	635	20	655	19	674	20	694	19	713	20	733	20	753	19	772	20	792	19	34811	19
223	34830	20	34850	19	34869	20	34889	19	34908	20	34928	19	34947	20	34967	19	34986	19	35005	20
224	35025	19	35044	20	35064	19	35083	19	35102	20	35122	19	35141	19	35160	20	35180	19	199	19
225	218	20	238	19	257	19	276	19	295	20	315	19	334	19	353	19	372	20	392	19
226	411	19	430	19	449	19	468	20	488	19	507	19	526	19	545	19	564	19	583	20
227	603	19	622	19	641	19	660	19	679	19	698	19	717	19	736	19	755	19	774	19
228	793	20	35813	19	35832	19	35851	19	35870	19	35889	19	35908	19	35927	19	35946	19	35965	19
229	35984	19	36003	18	36021	19	36040	19	36059	19	36078	19	36097	19	36116	19	36135	19	36154	19
230	36173	19	192	19	211	18	229	19	248	19	267	19	286	19	305	19	324	18	342	19
231	361	19	380	19	399	19	418	18	436	19	455	19	474	19	493	18	511	19	530	19
232	549	19	568	18	586	19	605	19	624	18	642	19	661	19	680	18	698	19	717	19
233	736	18	754	19	773	18	791	19	810	19	36829	18	36847	19	36866	18	36884	19	36903	19
234	36922	18	36940	19	36959	18	36977	19	36996	18	37014	19	37033	18	37051	19	37070	18	37088	19
235	37107	18	37125	19	37144	18	37162	19	37181	18	199	19	218	18	236	18	254	19	273	18
236	291	19	310	18	328	18	346	19	365	18	383	18	401	19	420	18	438	19	457	18
237	475	18	493	18	511	19	530	18	548	18	566	19	585	18	603	18	621	18	639	19
238	658	18	676	18	694	18	712	19	731	18	749	18	767	18	785	18	803	19	37822	18
239	37840	18	37858	18	37876	18	37894	18	37912	19	37931	18	37949	18	37967	18	37985	18	38003	18
240	38021	18	38039	18	38057	18	38075	18	38093	19	38112	18	38130	18	38148	18	38166	18	184	18
241	202	18	220	18	238	18	256	18	274	18	292	18	310	18	328	18	346	18	364	18
242	382	17	399	18	417	18	435	18	453	18	471	18	489	18	507	18	525	18	543	18
243	561	17	578	18	596	18	614	18	632	18	650	18	668	18	686	17	703	18	721	18
244	739	18	757	18	775	17	792	18	810	18	38828	18	38846	17	38863	18	38881	18	38899	18
245	38917	17	38934	18	38952	18	38970	17	38987	18	39005	18	39023	18	39041	17	39058	18	39076	18
246	39094	17	39111	18	39129	17	39146	18	39164	18	182	17	199	18	217	18	235	17	252	18
247	270	17	287	18	305	17	322	18	340	18	358	17	375	18	393	17	410	18	428	17
248	445	18	463	17	480	18	498	17	515	18	533	17	550	18	568	17	585	17	602	18
249	620	17	637	18	655	17	672	18	690	17	707	17	724	18	742	17	759	18	777	17
250	39794	17	39811	18	39829	17	39846	17	39863	18	39881	17	39898	17	39915	18	39933	17	39950	17
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TABLE 32.

Logarithms of Numbers.

250

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
250	39794	17	39811	18	39829	17	39846	17	39863	18	39881	17	39898	17	39915	18	39933	17	39950	17
251	39967	18	39985	17	40002	17	40019	18	40037	17	40054	17	40071	17	40088	18	40106	17	40123	17
252	40140	17	40157	18	175	17	192	17	209	17	226	17	243	18	261	17	278	17	295	17
253	312	17	329	17	346	18	364	17	381	17	398	17	415	17	432	17	449	17	466	17
254	483	17	500	18	518	17	535	17	552	17	569	17	586	17	603	17	620	17	637	17
255	654	17	671	17	688	17	705	17	722	17	739	17	756	17	773	17	790	17	807	17
256	824	17	40841	17	40858	17	40875	17	40892	17	40909	17	40926	17	40943	17	40960	16	40976	17
257	40993	17	41010	17	41027	17	41044	17	41061	17	41078	17	41095	16	41111	17	41128	17	41145	17
258	41162	17	179	17	196	16	212	17	229	17	246	17	263	17	280	16	296	17	313	17
259	330	17	347	16	363	17	380	17	397	17	414	16	430	17	447	17	464	17	481	16
260	497	17	514	17	531	16	547	17	564	17	581	16	597	17	614	17	631	16	647	17
261	664	17	681	16	697	17	714	17	731	16	747	17	764	16	780	17	797	17	814	16
262	830	17	41847	16	41863	17	41880	16	41896	17	41913	16	41929	17	41946	17	41963	16	41979	17
263	41996	16	42012	17	42029	16	42045	17	42062	16	42078	17	42095	16	42111	16	42127	17	42144	16
264	42160	17	177	16	193	17	210	16	226	17	243	16	259	16	275	17	292	16	308	17
265	325	16	341	16	357	17	374	16	390	16	406	17	423	16	439	16	455	17	472	16
266	488	16	504	17	521	16	537	16	553	17	570	16	586	16	602	17	619	16	635	16
267	651	16	667	17	684	16	700	16	716	16	732	17	749	16	765	16	781	16	797	16
268	813	17	830	16	42846	16	42862	16	42878	16	42894	17	42911	16	42927	16	42943	16	42959	16
269	42975	16	42991	17	43008	16	43024	16	43040	16	43056	16	43072	16	43088	16	43104	16	43120	16
270	43136	16	43152	17	169	16	185	16	201	16	217	16	233	16	249	16	265	16	281	16
271	297	16	313	16	329	16	345	16	361	16	377	16	393	16	409	16	425	16	441	16
272	457	16	473	16	489	16	505	16	521	16	537	16	553	16	569	15	584	16	600	16
273	616	16	632	16	648	16	664	16	680	16	696	16	712	15	727	16	743	16	759	16
274	775	16	791	16	807	16	823	15	838	16	43854	16	43870	16	43886	16	43902	15	43917	16
275	43933	16	43949	16	43965	16	43981	15	43996	16	44012	16	44028	16	44044	15	44059	16	44075	16
276	44091	16	44107	15	44122	16	44138	16	44154	16	170	15	185	16	201	16	217	15	232	16
277	248	16	264	15	279	16	295	16	311	15	326	16	342	16	358	15	373	16	389	15
278	404	16	420	16	436	15	451	16	467	16	483	15	498	16	514	15	529	16	545	15
279	560	16	576	16	592	15	607	16	623	15	638	16	654	15	669	16	685	15	700	16
280	716	15	731	16	747	15	762	16	778	15	793	16	809	15	824	16	840	15	44855	16
281	44871	15	44886	16	44902	15	44917	15	44932	16	44948	15	44963	16	44979	15	44994	16	45010	15
282	45025	15	45040	16	45056	15	45071	15	45086	16	45102	15	45117	16	45133	15	45148	15	163	16
283	179	15	194	15	209	16	225	15	240	15	255	16	271	15	286	15	301	16	317	15
284	332	15	347	15	362	16	378	15	393	15	408	15	423	16	439	15	454	15	469	15
285	484	16	500	15	515	15	530	15	545	16	561	15	576	15	591	15	606	15	621	16
286	637	15	652	15	667	15	682	15	697	15	712	16	728	15	743	15	758	15	773	15
287	788	15	803	15	818	16	834	15	45849	15	45864	15	45879	15	45894	15	45909	15	45924	15
288	45939	15	45954	15	45969	15	45984	16	46000	15	46015	15	46030	15	46045	15	46060	15	46075	15
289	46090	15	46105	15	46120	15	46135	15	150	15	165	15	180	15	195	15	210	15	225	15
290	240	15	255	15	270	15	285	15	300	15	315	15	330	15	345	14	359	15	374	15
291	389	15	404	15	419	15	434	15	449	15	464	15	479	15	494	15	509	14	523	15
292	538	15	553	15	568	15	583	15	598	15	613	14	627	15	642	15	657	15	672	15
293	687	15	702	14	716	15	731	15	746	15	761	15	776	14	790	15	805	15	820	15
294	835	15	850	14	46864	15	46879	15	46894	15	46909	14	46923	15	46938	15	46953	14	46967	15
295	46982	15	46997	15	47012	14	47026	15	47041	15	47056	14	47070	15	47085	15	47100	14	47114	15
296	47129	15	47144	15	159	14	173	15	188	14	202	15	217	15	232	14	246	15	261	15
297	276	14	290	15	305	14	319	15	334	15	349	14	363	15	378	14	392	15	407	15
298	422	14	436	15	451	14	465	15	480	14	494	15	509	15	524	14	538	15	553	14
299	567	15	582	14	596	15	611	14	625	15	640	14	654	15	669	14	683	15	698	14
300	47712	15	47727	14	47741	15	47756	14	47770	14	47784	15	47799	14	47813	15	47828	14	47842	15
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Prop.	Parts
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6	8
7	10
8	11
9	13

Logarithms of Numbers.

300

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
300	47712	15	47727	14	47741	15	47756	14	47770	14	47784	15	47799	14	47813	15	47828	14	47842	15
301	47857	14	47871	14	47885	15	47900	14	47914	15	47929	14	47943	15	47958	14	47972	14	47986	15
302	48001	14	48015	14	48029	15	48044	14	48058	15	48073	14	48087	14	48101	15	48116	14	48130	14
303	144	15	159	14	173	14	187	15	202	14	216	14	230	14	244	15	259	14	273	14
304	287	15	302	14	316	14	330	14	344	15	359	14	373	14	387	14	401	15	416	14
305	430	14	444	14	458	15	473	14	487	14	501	14	515	15	530	14	544	14	558	14
306	572	14	586	15	601	14	615	14	629	14	643	14	657	14	671	15	686	14	700	14
307	714	14	728	14	742	14	756	14	770	15	785	14	799	14	813	14	827	14	841	14
308	855	14	48869	14	48883	14	48897	14	48911	15	48926	14	48940	14	48954	14	48968	14	48982	14
309	48996	14	49010	14	49024	14	49038	14	49052	14	49066	14	49080	14	49094	14	49108	14	49122	14
310	49136	14	150	14	164	14	178	14	192	14	206	14	220	14	234	14	248	14	262	14
311	276	14	290	14	304	14	318	14	332	14	346	14	360	14	374	14	388	14	402	13
312	415	14	429	14	443	14	457	14	471	14	485	14	499	14	513	14	527	14	541	13
313	554	14	568	14	582	14	596	14	610	14	624	14	638	13	651	14	665	14	679	14
314	693	14	707	14	721	13	734	14	748	14	762	14	776	14	790	13	803	14	817	14
315	831	14	845	14	859	13	49872	14	49886	14	49900	14	49914	13	49927	14	49941	14	49955	14
316	49969	13	49982	14	49996	14	50010	14	50024	13	50037	14	50051	14	50065	14	50079	13	50092	14
317	50106	14	50120	13	50133	14	147	14	161	13	174	14	188	14	202	13	215	14	229	14
318	243	13	256	14	270	14	284	13	297	14	311	14	325	13	338	14	352	13	365	14
319	379	14	393	13	406	14	420	13	433	14	447	14	461	13	474	14	488	13	501	14
320	515	14	529	13	542	14	556	13	569	14	583	13	596	14	610	13	623	14	637	14
321	651	13	664	14	678	13	691	14	705	13	718	14	732	13	745	14	759	13	772	14
322	786	13	799	14	813	13	826	14	840	13	853	14	50866	14	50880	13	50893	14	50907	13
323	50920	14	50934	13	50947	14	50961	13	50974	13	50987	14	51001	13	51014	14	51028	13	51041	14
324	51055	13	51068	13	51081	14	51095	13	51108	13	51121	14	135	13	148	14	162	13	175	13
325	188	14	202	13	215	13	228	14	242	13	255	13	268	14	282	13	295	13	308	14
326	322	13	335	13	348	14	362	13	375	13	388	14	402	13	415	13	428	13	441	14
327	455	13	468	13	481	14	495	13	508	13	521	13	534	14	548	13	561	13	574	13
328	587	14	601	13	614	13	627	13	640	14	654	13	667	13	680	13	693	13	706	14
329	720	13	733	13	746	13	759	13	772	14	786	13	799	13	812	13	825	13	838	13
330	851	14	865	13	51878	13	51891	13	51904	13	51917	13	51930	13	51943	14	51957	13	51970	13
331	51983	13	51996	13	52009	13	52022	13	52035	13	52048	13	52061	14	52075	13	52088	13	52101	13
332	52114	13	52127	13	140	13	153	13	166	13	179	13	192	13	205	13	218	13	231	13
333	244	13	257	13	270	14	284	13	297	13	310	13	323	13	336	13	349	13	362	13
334	375	13	388	13	401	13	414	13	427	13	440	13	453	13	466	13	479	13	492	12
335	504	13	517	13	530	13	543	13	556	13	569	13	582	13	595	13	608	13	621	13
336	634	13	647	13	660	13	673	13	686	13	699	12	711	13	724	13	737	13	750	13
337	763	13	776	13	789	13	802	13	815	12	827	13	840	13	853	13	866	13	52879	13
338	52892	13	52905	12	52917	13	52930	13	52943	13	52956	13	52969	13	52982	12	52994	13	53007	13
339	53020	13	53033	13	53046	12	53058	13	53071	13	53084	13	53097	13	53110	12	53122	13	135	13
340	148	13	161	12	173	13	186	13	199	13	212	12	224	13	237	13	250	13	263	12
341	275	13	288	13	301	13	314	12	326	13	339	13	352	12	364	13	377	13	390	13
342	403	12	415	13	428	13	441	12	453	13	466	13	479	12	491	13	504	13	517	12
343	529	13	542	13	555	12	567	13	580	13	593	12	605	13	618	13	631	12	643	13
344	656	12	668	13	681	13	694	12	706	13	719	13	732	12	744	13	757	12	769	13
345	782	12	794	13	807	13	820	12	832	13	845	12	857	13	870	12	53882	13	53895	13
346	53908	12	53920	13	53933	12	53945	13	53958	12	53970	13	53983	12	53995	13	54008	12	54020	13
347	54033	12	54045	13	54058	12	54070	13	54083	12	54095	13	54108	12	54120	13	133	12	145	13
348	158	12	170	13	183	12	195	13	208	12	220	13	233	12	245	13	258	12	270	13
349	283	12	295	12	307	13	320	12	332	13	345	12	357	13	370	12	382	12	394	13
350	54407	12	54419	13	54432	12	54444	12	54456	13	54469	12	54481	13	54494	12	54506	12	54518	13
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Prop. Parts	
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4	**6**
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8	11
9	**13**
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2	**3**
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7	9
8	**10**
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3	4
4	5
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7	8
8	**10**
9	11

TABLE 32.

Logarithms of Numbers.

350

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
350	54407	12	54419	13	54432	12	54444	12	54456	13	54469	12	54481	12	54494	12	54506	12	54518	13
351	531	12	543	12	555	13	568	12	580	13	593	12	605	12	617	13	630	12	642	12
352	654	13	667	12	679	12	691	13	704	12	716	12	728	13	741	12	753	12	765	12
353	777	13	790	12	802	12	814	13	827	12	839	12	851	13	864	12	876	12	54888	12
354	54900	13	54913	12	54925	12	54937	12	54949	13	54962	12	54974	12	54986	12	54998	13	55011	12
355	55023	12	55035	12	55047	13	55060	12	55072	12	55084	12	55096	12	55108	13	55121	12	133	12
356	145	12	157	12	169	13	182	12	194	12	206	12	218	12	230	12	242	13	255	12
357	267	12	279	12	291	12	303	12	315	13	328	12	340	12	352	12	364	12	376	12
358	388	12	400	13	413	12	425	12	437	12	449	12	461	12	473	12	485	12	497	12
359	509	13	522	12	534	12	546	12	558	12	570	12	582	12	594	12	606	12	618	12
360	630	12	642	12	654	12	666	12	678	13	691	12	703	12	715	12	727	12	739	12
361	751	12	763	12	775	12	787	12	799	12	811	12	823	12	835	12	847	12	859	12
362	871	12	55883	12	55895	12	55907	12	55919	12	55931	12	55943	12	55955	12	55967	12	55979	12
363	55991	12	56003	12	56015	12	56027	11	56038	12	56050	12	56062	12	56074	12	56086	12	56098	12
364	56110	12	122	12	134	12	146	12	158	12	170	12	182	12	194	11	205	12	217	12
365	229	12	241	12	253	12	265	12	277	12	289	12	301	11	312	12	324	12	336	12
366	348	12	360	12	372	12	384	12	396	11	407	12	419	12	431	12	443	12	455	12
367	467	11	478	12	490	12	502	12	514	12	526	12	538	11	549	12	561	12	573	12
368	585	12	597	11	608	12	620	12	632	12	644	12	656	11	667	12	679	12	691	12
369	703	11	714	12	726	12	738	12	750	11	761	12	773	12	785	12	797	11	808	12
370	820	12	832	12	844	11	855	12	867	12	879	12	56891	11	56902	12	56914	12	56926	11
371	56937	12	56949	12	56961	11	56972	12	56984	12	56996	12	57008	11	57019	12	57031	12	57043	11
372	57054	12	57066	12	57078	11	57089	12	57101	12	57113	11	124	12	136	12	148	11	159	12
373	171	12	183	11	194	12	206	11	217	12	229	12	241	11	252	12	264	12	276	11
374	287	12	299	11	310	12	322	12	334	11	345	12	357	11	368	12	380	12	392	11
375	403	12	415	11	426	12	438	11	449	12	461	12	473	11	484	12	496	11	507	12
376	519	11	530	12	542	11	553	12	565	11	576	12	588	12	600	11	611	12	623	11
377	634	12	646	11	657	12	669	11	680	12	692	11	703	12	715	11	726	12	738	11
378	749	12	761	11	772	12	784	11	795	12	807	11	818	12	830	11	841	11	852	12
379	864	11	875	12	57887	11	57898	12	57910	11	57921	12	57933	11	57944	11	57955	12	57967	11
380	57978	12	57990	11	58001	12	58013	11	58024	11	58035	12	58047	11	58058	12	58070	11	58081	11
381	58092	12	58104	11	115	12	127	11	138	11	149	12	161	11	172	12	184	11	195	11
382	206	12	218	11	229	11	240	12	252	11	263	11	274	12	286	11	297	12	309	11
383	320	11	331	12	343	11	354	11	365	12	377	11	388	11	399	11	410	12	422	11
384	433	11	444	12	456	11	467	11	478	12	490	11	501	11	512	12	524	11	535	11
385	546	11	557	12	569	11	580	11	591	11	602	12	614	11	625	11	636	11	647	12
386	659	11	670	11	681	11	692	12	704	11	715	11	726	11	737	12	749	11	760	11
387	771	11	782	12	794	11	805	11	816	11	827	11	838	12	850	11	861	11	872	11
388	883	11	58894	12	58906	11	58917	11	58928	11	58939	11	58950	11	58961	12	58973	11	58984	11
389	58995	11	59006	11	59017	11	59028	12	59040	11	59051	11	59062	11	59073	11	59084	11	59095	11
390	59106	12	118	11	129	11	140	11	151	11	162	11	173	11	184	11	195	12	207	11
391	218	11	229	11	240	11	251	11	262	11	273	11	284	11	295	11	306	12	318	11
392	329	11	340	11	351	11	362	11	373	11	384	11	395	11	406	11	417	11	428	11
393	439	11	450	11	461	11	472	11	483	11	494	12	506	11	517	11	528	11	539	11
394	550	11	561	11	572	11	583	11	594	11	605	11	616	11	627	11	638	11	649	11
395	660	11	671	11	682	11	693	11	704	11	715	11	726	11	737	11	748	11	759	11
396	770	10	780	11	791	11	802	11	813	11	824	11	835	11	846	11	857	11	868	11
397	879	11	890	11	59901	11	59912	11	59923	11	59934	11	59945	11	59956	10	59966	11	59977	11
398	59988	11	59999	11	60010	11	60021	11	60032	11	60043	11	60054	11	60065	11	60076	10	60086	11
399	60097	11	60108	11	119	11	130	11	141	11	152	11	163	10	173	11	184	11	195	11
400	60206	11	60217	11	60228	11	60239	10	60249	11	60260	11	60271	11	60282	11	60293	11	60304	10
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts	
	13
1	1
2	3
3	4
4	5
5	7
6	8
7	9
8	**10**
9	12
	12
1	1
2	2
3	4
4	5
5	6
6	7
7	8
8	**10**
9	11
	11
1	1
2	2
3	3
4	4
5	6
6	7
7	8
8	9
9	10
	10
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Logarithms of Numbers.

400

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d	Prop. Parts	
400	60206	11	60217	11	60228	11	60239	10	60249	11	60260	11	60271	11	60282	11	60293	11	60304	10		**11**
401	314	11	325	11	336	11	347	11	358	11	369	10	379	11	390	11	401	11	412	11		
402	423	10	433	11	444	11	455	11	466	11	477	10	487	11	498	11	509	11	520	11	1	1
403	531	10	541	11	552	11	563	11	574	10	584	11	595	11	606	11	617	10	627	11	2	2
404	638	11	649	11	660	10	670	11	681	11	692	11	703	10	713	11	724	11	735	11	3	3
																					4	4
405	746	10	756	11	767	11	778	10	788	11	799	11	810	11	821	10	831	11	842	11	5	**6**
406	853	10	863	11	874	11	885	10	60895	11	60906	11	60917	10	60927	11	60938	11	60949	10	6	7
407	60959	11	60970	11	60981	10	60991	11	61002	11	61013	10	61023	11	61034	11	61045	10	61055	11	7	8
408	61066	11	61077	10	61087	11	61098	11	109	10	119	11	130	10	140	11	151	11	162	10	8	9
409	172	11	183	11	194	10	204	11	215	10	225	11	236	11	247	10	257	11	268	10	9	10
410	278	11	289	11	300	10	310	11	321	10	331	11	342	10	352	11	363	11	374	10		
411	384	11	395	10	405	11	416	10	426	11	437	11	448	10	458	11	469	10	479	11		
412	490	10	500	11	511	10	521	11	532	10	542	11	553	10	563	11	574	10	584	11		
413	595	11	606	10	616	11	627	10	637	11	648	10	658	11	669	10	679	11	690	10		
414	700	11	711	10	721	10	731	11	742	10	752	11	763	10	773	11	784	10	794	11		
415	805	10	815	11	826	10	836	11	847	10	857	11	868	10	878	10	888	11	61899	10		
416	61909	11	61920	10	61930	11	61941	10	61951	11	61962	10	61972	10	61982	11	61993	10	62003	11		
417	62014	10	62024	10	62034	11	62045	10	62055	11	62066	10	62076	10	62086	11	62097	10	107	11		
418	118	10	128	10	138	11	149	10	159	11	170	10	180	10	190	11	201	10	211	10		
419	221	11	232	10	242	10	252	11	263	10	273	11	284	10	294	10	304	11	315	10		
420	325	10	335	11	346	10	356	10	366	11	377	10	387	10	397	11	408	10	418	10		
421	428	11	439	10	449	10	459	10	469	11	480	10	490	10	500	11	511	10	521	10		**10**
422	531	11	542	10	552	10	562	10	572	11	583	10	593	10	603	10	613	11	624	10		
423	634	10	644	11	655	10	665	10	675	10	685	11	696	10	706	10	716	10	726	11	1	1
424	737	10	747	10	757	10	767	11	778	10	788	10	798	10	808	10	818	11	829	10	2	2
																					3	3
425	839	10	849	10	859	11	870	10	880	10	890	10	62900	10	62910	11	62921	10	62931	10	4	4
426	62941	10	62951	10	62961	11	62972	10	62982	10	62992	10	63002	10	63012	10	63022	11	63033	10	5	5
427	63043	10	63053	10	63063	10	63073	10	63083	11	63094	10	104	10	114	10	124	10	134	10	6	6
428	144	11	155	10	165	10	175	10	185	10	195	10	205	10	215	10	225	11	236	10	7	7
429	246	10	256	10	266	10	276	10	286	10	296	10	306	11	317	10	327	10	337	10	8	8
																					9	9
430	347	10	357	10	367	10	377	10	387	10	397	10	407	10	417	11	428	10	438	10		
431	448	10	458	10	468	10	478	10	488	10	498	10	508	10	518	10	528	10	538	10		
432	548	10	558	10	568	11	579	10	589	10	599	10	609	10	619	10	629	10	639	10		
433	649	10	659	10	669	10	679	10	689	10	699	10	709	10	719	10	729	10	739	10		
434	749	10	759	10	769	10	779	10	789	10	799	10	809	10	819	10	829	10	839	10		
435	849	10	859	10	869	10	879	10	889	10	899	10	63909	10	63919	10	63929	10	63939	10		
436	63949	10	63959	10	63969	10	63979	9	63988	10	63998	10	64008	10	64018	10	64028	10	64038	10		
437	64048	10	64058	10	64068	10	64078	10	64088	10	64098	10	108	10	118	10	128	9	137	10		
438	147	10	157	10	167	10	177	10	187	10	197	10	207	10	217	10	227	10	237	9		
439	246	10	256	10	266	10	276	10	286	10	296	10	306	10	316	10	326	9	335	10		
440	345	10	355	10	365	10	375	10	385	10	395	9	404	10	414	10	424	10	434	10		
441	444	10	454	10	464	9	473	10	483	10	493	10	503	10	513	10	523	9	532	10		
442	542	10	552	10	562	10	572	10	582	9	591	10	601	10	611	10	621	10	631	9		**9**
443	640	10	650	10	660	10	670	10	680	9	689	10	699	10	709	10	719	10	729	9		
444	738	10	748	10	758	10	768	9	777	10	787	10	797	10	807	9	816	10	826	10	1	1
																					2	2
445	836	10	846	10	856	9	865	10	875	10	885	10	895	9	64904	10	64914	10	64924	9	3	3
446	64933	10	64943	10	64953	10	64963	9	64972	10	64982	10	64992	10	65002	9	65011	10	65021	10	4	4
447	65031	9	65040	10	65050	10	65060	10	65070	9	65079	10	65089	10	099	9	108	10	118	10	5	5
448	128	9	137	10	147	10	157	10	167	9	176	10	186	10	196	9	205	10	215	10	6	5
449	225	9	234	10	244	10	254	9	263	10	273	10	283	9	292	10	302	10	312	9	7	6
																					8	7
450	65321	10	65331	10	65341	9	65350	10	65360	9	65369	10	65379	10	65389	9	65398	10	65408	10	9	8
No.	0		1		2		3		4		5		6		7		8		9			

TABLE 32.

Logarithms of Numbers.

450

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d	Prop.	Parts
450	65321	10	65331	10	65341	9	65350	10	65360	9	65369	10	65379	10	65389	9	65398	10	65408	10		10
451	418	9	427	10	437	10	447	9	456	10	466	9	475	10	485	10	495	9	504	10		
452	514	9	523	10	533	10	543	9	552	10	562	9	571	10	581	10	591	9	600	10	1	1
453	610	9	619	10	629	10	639	9	648	10	658	9	667	10	677	9	686	10	696	10	2	2
454	706	9	715	10	725	9	734	10	744	9	753	10	763	9	772	10	782	10	792	9	3	3
																					4	4
455	801	10	811	9	820	10	830	9	839	10	849	9	858	10	868	9	877	10	887	9	5	5
456	896	10	65906	10	65916	9	65925	10	65935	9	65944	10	65954	9	65963	10	65973	9	65982	10	6	6
457	65992	9	66001	10	66011	9	66020	10	66030	9	66039	10	66049	9	66058	10	66068	9	66077	10	7	7
458	66087	9	096	10	106	9	115	9	124	10	134	9	143	10	153	9	162	10	172	9	8	8
459	181	10	191	9	200	10	210	9	219	10	229	9	238	9	247	10	257	9	266	10	9	9
460	276	9	285	10	295	9	304	10	314	9	323	9	332	10	342	9	351	10	361	9		
461	370	10	380	9	389	9	398	10	408	9	417	10	427	9	436	9	445	10	455	9		
462	464	10	474	9	483	9	492	10	502	9	511	10	521	9	530	9	539	10	549	9		
463	558	9	567	10	577	9	586	10	596	9	605	9	614	10	624	9	633	9	642	10		
464	652	9	661	10	671	9	680	9	689	10	699	9	708	9	717	10	727	9	736	9		
465	745	10	755	9	764	9	773	10	783	9	792	9	801	10	811	9	820	9	829	10		
466	839	9	848	9	857	10	867	9	876	9	885	9	894	10	904	9	66913	9	66922	10		
467	66932	9	66941	9	66950	10	66960	9	66969	9	66978	9	66987	10	66997	9	67006	9	67015	10		
468	67025	9	67034	9	67043	9	67052	10	67062	9	67071	9	67080	9	67089	10	099	9	108	9		
469	117	10	127	9	136	9	145	9	154	10	164	9	173	9	182	9	191	10	201	9		
470	210	9	219	9	228	9	237	10	247	9	256	9	265	9	274	10	284	9	293	9		9
471	302	9	311	10	321	9	330	9	339	9	348	9	357	10	367	9	376	9	385	9		
472	394	9	403	10	413	9	422	9	431	9	440	9	449	10	67459	9	67468	9	67477	9		
473	67486	9	67495	9	67504	10	67514	9	67523	9	67532	9	67541	9	550	10	560	9	569	9	1	1
474	578	9	587	9	596	9	605	9	614	10	624	9	633	9	642	9	651	9	660	9	2	2
																					3	3
475	669	10	679	9	688	9	697	9	706	9	715	9	724	9	733	9	742	10	752	9	4	4
476	761	9	770	9	779	9	788	9	797	9	806	9	815	10	825	9	834	9	843	9	5	5
477	852	9	861	9	870	9	879	9	888	9	897	9	906	10	67916	9	67925	9	67934	9	6	5
478	67943	9	67952	9	67961	9	67970	9	67979	9	67988	9	67997	9	68006	9	68015	9	68024	10	7	6
479	68034	9	68043	9	68052	9	68061	9	68070	9	68079	9	68088	9	097	9	106	9	115	9	8	7
																					9	8
480	124	9	133	9	142	9	151	9	160	9	169	9	178	9	187	9	196	9	205	10		
481	215	9	224	9	233	9	242	9	251	9	260	9	269	9	278	9	287	9	296	9		
482	305	9	314	9	323	9	332	9	341	9	350	9	359	9	368	9	377	9	386	9		
483	395	9	404	9	413	9	422	9	431	9	440	9	449	9	458	9	68467	9	68476	9		
484	68485	9	68494	8	68502	9	68511	9	68520	9	68529	9	68538	9	68547	9	556	9	565	9		
485	574	9	583	9	592	9	601	9	610	9	619	9	628	9	637	9	646	9	655	9		
486	664	9	673	8	681	9	690	9	699	9	708	9	717	9	726	9	735	9	744	9		
487	753	9	762	9	771	9	780	9	789	8	797	9	806	9	815	9	824	9	833	9		
488	842	9	851	9	860	9	869	9	878	8	886	9	895	9	904	9	68913	9	68922	9		
489	68931	9	68940	9	68949	9	68958	8	68966	9	68975	9	68984	9	68993	9	69002	9	69011	9		
490	69020	8	69028	9	69037	9	69046	9	69055	9	69064	9	69073	9	69082	8	090	9	099	9		
491	108	9	117	9	126	9	135	9	144	8	152	9	161	9	170	9	179	9	188	9		8
492	197	8	205	9	214	9	223	9	232	9	241	8	249	9	258	9	267	9	276	9		
493	285	9	294	8	302	9	311	9	320	9	329	9	338	8	346	9	355	9	364	9		
494	373	8	381	9	390	9	399	9	408	9	417	8	425	9	434	9	443	9	452	9	1	1
																					2	2
495	461	8	469	9	478	9	487	9	496	8	504	9	513	9	522	9	531	8	539	9	3	2
496	548	9	557	9	566	8	574	9	583	9	592	9	601	8	609	9	618	9	627	9	4	3
497	636	8	644	9	653	9	662	9	671	8	679	9	688	9	697	8	705	9	714	9	5	4
498	723	9	732	8	740	9	749	9	758	9	767	8	775	9	784	9	793	8	801	9	6	5
499	810	9	819	8	827	9	836	9	845	9	854	8	862	9	871	9	880	8	888	9	7	6
																					8	6
500	69897	9	69906	8	69914	9	69923	9	69932	8	69940	9	69949	9	69958	8	69966	9	69975	9	9	7
No.	0		1		2		3		4		5		6		7		8		9			

Logarithms of Numbers.

500

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d	Prop. Parts
500	69897	9	69906	8	69914	9	69923	9	69932	8	69940	9	69949	9	69958	8	69966	9	69975	9	
501	69984	8	69992	9	70001	9	70010	8	70018	9	70027	9	70036	8	70044	9	70053	9	70062	8	9
502	70070	9	70079	9	088	8	096	9	105	9	114	8	122	9	131	9	140	8	148	9	
503	157	8	165	9	174	9	183	8	191	9	200	9	209	8	217	9	226	8	234	9	
504	243	9	252	8	260	9	269	9	278	8	286	9	295	8	303	9	312	9	321	8	1 1
505	329	9	338	8	346	9	355	9	364	8	372	9	381	8	389	9	398	8	406	9	2 2
506	415	9	424	8	70432	9	70441	8	70449	9	70458	9	70467	8	70475	9	70484	8	70492	9	3 3
507	70501	8	70509	9	518	8	526	9	535	9	544	8	552	9	561	8	569	9	578	8	4 4
508	586	9	595	8	603	9	612	9	621	8	629	9	638	8	646	9	655	8	663	9	5 5
509	672	8	680	9	689	8	697	9	706	8	714	9	723	8	731	9	740	9	749	8	6 6
510	757	9	766	8	774	9	783	8	791	9	800	8	808	9	817	8	825	9	834	8	7 7
511	842	9	851	8	859	9	868	8	876	9	885	8	893	9	902	8	910	9	70919	8	8 8
512	70927	8	70935	9	70944	8	70952	9	70961	8	70969	9	70978	8	70986	9	70995	8	71003	9	9
513	71012	8	71020	9	71029	8	71037	9	71046	8	71054	9	71063	8	71071	8	71079	9	088	8	
514	096	9	105	8	113	9	122	8	130	9	139	8	147	8	155	9	164	8	172	9	
515	181	8	189	9	198	8	206	8	214	9	223	8	231	9	240	8	248	9	257	8	
516	265	8	273	9	282	8	290	9	299	8	307	8	315	9	324	8	332	9	341	8	
517	349	8	357	9	366	8	374	9	383	8	391	8	399	9	408	8	416	9	425	8	
518	433	8	441	9	450	8	458	8	466	9	475	8	483	9	492	8	500	8	508	9	
519	517	8	525	8	533	9	542	8	550	9	559	8	567	8	575	9	584	8	592	8	
520	600	9	609	8	617	8	625	9	634	8	642	8	650	9	659	8	667	8	675	9	
521	684	8	692	8	700	9	709	8	717	8	725	9	734	8	742	8	750	9	759	8	8
522	767	8	775	9	784	8	792	8	800	9	809	8	817	8	825	9	834	8	842	8	
523	850	8	858	9	867	8	875	8	883	9	892	8	900	8	908	9	917	8	71925	8	
524	71933	8	71941	9	71950	8	71958	8	71966	9	71975	8	71983	8	71991	8	71999	9	72008	8	1 1
525	72016	8	72024	8	72032	9	72041	8	72049	8	72057	9	72066	8	72074	8	72082	8	090	9	2 2
526	099	8	107	8	115	8	123	9	132	8	140	8	148	8	156	9	165	8	173	8	3 2
527	181	8	189	9	198	8	206	8	214	8	222	8	230	9	239	8	247	8	255	8	4 3
528	263	9	272	8	280	8	288	8	296	8	304	9	313	8	321	8	329	8	337	9	5 4
529	346	8	354	8	362	8	370	8	378	9	387	8	395	8	403	8	411	8	419	9	6 5
530	428	8	72436	8	72444	8	72452	8	72460	9	72469	8	72477	8	72485	8	72493	8	72501	8	7 6
531	72509	9	518	8	526	8	534	8	542	8	550	8	558	9	567	8	575	8	583	8	8 6
532	591	8	599	8	607	9	616	8	624	8	632	8	640	8	648	8	656	9	665	8	9 7
533	673	8	681	8	689	8	697	8	705	8	713	9	722	8	730	8	738	8	746	8	
534	754	8	762	8	770	9	779	8	787	8	795	8	803	8	811	8	819	8	827	8	
535	835	8	843	9	852	8	860	8	868	8	876	8	884	8	892	8	900	8	908	8	
536	916	9	72925	8	72933	8	72941	8	72949	8	72957	8	72965	8	72973	8	72981	8	72989	8	
537	72997	9	73006	8	73014	8	73022	8	73030	8	73038	8	73046	8	73054	8	73062	8	73070	8	
538	73078	8	086	8	094	8	102	9	111	8	119	8	127	8	135	8	143	8	151	8	
539	159	8	167	8	175	8	183	8	191	8	199	8	207	8	215	8	223	8	231	8	
540	239	8	247	8	255	8	263	9	272	8	280	8	288	8	296	8	304	8	312	8	
541	320	8	328	8	336	8	344	8	352	8	360	8	368	8	376	8	384	8	392	8	7
542	400	8	408	8	416	8	424	8	432	8	440	8	448	8	456	8	464	8	472	8	
543	73480	8	73488	8	73496	8	73504	8	73512	8	73520	8	73528	8	73536	8	73544	8	73552	8	1 1
544	560	8	568	8	576	8	584	8	592	8	600	8	608	8	616	8	624	8	632	8	2 1
545	640	8	648	8	656	8	664	8	672	7	679	8	687	8	695	8	703	8	711	8	3 2
546	719	8	727	8	735	8	743	8	751	8	759	8	767	8	775	8	783	8	791	8	4 3
547	799	8	807	8	815	8	823	7	830	8	838	8	846	8	854	8	862	8	870	8	5 4
548	878	8	886	8	894	8	902	8	910	8	918	8	73926	7	73933	8	73941	8	73949	8	6 4
549	73957	8	73965	8	73973	8	73981	8	73989	8	73997	8	74005	8	74013	7	74020	8	74028	8	7 5
550	74036	8	74044	8	74052	8	74060	8	74068	8	74076	8	74084	8	74092	7	74099	8	74107	8	8 6 9 6
No.	0		1		2		3		4		5		6		7		8		9		

TABLE 32.

Logarithms of Numbers.

550

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
550	74036	8	74044	8	74052	8	74060	8	74068	8	74076	8	74084	8	74092	7	74099	8	74107	8
551	115	8	123	8	131	8	139	8	147	8	155	7	162	8	170	8	178	8	186	8
552	194	8	202	8	210	8	218	7	225	8	233	8	241	8	249	8	257	8	265	8
553	273	7	280	8	288	8	296	8	304	8	312	8	320	7	327	8	335	8	343	8
554	351	8	359	8	367	7	374	8	382	8	390	8	398	8	406	8	414	7	421	8
555	429	8	437	8	445	8	453	8	74461	7	74468	8	74476	8	74484	8	74492	8	74500	7
556	74507	8	74515	8	74523	8	74531	8	539	8	547	7	554	8	562	8	570	8	578	8
557	586	7	593	8	601	8	609	8	617	7	624	8	632	8	640	8	648	8	656	7
558	663	8	671	8	679	8	687	8	695	7	702	8	710	8	718	8	726	7	733	8
559	741	8	749	8	757	7	764	8	772	8	780	8	788	8	796	7	803	8	811	8
560	819	8	827	7	834	8	842	8	850	8	858	7	865	8	873	8	881	8	889	7
561	896	8	904	8	912	8	920	7	74927	8	74935	8	74943	7	74950	8	74958	8	74966	8
562	74974	7	74981	8	74989	8	74997	8	75005	7	75012	8	75020	8	75028	7	75035	8	75043	8
563	75051	8	75059	7	75066	8	75074	8	082	7	089	8	097	8	105	8	113	7	120	8
564	128	8	136	7	143	8	151	8	159	7	166	8	174	8	182	7	189	8	197	8
565	205	8	213	7	220	8	228	8	236	7	243	8	251	8	259	7	266	8	274	8
566	282	7	289	8	297	8	305	7	312	8	320	8	328	7	335	8	343	8	351	7
567	358	8	366	8	374	7	381	8	389	8	397	7	404	8	412	8	420	7	427	8
568	435	7	442	8	450	8	458	7	465	8	75473	8	75481	7	75488	8	75496	8	75504	7
569	75511	8	75519	7	75526	8	75534	8	75542	7	549	8	557	8	565	7	572	8	580	7
570	587	8	595	8	603	7	610	8	618	8	626	7	633	8	641	7	648	8	656	8
571	664	7	671	8	679	7	686	8	694	8	702	7	709	8	717	7	724	8	732	8
572	740	7	747	8	755	7	762	8	770	8	778	7	785	8	793	7	800	8	808	7
573	815	8	823	8	831	7	838	8	846	7	853	8	861	7	868	8	876	8	884	7
574	891	8	899	7	906	8	914	7	921	8	75929	8	75937	7	75944	8	75952	7	75959	8
575	75967	7	75974	8	75982	7	75989	8	75997	8	76005	7	76012	8	76020	7	76027	8	76035	7
576	76042	8	76050	7	76057	8	76065	7	76072	8	080	7	087	8	095	8	103	7	110	8
577	118	7	125	8	133	7	140	8	148	7	155	8	163	7	170	8	178	7	185	8
578	193	7	200	8	208	7	215	8	223	7	230	8	238	7	245	8	253	7	260	8
579	268	7	275	8	283	7	290	8	298	7	305	8	313	7	320	8	328	7	335	8
580	343	7	350	8	358	7	365	8	373	7	380	8	388	7	395	8	403	7	410	8
581	418	7	425	8	433	7	440	8	448	7	76455	7	76462	8	76470	7	76477	8	76485	7
582	76492	8	76500	7	76507	8	76515	7	76522	8	530	7	537	8	545	7	552	7	559	8
583	567	7	574	8	582	7	589	8	597	7	604	8	612	7	619	7	626	8	634	7
584	641	8	649	7	656	8	664	7	671	7	678	8	686	7	693	8	701	7	708	8
585	716	7	723	7	730	8	738	7	745	8	753	7	760	8	768	7	775	7	782	8
586	790	7	797	8	805	7	812	7	819	8	827	7	834	8	842	7	849	7	856	8
587	864	7	871	8	879	7	886	7	893	8	901	7	908	8	916	7	923	7	76930	8
588	76938	7	76945	8	76953	7	76960	7	76967	8	76975	7	76982	7	76989	8	76997	7	77004	8
589	77012	7	77019	7	77026	8	77034	7	77041	7	77048	8	77056	7	77063	7	77070	8	078	7
590	085	8	093	7	100	7	107	8	115	7	122	7	129	8	137	7	144	7	151	8
591	159	7	166	7	173	8	181	7	188	7	195	8	203	7	210	7	217	8	225	7
592	232	8	240	7	247	7	254	8	262	7	269	7	276	7	283	8	291	7	298	7
593	305	8	313	7	320	7	327	8	335	7	342	7	349	8	357	7	364	7	371	8
594	379	7	386	7	393	8	401	7	408	7	415	7	422	8	430	7	437	7	77444	8
595	77452	7	77459	7	77466	8	77474	7	77481	7	77488	7	77495	8	77503	7	77510	7	517	8
596	525	7	532	7	539	7	546	8	554	7	561	7	568	8	576	7	583	7	590	7
597	597	8	605	7	612	7	619	8	627	7	634	7	641	7	648	8	656	7	663	7
598	670	7	677	8	685	7	692	7	699	7	706	8	714	7	721	7	728	7	735	8
599	743	7	750	7	757	7	764	8	772	7	779	7	786	7	793	8	801	7	808	7
600	77815	7	77822	8	77830	7	77837	7	77844	7	77851	8	77859	7	77866	7	77873	7	77880	7
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts	
	8
1	1
2	2
3	2
4	3
5	4
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7	6
8	6
9	7
	7
1	1
2	1
3	2
4	3
5	4
6	4
7	5
8	6
9	6

Logarithms of Numbers.

600

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
600	77815	7	77822	8	77830	7	77837	7	77844	7	77851	8	77859	7	77866	7	77873	7	77880	7
601	887	8	895	7	902	7	909	7	916	8	924	7	77931	7	77938	7	77945	7	77952	8
602	77960	7	77967	7	77974	7	77981	7	77988	8	77996	7	78003	7	78010	7	78017	8	78025	7
603	78032	7	78039	7	78046	7	78053	8	78061	7	78068	7	075	7	082	7	089	8	097	7
604	104	7	111	7	118	7	125	7	132	8	140	7	147	7	154	7	161	7	168	8
605	176	7	183	7	190	7	197	7	204	7	211	8	219	7	226	7	233	7	240	7
606	247	7	254	8	262	7	269	7	276	7	283	7	290	7	297	8	305	7	312	7
607	319	7	326	7	333	7	340	7	347	8	355	7	362	7	369	7	376	7	383	7
608	390	8	398	7	405	7	412	7	419	7	426	7	78433	7	78440	7	78447	8	78455	7
609	78462	7	78469	7	78476	7	78483	7	78490	7	78497	7	504	8	512	7	519	7	526	7
610	533	7	540	7	547	7	554	7	561	8	569	7	576	7	583	7	590	7	597	7
611	604	7	611	7	618	7	625	8	633	7	640	7	647	7	654	7	661	7	668	7
612	675	7	682	7	689	7	696	8	704	7	711	7	718	7	725	7	732	7	739	7
613	746	7	753	7	760	7	767	7	774	7	781	8	789	7	796	7	803	7	810	7
614	817	7	824	7	831	7	838	7	845	7	852	7	859	7	866	7	873	7	880	8
615	888	7	895	7	902	7	909	7	916	7	923	7	78930	7	78937	7	78944	7	78951	7
616	78958	7	78965	7	78972	7	78979	7	78986	7	78993	7	79000	7	79007	7	79014	7	79021	8
617	79029	7	79036	7	79043	7	79050	7	79057	7	79064	7	071	7	078	7	085	7	092	7
618	099	7	106	7	113	7	120	7	127	7	134	7	141	7	148	7	155	7	162	7
619	169	7	176	7	183	7	190	7	197	7	204	7	211	7	218	7	225	7	232	7
620	239	7	246	7	253	7	260	7	267	7	274	7	281	7	288	7	295	7	302	7
621	309	7	316	7	323	7	330	7	337	7	344	7	351	7	358	7	365	7	372	7
622	379	7	386	7	393	7	400	7	407	7	414	7	421	7	428	7	435	7	442	7
623	449	7	456	7	463	7	470	7	477	7	484	7	79491	7	79498	7	79505	6	79511	7
624	79518	7	79525	7	79532	7	79539	7	79546	7	79553	7	560	7	567	7	574	7	581	7
625	588	7	595	7	602	7	609	7	616	7	623	7	630	7	637	7	644	6	650	7
626	657	7	664	7	671	7	678	7	685	7	692	7	699	7	706	7	713	7	720	7
627	727	7	734	7	741	7	748	6	754	7	761	7	768	7	775	7	782	7	789	7
628	796	7	803	7	810	7	817	7	824	7	831	6	837	7	844	7	851	7	858	7
629	865	7	872	7	879	7	886	7	893	7	900	6	906	7	913	7	920	7	927	7
630	79934	7	79941	7	79948	7	79955	7	79962	7	79969	6	79975	7	79982	7	79989	7	79996	7
631	80003	7	80010	7	80017	7	80024	6	80030	7	80037	7	80044	7	80051	7	80058	7	80065	7
632	072	7	079	6	085	7	092	7	099	7	106	7	113	7	120	7	127	7	134	6
633	140	7	147	7	154	7	161	7	168	7	175	7	182	6	188	7	195	7	202	7
634	209	7	216	7	223	6	229	7	236	7	243	7	250	7	257	7	264	7	271	6
635	277	7	284	7	291	7	298	7	305	7	312	6	318	7	325	7	332	7	339	7
636	346	7	353	6	359	7	366	7	373	7	380	7	387	6	393	7	400	7	407	7
637	414	7	421	7	428	6	434	7	441	7	448	7	455	7	462	6	468	7	475	7
638	80482	7	80489	7	80496	6	80502	7	80509	7	80516	7	80523	7	80530	6	80536	7	80543	7
639	550	7	557	7	564	6	570	7	577	7	584	7	591	7	598	6	604	7	611	7
640	618	7	625	7	632	6	638	7	645	7	652	7	659	6	665	7	672	7	679	7
641	686	7	693	6	699	7	706	7	713	7	720	6	726	7	733	7	740	7	747	7
642	754	6	760	7	767	7	774	7	781	6	787	7	794	7	801	7	808	6	814	7
643	821	7	828	7	835	6	841	7	848	7	855	7	862	6	868	7	875	7	882	7
644	889	6	895	7	902	7	909	7	916	6	922	7	929	7	80936	7	80943	6	80949	7
645	80956	7	80963	6	80969	7	80976	7	80983	7	80990	6	80996	7	81003	7	81010	7	81017	6
646	81023	7	81030	7	81037	6	81043	7	81050	7	81057	7	81064	6	070	7	077	7	084	6
647	090	7	097	7	104	7	111	6	117	7	124	7	131	6	137	7	144	7	151	7
648	158	6	164	7	171	7	178	6	184	7	191	7	198	6	204	7	211	7	218	6
649	224	7	231	7	238	7	245	6	251	7	258	7	265	6	271	7	278	7	285	6
650	81291	7	81298	7	81305	6	81311	7	81318	7	81325	6	81331	7	81338	7	81345	6	81351	7
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts	
	8
1	1
2	2
3	2
4	3
5	4
6	5
7	6
8	6
9	7
	7
1	1
2	1
3	2
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6	4
7	5
8	6
9	6
	6
1	1
2	1
3	2
4	2
5	3
6	4
7	4
8	5
9	5

TABLE 32.

Logarithms of Numbers.

650

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
650	81291	7	81298	7	81305	6	81311	7	81318	7	81325	6	81331	7	81338	7	81345	6	81351	7
651	358	7	365	6	371	7	378	7	385	6	391	7	398	7	405	6	411	7	418	7
652	425	6	431	7	438	7	445	6	45[illegible]	7	458	7	465	6	471	7	478	7	485	6
653	491	7	498	7	505	6	511	7	518	7	525	6	531	7	538	6	544	7	551	7
654	558	6	564	7	571	7	578	6	584	7	591	7	598	6	604	7	611	6	617	7
655	624	7	631	6	637	7	644	7	651	6	657	7	664	7	671	6	677	7	684	6
656	690	7	697	7	704	6	710	7	717	6	723	7	730	7	737	6	743	7	750	7
657	757	6	763	7	770	6	776	7	783	7	790	6	796	7	803	6	809	7	816	7
658	823	6	829	7	836	6	842	7	849	7	856	6	862	7	869	6	875	7	882	7
659	889	6	895	7	902	6	908	7	915	6	921	7	928	7	81935	6	81941	7	81948	6
660	81954	7	81961	7	81968	6	81974	7	81981	6	81987	7	81994	6	82000	7	82007	7	82014	6
661	82020	7	82027	6	82033	7	82040	6	82046	7	82053	7	82060	6	066	7	073	6	079	7
662	086	6	092	7	099	6	105	7	112	7	119	6	125	7	132	6	138	7	145	6
663	151	7	158	6	164	7	171	7	178	6	184	7	191	6	197	7	204	6	210	7
664	217	6	223	7	230	6	236	7	243	6	249	7	256	7	263	6	269	7	276	6
665	282	7	289	6	295	7	302	6	308	7	315	6	321	7	328	6	334	7	341	6
666	347	7	354	6	360	7	367	6	373	7	380	7	387	6	393	7	400	6	406	7
667	413	6	419	7	426	6	432	7	439	6	445	7	452	6	458	7	465	6	471	7
668	82478	6	82484	7	82491	6	82497	7	82504	6	82510	7	82517	6	82523	7	82530	6	82536	7
669	543	6	549	7	556	6	562	7	569	6	575	7	582	6	588	7	595	6	601	6
670	607	7	614	6	620	7	627	6	633	7	640	6	646	7	653	6	659	7	666	6
671	672	7	679	6	685	7	692	6	698	7	705	6	711	7	718	6	724	6	730	7
672	737	6	743	7	750	6	756	7	763	6	769	7	776	6	782	7	789	6	795	7
673	802	6	808	6	814	7	821	6	827	7	834	6	840	7	847	6	853	7	860	6
674	866	6	872	7	879	6	885	7	892	6	898	7	905	6	911	7	918	6	924	6
675	930	7	82937	6	82943	7	82950	6	82956	7	82963	6	82969	6	82975	7	82982	6	82988	7
676	82995	6	83001	7	83008	6	83014	6	83020	7	83027	6	83033	7	83040	6	83046	6	83052	7
677	83059	6	065	7	072	6	078	7	085	6	091	6	097	7	104	6	110	7	117	6
678	123	6	129	7	136	6	142	7	149	6	155	6	161	7	168	6	174	7	181	6
679	187	6	193	7	200	6	206	7	213	6	219	6	225	7	232	6	238	7	245	6
680	251	6	257	7	264	6	270	6	276	7	283	6	289	7	296	6	302	6	308	7
681	315	6	321	6	327	7	334	6	340	7	347	6	353	6	359	7	366	6	372	6
682	378	7	385	6	391	7	398	6	404	6	410	7	417	6	423	6	429	7	436	6
683	442	6	448	7	455	6	461	6	467	7	474	6	480	7	487	6	493	6	83499	7
684	83506	6	83512	6	83518	7	83525	6	83531	6	83537	7	83544	6	83550	6	83556	7	563	6
685	569	6	575	7	582	6	588	6	594	7	601	6	607	6	613	7	620	6	626	6
686	632	7	639	6	645	6	651	7	658	6	664	6	670	7	677	6	683	6	689	7
687	696	6	702	6	708	7	715	6	721	6	727	7	734	6	740	6	746	7	753	6
688	759	6	765	6	771	7	778	6	784	6	790	7	797	6	803	6	809	7	816	6
689	822	6	828	7	835	6	841	6	847	6	853	7	860	6	866	6	872	7	879	6
690	885	6	891	6	897	7	904	6	910	6	916	7	923	6	929	6	935	7	83942	6
691	83948	6	83954	6	83960	7	83967	6	83973	6	83979	6	83985	7	83992	6	83998	6	84004	7
692	84011	6	84017	6	84023	6	84029	7	84036	6	84042	6	84048	7	84055	6	84061	6	067	6
693	073	7	080	6	086	6	092	6	098	7	105	6	111	6	117	6	123	7	130	6
694	136	6	142	6	148	7	155	6	161	6	167	6	173	7	180	6	186	6	192	6
695	198	7	205	6	211	6	217	6	223	7	230	6	236	6	242	6	248	7	255	6
696	261	6	267	6	273	7	280	6	286	6	292	6	298	7	305	6	311	6	317	6
697	323	7	330	6	336	6	342	6	348	6	354	7	361	6	367	6	373	6	379	7
698	386	6	392	6	398	6	404	6	410	7	417	6	423	6	429	6	435	7	442	6
699	448	6	454	6	460	6	466	7	473	6	479	6	485	6	491	6	497	7	504	6
700	84510	6	84516	6	84522	6	84528	7	84535	6	84541	6	84547	6	84553	6	84559	7	84566	6
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts	
	7
1	1
2	1
3	2
4	3
5	4
6	4
7	5
8	6
9	6
	6
1	1
2	1
3	2
4	2
5	3
6	4
7	4
8	5
9	5

Logarithms of Numbers

700

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
700	84510	6	84516	6	84522	6	84528	7	84535	6	84541	6	84547	6	84553	6	84559	7	84566	6
701	572	6	578	6	584	6	590	7	597	6	603	6	609	6	615	6	621	7	628	6
702	634	6	640	6	646	6	652	6	658	7	665	6	671	6	677	6	683	6	689	7
703	696	6	702	6	708	6	714	6	720	6	726	7	733	6	739	6	745	6	751	6
704	757	6	763	7	770	6	776	6	782	6	788	6	794	6	800	7	807	6	813	6
705	819	6	825	6	831	6	837	7	844	6	850	6	856	6	862	6	868	6	874	6
706	880	7	887	6	893	6	899	6	905	6	911	6	917	7	924	6	930	6	936	6
707	84942	6	84948	6	84954	6	84960	7	84967	6	84973	6	84979	6	84985	6	84991	6	84997	6
708	85003	6	85009	7	85016	6	85022	6	85028	6	85034	6	85040	6	85046	6	85052	6	85058	7
709	065	6	071	6	077	6	083	6	089	6	095	6	101	6	107	7	114	6	120	6
710	126	6	132	6	138	6	144	6	150	6	156	7	163	6	169	6	175	6	181	6
711	187	6	193	6	199	6	205	6	211	6	217	7	224	6	230	6	236	6	242	6
712	248	6	254	6	260	6	266	6	272	6	278	7	285	6	291	6	297	6	303	6
713	309	6	315	6	321	6	327	6	333	6	339	6	345	7	352	6	358	6	364	6
714	370	6	376	6	382	6	388	6	394	6	400	6	406	6	412	6	418	7	425	6
715	431	6	437	6	443	6	449	6	455	6	461	6	467	6	473	6	479	6	485	6
716	85491	6	85497	6	85503	6	85509	7	85516	6	85522	6	85528	6	85534	6	85540	6	85546	6
717	552	6	558	6	564	6	570	6	576	6	582	6	588	6	594	6	600	6	606	6
718	612	6	618	7	625	6	631	6	637	6	643	6	649	6	655	6	661	6	667	6
719	673	6	679	6	685	6	691	6	697	6	703	6	709	6	715	6	721	6	727	6
720	733	6	739	6	745	6	751	6	757	6	763	6	769	6	775	6	781	7	788	6
721	794	6	800	6	806	6	812	6	818	6	824	6	830	6	836	6	842	6	848	6
722	854	6	860	6	866	6	872	6	878	6	884	6	890	6	896	6	902	6	908	6
723	914	6	920	6	926	6	932	6	938	6	85944	6	85950	6	85956	6	85962	6	85968	6
724	85974	6	85980	6	85986	6	85992	6	85998	6	86004	6	86010	6	86016	6	86022	6	86028	6
725	86034	6	86040	6	86046	6	86052	6	86058	6	064	6	070	6	076	6	082	6	088	6
726	094	6	100	6	106	6	112	6	118	6	124	6	130	6	136	5	141	6	147	6
727	153	6	159	6	165	6	171	6	177	6	183	6	189	6	195	6	201	6	207	6
728	213	6	219	6	225	6	231	6	237	6	243	6	249	6	255	6	261	6	267	6
729	273	6	279	6	285	6	291	6	297	6	303	5	308	6	314	6	320	6	326	6
730	332	6	338	6	344	6	350	6	356	6	362	6	368	6	374	6	380	6	386	6
731	392	6	398	6	404	6	410	5	415	6	421	6	427	6	433	6	439	6	445	6
732	86451	6	86457	6	86463	6	86469	6	86475	6	86481	6	86487	6	86493	6	86499	5	86504	6
733	510	6	516	6	522	6	528	6	534	6	540	6	546	6	552	6	558	6	564	6
734	570	6	576	5	581	6	587	6	593	6	599	6	605	6	611	6	617	6	623	6
735	629	6	635	6	641	5	646	6	652	6	658	6	664	6	670	6	676	6	682	6
736	688	6	694	6	700	5	705	6	711	6	717	6	723	6	729	6	735	6	741	6
737	747	6	753	6	759	5	764	6	770	6	776	6	782	6	788	6	794	6	800	6
738	806	6	812	5	817	6	823	6	829	6	835	6	841	6	847	6	853	6	859	5
739	864	6	870	6	876	6	882	6	888	6	894	6	900	6	906	5	911	6	917	6
740	923	6	929	6	935	6	941	6	86947	6	86953	5	86958	6	86964	6	86970	6	86976	6
741	86982	6	86988	6	86994	5	86999	6	87005	6	87011	6	87017	6	87023	6	87029	6	87035	5
742	87040	6	87046	6	87052	6	87058	6	064	6	070	5	075	6	081	6	087	6	093	6
743	099	6	105	6	111	5	116	6	122	6	128	6	134	6	140	6	146	5	151	6
744	157	6	163	6	169	6	175	6	181	5	186	6	192	6	198	6	204	6	210	6
745	216	5	221	6	227	6	233	6	239	6	245	6	251	5	256	6	262	6	268	6
746	274	6	280	6	286	5	291	6	297	6	303	6	309	6	315	5	320	6	326	6
747	332	6	338	6	344	5	349	6	355	6	361	6	367	6	373	6	379	5	384	6
748	390	6	396	6	402	6	408	5	413	6	419	6	425	6	431	6	437	5	442	6
749	448	6	454	6	460	6	466	5	471	6	477	6	483	6	489	6	495	5	500	6
750	87506	6	87512	6	87518	5	87523	6	87529	6	87535	6	87541	6	87547	5	87552	6	87558	6
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts

	7	6	5
1	1	1	1
2	1	1	1
3	2	2	1
4	3	2	2
5	4	3	2
6	4	4	3
7	5	4	3
8	6	5	4
9	6	5	4
10			5

TABLE 32.

Logarithms of Numbers.

750

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d	Prop. Parts	
750	87506	6	87512	6	87518	5	87523	6	87529	6	87535	6	87541	6	87547	5	87552	6	87558	6		**6**
751	564	6	570	6	576	5	581	6	587	6	593	6	599	5	604	6	610	6	616	6		
752	622	6	628	5	633	6	639	6	645	6	651	5	656	6	662	6	668	6	674	5	1	1
753	679	6	685	6	691	6	697	6	703	5	708	6	714	6	720	6	726	5	731	6	2	1
754	737	6	743	6	749	5	754	6	760	6	766	6	772	5	777	6	783	6	789	6	3	2
																					4	2
755	795	5	800	6	806	6	812	6	818	5	823	6	829	6	835	6	841	5	846	6	5	3
756	852	6	858	6	864	5	869	6	875	6	881	6	887	5	892	6	898	6	904	6	6	4
757	910	5	915	6	921	6	927	6	933	5	938	6	87944	6	87950	5	87955	6	87961	6	7	4
758	87967	6	87973	5	87978	6	87984	6	87990	6	87996	5	88001	6	88007	6	88013	5	88018	6	8	5
759	88024	6	88030	6	88036	5	88041	6	88047	6	88053	5	058	6	064	6	070	6	076	5	9	5
760	081	6	087	6	093	5	098	6	104	6	110	6	116	5	121	6	127	6	133	5		
761	138	6	144	6	150	6	156	5	161	6	167	6	173	5	178	6	184	6	190	5		
762	195	6	201	6	207	6	213	5	218	6	224	6	230	5	235	6	241	6	247	5		
763	252	6	258	6	264	6	270	5	275	6	281	6	287	5	292	6	298	6	304	5		
764	309	6	315	6	321	5	326	6	332	6	338	5	343	6	349	6	355	5	360	6		
765	366	6	372	5	377	6	383	6	389	6	395	5	400	6	406	6	412	5	417	6		
766	423	6	429	5	434	6	440	6	446	5	451	6	457	6	463	5	468	6	474	6		
767	480	5	485	6	491	6	88497	5	88502	6	88508	5	88513	6	88519	6	88525	5	88530	6		
768	88536	6	88542	5	88547	6	553	6	559	5	564	6	570	6	576	5	581	6	587	6		
769	593	5	598	6	604	6	610	5	615	6	621	6	627	5	632	6	638	5	643	6		
770	649	6	655	5	660	6	666	6	672	5	677	6	683	6	689	5	694	6	700	5		
771	705	6	711	6	717	5	722	6	728	6	734	5	739	6	745	5	750	6	756	6		
772	762	5	767	6	773	6	779	5	784	6	790	5	795	6	801	6	807	5	812	6		
773	818	6	824	5	829	6	835	5	840	6	846	6	852	5	857	6	863	5	868	6		
774	874	6	880	5	885	6	891	6	897	5	902	6	908	5	913	6	919	6	925	5		
775	930	6	936	5	941	6	88947	6	88953	5	88958	6	88964	5	88969	6	88975	6	88981	5		
776	88986	6	88992	5	88997	6	89003	6	89009	5	89014	6	89020	5	89025	6	89031	6	89037	5		
777	89042	6	89048	5	89053	6	059	5	064	6	070	6	076	5	081	6	087	5	092	6		
778	098	6	104	5	109	6	115	5	120	6	126	5	131	6	137	6	143	5	148	6		
779	154	5	159	6	165	5	170	6	176	6	182	5	187	6	193	5	198	6	204	5		
780	209	6	215	6	221	5	226	6	232	5	237	6	243	5	248	6	254	6	260	5		
781	265	6	271	5	276	6	282	5	287	6	293	5	298	6	304	6	310	5	315	6		
782	321	5	326	6	332	5	337	6	343	5	348	6	354	6	360	5	365	6	371	5		
783	376	6	382	5	387	6	393	5	398	6	404	5	409	6	415	6	421	5	426	6		
784	432	5	437	6	443	5	448	6	89454	5	89459	6	89465	5	89470	6	89476	5	89481	6		
785	89487	5	89492	6	89498	6	89504	5	509	6	515	5	520	6	526	5	531	6	537	5		
786	542	6	548	5	553	6	559	5	564	6	570	5	575	6	581	5	586	6	592	5		
787	597	6	603	6	609	5	614	6	620	5	625	6	631	5	636	6	642	5	647	6		
788	653	5	658	6	664	5	669	6	675	5	680	6	686	5	691	6	697	5	702	6		
789	708	5	713	6	719	5	724	6	730	5	735	6	741	5	746	6	752	5	757	6		
790	763	5	768	6	774	5	779	6	785	5	790	6	796	5	801	6	807	5	812	6		
791	818	5	823	6	829	5	834	6	840	5	845	6	851	5	856	6	862	5	867	6		**5**
792	873	5	878	5	883	6	889	5	894	6	900	5	905	6	911	5	916	6	922	5		
793	927	6	933	5	938	6	944	5	89949	6	89955	5	89960	6	89966	5	89971	6	89977	5	1	1
794	89982	6	89988	5	89993	5	89998	6	90004	5	90009	6	90015	5	90020	6	90026	5	90031	6	2	1
																					3	2
795	90037	5	90042	6	90048	5	90053	6	059	5	064	5	069	6	075	5	080	6	086	5	4	2
796	091	6	097	5	102	6	108	5	113	6	119	5	124	5	129	6	135	5	140	6	5	3
797	146	5	151	6	157	5	162	6	168	5	173	6	179	5	184	5	189	6	195	5	6	3
798	200	6	206	5	211	6	217	5	222	5	227	6	233	5	238	6	244	5	249	6	7	4
799	255	5	260	6	266	5	271	5	276	6	282	5	287	6	293	5	298	6	304	5	8	4
																					9	5
800	90309	5	90314	6	90320	5	90325	6	90331	5	90336	6	90342	5	90347	5	90352	6	90358	5	10	5
No.	0		1		2		3		4		5		6		7		8		9			

Logarithms of Numbers.

800

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
800	90309	5	90314	6	90320	5	90325	6	90331	5	90336	6	90342	5	90347	5	90352	6	90358	5
801	363	6	369	5	374	6	380	5	385	5	390	6	396	5	401	6	407	5	412	5
802	417	6	423	5	428	6	434	5	439	6	445	5	450	5	455	6	461	5	466	6
803	472	5	477	5	482	6	488	5	493	6	90499	5	504	5	509	6	515	5	520	6
804	526	5	531	5	536	6	542	5	547	6	553	5	558	5	563	6	569	5	574	6
805	580	5	585	5	590	6	596	5	601	6	607	5	612	5	617	6	623	5	90628	6
806	90634	5	90639	5	90644	6	90650	5	90655	5	90660	6	90666	5	90671	6	90677	5	682	5
807	687	6	693	5	698	5	703	6	709	5	714	6	720	5	725	5	730	6	736	5
808	741	6	747	5	752	5	757	6	763	5	768	5	773	6	779	5	784	5	789	6
809	795	5	800	6	806	5	811	5	816	6	822	5	827	5	832	6	838	5	843	6
810	849	5	854	5	859	6	865	5	870	5	875	6	881	5	886	5	891	6	897	5
811	902	5	907	6	913	5	918	6	924	5	929	5	934	6	940	5	945	5	90950	6
812	90956	5	90961	5	90966	6	90972	5	90977	5	90982	6	90988	5	90993	5	90998	6	91004	5
813	91009	5	91014	6	91020	5	91025	5	91030	6	91036	5	91041	5	91046	6	91052	5	057	5
814	062	6	068	5	073	5	078	6	084	5	089	5	094	6	100	5	105	5	110	6
815	116	5	121	5	126	6	132	5	137	5	142	6	148	5	153	5	158	6	164	5
816	169	5	174	6	180	5	185	5	190	6	196	5	201	5	206	6	212	5	217	5
817	222	6	228	5	233	5	238	5	243	6	249	5	254	5	259	6	265	5	270	5
818	275	6	281	5	286	5	291	6	297	5	302	5	307	5	312	6	318	5	91323	5
819	91328	6	91334	5	91339	5	91344	6	91350	5	91355	5	91360	5	91365	6	91371	5	376	5
820	381	6	387	5	392	5	397	6	403	5	408	5	413	5	418	6	424	5	429	5
821	434	6	440	5	445	5	450	5	455	6	461	5	466	5	471	6	477	5	482	5
822	487	5	492	6	498	5	503	5	508	6	514	5	519	5	524	5	529	6	535	5
823	540	5	545	6	551	5	556	5	561	5	566	6	572	5	577	5	582	5	587	6
824	593	5	598	5	603	6	609	5	614	5	619	5	624	6	630	5	635	5	91640	5
825	91645	6	91651	5	91656	5	91661	5	91666	6	91672	5	91677	5	91682	5	91687	6	693	5
826	698	5	703	6	709	5	714	5	719	5	724	6	730	5	735	5	740	5	745	6
827	751	5	756	5	761	5	766	6	772	5	777	5	782	5	787	6	793	5	798	5
828	803	5	808	6	814	5	819	5	824	5	829	5	834	6	840	5	845	5	850	5
829	855	6	861	5	866	5	871	5	876	6	882	5	887	5	892	5	897	6	903	5
830	908	5	913	5	918	6	924	5	929	5	934	5	939	5	944	6	91950	5	91955	5
831	91960	5	91965	6	91971	5	91976	5	91981	5	91986	5	91991	6	91997	5	92002	5	92007	5
832	92012	6	92018	5	92023	5	92028	5	92033	5	92038	6	92044	5	92049	5	054	5	059	6
833	065	5	070	5	075	5	080	5	085	6	091	5	096	5	101	5	106	5	111	6
834	117	5	122	5	127	5	132	5	137	6	143	5	148	5	153	5	158	5	163	6
835	169	5	174	5	179	5	184	5	189	6	195	5	200	5	205	5	210	5	215	6
836	221	5	226	5	231	5	236	5	241	6	247	5	252	5	257	5	262	5	267	6
837	273	5	278	5	283	5	288	5	293	5	298	6	304	5	309	5	314	5	319	5
838	324	6	330	5	335	5	340	5	345	5	350	5	355	6	361	5	366	5	371	5
839	376	5	381	6	387	5	392	5	397	5	402	5	407	5	412	6	418	5	423	5
840	428	5	433	5	438	5	443	6	449	5	454	5	459	5	464	5	92469	5	92474	6
841	92480	5	92485	5	92490	5	92495	5	92500	5	92505	6	92511	5	92516	5	521	5	526	5
842	531	5	536	6	542	5	547	5	552	5	557	5	562	5	567	5	572	6	578	5
843	583	5	588	5	593	5	598	5	603	6	609	5	614	5	619	5	624	5	629	5
844	634	5	639	6	645	5	650	5	655	5	660	5	665	5	670	5	675	6	681	5
845	686	5	691	5	696	5	701	5	706	5	711	5	716	6	722	5	727	5	732	5
846	737	5	742	5	747	5	752	6	758	5	763	5	768	5	773	5	778	5	783	5
847	788	5	793	6	799	5	804	5	809	5	814	5	819	5	824	5	829	5	834	6
848	840	5	845	5	850	5	855	5	860	5	865	5	870	5	875	6	881	5	886	5
849	891	5	896	5	901	5	906	5	911	5	916	5	921	6	927	5	932	5	937	5
850	92942	5	92947	5	92952	5	92957	5	92962	5	92967	6	92973	5	92978	5	92983	5	92988	5
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts	
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1	1
2	1
3	2
4	2
5	3
6	4
7	4
8	5
9	5

Prop. Parts	
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2	1
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6	3
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10	5

TABLE 32.

Logarithms of Numbers.

850

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
850	92942	5	92947	5	92952	5	92957	5	92962	5	92967	6	92973	5	92978	5	92983	5	92988	5
851	92993	5	92998	5	93003	5	93008	5	93013	5	93018	6	93024	5	93029	5	93034	5	93039	5
852	93044	5	93049	5	054	5	059	5	064	5	069	6	075	5	080	5	085	5	090	5
853	095	5	100	5	105	5	110	5	115	5	120	5	125	6	131	5	136	5	141	5
854	146	5	151	5	156	5	161	5	166	5	171	5	176	5	181	5	186	6	192	5
855	197	5	202	5	207	5	212	5	217	5	222	5	227	5	232	5	237	5	242	5
856	247	5	252	6	258	5	263	5	268	5	273	5	278	5	283	5	288	5	293	5
857	298	5	303	5	93308	5	93313	5	93318	5	93323	5	93328	6	93334	5	93339	5	93344	5
858	93349	5	93354	5	359	5	364	5	369	5	374	5	379	5	384	5	389	5	394	5
859	399	5	404	5	409	5	414	6	420	5	425	5	430	5	435	5	440	5	445	5
860	450	5	455	5	460	5	465	5	470	5	475	5	480	5	485	5	490	5	495	5
861	500	5	505	5	510	5	515	5	520	6	526	5	531	5	536	5	541	5	546	5
862	551	5	556	5	561	5	566	5	571	5	576	5	581	5	586	5	591	5	596	5
863	601	5	606	5	611	5	616	5	621	5	626	5	631	5	636	5	641	5	646	5
864	93651	5	93656	5	93661	5	93666	5	93671	5	93676	6	93682	5	93687	5	93692	5	93697	5
865	702	5	707	5	712	5	717	5	722	5	727	5	732	5	737	5	742	5	747	5
866	752	5	757	5	762	5	767	5	772	5	777	5	782	5	787	5	792	5	797	5
867	802	5	807	5	812	5	817	5	822	5	827	5	832	5	837	5	842	5	847	5
868	852	5	857	5	862	5	867	5	872	5	877	5	882	5	887	5	892	5	897	5
869	902	5	907	5	912	5	917	5	922	5	927	5	932	5	937	5	942	5	947	5
870	93952	5	93957	5	93962	5	93967	5	93972	5	93977	5	93982	5	93987	5	93992	5	93997	5
871	94002	5	94007	5	94012	5	94017	5	94022	5	94027	5	94032	5	94037	5	94042	5	94047	5
872	052	5	057	5	062	5	067	5	072	5	077	5	082	4	086	5	091	5	096	5
873	101	5	106	5	111	5	116	5	121	5	126	5	131	5	136	5	141	5	146	5
874	151	5	156	5	161	5	166	5	171	5	176	5	181	5	186	5	191	5	196	5
875	201	5	206	5	211	5	216	5	221	5	226	5	231	5	236	4	240	5	245	5
876	250	5	255	5	260	5	265	5	270	5	275	5	280	5	285	5	290	5	295	5
877	300	5	305	5	310	5	315	5	320	5	325	5	330	5	335	5	340	5	345	4
878	349	5	354	5	359	5	364	5	369	5	374	5	379	5	384	5	389	5	394	5
879	399	5	404	5	409	5	414	5	419	5	424	5	429	4	433	5	438	5	443	5
880	94448	5	94453	5	94458	5	94463	5	94468	5	94473	5	94478	5	94483	5	94488	5	94493	5
881	498	5	503	4	507	5	512	5	517	5	522	5	527	5	532	5	537	5	542	5
882	547	5	552	5	557	5	562	5	567	4	571	5	576	5	581	5	586	5	591	5
883	596	5	601	5	606	5	611	5	616	5	621	5	626	4	630	5	635	5	640	5
884	645	5	650	5	655	5	660	5	665	5	670	5	675	5	680	5	685	4	689	5
885	694	5	699	5	704	5	709	5	714	5	719	5	724	5	729	5	734	4	738	5
886	743	5	748	5	753	5	758	5	763	5	768	5	773	5	778	5	783	4	787	5
887	792	5	797	5	802	5	807	5	812	5	817	5	822	5	827	5	832	4	836	5
888	841	5	846	5	851	5	856	5	861	5	866	5	871	5	876	4	880	5	885	5
889	890	5	895	5	900	5	905	5	910	5	915	4	919	5	924	5	929	5	934	5
890	939	5	944	5	949	5	94954	5	94959	4	94963	5	94968	5	94973	5	94978	5	94983	5
891	94988	5	94993	5	94998	4	95002	5	95007	5	95012	5	95017	5	95022	5	95027	5	95032	4
892	95036	5	95041	5	95046	5	051	5	056	5	061	5	066	5	071	4	075	5	080	5
893	085	5	090	5	095	5	100	5	105	4	109	5	114	5	119	5	124	5	129	5
894	134	5	139	4	143	5	148	5	153	5	158	5	163	5	168	5	173	4	177	5
895	182	5	187	5	192	5	197	5	202	5	207	4	211	5	216	5	221	5	226	5
896	231	5	236	4	240	5	245	5	250	5	255	5	260	5	265	5	270	4	274	5
897	279	5	284	5	289	5	294	5	299	4	303	5	308	5	313	5	318	5	323	5
898	328	4	332	5	337	5	342	5	347	5	352	5	357	4	361	5	366	5	371	5
899	376	5	381	5	386	4	390	5	395	5	400	5	405	5	410	5	415	4	419	5
900	95424	5	95429	5	95434	5	95439	5	95444	4	95448	5	95453	5	95458	5	95463	5	95468	4
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts	
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1	1
2	1
3	2
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8	5
9	5
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7	4
8	4
9	5
10	5
	4
1	0
2	1
3	1
4	2
5	2
6	2
7	3
8	3
9	4
10	4

Logarithms of Numbers.

900

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
900	95424	5	95429	5	95434	5	95439	5	95444	4	95448	5	95453	5	95458	5	95463	5	95468	4
901	472	5	477	5	482	5	487	5	492	5	497	4	501	5	506	5	511	5	516	5
902	521	4	525	5	530	5	535	5	540	5	545	5	550	4	554	5	559	5	564	5
903	569	5	574	4	578	5	583	5	588	5	593	5	598	4	602	5	607	5	612	5
904	617	5	622	4	626	5	631	5	636	5	641	5	646	4	650	5	655	5	660	5
905	665	5	95670	4	95674	5	95679	5	95684	5	95689	5	95694	4	95698	5	95703	5	95708	5
906	95713	5	718	4	722	5	727	5	732	5	737	5	742	4	746	5	751	5	756	5
907	761	5	766	4	770	5	775	5	780	5	785	4	789	5	794	5	799	5	804	5
908	809	4	813	5	818	5	823	5	828	4	832	5	837	5	842	5	847	5	852	4
909	856	5	861	5	866	5	871	4	875	5	880	5	885	5	890	5	895	4	899	5
910	904	5	909	5	914	4	918	5	923	5	928	5	933	5	938	4	942	5	947	5
911	952	5	95957	4	95961	5	95966	5	95971	5	95976	4	95980	5	95985	5	95990	5	95995	4
912	95999	5	96004	5	96009	5	96014	5	96019	4	96023	5	96028	5	96033	5	96038	4	96042	5
913	96047	5	052	5	057	4	061	5	066	5	071	5	076	4	080	5	085	5	090	5
914	095	4	099	5	104	5	109	5	114	4	118	5	123	5	128	5	133	4	137	5
915	142	5	147	5	152	4	156	5	161	5	166	5	171	4	175	5	180	5	185	5
916	190	4	194	5	199	5	204	5	209	4	213	5	218	5	223	4	227	5	232	5
917	237	5	242	4	246	5	251	5	256	5	261	4	265	5	270	5	275	5	280	4
918	284	5	289	5	294	4	298	5	303	5	308	5	313	4	317	5	322	5	327	5
919	332	4	96336	5	96341	5	96346	4	96350	5	96355	5	96360	5	96365	4	96369	5	96374	5
920	96379	5	384	4	388	5	393	5	398	4	402	5	407	5	412	5	417	4	421	5
921	426	5	431	4	435	5	440	5	445	5	450	4	454	5	459	5	464	4	468	5
922	473	5	478	5	483	4	487	5	492	5	497	4	501	5	506	5	511	4	515	5
923	520	5	525	5	530	4	534	5	539	5	544	4	548	5	553	5	558	4	562	5
924	567	5	572	5	577	4	581	5	586	5	591	4	595	5	600	5	605	4	609	5
925	614	5	619	5	624	4	96628	5	96633	5	96638	4	96642	5	96647	5	96652	4	96656	5
926	96661	5	96666	4	96670	5	675	5	680	5	685	4	689	5	694	5	699	4	703	5
927	708	5	713	4	717	5	722	5	727	4	731	5	736	5	741	4	745	5	750	5
928	755	4	759	5	764	5	769	5	774	4	778	5	783	5	788	4	792	5	797	5
929	802	4	806	5	811	5	816	4	820	5	825	5	830	4	834	5	839	5	844	4
930	848	5	853	5	858	4	862	5	867	5	872	4	876	5	881	5	886	4	890	5
931	895	5	900	4	904	5	909	5	914	4	918	5	923	5	928	4	932	5	937	5
932	942	4	946	5	951	5	96956	4	96960	5	96965	5	96970	4	96974	5	96979	5	96984	4
933	96988	5	96993	4	96997	5	97002	5	97007	4	97011	5	97016	5	97021	4	97025	5	97030	5
934	97035	4	97039	5	97044	5	049	4	053	5	058	5	063	4	067	5	072	5	077	4
935	081	5	086	4	090	5	095	5	100	4	104	5	109	5	114	4	118	5	123	5
936	128	4	132	5	137	5	142	4	146	5	151	4	155	5	160	5	165	4	169	5
937	174	5	179	4	183	5	188	4	192	5	197	5	202	4	206	5	211	5	216	4
938	220	5	225	5	230	4	234	5	239	4	243	5	248	5	253	4	257	5	262	5
939	267	4	271	5	276	4	280	5	285	5	290	4	294	5	299	5	304	4	308	5
940	313	4	317	5	322	5	327	4	331	5	336	4	340	5	345	5	350	4	354	5
941	359	5	364	4	368	5	373	4	377	5	382	5	387	4	391	5	396	4	400	5
942	97405	5	97410	4	97414	5	97419	5	97424	4	97428	5	97433	4	97437	5	97442	5	97447	4
943	451	5	456	4	460	5	465	5	470	4	474	5	479	4	483	5	488	5	493	4
944	497	5	502	4	506	5	511	5	516	4	520	5	525	4	529	5	534	5	539	4
945	543	5	548	4	552	5	557	5	562	4	566	5	571	4	575	5	580	5	585	4
946	589	5	594	4	598	5	603	4	607	5	612	5	617	4	621	5	626	4	630	5
947	635	5	640	4	644	5	649	4	653	5	658	5	663	4	667	5	672	4	676	5
948	681	4	685	5	690	5	695	4	699	5	704	4	708	5	713	4	717	5	722	5
949	727	4	731	5	736	4	740	5	745	4	749	5	754	5	759	4	763	5	97768	4
950	97772	5	97777	5	97782	4	97786	5	97791	4	97795	5	97800	4	97804	5	97809	4	97813	5
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts

	5
1	1
2	1
3	2
4	2
5	3
6	3
7	4
8	4
9	5
10	5

	4
1	0
2	1
3	1
4	2
5	2
6	2
7	3
8	3
9	4
10	4

TABLE 32.

Logarithms of Numbers.

950

No.	0	d	1	d	2	d	3	d	4	d	5	d	6	d	7	d	8	d	9	d
950	97772	5	97777	5	97782	4	97786	5	97791	4	97795	5	97800	4	97804	5	97809	4	97813	5
951	818	5	823	4	827	5	832	4	836	5	841	4	845	5	850	5	855	4	859	5
952	864	4	868	5	873	4	877	5	882	4	886	5	891	5	896	4	900	5	905	4
953	909	5	914	4	918	5	923	5	928	4	932	5	937	4	941	5	946	4	950	5
954	97955	4	97959	5	97964	4	97968	5	97973	5	97978	4	97982	5	97987	4	97991	5	97996	4
955	98000	5	98005	4	98009	5	98014	5	98019	4	98023	5	98028	4	98032	5	98037	4	98041	5
956	046	4	050	5	055	4	059	5	064	4	068	5	073	5	078	4	082	5	087	4
957	091	5	096	4	100	5	105	4	109	5	114	4	118	5	123	4	127	5	132	5
958	137	4	141	5	146	4	150	5	155	4	159	5	164	4	168	5	173	4	177	5
959	182	4	186	5	191	4	195	5	200	4	204	5	209	5	214	4	218	5	223	4
960	227	5	232	4	236	5	241	4	245	5	250	4	254	5	259	4	263	5	268	4
961	272	5	277	4	281	5	286	4	290	5	295	4	299	5	304	4	308	5	313	5
962	98318	4	98322	5	98327	4	98331	5	98336	4	98340	5	98345	4	98349	5	98354	4	98358	5
963	363	4	367	5	372	4	376	5	381	4	385	5	390	4	394	5	399	4	403	5
964	408	4	412	5	417	4	421	5	426	4	430	5	435	4	439	5	444	4	448	5
965	453	4	457	5	462	4	466	5	471	4	475	5	480	4	484	5	489	4	493	5
966	498	4	502	5	507	4	511	5	516	4	520	5	525	4	529	5	534	4	538	5
967	543	4	547	5	552	4	556	5	561	4	565	5	570	4	574	5	579	4	583	5
968	588	4	592	5	597	4	601	4	605	5	610	4	614	5	619	4	623	5	628	4
969	632	5	637	4	641	5	98646	4	98650	5	98655	4	98659	5	98664	4	98668	5	98673	4
970	98677	5	98682	4	98686	5	691	4	695	5	700	4	704	5	709	4	713	4	717	5
971	722	4	726	5	731	4	735	5	740	4	744	5	749	4	753	5	758	4	762	5
972	767	4	771	5	776	4	780	4	784	5	789	4	793	5	798	4	802	5	807	4
973	811	5	816	4	820	5	825	4	829	5	834	4	838	5	843	4	847	4	851	5
974	856	4	860	5	865	4	869	5	874	4	878	5	883	4	887	5	892	4	896	4
975	900	5	905	4	909	5	914	4	918	5	923	4	927	5	932	4	936	5	941	4
976	945	4	949	5	954	4	98958	5	98963	4	98967	5	98972	4	98976	5	98981	4	98985	4
977	98989	5	98994	4	98998	5	99003	4	99007	5	99012	4	99016	5	99021	4	99025	4	99029	5
978	99034	4	99038	5	99043	4	047	5	052	4	056	5	061	4	065	4	069	5	074	4
979	078	5	083	4	087	5	092	4	096	4	100	5	105	4	109	5	114	4	118	5
980	123	4	127	4	131	5	136	4	140	5	145	4	149	5	154	4	158	4	162	5
981	167	4	171	5	176	4	180	5	185	4	189	4	193	5	198	4	202	5	207	4
982	211	5	216	4	220	4	224	5	229	4	233	5	238	4	242	5	247	4	251	4
983	255	5	260	4	264	5	269	4	273	4	277	5	282	4	286	5	291	4	295	5
984	300	4	304	4	308	5	99313	4	99317	5	99322	4	99326	4	99330	5	99335	4	99339	5
985	99344	4	99348	4	99352	5	357	4	361	5	366	4	370	4	374	5	379	4	383	5
986	388	4	392	4	396	5	401	4	405	5	410	4	414	5	419	4	423	4	427	5
987	432	4	436	5	441	4	445	4	449	5	454	4	458	5	463	4	467	4	471	5
988	476	4	480	4	484	5	489	4	493	5	498	4	502	4	506	5	511	4	515	5
989	520	4	524	4	528	5	533	4	537	5	542	4	546	4	550	5	555	4	559	5
990	564	4	568	4	572	5	577	4	581	4	585	5	590	4	594	5	599	4	603	4
991	607	5	612	4	616	5	621	4	625	4	629	5	634	4	638	4	642	5	647	4
992	99651	5	99656	4	99660	4	99664	5	99669	4	99673	4	99677	5	99682	4	99686	5	99691	4
993	695	4	699	5	704	4	708	4	712	5	717	4	721	5	726	4	730	4	734	5
994	739	4	743	4	747	5	752	4	756	4	760	5	765	4	769	5	774	4	778	4
995	782	5	787	4	791	4	795	5	800	4	804	4	808	5	813	4	817	5	822	4
996	826	4	830	5	835	4	839	4	843	5	848	4	852	4	856	5	861	4	865	5
997	870	4	874	4	878	5	883	4	887	4	891	5	896	4	900	4	904	5	909	4
998	913	4	917	5	922	4	926	4	930	5	935	4	939	5	944	4	948	4	952	5
999	99957	4	99961	4	99965	5	99970	4	99974	4	99978	5	99983	4	99987	4	99991	5	99996	4
1000	00000	4	00004	5	00009	4	00013	4	00017	5	00022	4	00026	4	00030	5	00035	4	00039	
No.	0		1		2		3		4		5		6		7		8		9	

Prop. Parts	
	5
1	1
2	1
3	2
4	2
5	3
6	3
7	4
8	4
9	5
10	5
	4
1	0
2	1
3	1
4	2
5	2
6	2
7	3
8	3
9	4
10	4

Logarithms of Trigonometric Functions.

0° → ′	sin	Diff. 1′.	csc	tan	Diff. 1′.	cot	sec	cos ← 179° ′
0	Inf. neg.		Infinite.	Inf. neg.		Infinite.	10. 00000	10. 00000	60
1	6. 46373	30103	13. 53627	6. 46373	30103	13. 53627	000	000	59
2	76476	17609	23524	76476	17609	23524	000	000	58
3	6. 94085	12494	13. 05915	6. 94085	12494	13. 05915	000	000	57
4	7. 06579	9691	12. 93421	7. 06579	9691	12. 93421	000	000	56
5	16270	7918	83730	16270	7918	83730	000	000	55
6	24188	6694	75812	24188	6694	75812	000	000	54
7	30882	5800	69118	30882	5800	69118	000	000	53
8	36682	5115	63318	36682	5115	63318	000	000	52
9	41797	4576	58203	41797	4576	58203	000	000	51
10	7. 46373	4139	12. 53627	7. 46373	4139	12. 53627	10. 00000	10. 00000	50
11	50512	3779	49488	50512	3779	49488	000	000	49
12	54291	3476	45709	54291	3476	45709	000	000	48
13	57767	3218	42233	57767	3219	42233	000	000	47
14	60985	2997	39015	60986	2996	39014	000	000	46
15	7. 63982	2802	12. 36018	7. 63982	2803	12. 36018	000	000	45
16	66784	2633	33216	66785	2633	33215	000	10. 00000	44
17	69417	2483	30583	69418	2482	30582	001	9. 99999	43
18	71900	2348	28100	71900	2348	28100	001	999	42
19	74248	2227	25752	74248	2228	25752	001	999	41
20	7. 76475	2119	12. 23525	7. 76476	2119	12. 23524	10. 00001	9. 99999	40
21	78594	2021	21406	78595	2020	21405	001	999	39
22	80615	1930	19385	80615	1931	19385	001	999	38
23	82545	1848	17455	82546	1848	17454	001	999	37
24	84393	1773	15607	84394	1773	15606	001	999	36
25	7. 86166	1704	12. 13834	7. 86167	1704	12. 13833	001	999	35
26	87870	1639	12130	87871	1639	12129	001	999	34
27	7. 89509	1579	10491	89510	1579	10490	001	999	33
28	91088	1524	08912	91089	1524	08911	001	999	32
29	92612	1472	07388	92613	1473	07387	002	998	31
30	7. 94084	1424	12. 05916	7. 94086	1424	12. 05914	10. 00002	9. 99998	30
31	95508	1379	04492	95510	1379	04490	002	998	29
32	96887	1336	03113	96889	1336	03111	002	998	28
33	98223	1297	01777	98225	1297	01775	002	998	27
34	7. 99520	1259	12. 00480	7. 99522	1259	12. 00478	002	998	26
35	8. 00779	1223	11. 99221	8. 00781	1223	11. 99219	002	998	25
36	02002	1190	97998	02004	1190	97996	002	998	24
37	03192	1158	96808	03194	1159	96806	003	997	23
38	04350	1128	95650	04353	1128	95647	003	997	22
39	05478	1100	94522	05481	1100	94519	003	997	21
40	8. 06578	1072	11. 93422	8. 06581	1072	11. 93419	10. 00003	9. 99997	20
41	07650	1046	92350	07653	1047	92347	003	997	19
42	08696	1022	91304	08700	1022	91300	003	997	18
43	09718	999	90282	09722	998	90278	003	997	17
44	10717	976	89283	10720	976	89280	004	996	16
45	8. 11693	954	11. 88307	8. 11696	955	11. 88304	004	996	15
46	12647	934	87353	12651	934	87349	004	996	14
47	13581	914	86419	13585	915	86415	004	996	13
48	14495	896	85505	14500	895	85500	004	996	12
49	15391	877	84609	15395	878	84605	004	996	11
50	8. 16268	860	11. 83732	8. 16273	860	11. 83727	10. 00005	9. 99995	10
51	17128	843	82872	17133	843	82867	005	995	9
52	17971	827	82029	17976	828	82024	005	995	8
53	18798	812	81202	18804	812	81196	005	995	7
54	19610	797	80390	19616	797	80384	005	995	6
55	8. 20407	782	11. 79593	8. 20413	782	11. 79587	006	994	5
56	21189	769	78811	21195	769	78805	006	994	4
57	21958	755	78042	21964	756	78036	006	994	3
58	22713	743	77287	22720	742	77280	006	994	2
59	23456	730	76544	23462	730	76538	006	994	1
60	8. 24186	717	11. 75814	8. 24192	718	11. 75808	10. 00007	9. 99993	0
′ ↑ 90° →	cos	Diff. 1′.	sec	cot	Diff. 1′.	tan	csc	sin ← 89° ′ ↑

TABLE 33.

Logarithms of Trigonometric Functions.

1°→ ′	sin	Diff. 1′.	csc	tan	Diff. 1′.	cot	sec	cos	←178° ′
0	8. 24186	717	11. 75814	8. 24192	718	11. 75808	10. 00007	9. 99993	60
1	4903	706	5097	4910	706	5090	007	993	59
2	5609	695	4391	5616	696	4384	007	993	58
3	6304	684	3696	6312	684	3688	007	993	57
4	6988	673	3012	6996	673	3004	008	992	56
5	7661	663	2339	7669	663	2331	008	992	55
6	8324	653	1676	8332	654	1668	008	992	54
7	8977	644	1023	8986	643	1014	008	992	53
8	8. 29621	634	11. 70379	8. 29629	634	11. 70371	008	992	52
9	8. 30255	624	11. 69745	8. 30263	625	11. 69737	009	991	51
10	0879	616	9121	0888	617	9112	10. 00009	9. 99991	50
11	1495	608	8505	1505	607	8495	009	991	49
12	2103	599	7897	2112	599	7888	010	990	48
13	2702	590	7298	2711	591	7289	010	990	47
14	3292	583	6708	3302	584	6698	010	990	46
15	3875	575	6125	8. 33886	575	11. 66114	010	990	45
16	4450	568	5550	4461	568	5539	011	989	44
17	8. 35018	560	11. 64982	5029	561	4971	011	989	43
18	5578	553	4422	5590	553	4410	011	989	42
19	6131	547	3869	6143	546	3857	011	989	41
20	6678	539	3322	8. 36689	540	11. 63311	10. 00012	9. 99988	40
21	7217	533	2783	7229	533	2771	012	988	39
22	7750	526	2250	7762	527	2238	012	988	38
23	8276	520	1724	8289	520	1711	013	987	37
24	8796	514	1204	8809	514	1191	013	987	36
25	9310	508	0690	9323	509	0677	013	987	35
26	8. 39818	502	11. 60182	8. 39832	502	11. 60168	014	986	34
27	8. 40320	496	11. 59680	8. 40334	496	11. 59666	014	986	33
28	0816	491	9184	0830	491	9170	014	986	32
29	1307	485	8693	1321	486	8679	015	985	31
30	1792	480	8208	1807	480	8193	10. 00015	9. 99985	30
31	2272	474	7728	2287	475	7713	015	985	29
32	2746	470	7254	2762	470	7238	016	984	28
33	3216	464	6784	3232	464	6768	016	984	27
34	8. 43680	459	11. 56320	8. 43696	460	11. 56304	016	984	26
35	4139	455	5861	4156	455	5844	017	983	25
36	4594	450	5406	4611	450	5389	017	983	24
37	5044	445	4956	5061	446	4939	017	983	23
38	5489	441	4511	5507	441	4493	018	982	22
39	5930	436	4070	5948	437	4052	018	982	21
40	6366	433	3634	6385	432	3615	10. 00018	9. 99982	20
41	8. 46799	427	11. 53201	6817	428	3183	019	981	19
42	7226	424	2774	8. 47245	424	11. 52755	019	981	18
43	7650	419	2350	7669	420	2331	019	981	17
44	8069	416	1931	8089	416	1911	020	980	16
45	8485	411	1515	8505	412	1495	020	980	15
46	8896	408	1104	8917	408	1083	021	979	14
47	9304	404	0696	9325	404	0675	021	979	13
48	8. 49708	400	11. 50292	8. 49729	401	11. 50271	021	979	12
49	8. 50108	396	11. 49892	8. 50130	397	11. 49870	022	978	11
50	0504	393	9496	0527	393	9473	10. 00022	9. 99978	10
51	0897	390	9103	0920	390	9080	023	977	9
52	1287	386	8713	1310	386	8690	023	977	8
53	1673	382	8327	1696	383	8304	023	977	7
54	2055	379	7945	2079	380	7921	024	976	6
55	8. 52434	376	11. 47566	8. 52459	376	11. 47541	024	976	5
56	2810	373	7190	2835	373	7165	025	975	4
57	3183	369	6817	3208	370	6792	025	975	3
58	3552	367	6448	3578	367	6422	026	974	2
59	3919	363	6081	3945	363	6055	026	974	1
60	8. 54282	360	11. 45718	8. 54308	361	11. 45692	10. 00026	9. 99974	0
′									′
91°→	cos	Diff. 1′.	sec	cot	Diff. 1′.	tan	csc	sin	←88°

Logarithms of Trigonometric Functions.

2° → ′	sin	Diff.1′.	csc	tan	Diff.1′.	cot	sec	cos	← 177° ′
0	8. 54282	360	11. 45718	8. 54308	361	11. 45692	10. 00026	9. 99974	**60**
1	4642	357	5358	4669	358	5331	027	973	59
2	4999	355	5001	5027	355	4973	027	973	58
3	5354	351	4646	5382	352	4618	028	972	57
4	5705	349	4295	5734	349	4266	028	972	56
5	6054	346	3946	6083	346	3917	029	971	55
6	6400	343	3600	6429	344	3571	029	971	54
7	6743	341	3257	6773	341	3227	030	970	53
8	8. 57084	337	11. 42916	8. 57114	338	11. 42886	030	970	52
9	7421	336	2579	7452	336	2548	031	969	51
10	7757	332	2243	7788	333	2212	10. 00031	9. 99969	**50**
11	8089	330	1911	8121	330	1879	032	968	49
12	8419	328	1581	8451	328	1549	032	968	48
13	8747	325	1253	8779	326	1221	033	967	47
14	9072	323	0928	9105	323	0895	033	967	46
15	9395	320	0605	9428	321	0572	033	967	45
16	8. 59715	318	11. 40285	8. 59749	319	11. 40251	034	966	44
17	8. 60033	316	11. 39967	8. 60068	316	11. 39932	034	966	43
18	0349	313	9651	0384	314	9616	035	965	42
19	0662	311	9338	0698	311	9302	036	964	41
20	0973	309	9027	1009	310	8991	10. 00036	9. 99964	**40**
21	1282	307	8718	1319	307	8681	037	963	39
22	1589	305	8411	1626	305	8374	037	963	38
23	1894	302	8106	1931	303	8069	038	962	37
24	2196	301	7804	2234	301	7766	038	962	36
25	2497	298	7503	2535	299	7465	039	961	35
26	8. 62795	296	11. 37205	8. 62834	297	11. 37166	039	961	34
27	3091	294	6909	3131	295	6869	040	960	33
28	3385	293	6615	3426	292	6574	040	960	32
29	3678	290	6322	3718	291	6282	041	959	31
30	3968	288	6032	4009	289	5991	10. 00041	9. 99959	**30**
31	4256	287	5744	4298	287	5702	042	958	29
32	4543	284	5457	4585	285	5415	042	958	28
33	4827	283	5173	4870	284	5130	043	957	27
34	5110	281	4890	5154	281	4846	044	956	26
35	8. 65391	279	11. 34609	8. 65435	280	11. 34565	044	956	25
36	5670	277	4330	5715	278	4285	045	955	24
37	5947	276	4053	5993	276	4007	045	955	23
38	6223	274	3777	6269	274	3731	046	954	22
39	6497	272	3503	6543	273	3457	046	954	21
40	6769	270	3231	6816	271	3184	10. 00047	9. 99953	**20**
41	7039	269	2961	7087	269	2913	048	952	19
42	7308	267	2692	7356	268	2644	048	952	18
43	7575	266	2425	7624	266	2376	049	951	17
44	7841	263	2159	7890	264	2110	049	951	16
45	8. 68104	263	11. 31896	8. 68154	263	11. 31846	050	950	15
46	8367	260	1633	8417	261	1583	051	949	14
47	8627	259	1373	8678	260	1322	051	949	13
48	8886	258	1114	8938	258	1062	052	948	12
49	9144	256	0856	9196	257	0804	052	948	11
50	9400	254	0600	9453	255	0547	10. 00053	9. 99947	**10**
51	9654	253	0346	9708	254	0292	054	946	9
52	8. 69907	252	11. 30093	8. 69962	252	11. 30038	054	946	8
53	8. 70159	250	11. 29841	8. 70214	251	11. 29786	055	945	7
54	0409	249	9591	0465	249	9535	056	944	6
55	0658	247	9342	0714	248	9286	056	944	5
56	0905	246	9095	0962	246	9038	057	943	4
57	1151	244	8849	1208	245	8792	058	942	3
58	1395	243	8605	1453	244	8547	058	942	2
59	1638	242	8362	1697	243	8303	059	941	1
60	8. 71880	240	11. 28120	8. 71940	241	11. 28060	10. 00060	9. 99940	**0**
↑ ′ 92° →	cos	Diff.1′.	sec	cot	Diff.1′.	tan	csc	sin	← 87° ↑ ′

TABLE 33.

Logarithms of Trigonometric Functions.

3° → ′	sin	Diff. 1′.	csc	tan	Diff. 1′.	cot	sec	cos	← 176° ′
0	8. 71880	240	11. 28120	8. 71940	241	11. 28060	10. 00060	9. 99940	60
1	8. 72120	239	11. 27880	8. 72181	239	11. 27819	060	940	59
2	359	238	641	420	239	580	061	939	58
3	597	237	403	659	237	341	062	938	57
4	8. 72834	235	11. 27166	8. 72896	236	11. 27104	062	938	56
5	8. 73069	234	11. 26931	8. 73132	234	11. 26868	063	937	55
6	303	232	697	366	234	634	064	936	54
7	535	232	465	600	232	400	064	936	53
8	767	230	233	8. 73832	231	11. 26168	065	935	52
9	8. 73997	229	11. 26003	8. 74063	229	11. 25937	066	934	51
10	8. 74226	228	11. 25774	292	229	708	10. 00066	9. 99934	50
11	454	226	546	521	227	479	067	933	49
12	680	226	320	748	226	252	068	932	48
13	8. 74906	224	11. 25094	8. 74974	225	11. 25026	068	932	47
14	8. 75130	223	11. 24870	8. 75199	224	11. 24801	069	931	46
15	353	222	647	423	222	577	070	930	45
16	575	220	425	645	222	355	071	929	44
17	8. 75795	220	11. 24205	8. 75867	220	11. 24133	071	929	43
18	8. 76015	219	11. 23985	8. 76087	219	11. 23913	072	928	42
19	234	217	766	306	219	694	073	927	41
20	451	216	549	525	217	475	10. 00074	9. 99926	40
21	667	216	333	742	216	258	074	926	39
22	8. 76883	214	11. 23117	8. 76958	215	11. 23042	075	925	38
23	8. 77097	213	11. 22903	8. 77173	214	11. 22827	076	924	37
24	310	212	690	387	213	613	077	923	36
25	522	211	478	600	211	400	077	923	35
26	733	210	267	8. 77811	211	11. 22189	078	922	34
27	8. 77943	209	11. 22057	8. 78022	210	11. 21978	079	921	33
28	8. 78152	208	11. 21848	232	209	768	080	920	32
29	360	208	640	441	208	559	080	920	31
30	568	206	432	649	206	351	10. 00081	9. 99919	30
31	774	205	226	8. 78855	206	11. 21145	082	918	29
32	8. 78979	204	11. 21021	8. 79061	205	11. 20939	083	917	28
33	8. 79183	203	11. 20817	266	204	734	083	917	27
34	386	202	614	470	203	530	084	916	26
35	588	201	412	673	202	327	085	915	25
36	789	201	211	8. 79875	201	11. 20125	086	914	24
37	8. 79990	199	11. 20010	8. 80076	201	11. 19924	087	913	23
38	8. 80189	199	11. 19811	277	199	723	087	913	22
39	388	197	612	476	198	524	088	912	21
40	585	197	415	674	198	326	10. 00089	9. 99911	20
41	782	196	218	8. 80872	196	11. 19128	090	910	19
42	8. 80978	195	11. 19022	8. 81068	196	11. 18932	091	909	18
43	8. 81173	194	11. 18827	264	195	736	091	909	17
44	367	193	633	459	194	541	092	908	16
45	560	192	440	653	193	347	093	907	15
46	752	192	248	8. 81846	192	11. 18154	094	906	14
47	8. 81944	190	11. 18056	8. 82038	192	11. 17962	095	905	13
48	8. 82134	190	11. 17866	230	190	770	096	904	12
49	324	189	676	420	190	580	096	904	11
50	513	188	487	610	189	390	10. 00097	9. 99903	10
51	701	187	299	799	188	201	098	902	9
52	8. 82888	187	11. 17112	8. 82987	188	11. 17013	099	901	8
53	8. 83075	186	11. 16925	8. 83175	186	11. 16825	100	900	7
54	261	185	739	361	186	639	101	899	6
55	446	184	554	547	185	453	102	898	5
56	630	183	370	732	184	268	102	898	4
57	813	183	187	8. 83916	184	11. 16084	103	897	3
58	8. 83996	181	11. 16004	8. 84100	182	11. 15900	104	896	2
59	8. 84177	181	11. 15823	282	182	718	105	895	1
60	8. 84358	181	11. 15642	8. 84464	182	11. 15536	10. 00106	9. 99894	0
′ ↑ 93° →	cos	Diff. 1′.	sec	cot	Diff. 1′.	tan	csc	sin	′ ↑ ← 86°

Logarithms of Trigonometric Functions.

4° → ′	sin	Diff. 1′.	csc	tan	Diff. 1′.	cot	sec	cos	← 175° ′
0	8. 84358	181	11. 15642	8. 84464	182	11. 15536	10. 00106	9. 99894	60
1	539	179	461	646	180	354	107	893	59
2	718	179	282	8. 84826	180	11. 15174	108	892	58
3	8. 84897	178	11. 15103	8. 85006	179	11. 14994	109	891	57
4	8. 85075	177	11. 14925	185	178	815	109	891	56
5	252	177	748	363	177	637	110	890	55
6	429	176	571	540	177	460	111	889	54
7	605	175	395	717	176	283	112	888	53
8	780	175	220	8. 85893	176	11. 14107	113	887	52
9	8. 85955	173	11. 14045	8. 86069	174	11. 13931	114	886	51
10	8. 86128	173	11. 13872	243	174	757	10. 00115	9. 99885	50
11	301	173	699	417	174	583	116	884	49
12	474	171	526	591	172	409	117	883	48
13	645	171	355	763	172	237	118	882	47
14	816	171	184	8. 86935	171	11. 13065	119	881	46
15	8. 86987	169	11. 13013	8. 87106	171	11. 12894	120	880	45
16	8. 87156	169	11. 12844	277	170	723	121	879	44
17	325	169	675	447	169	553	121	879	43
18	494	167	506	616	169	384	122	878	42
19	661	168	339	785	168	215	123	877	41
20	829	166	171	8. 87953	167	11. 12047	10. 00124	9. 99876	40
21	8. 87995	166	11. 12005	8. 88120	167	11. 11880	125	875	39
22	8. 88161	165	11. 11839	287	166	713	126	874	38
23	326	164	674	453	165	547	127	873	37
24	490	164	510	618	165	382	128	872	36
25	654	163	346	783	165	217	129	871	35
26	817	163	183	8. 88948	163	11. 11052	130	870	34
27	8. 88980	162	11. 11020	8. 89111	163	11. 10889	131	869	33
28	8. 89142	162	11. 10858	274	163	726	132	868	32
29	304	160	696	437	161	563	133	867	31
30	464	161	536	598	162	402	10. 00134	9. 99866	30
31	625	159	375	760	160	240	135	865	29
32	784	159	216	8. 89920	160	11. 10080	136	864	28
33	8. 89943	159	11. 10057	8. 90080	160	11. 09920	137	863	27
34	8. 90102	158	11. 09898	240	159	760	138	862	26
35	260	157	740	399	158	601	139	861	25
36	417	157	583	557	158	443	140	860	24
37	574	156	426	715	157	285	141	859	23
38	730	155	270	8. 90872	157	11. 09128	142	858	22
39	8. 90885	155	11. 09115	8. 91029	156	11. 08971	143	857	21
40	8. 91040	155	11. 08960	185	155	815	10. 00144	9. 99856	20
41	195	154	805	340	155	660	145	855	19
42	349	153	651	495	155	505	146	854	18
43	502	153	498	650	153	350	147	853	17
44	655	152	345	803	154	197	148	852	16
45	807	152	193	8. 91957	153	11. 08043	149	851	15
46	8. 91959	151	11. 08041	8. 92110	152	11. 07890	150	850	14
47	8. 92110	151	11. 07890	262	152	738	152	848	13
48	261	150	739	414	151	586	153	847	12
49	411	150	589	565	151	435	154	846	11
50	561	149	439	716	150	284	10. 00155	9. 99845	10
51	710	149	290	8. 92866	150	11. 07134	156	844	9
52	8. 92859	148	11. 07141	8. 93016	149	11. 06984	157	843	8
53	8. 93007	147	11. 06993	165	148	835	158	842	7
54	154	147	846	313	149	687	159	841	6
55	301	147	699	462	147	538	160	840	5
56	448	146	552	609	147	391	161	839	4
57	594	146	406	756	147	244	162	838	3
58	740	145	260	8. 93903	146	11. 06097	163	837	2
59	8. 93885	145	11. 06115	8. 94049	146	11. 05951	164	836	1
60	8. 94030	144	11. 05970	8. 94195	145	11. 05805	10. 00166	9. 99834	0
′ ↑ 94° →	cos	Diff. 1′.	sec	cot	Diff. 1′.	tan	csc	sin	′ ↑ ← 85°

TABLE 33.

Logarithms of Trigonometric Functions.

5°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos ←174° ′
0	8.94030	0	0	11.05970	8.94195	0	0	11.05805	10.00166	0	0	9.99834	60
1	174	1	2	826	340	1	2	660	167	1	0	833	59
2	317	2	4	683	485	2	4	515	168	2	0	832	58
3	461	3	7	539	630	3	7	370	169	3	0	831	57
4	603	4	9	397	773	4	9	227	170	4	0	830	56
5	746	5	11	254	8.94917	5	11	11.05083	171	5	0	829	55
6	8.94887	6	13	11.05113	8.95060	6	13	11.04940	172	6	0	828	54
7	8.95029	7	15	11.04971	202	7	15	798	173	7	0	827	53
8	170	8	18	830	344	8	18	656	175	8	0	825	52
9	310	9	20	690	486	9	20	514	176	9	0	824	51
10	450	10	22	550	627	10	22	373	10.00177	10	0	9.99823	50
11	589	11	24	411	767	11	24	233	178	11	0	822	49
12	728	12	26	272	8.95908	12	27	11.04092	179	12	0	821	48
13	8.95867	13	29	11.04133	8.96047	13	29	11.03953	180	13	0	820	47
14	8.96005	14	31	11.03995	187	14	31	813	181	14	0	819	46
15	143	15	33	857	325	15	33	675	183	15	0	817	45
16	280	16	35	720	464	16	35	536	184	16	0	816	44
17	417	17	37	583	602	17	38	398	185	17	0	815	43
18	553	18	39	447	739	18	40	261	186	18	0	814	42
19	689	19	42	311	8.96877	19	42	11.03123	187	19	0	813	41
20	825	20	44	175	8.97013	20	44	11.02987	10.00188	20	0	9.99812	40
21	8.96960	21	46	11.03040	150	21	46	850	190	21	0	810	39
22	8.97095	22	48	11.02905	285	22	49	715	191	22	0	809	38
23	229	23	50	771	421	23	51	579	192	23	0	808	37
24	363	24	53	637	556	24	53	444	193	24	0	807	36
25	496	25	55	504	691	25	55	309	194	25	1	806	35
26	629	26	57	371	825	26	58	175	196	26	1	804	34
27	762	27	59	238	8.97959	27	60	11.02041	197	27	1	803	33
28	8.97894	28	61	11.02106	8.98092	28	62	11.01908	198	28	1	802	32
29	8.98026	29	64	11.01974	225	29	64	775	199	29	1	801	31
30	157	30	66	843	358	30	66	642	10.00200	30	1	9.99800	30
31	288	31	68	712	490	31	69	510	202	31	1	798	29
32	419	32	70	581	622	32	71	378	203	32	1	797	28
33	549	33	72	451	753	33	73	247	204	33	1	796	27
34	679	34	75	321	8.98884	34	75	11.01116	205	34	1	795	26
35	808	35	77	192	8.99015	35	77	11.00985	207	35	1	793	25
36	8.98937	36	79	11.01063	145	36	80	855	208	36	1	792	24
37	8.99066	37	81	11.00934	275	37	82	725	209	37	1	791	23
38	194	38	83	806	405	38	84	595	210	38	1	790	22
39	322	39	86	678	534	39	86	466	212	39	1	788	21
40	450	40	88	550	662	40	89	338	10.00213	40	1	9.99787	20
41	577	41	90	423	791	41	91	209	214	41	1	786	19
42	704	42	92	296	8.99919	42	93	11.00081	215	42	1	785	18
43	830	43	94	170	9.00046	43	95	10.99954	217	43	1	783	17
44	8.99956	44	96	11.00044	174	44	97	826	218	44	1	782	16
45	9.00082	45	99	10.99918	301	45	100	699	219	45	1	781	15
46	207	46	101	793	427	46	102	573	220	46	1	780	14
47	332	47	103	668	553	47	104	447	222	47	1	778	13
48	456	48	105	544	679	48	106	321	223	48	1	777	12
49	581	49	107	419	805	49	108	195	224	49	1	776	11
50	704	50	110	296	9.00930	50	111	10.99070	10.00225	50	1	9.99775	10
51	828	51	112	172	9.01055	51	113	10.98945	227	51	1	773	9
52	9.00951	52	114	10.99049	179	52	115	821	228	52	1	772	8
53	9.01074	53	116	10.98926	303	53	117	697	229	53	1	771	7
54	196	54	118	804	427	54	120	573	231	54	1	769	6
55	318	55	121	682	550	55	122	450	232	55	1	768	5
56	440	56	123	560	673	56	124	327	233	56	1	767	4
57	561	57	125	439	796	57	126	204	235	57	1	765	3
58	682	58	127	318	9.01918	58	128	10.98082	236	58	1	764	2
59	803	59	129	197	9.02040	59	131	10.97960	237	59	1	763	1
60	9.01923	60	132	10.98077	9.02162	60	133	10.97838	10.00239	60	1	9.99761	0
↑ ′ 95°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin ←84° ↑ ′

Logarithms of Trigonometric Functions.

6°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←173° ′
0	9.01923	0	0	10.98077	9.02162	0	0	10.97838	10.00239	0	0	9.99761	60
1	9.02043	1	2	10.97957	283	1	2	717	240	1	0	760	59
2	163	2	4	837	404	2	4	596	241	2	0	759	58
3	283	3	6	717	525	3	6	475	243	3	0	757	57
4	402	4	7	598	645	4	8	355	244	4	0	756	56
5	520	5	9	480	766	5	9	234	245	5	0	755	55
6	639	6	11	361	9.02885	6	11	10.97115	247	6	0	753	54
7	757	7	13	243	9.03005	7	13	10.96995	248	7	0	752	53
8	874	8	15	126	124	8	15	876	249	8	0	751	52
9	9.02992	9	17	10.97008	242	9	17	758	251	9	0	749	51
10	9.03109	10	19	10.96891	361	10	19	639	10.00252	10	0	9.99748	50
11	226	11	20	774	479	11	21	521	253	11	0	747	49
12	342	12	22	658	597	12	23	403	255	12	0	745	48
13	458	13	24	542	714	13	24	286	256	13	0	744	47
14	574	14	26	426	832	14	26	168	258	14	0	742	46
15	690	15	28	310	9.03948	15	28	10.96052	259	15	0	741	45
16	805	16	30	195	9.04065	16	30	10.95935	260	16	0	740	44
17	9.03920	17	31	10.96080	181	17	32	819	262	17	0	738	43
18	9.04034	18	33	10.95966	297	18	34	703	263	18	0	737	42
19	149	19	35	851	413	19	36	587	264	19	0	736	41
20	262	20	37	738	528	20	38	472	10.00266	20	0	9.99734	40
21	376	21	39	624	643	21	39	357	267	21	1	733	39
22	490	22	41	510	758	22	41	242	269	22	1	731	38
23	603	23	43	397	873	23	43	127	270	23	1	730	37
24	715	24	44	285	9.04987	24	45	10.95013	272	24	1	728	36
25	828	25	46	172	9.05101	25	47	10.94899	273	25	1	727	35
26	9.04940	26	48	10.95060	214	26	49	786	274	26	1	726	34
27	9.05052	27	50	10.94948	328	27	51	672	276	27	1	724	33
28	164	28	52	836	441	28	53	559	277	28	1	723	32
29	275	29	54	725	553	29	54	447	279	29	1	721	31
30	386	30	56	614	666	30	56	334	10.00280	30	1	9.99720	30
31	497	31	57	503	778	31	58	222	282	31	1	718	29
32	607	32	59	393	9.05890	32	60	10.94110	283	32	1	717	28
33	717	33	61	283	9.06002	33	62	10.93998	284	33	1	716	27
34	827	34	63	173	113	34	64	887	286	34	1	714	26
35	9.05937	35	65	10.94063	224	35	66	776	287	35	1	713	25
36	9.06046	36	67	10.93954	335	36	68	665	289	36	1	711	24
37	155	37	69	845	445	37	69	555	290	37	1	710	23
38	264	38	70	736	556	38	71	444	292	38	1	708	22
39	372	39	72	628	666	39	73	334	293	39	1	707	21
40	481	40	74	519	775	40	75	225	10.00295	40	1	9.99705	20
41	589	41	76	411	885	41	77	115	296	41	1	704	19
42	696	42	78	304	9.06994	42	79	10.93006	298	42	1	702	18
43	804	43	80	196	9.07103	43	81	10.92897	299	43	1	701	17
44	9.06911	44	81	10.93089	211	44	83	789	301	44	1	699	16
45	9.07018	45	83	10.92982	320	45	84	680	302	45	1	698	15
46	124	46	85	876	428	46	86	572	304	46	1	696	14
47	231	47	87	769	536	47	88	464	305	47	1	695	13
48	337	48	89	663	643	48	90	357	307	48	1	693	12
49	442	49	91	558	751	49	92	249	308	49	1	692	11
50	548	50	93	452	858	50	94	142	10.00310	50	1	9.99690	10
51	653	51	94	347	9.07964	51	96	10.92036	311	51	1	689	9
52	758	52	96	242	9.08071	52	98	10.91929	313	52	1	687	8
53	863	53	98	137	177	53	99	823	314	53	1	686	7
54	9.07968	54	100	10.92032	283	54	101	717	316	54	1	684	6
55	9.08072	55	102	10.91928	389	55	103	611	317	55	1	683	5
56	176	56	104	824	495	56	105	505	319	56	1	681	4
57	280	57	106	720	600	57	107	400	320	57	1	680	3
58	383	58	107	617	705	58	109	295	322	58	1	678	2
59	486	59	109	514	810	59	111	190	323	59	1	677	1
60	9.08589	60	111	10.91411	9.08914	60	113	10.91086	10.00325	60	1	9.99675	0
′													′
96°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	←83°

TABLE 33.

Logarithms of Trigonometric Functions.

7°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←172° ′ ↓
0	9. 08589	0	0	10. 91411	9. 08914	0	0	10. 91086	10. 00325	0	0	9. 99675	60
1	692	1	2	308	9. 09019	1	2	10. 90981	326	1	0	674	59
2	795	2	3	205	123	2	3	877	328	2	0	672	58
3	897	3	5	103	227	3	5	773	330	3	0	670	57
4	9. 08999	4	6	10. 91001	330	4	7	670	331	4	0	669	56
5	9. 09101	5	8	10. 90899	434	5	8	566	333	5	0	667	55
6	202	6	10	798	537	6	10	463	334	6	0	666	54
7	304	7	11	696	640	7	11	360	336	7	0	664	53
8	405	8	13	595	742	8	13	258	337	8	0	663	52
9	506	9	14	494	845	9	15	155	339	9	0	661	51
10	606	10	16	394	9. 09947	10	16	10. 90053	10. 00341	10	0	9. 99659	50
11	707	11	18	293	9. 10049	11	18	10. 89951	342	11	0	658	49
12	807	12	19	193	150	12	20	850	344	12	0	656	48
13	9. 09907	13	21	10. 90093	252	13	21	748	345	13	0	655	47
14	9. 10006	14	22	10. 89994	353	14	23	647	347	14	0	653	46
15	106	15	24	894	454	15	24	546	349	15	0	651	45
16	205	16	26	795	555	16	26	445	350	16	0	650	44
17	304	17	27	696	656	17	28	344	352	17	0	648	43
18	402	18	29	598	756	18	29	244	353	18	1	647	42
19	501	19	30	499	856	19	31	144	355	19	1	645	41
20	599	20	32	401	9. 10956	20	33	10. 89044	10. 00357	20	1	9. 99643	40
21	697	21	34	303	9. 11056	21	34	10. 88944	358	21	1	642	39
22	795	22	35	205	155	22	36	845	360	22	1	640	38
23	893	23	37	107	254	23	37	746	362	23	1	638	37
24	9. 10990	24	38	10. 89010	353	24	39	647	363	24	1	637	36
25	9. 11087	25	40	10. 88913	452	25	41	548	365	25	1	635	35
26	184	26	42	816	551	26	42	449	367	26	1	633	34
27	281	27	43	719	649	27	44	351	368	27	1	632	33
28	377	28	45	623	747	28	46	253	370	28	1	630	32
29	474	29	46	526	845	29	47	155	371	29	1	629	31
30	570	30	48	430	9. 11943	30	49	10. 88057	10. 00373	30	1	9. 99627	30
31	666	31	50	334	9. 12040	31	51	10. 87960	375	31	1	625	29
32	761	32	51	239	138	32	52	862	376	32	1	624	28
33	857	33	53	143	235	33	54	765	378	33	1	622	27
34	9. 11952	34	54	10. 88048	332	34	55	668	380	34	1	620	26
35	9. 12047	35	56	10. 87953	428	35	57	572	382	35	1	618	25
36	142	36	58	858	525	36	59	475	383	36	1	617	24
37	236	37	59	764	621	37	60	379	385	37	1	615	23
38	331	38	61	669	717	38	62	283	387	38	1	613	22
39	425	39	62	575	813	39	64	187	388	39	1	612	21
40	519	40	64	481	9. 12909	40	65	10. 87091	10. 00390	40	1	9. 99610	20
41	612	41	66	388	9. 13004	41	67	10. 86996	392	41	1	608	19
42	706	42	67	294	099	42	68	901	393	42	1	607	18
43	799	43	69	201	194	43	70	806	395	43	1	605	17
44	892	44	70	108	289	44	72	711	397	44	1	603	16
45	9. 12985	45	72	10. 87015	384	45	73	616	399	45	1	601	15
46	9. 13078	46	74	10. 86922	478	46	75	522	400	46	1	600	14
47	171	47	75	829	573	47	77	427	402	47	1	598	13
48	263	48	77	737	667	48	78	333	404	48	1	596	12
49	355	49	78	645	761	49	80	239	405	49	1	595	11
50	447	50	80	553	854	50	81	146	10. 00407	50	1	9. 99593	10
51	539	51	82	461	9. 13948	51	83	10. 86052	409	51	1	591	9
52	630	52	83	370	9. 14041	52	85	10. 85959	411	52	1	589	8
53	722	53	85	278	134	53	86	866	412	53	1	588	7
54	813	54	87	187	227	54	88	773	414	54	2	586	6
55	904	55	88	096	320	55	90	680	416	55	2	584	5
56	9. 13994	56	90	10. 86006	412	56	91	588	418	56	2	582	4
57	9. 14085	57	91	10. 85915	504	57	93	496	419	57	2	581	3
58	175	58	93	825	597	58	95	403	421	58	2	579	2
59	266	59	95	734	688	59	96	312	423	59	2	577	1
60	9. 14356	60	96	10. 85644	9. 14780	60	98	10. 85220	10. 00425	60	2	9. 99575	0
′ ↑ 97°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←82°

Logarithms of Trigonometric Functions.

8°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←171° ′
0	9.14356	*0*	0	10.85644	9.14780	*0*	0	10.85220	10.00425	*0*	0	9.99575	**60**
1	445	*1*	1	555	872	*1*	1	128	426	*1*	0	574	59
2	535	*2*	3	465	9.14963	*2*	3	10.85037	428	*2*	0	572	58
3	624	*3*	4	376	9.15054	*3*	4	10.84946	430	*3*	0	570	57
4	714	*4*	6	286	145	*4*	6	855	432	*4*	0	568	56
5	803	*5*	7	197	236	*5*	7	764	434	*5*	0	566	55
6	891	*6*	8	109	327	*6*	9	673	435	*6*	0	565	54
7	9.14980	*7*	10	10.85020	417	*7*	10	583	437	*7*	0	563	53
8	9.15069	*8*	11	10.84931	508	*8*	12	492	439	*8*	0	561	52
9	157	*9*	13	843	598	*9*	13	402	441	*9*	0	559	51
10	245	*10*	14	755	688	*10*	14	312	10.00443	*10*	0	9.99557	**50**
11	333	*11*	16	667	777	*11*	16	223	444	*11*	0	556	49
12	421	*12*	17	579	867	*12*	17	133	446	*12*	0	554	48
13	508	*13*	18	492	9.15956	*13*	19	10.84044	448	*13*	0	552	47
14	596	*14*	20	404	9.16046	*14*	20	10.83954	450	*14*	0	550	46
15	683	*15*	21	317	135	*15*	22	865	452	*15*	0	548	45
16	770	*16*	23	230	224	*16*	23	776	454	*16*	1	546	44
17	857	*17*	24	143	312	*17*	25	688	455	*17*	1	545	43
18	9.15944	*18*	25	10.84056	401	*18*	26	599	457	*18*	1	543	42
19	9.16030	*19*	27	10.83970	489	*19*	27	511	459	*19*	1	541	41
20	116	*20*	28	884	577	*20*	29	423	10.00461	*20*	1	9.99539	**40**
21	203	*21*	30	797	665	*21*	30	335	463	*21*	1	537	39
22	289	*22*	31	711	753	*22*	32	247	465	*22*	1	535	38
23	374	*23*	32	626	841	*23*	33	159	467	*23*	1	533	37
24	460	*24*	34	540	9.16928	*24*	35	10.83072	468	*24*	1	532	36
25	545	*25*	35	455	9.17016	*25*	36	10.82984	470	*25*	1	530	35
26	631	*26*	37	369	103	*26*	37	897	472	*26*	1	528	34
27	716	*27*	38	284	190	*27*	39	810	474	*27*	1	526	33
28	801	*28*	39	199	277	*28*	40	723	476	*28*	1	524	32
29	886	*29*	41	114	363	*29*	42	637	478	*29*	1	522	31
30	9.16970	*30*	42	10.83030	450	*30*	43	550	10.00480	*30*	1	9.99520	**30**
31	9.17055	*31*	44	10.82945	536	*31*	45	464	482	*31*	1	518	29
32	139	*32*	45	861	622	*32*	46	378	483	*32*	1	517	28
33	223	*33*	47	777	708	*33*	48	292	485	*33*	1	515	27
34	307	*34*	48	693	794	*34*	49	206	487	*34*	1	513	26
35	391	*35*	49	609	880	*35*	50	120	489	*35*	1	511	25
36	474	*36*	51	526	9.17965	*36*	52	10.82035	491	*36*	1	509	24
37	558	*37*	52	442	9.18051	*37*	53	10.81949	493	*37*	1	507	23
38	641	*38*	54	359	136	*38*	55	864	495	*38*	1	505	22
39	724	*39*	55	276	221	*39*	56	779	497	*39*	1	503	21
40	807	*40*	56	193	306	*40*	58	694	10.00499	*40*	1	9.99501	**20**
41	890	*41*	58	110	391	*41*	59	609	501	*41*	1	499	19
42	9.17973	*42*	59	10.82027	475	*42*	61	525	503	*42*	1	497	18
43	9.18055	*43*	61	10.81945	560	*43*	62	440	505	*43*	1	495	17
44	137	*44*	62	863	644	*44*	63	356	506	*44*	1	494	16
45	220	*45*	63	780	728	*45*	65	272	508	*45*	1	492	15
46	302	*46*	65	698	812	*46*	66	188	510	*46*	1	490	14
47	383	*47*	66	617	896	*47*	68	104	512	*47*	1	488	13
48	465	*48*	68	535	9.18979	*48*	69	10.81021	514	*48*	2	486	12
49	547	*49*	69	453	9.19063	*49*	71	10.80937	516	*49*	2	484	11
50	628	*50*	71	372	146	*50*	72	854	10.00518	*50*	2	9.99482	**10**
51	709	*51*	72	291	229	*51*	74	771	520	*51*	2	480	9
52	790	*52*	73	210	312	*52*	75	688	522	*52*	2	478	8
53	871	*53*	75	129	395	*53*	76	605	524	*53*	2	476	7
54	9.18952	*54*	76	10.81048	478	*54*	78	522	526	*54*	2	474	6
55	9.19033	*55*	78	10.80967	561	*55*	79	439	528	*55*	2	472	5
56	113	*56*	79	887	643	*56*	81	357	530	*56*	2	470	4
57	193	*57*	80	807	725	*57*	82	275	532	*57*	2	468	3
58	273	*58*	82	727	807	*58*	84	193	534	*58*	2	466	2
59	353	*59*	83	647	889	*59*	85	111	536	*59*	2	464	1
60	9.19433	*60*	85	10.80567	9.19971	*60*	87	10.80029	10.00538	*60*	2	9.99462	**0**
′ ↑ 98°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←81°

TABLE 33.

Logarithms of Trigonometric Functions.

9°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←170° ′ ↓
0	9. 19433	0	0	10. 80567	9. 19971	0	0	10. 80029	10. 00538	0	0	9. 99462	60
1	513	1	1	487	9. 20053	1	1	10. 79947	540	1	0	460	59
2	592	2	3	408	134	2	3	866	542	2	0	458	58
3	672	3	4	328	216	3	4	784	544	3	0	456	57
4	751	4	5	249	297	4	5	703	546	4	0	454	56
5	830	5	6	170	378	5	6	622	548	5	0	452	55
6	909	6	8	091	459	6	8	541	550	6	0	450	54
7	9. 19988	7	9	10. 80012	540	7	9	460	552	7	0	448	53
8	9. 20067	8	10	10. 79933	621	8	10	379	554	8	0	446	52
9	145	9	11	855	701	9	12	299	556	9	0	444	51
10	223	10	13	777	782	10	13	218	10. 00558	10	0	9. 99442	50
11	302	11	14	698	862	11	14	138	560	11	0	440	49
12	380	12	15	620	9. 20942	12	16	10. 79058	562	12	0	438	48
13	458	13	16	542	9. 21022	13	17	10. 78978	564	13	0	436	47
14	9. 20535	14	18	10. 79465	102	14	18	898	566	14	0	434	46
15	613	15	19	387	182	15	19	818	568	15	1	432	45
16	691	16	20	309	261	16	21	739	571	16	1	429	44
17	768	17	21	232	341	17	22	659	573	17	1	427	43
18	845	18	23	155	420	18	23	580	575	18	1	425	42
19	922	19	24	078	9. 21499	19	25	10. 78501	577	19	1	423	41
20	9. 20999	20	25	10. 79001	578	20	26	422	10. 00579	20	1	9. 99421	40
21	9. 21076	21	26	10. 78924	657	21	27	343	581	21	1	419	39
22	153	22	28	847	736	22	28	264	583	22	1	417	38
23	229	23	29	771	814	23	30	186	585	23	1	415	37
24	306	24	30	694	893	24	31	107	587	24	1	413	36
25	382	25	31	618	9. 21971	25	32	10. 78029	589	25	1	411	35
26	458	26	33	542	9. 22049	26	34	10. 77951	591	26	1	409	34
27	9. 21534	27	34	10 78466	127	27	35	873	593	27	1	407	33
28	610	28	35	390	205	28	36	795	596	28	1	404	32
29	685	29	37	315	283	29	38	717	598	29	1	402	31
30	761	30	38	239	361	30	39	639	10. 00600	30	1	9. 99400	30
31	836	31	39	164	438	31	40	562	602	31	1	398	29
32	912	32	40	088	9. 22516	32	41	10. 77484	604	32	1	396	28
33	9. 21987	33	42	10. 78013	593	33	43	407	606	33	1	394	27
34	9. 22062	34	43	10. 77938	670	34	44	330	608	34	1	392	26
35	137	35	44	863	747	35	45	253	610	35	1	390	25
36	211	36	45	789	824	36	47	176	612	36	1	388	24
37	286	37	47	714	901	37	48	099	615	37	1	385	23
38	361	38	48	639	9. 22977	38	49	10. 77023	617	38	1	383	22
39	435	39	49	565	9. 23054	39	50	10. 76946	619	39	1	381	21
40	9. 22509	40	50	10. 77491	130	40	52	870	10. 00621	40	1	9. 99379	20
41	583	41	52	417	206	41	53	794	623	41	1	377	19
42	657	42	53	343	283	42	54	717	625	42	1	375	18
43	731	43	54	269	359	43	56	641	628	43	2	372	17
44	805	44	55	195	435	44	57	565	630	44	2	370	16
45	878	45	57	122	9. 23510	45	58	10. 76490	632	45	2	368	15
46	9. 22952	46	58	10. 77048	586	46	60	414	634	46	2	366	14
47	9. 23025	47	59	10. 76975	661	47	61	339	636	47	2	364	13
48	098	48	60	902	737	48	62	263	638	48	2	362	12
49	171	49	62	829	812	49	63	188	641	49	2	359	11
50	244	50	63	756	887	50	65	113	10. 00643	50	2	9. 99357	10
51	317	51	64	683	9. 23962	51	66	10. 76038	645	51	2	355	9
52	390	52	65	610	9. 24037	52	67	10. 75963	647	52	2	353	8
53	462	53	67	538	112	53	69	888	649	53	2	351	7
54	9. 23535	54	68	10. 76465	186	54	70	814	652	54	2	348	6
55	607	55	69	393	261	55	71	739	654	55	2	346	5
56	679	56	71	321	335	56	73	665	656	56	2	344	4
57	752	57	72	248	410	57	74	590	658	57	2	342	3
58	823	58	73	177	484	58	75	516	660	58	2	340	2
59	895	59	74	105	558	59	76	442	663	59	2	337	1
60	9. 23967	60	76	10. 76033	9. 24632	60	78	10. 75368	10. 00665	60	2	9. 99335	0
′ ↑ 99°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←80°

Logarithms of Trigonometric Functions.

10°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←169° ′ ↓
0	9. 23967	0	0	10. 76033	9. 24632	0	0	10. 75368	10. 00665	0	0	9. 99335	60
1	9. 24039	1	1	10. 75961	706	1	1	294	667	1	0	333	59
2	110	2	2	890	779	2	2	221	669	2	0	331	58
3	181	3	3	819	853	3	4	147	672	3	0	328	57
4	253	4	5	747	9. 24926	4	5	074	674	4	0	326	56
5	324	5	6	676	9. 25000	5	6	10. 75000	676	5	0	324	55
6	395	6	7	605	073	6	7	10. 74927	678	6	0	322	54
7	9. 24466	7	8	10. 75534	146	7	8	854	681	7	0	319	53
8	536	8	9	464	219	8	9	781	683	8	0	317	52
9	607	9	10	393	292	9	11	708	685	9	0	315	51
10	677	10	11	323	365	10	12	635	10. 00687	10	0	9. 99313	50
11	748	11	13	252	9. 25437	11	13	563	690	11	0	310	49
12	818	12	14	182	510	12	14	10. 74490	692	12	0	308	48
13	888	13	15	112	582	13	15	418	694	13	1	306	47
14	9. 24958	14	16	10. 75042	655	14	16	345	696	14	1	304	46
15	9. 25028	15	17	10. 74972	727	15	18	273	699	15	1	301	45
16	098	16	18	902	799	16	19	201	701	16	1	299	44
17	168	17	19	832	871	17	20	129	703	17	1	297	43
18	237	18	20	763	9. 25943	18	21	10. 74057	706	18	1	294	42
19	307	19	22	693	9. 26015	19	22	10. 73985	708	19	1	292	41
20	376	20	23	624	086	20	24	914	10. 00710	20	1	9. 99290	40
21	445	21	24	555	158	21	25	842	712	21	1	288	39
22	9. 25514	22	25	10. 74486	229	22	26	771	715	22	1	285	38
23	583	23	26	417	301	23	27	699	717	23	1	283	37
24	652	24	27	348	372	24	28	628	719	24	1	281	36
25	721	25	28	279	9. 26443	25	29	10. 73557	722	25	1	278	35
26	790	26	30	210	514	26	31	486	724	26	1	276	34
27	858	27	31	142	585	27	32	415	726	27	1	274	33
28	927	28	32	073	655	28	33	345	729	28	1	271	32
29	9. 25995	29	33	10. 74005	726	29	34	274	731	29	1	269	31
30	9. 26063	30	34	10. 73937	797	30	35	203	10 00733	30	1	9. 99267	30
31	131	31	35	869	867	31	36	133	736	31	1	264	29
32	199	32	36	801	9. 26937	32	38	10. 73063	738	32	1	262	28
33	267	33	38	733	9. 27008	33	39	10. 72992	740	33	1	260	27
34	335	34	39	665	078	34	40	922	743	34	1	257	26
35	403	35	40	597	148	35	41	852	745	35	1	255	25
36	9. 26470	36	41	10. 73530	218	36	42	782	748	36	1	252	24
37	538	37	42	462	288	37	44	712	750	37	1	250	23
38	605	38	43	395	357	38	45	643	752	38	1	248	22
39	672	39	44	328	427	39	46	573	755	39	2	245	21
40	739	40	45	261	9. 27496	40	47	10. 72504	10. 00757	40	2	9. 99243	20
41	806	41	47	194	566	41	48	434	759	41	2	241	19
42	873	42	48	127	635	42	49	365	762	42	2	238	18
43	9. 26940	43	49	10. 73060	704	43	51	296	764	43	2	236	17
44	9. 27007	44	50	10. 72993	773	44	52	227	767	44	2	233	16
45	073	45	51	927	842	45	53	158	769	45	2	231	15
46	140	46	52	860	911	46	54	089	771	46	2	229	14
47	206	47	53	794	9. 27980	47	55	10. 72020	774	47	2	226	13
48	273	48	55	727	9. 28049	48	56	10. 71951	776	48	2	224	12
49	339	49	56	661	117	49	58	883	779	49	2	221	11
50	405	50	57	595	186	50	59	814	10. 00781	50	2	9. 99219	10
51	471	51	58	529	254	51	60	746	783	51	2	217	9
52	9. 27537	52	59	10. 72463	323	52	61	677	786	52	2	214	8
53	602	53	60	398	391	53	62	609	788	53	2	212	7
54	668	54	61	332	9. 28459	54	63	10. 71541	791	54	2	209	6
55	734	55	63	266	527	55	65	473	793	55	2	207	5
56	799	56	64	201	595	56	66	405	796	56	2	204	4
57	864	57	65	136	662	57	67	338	798	57	2	202	3
58	930	58	66	070	730	58	68	270	800	58	2	200	2
59	9. 27995	59	67	10. 72005	798	59	69	202	803	59	2	197	1
60	9. 28060	60	68	10. 71940	9. 28865	60	71	10. 71135	10. 00805	60	2	9. 99195	0
′ ↑ 100°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←79°

TABLE 33.

Logarithms of Trigonometric Functions.

11°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos ←168° ′
0	9. 28060	0	0	10. 71940	9. 28865	0	0	10. 71135	10. 00805	0	0	9. 99195	60
1	125	1	1	875	9. 28933	1	1	067	808	1	0	192	59
2	190	2	2	810	9. 29000	2	2	10. 71000	810	2	0	190	58
3	254	3	3	746	067	3	3	10. 70933	813	3	0	187	57
4	319	4	4	681	134	4	4	866	815	4	0	185	56
5	384	5	5	616	201	5	5	799	818	5	0	182	55
6	448	6	6	552	268	6	6	732	820	6	0	180	54
7	9. 28512	7	7	10. 71488	335	7	8	665	823	7	0	177	53
8	577	8	8	423	402	8	9	598	825	8	0	175	52
9	641	9	9	359	468	9	10	532	828	9	0	172	51
10	705	10	10	295	9. 29535	10	11	10. 70465	10. 00830	10	0	9. 99170	50
11	769	11	11	231	601	11	12	399	833	11	0	167	49
12	833	12	12	167	668	12	13	332	835	12	1	165	48
13	896	13	13	104	734	13	14	266	838	13	1	162	47
14	9. 28960	14	14	10. 71040	800	14	15	200	840	14	1	160	46
15	9. 29024	15	16	10. 70976	866	15	16	134	843	15	1	157	45
16	087	16	17	913	932	16	17	068	845	16	1	155	44
17	150	17	18	850	9. 29998	17	18	10. 70002	848	17	1	152	43
18	214	18	19	786	9. 30064	18	19	10. 69936	850	18	1	150	42
19	277	19	20	723	130	19	20	870	853	19	1	147	41
20	340	20	21	660	195	20	22	805	10. 00855	20	1	9. 99145	40
21	403	21	22	597	261	21	23	739	858	21	1	142	39
22	9. 29466	22	23	10. 70534	326	22	24	674	860	22	1	140	38
23	529	23	24	471	391	23	25	609	863	23	1	137	37
24	591	24	25	409	457	24	26	543	865	24	1	135	36
25	654	25	26	346	9. 30522	25	27	10. 69478	868	25	1	132	35
26	716	26	27	284	587	26	28	413	870	26	1	130	34
27	779	27	28	221	652	27	29	348	873	27	1	127	33
28	841	28	29	159	717	28	30	283	876	28	1	124	32
29	903	29	30	097	782	29	31	218	878	29	1	122	31
30	9. 29966	30	31	10. 70034	846	30	32	154	10. 00881	30	1	9. 99119	30
31	9. 30028	31	32	10. 69972	911	31	33	089	883	31	1	117	29
32	090	32	33	910	9. 30975	32	35	10. 69025	886	32	1	114	28
33	151	33	34	849	9. 31040	33	36	10. 68960	888	33	1	112	27
34	213	34	35	787	104	34	37	896	891	34	1	109	26
35	275	35	36	725	168	35	38	832	894	35	2	106	25
36	336	36	37	664	233	36	39	767	896	36	2	104	24
37	398	37	38	602	297	37	40	703	899	37	2	101	23
38	9. 30459	38	39	10. 69541	361	38	41	639	901	38	2	099	22
39	521	39	40	479	425	39	42	575	904	39	2	096	21
40	582	40	41	418	9. 31489	40	43	10. 68511	10. 00907	40	2	9. 99093	20
41	643	41	42	357	552	41	44	448	909	41	2	091	19
42	704	42	43	296	616	42	45	384	912	42	2	088	18
43	765	43	45	235	679	43	46	321	914	43	2	086	17
44	826	44	46	174	743	44	47	257	917	44	2	083	16
45	887	45	47	113	806	45	49	194	920	45	2	080	15
46	9. 30947	46	48	10. 69053	870	46	50	130	922	46	2	078	14
47	9. 31008	47	49	10. 68992	933	47	51	067	925	47	2	075	13
48	068	48	50	932	9. 31996	48	52	10. 68004	928	48	2	072	12
49	129	49	51	871	9. 32059	49	53	10. 67941	930	49	2	070	11
50	189	50	52	811	122	50	54	878	10. 00933	50	2	9. 99067	10
51	250	51	53	750	185	51	55	815	936	51	2	064	9
52	310	52	54	690	248	52	56	752	938	52	2	062	8
53	370	53	55	630	311	53	57	689	941	53	2	059	7
54	9. 31430	54	56	10. 68570	373	54	58	627	944	54	2	056	6
55	490	55	57	510	9. 32436	55	59	10. 67564	946	55	2	054	5
56	549	56	58	451	498	56	60	502	949	56	2	051	4
57	609	57	59	391	561	57	61	439	952	57	2	048	3
58	669	58	60	331	623	58	63	377	954	58	2	046	2
59	728	59	61	272	685	59	64	315	957	59	3	043	1
60	9. 31788	60	62	10. 68212	9. 32747	60	65	10. 67253	10. 00960	60	3	9. 99040	0
′		″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin ←78° ′
101°→	cos											

Logarithms of Trigonometric Functions.

12° → ′	sin	″	Diff.	csc	tan	″	Diff.	cot	sec	″	Diff.	cos	← 167° ′
0	9. 31788	0	0	10. 68212	9. 32747	0	0	10. 67253	10. 00960	0	0	9. 99040	60
1	847	1	1	153	810	1	1	190	962	1	0	038	59
2	907	2	2	093	872	2	2	128	965	2	0	035	58
3	9. 31966	3	3	10. 68034	933	3	3	067	968	3	0	032	57
4	9. 32025	4	4	10. 67975	9. 32995	4	4	10. 67005	970	4	0	030	56
5	084	5	5	916	9. 33057	5	5	10. 66943	973	5	0	027	55
6	143	6	6	857	119	6	6	881	976	6	0	024	54
7	202	7	7	798	180	7	7	820	10. 00978	7	0	9. 99022	53
8	261	8	8	739	242	8	8	758	981	8	0	019	52
9	319	9	9	681	303	9	9	697	984	9	0	016	51
10	378	10	10	622	365	10	10	635	987	10	0	013	50
11	437	11	10	563	426	11	11	574	989	11	1	011	49
12	9. 32495	12	11	10. 67505	9. 33487	12	12	10. 66513	992	12	1	008	48
13	553	13	12	447	548	13	13	452	995	13	1	005	47
14	612	14	13	388	609	14	14	391	10. 00998	14	1	002	46
15	670	15	14	330	670	15	15	330	10. 01000	15	1	9. 99000	45
16	728	16	15	272	731	16	16	269	003	16	1	9. 98997	44
17	786	17	16	214	792	17	17	208	006	17	1	994	43
18	844	18	17	156	853	18	18	147	009	18	1	991	42
19	902	19	18	098	913	19	19	087	011	19	1	989	41
20	9. 32960	20	19	10. 67040	9. 33974	20	20	10. 66026	014	20	1	986	40
21	9. 33018	21	20	10. 66982	9. 34034	21	21	10. 65966	017	21	1	983	39
22	075	22	21	925	095	22	22	905	020	22	1	980	38
23	133	23	22	867	155	23	23	845	022	23	1	978	37
24	190	24	23	810	215	24	24	785	10. 01025	24	1	9. 98975	36
25	248	25	24	752	276	25	25	724	028	25	1	972	35
26	305	26	25	695	336	26	26	664	031	26	1	969	34
27	362	27	26	638	396	27	27	604	033	27	1	967	33
28	420	28	27	580	456	28	28	544	036	28	1	964	32
29	477	29	28	523	9. 34516	29	29	10. 65484	039	29	1	961	31
30	9. 33534	30	29	10. 66466	576	30	30	424	042	30	1	958	30
31	591	31	29	409	635	31	31	365	045	31	1	9. 98955	29
32	647	32	30	353	695	32	32	305	10. 01047	32	1	953	28
33	704	33	31	296	755	33	33	245	050	33	2	950	27
34	761	34	32	239	814	34	34	186	053	34	2	947	26
35	818	35	33	182	874	35	35	126	056	35	2	944	25
36	874	36	34	126	933	36	36	067	059	36	2	941	24
37	931	37	35	069	9. 34992	37	37	10. 65008	062	37	2	938	23
38	9. 33987	38	36	10. 66013	9. 35051	38	38	10. 64949	10. 01064	38	2	9. 98936	22
39	9. 34043	39	37	10. 65957	111	39	39	889	067	39	2	933	21
40	100	40	38	900	170	40	40	830	070	40	2	930	20
41	156	41	39	844	229	41	41	771	073	41	2	927	19
42	212	42	40	788	288	42	42	712	076	42	2	924	18
43	268	43	41	732	347	43	43	653	079	43	2	921	17
44	324	44	42	676	405	44	44	595	081	44	2	919	16
45	380	45	43	620	464	45	45	536	10. 01084	45	2	9. 98916	15
46	436	46	44	564	9. 35523	46	46	10. 64477	087	46	2	913	14
47	491	47	45	509	581	47	47	419	090	47	2	910	13
48	9. 34547	48	46	10. 65453	640	48	48	360	093	48	2	907	12
49	602	49	47	398	698	49	49	302	096	49	2	904	11
50	658	50	48	342	757	50	50	243	099	50	2	901	10
51	713	51	48	287	815	51	51	185	102	51	2	898	9
52	769	52	49	231	873	52	52	127	10. 01104	52	2	9. 98896	8
53	824	53	50	176	931	53	53	069	107	53	2	893	7
54	879	54	51	121	9. 35989	54	54	10. 64011	110	54	3	890	6
55	934	55	52	066	9. 36047	55	55	10. 63953	113	55	3	887	5
56	9. 34989	56	53	10. 65011	105	56	56	895	116	56	3	884	4
57	9. 35044	57	54	10. 64956	163	57	57	837	119	57	3	881	3
58	099	58	55	901	221	58	58	779	122	58	3	878	2
59	154	59	56	846	279	59	59	721	125	59	3	875	1
60	9. 35209	60	57	10. 64791	9. 36336	60	60	10. 63664	10. 01128	60	3	9. 98872	0
′ ↑ 102° →	cos	″	Diff.	sec	cot	″	Diff.	tan	csc	″	Diff.	sin	← 77° ′ ↑

TABLE 33.

Logarithms of Trigonometric Functions.

13°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←166° ′
0	9. 35209	0	0	10. 64791	9. 36336	0	0	10. 63664	10. 01128	0	0	9. 98872	60
1	263	1	1	737	394	1	1	606	131	1	0	869	59
2	318	2	2	682	452	2	2	548	133	2	0	867	58
3	373	3	3	627	509	3	3	491	136	3	0	864	57
4	427	4	4	573	566	4	4	434	139	4	0	861	56
5	481	5	4	519	9. 36624	5	5	10. 63376	142	5	0	858	55
6	536	6	5	464	681	6	6	319	145	6	0	855	54
7	9. 35590	7	6	10. 64410	738	7	6	262	148	7	0	852	53
8	644	8	7	356	795	8	7	205	151	8	0	849	52
9	698	9	8	302	852	9	8	148	154	9	0	846	51
10	752	10	9	248	909	10	9	091	10. 01157	10	1	9. 98843	50
11	806	11	10	194	9. 36966	11	10	10. 63034	160	11	1	840	49
12	860	12	11	140	9. 37023	12	11	10. 62977	163	12	1	837	48
13	914	13	11	086	080	13	12	920	166	13	1	834	47
14	9. 35968	14	12	10. 64032	137	14	13	863	169	14	1	831	46
15	9. 36022	15	13	10. 63978	193	15	14	807	172	15	1	828	45
16	075	16	14	925	250	16	15	750	175	16	1	825	44
17	129	17	15	871	306	17	16	694	178	17	1	822	43
18	182	18	16	818	363	18	17	637	181	18	1	819	42
19	236	19	17	764	419	19	18	581	184	19	1	816	41
20	289	20	18	711	9. 37476	20	19	10. 62524	10. 01187	20	1	9. 98813	40
21	342	21	18	658	532	21	19	468	190	21	1	810	39
22	395	22	19	605	588	22	20	412	193	22	1	807	38
23	449	23	20	551	644	23	21	356	196	23	1	804	37
24	9. 36502	24	21	10. 63498	700	24	22	300	199	24	1	801	36
25	555	25	22	445	756	25	23	244	202	25	1	798	35
26	608	26	23	392	812	26	24	188	205	26	1	795	34
27	660	27	24	340	868	27	25	132	208	27	1	792	33
28	713	28	25	287	924	28	26	076	211	28	1	789	32
29	766	29	25	234	9. 37980	29	27	10. 62020	214	29	1	786	31
30	819	30	26	181	9. 38035	30	28	10. 61965	10. 01217	30	2	9. 98783	30
31	871	31	27	129	091	31	29	909	220	31	2	780	29
32	924	32	28	076	147	32	30	853	223	32	2	777	28
33	9. 36976	33	29	10. 63024	202	33	31	798	226	33	2	774	27
34	9. 37028	34	30	10. 62972	257	34	32	743	229	34	2	771	26
35	081	35	31	919	313	35	32	687	232	35	2	768	25
36	133	36	32	867	368	36	33	632	235	36	2	765	24
37	185	37	32	815	423	37	34	577	238	37	2	762	23
38	237	38	33	763	479	38	35	521	241	38	2	759	22
39	289	39	34	711	9. 38534	39	36	10. 61466	244	39	2	756	21
40	341	40	35	659	589	40	37	411	10. 01247	40	2	9. 98753	20
41	393	41	36	607	644	41	38	356	250	41	2	750	19
42	445	42	37	555	699	42	39	301	254	42	2	746	18
43	9. 37497	43	38	10. 62503	754	43	40	246	257	43	2	743	17
44	549	44	39	451	808	44	41	192	260	44	2	740	16
45	600	45	39	400	863	45	42	137	263	45	2	737	15
46	652	46	40	348	918	46	43	082	266	46	2	734	14
47	703	47	41	297	9. 38972	47	44	10. 61028	269	47	2	731	13
48	755	48	42	245	9. 39027	48	45	10. 60973	272	48	2	728	12
49	806	49	43	194	082	49	45	918	275	49	2	725	11
50	858	50	44	142	136	50	46	864	10. 01278	50	3	9. 98722	10
51	909	51	45	091	190	51	47	810	281	51	3	719	9
52	9. 37960	52	46	10. 62040	245	52	48	755	285	52	3	715	8
53	9. 38011	53	47	10. 61989	299	53	49	701	288	53	3	712	7
54	062	54	47	938	9. 39353	54	50	10. 60647	291	54	3	709	6
55	113	55	48	887	407	55	51	593	294	55	3	706	5
56	164	56	49	836	461	56	52	539	297	56	3	703	4
57	215	57	50	785	515	57	53	485	300	57	3	700	3
58	266	58	51	734	569	58	54	431	303	58	3	697	2
59	317	59	52	683	623	59	55	377	306	59	3	694	1
60	9. 38368	60	53	10. 61632	9. 39677	60	56	10. 60323	10. 01310	60	3	9. 98690	0
↑ ′ 103°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	↑ ′ ←76°

Logarithms of Trigonometric Functions.

14°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←165° ′
0	9. 38368	*0*	0	10. 61632	9. 39677	*0*	0	10. 60323	10. 01310	*0*	0	9. 98690	**60**
1	418	*1*	1	582	731	*1*	1	269	313	*1*	0	687	59
2	469	*2*	**2**	531	785	*2*	2	215	316	*2*	0	684	58
3	519	*3*	2	481	838	*3*	3	162	319	*3*	0	681	57
4	570	*4*	3	430	892	*4*	**3**	108	322	*4*	0	678	56
5	620	*5*	4	380	945	*5*	4	055	325	*5*	0	675	55
6	9. 38670	*6*	5	10. 61330	9. 39999	*6*	5	10. 60001	329	*6*	0	671	54
7	721	*7*	6	279	9. 40052	*7*	6	10. 59948	332	*7*	0	668	53
8	771	*8*	**7**	229	106	*8*	7	894	335	*8*	0	665	52
9	821	*9*	7	179	159	*9*	8	841	338	*9*	0	662	51
10	871	*10*	8	129	212	*10*	9	788	10. 01341	*10*	1	9. 98659	**50**
11	921	*11*	9	079	266	*11*	10	734	344	*11*	1	656	49
12	9. 38971	*12*	10	10. 61029	319	*12*	**10**	681	348	*12*	1	652	48
13	9. 39021	*13*	11	10. 60979	372	*13*	11	628	351	*13*	1	649	47
14	071	*14*	**11**	929	425	*14*	12	575	354	*14*	1	646	46
15	121	*15*	12	879	9. 40478	*15*	13	10. 59522	357	*15*	1	643	45
16	170	*16*	13	830	531	*16*	14	469	360	*16*	1	640	44
17	220	*17*	14	780	584	*17*	15	416	364	*17*	1	636	43
18	270	*18*	**15**	730	636	*18*	16	364	367	*18*	**1**	633	42
19	319	*19*	15	681	689	*19*	17	311	370	*19*	1	630	41
20	369	*20*	16	631	742	*20*	**17**	258	10. 01373	*20*	1	9. 98627	**40**
21	418	*21*	17	582	795	*21*	18	205	377	*21*	1	623	39
22	9. 39467	*22*	18	10. 60533	847	*22*	19	153	380	*22*	1	620	38
23	517	*23*	19	483	900	*23*	20	100	383	*23*	1	617	37
24	566	*24*	**20**	434	9. 40952	*24*	21	10. 59048	386	*24*	1	614	36
25	615	*25*	20	385	9. 41005	*25*	22	10. 58995	390	*25*	1	610	35
26	664	*26*	21	336	057	*26*	**23**	943	393	*26*	1	607	34
27	713	*27*	22	287	109	*27*	23	891	396	*27*	1	604	**33**
28	762	*28*	23	238	161	*28*	24	839	399	*28*	2	601	32
29	811	*29*	24	189	214	*29*	25	786	403	*29*	2	597	31
30	860	*30*	**24**	140	266	*30*	26	734	10. 01406	*30*	2	9. 98594	**30**
31	909	*31*	25	091	318	*31*	27	682	409	*31*	2	591	29
32	9. 39958	*32*	26	10. 60042	370	*32*	28	630	412	*32*	2	588	28
33	9. 40006	*33*	27	10. 59994	422	*33*	29	578	416	*33*	2	584	27
34	055	*34*	28	945	474	*34*	**30**	526	419	*34*	2	581	26
35	103	*35*	29	897	9. 41526	*35*	30	10. 58474	422	*35*	2	578	25
36	152	*36*	**29**	848	578	*36*	31	422	426	*36*	**2**	574	24
37	200	*37*	30	800	629	*37*	32	371	429	*37*	2	571	23
38	249	*38*	31	751	681	*38*	33	319	432	*38*	2	568	22
39	297	*39*	32	703	733	*39*	34	267	435	*39*	2	565	21
40	346	*40*	**33**	654	784	*40*	35	216	10. 01439	*40*	2	9. 98561	**20**
41	394	*41*	33	606	836	*41*	36	164	442	*41*	2	558	19
42	442	*42*	34	558	887	*42*	**36**	113	445	*42*	2	555	18
43	9. 40490	*43*	35	10. 59510	939	*43*	37	061	449	*43*	2	551	17
44	538	*44*	36	462	9. 41990	*44*	38	10. 58010	452	*44*	2	548	16
45	586	*45*	37	414	9. 42041	*45*	39	10. 57959	455	*45*	2	545	15
46	634	*46*	**37**	366	093	*46*	40	907	459	*46*	3	541	14
47	682	*47*	38	318	144	*47*	41	856	462	*47*	3	538	13
48	730	*48*	39	270	195	*48*	42	805	465	*48*	3	535	12
49	778	*49*	40	222	246	*49*	43	754	469	*49*	3	531	11
50	825	*50*	41	175	297	*50*	**43**	703	10. 01472	*50*	3	9. 98528	**10**
51	873	*51*	42	127	348	*51*	44	652	475	*51*	3	525	9
52	921	*52*	**42**	079	399	*52*	45	601	479	*52*	3	521	8
53	9. 40968	*53*	43	10. 59032	9. 42450	*53*	46	10. 57550	482	*53*	**3**	518	7
54	9. 41016	*54*	44	10. 58984	501	*54*	47	499	485	*54*	3	515	6
55	063	*55*	45	937	552	*55*	48	448	489	*55*	3	511	5
56	111	*56*	**46**	889	603	*56*	49	397	492	*56*	3	508	4
57	158	*57*	46	842	653	*57*	50	347	495	*57*	3	505	3
58	205	*58*	47	795	704	*58*	**50**	296	499	*58*	3	501	2
59	252	*59*	48	748	755	*59*	51	245	502	*59*	3	498	1
60	9. 41300	*60*	49	10. 58700	9. 42805	*60*	52	10. 57195	10. 01506	*60*	3	9. 98494	**0**
′ ↑ 104°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←75°

TABLE 33.

Logarithms of Trigonometric Functions.

15°→ ′	sin	″	Diff.	csc	tan	″	Diff.	cot	sec	″	Diff.	cos	←164° ′
0	9. 41300	0	0	10. 58700	9. 42805	0	0	10. 57195	10. 01506	0	0	9. 98494	60
1	347	1	1	653	856	1	1	144	509	1	0	491	59
2	394	2	2	606	906	2	2	094	512	2	0	488	58
3	441	3	2	559	9. 42957	3	2	10. 57043	516	3	0	484	57
4	488	4	3	512	9. 43007	4	3	10. 56993	519	4	0	481	56
5	535	5	4	465	057	5	4	943	523	5	0	477	55
6	582	6	5	418	108	6	5	892	526	6	0	474	54
7	9. 41628	7	5	10. 58372	158	7	6	842	529	7	0	471	53
8	675	8	6	325	208	8	7	792	533	8	0	467	52
9	722	9	7	278	258	9	7	742	536	9	1	464	51
10	768	10	8	232	308	10	8	692	10. 01540	10	1	9. 98460	50
11	815	11	8	185	358	11	9	642	543	11	1	457	49
12	861	12	9	139	408	12	10	592	547	12	1	453	48
13	908	13	10	092	458	13	11	542	550	13	1	450	47
14	9. 41954	14	11	10. 58046	9. 43508	14	11	10. 56492	553	14	1	447	46
15	9. 42001	15	11	10. 57999	558	15	12	442	557	15	1	443	45
16	047	16	12	953	607	16	13	393	560	16	1	440	44
17	093	17	13	907	657	17	14	343	564	17	1	436	43
18	140	18	14	860	707	18	15	293	567	18	1	433	42
19	186	19	14	814	756	19	16	244	571	19	1	429	41
20	232	20	15	768	806	20	16	194	10. 01574	20	1	9. 98426	40
21	278	21	16	722	855	21	17	145	578	21	1	422	39
22	324	22	17	676	905	22	18	095	581	22	1	419	38
23	370	23	17	630	9. 43954	23	19	10. 56046	585	23	1	415	37
24	416	24	18	584	9. 44004	24	20	10. 55996	588	24	1	412	36
25	9 42461	25	19	10. 57539	053	25	20	947	591	25	1	409	35
26	507	26	20	493	102	26	21	898	595	26	2	405	34
27	553	27	21	447	151	27	22	849	598	27	2	402	33
28	599	28	21	401	201	28	23	799	602	28	2	398	32
29	644	29	22	356	250	29	24	750	605	29	2	395	31
30	690	30	23	310	299	30	25	701	10. 01609	30	2	9. 98391	30
31	735	31	24	265	348	31	25	652	612	31	2	388	29
32	781	32	24	219	397	32	26	603	616	32	2	384	28
33	826	33	25	174	446	33	27	554	619	33	2	381	27
34	872	34	26	128	9. 44495	34	28	10. 55505	623	34	2	377	26
35	917	35	27	083	544	35	29	456	627	35	2	373	25
36	9. 42962	36	27	10. 57038	592	36	29	408	630	36	2	370	24
37	9. 43008	37	28	10 56992	641	37	30	359	634	37	2	366	23
38	053	38	29	947	690	38	31	310	637	38	2	363	22
39	098	39	30	902	738	39	32	262	641	39	2	359	21
40	143	40	30	857	787	40	33	213	10. 01644	40	2	9. 98356	20
41	188	41	31	812	836	41	34	164	648	41	2	352	19
42	233	42	32	767	884	42	34	116	651	42	2	349	18
43	278	43	33	722	933	43	35	067	655	43	3	345	17
44	323	44	33	677	9. 44981	44	36	10. 55019	658	44	3	342	16
45	367	45	34	633	9. 45029	45	37	10. 54971	662	45	3	338	15
46	412	46	35	588	078	46	38	922	666	46	3	334	14
47	457	47	36	543	126	47	38	874	669	47	3	331	13
48	9. 43502	48	36	10. 56498	174	48	39	826	673	48	3	327	12
49	546	49	37	454	222	49	40	778	676	49	3	324	11
50	591	50	38	409	271	50	41	729	10. 01680	50	3	9. 98320	10
51	635	51	39	365	319	51	42	681	683	51	3	317	9
52	680	52	39	320	367	52	43	633	687	52	3	313	8
53	724	53	40	276	9. 45415	53	43	10. 54585	691	53	3	309	7
54	769	54	41	231	463	54	44	537	694	54	3	306	6
55	813	55	42	187	511	55	45	489	698	55	3	302	5
56	857	56	43	143	559	56	46	441	701	56	3	299	4
57	901	57	43	099	606	57	47	394	705	57	3	295	3
58	946	58	44	054	654	58	47	346	709	58	3	291	2
59	9. 43990	59	45	10. 56010	702	59	48	298	712	59	3	288	1
60	9. 44034	60	46	10. 55966	9. 45750	60	49	10. 54250	10. 01716	60	4	9. 98284	0
′ ↑ 105°→	cos	″	Diff.	sec	cot	″	Diff.	tan	csc	″	Diff.	sin	′ ↑ ←74°

Logarithms of Trigonometric Functions.

16°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←163° ′ ↓
0	9. 44034	0	0	10. 55966	9. 45750	0	0	10. 54250	10. 01716	0	0	9. 98284	60
1	078	1	1	922	797	1	1	203	719	1	0	281	59
2	122	2	1	878	845	2	2	155	723	2	0	277	58
3	166	3	2	834	892	3	2	108	727	3	0	273	57
4	210	4	3	790	940	4	3	060	730	4	0	270	56
5	253	5	4	747	9. 45987	5	4	10. 54013	734	5	0	266	55
6	297	6	4	703	9. 46035	6	5	10. 53965	738	6	0	262	54
7	9. 44341	7	5	10. 55659	082	7	5	918	741	7	0	259	53
8	385	8	6	615	130	8	6	870	745	8	0	255	52
9	428	9	6	572	177	9	7	823	749	9	1	251	51
10	472	10	7	528	224	10	8	776	10. 01752	10	1	9. 98248	50
11	516	11	8	484	271	11	9	729	756	11	1	244	49
12	559	12	9	441	319	12	9	681	760	12	1	240	48
13	602	13	9	398	366	13	10	634	763	13	1	237	47
14	646	14	10	354	413	14	11	587	767	14	1	233	46
15	9. 44689	15	11	10. 55311	460	15	12	540	771	15	1	229	45
16	733	16	11	267	9. 46507	16	12	10. 53493	774	16	1	226	44
17	776	17	12	224	554	17	13	446	778	17	1	222	43
18	819	18	13	181	601	18	14	399	782	18	1	218	42
19	862	19	14	138	648	19	15	352	785	19	1	215	41
20	905	20	14	095	694	20	15	306	10. 01789	20	1	9. 98211	40
21	948	21	15	052	741	21	16	259	793	21	1	207	39
22	9. 44992	22	16	10. 55008	788	22	17	212	796	22	1	204	38
23	9. 45035	23	16	10. 54965	835	23	18	165	800	23	1	200	37
24	077	24	17	923	881	24	19	119	804	24	1	196	36
25	120	25	18	880	928	25	19	072	808	25	2	192	35
26	163	26	18	837	9. 46975	26	20	10. 53025	811	26	2	189	34
27	206	27	19	794	9. 47021	27	21	10. 52979	815	27	2	185	33
28	249	28	20	751	068	28	22	932	819	28	2	181	32
29	292	29	21	708	114	29	22	886	823	29	2	177	31
30	9. 45334	30	21	10. 54666	160	30	23	840	10. 01826	30	2	9. 98174	30
31	377	31	22	623	207	31	24	793	830	31	2	170	29
32	419	32	23	581	253	32	25	747	834	32	2	166	28
33	462	33	23	538	299	33	26	701	838	33	2	162	27
34	504	34	24	496	346	34	26	654	841	34	2	159	26
35	547	35	25	453	392	35	27	608	845	35	2	155	25
36	589	36	26	411	438	36	28	562	849	36	2	151	24
37	632	37	26	368	484	37	29	516	853	37	2	147	23
38	9. 45674	38	27	10. 54326	9. 47530	38	29	10. 52470	856	38	2	144	22
39	716	39	28	284	576	39	30	424	860	39	2	140	21
40	758	40	28	242	622	40	31	378	10. 01864	40	2	9. 98136	20
41	801	41	29	199	668	41	32	332	868	41	3	132	19
42	843	42	30	157	714	42	32	286	871	42	3	129	18
43	885	43	31	115	760	43	33	240	875	43	3	125	17
44	927	44	31	073	806	44	34	194	879	44	3	121	16
45	9. 45969	45	32	10. 54031	852	45	35	148	883	45	3	117	15
46	9. 46011	46	33	10. 53989	897	46	36	103	887	46	3	113	14
47	053	47	33	947	943	47	36	057	890	47	3	110	13
48	095	48	34	905	9. 47989	48	37	10. 52011	894	48	3	106	12
49	136	49	35	864	9. 48035	49	38	10. 51965	898	49	3	102	11
50	178	50	36	822	080	50	39	920	10. 01902	50	3	9. 98098	10
51	220	51	36	780	126	51	39	874	906	51	3	094	9
52	262	52	37	738	171	52	40	829	910	52	3	090	8
53	9. 46303	53	38	10. 53697	217	53	41	783	913	53	3	087	7
54	345	54	38	655	262	54	42	738	917	54	3	083	6
55	386	55	39	614	307	55	43	693	921	55	3	079	5
56	428	56	40	572	353	56	43	647	925	56	3	075	4
57	469	57	41	531	398	57	44	602	929	57	4	071	3
58	511	58	41	489	443	58	45	557	933	58	4	067	2
59	552	59	42	448	489	59	46	511	937	59	4	063	1
60	9. 46594	60	43	10. 53406	9. 48534	60	46	10. 51466	10. 01940	60	4	9. 98060	0
′ ↑ 106°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←73°

TABLE 33.

Logarithms of Trigonometric Functions.

17°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←162° ′ ↓
0	9. 46594	0	0	10. 53406	9. 48534	0	0	10. 51466	10. 01940	0	0	9. 98060	60
1	635	1	1	365	579	1	1	421	944	1	0	056	59
2	676	2	1	324	624	2	1	376	948	2	0	052	58
3	717	3	2	283	669	3	2	331	952	3	0	048	57
4	758	4	3	242	714	4	3	286	956	4	0	044	56
5	800	5	3	200	759	5	4	241	960	5	0	040	55
6	841	6	4	159	804	6	4	196	964	6	0	036	54
7	882	7	5	118	849	7	5	151	10. 01968	7	0	9. 98032	53
8	923	8	5	077	894	8	6	106	971	8	1	029	52
9	9. 46964	9	6	10. 53036	939	9	7	061	975	9	1	025	51
10	9. 47005	10	7	10. 52995	9. 48984	10	7	10. 51016	979	10	1	021	50
11	045	11	7	955	9. 49029	11	8	10. 50971	983	11	1	017	49
12	086	12	8	914	073	12	9	927	987	12	1	013	48
13	127	13	9	873	118	13	10	882	991	13	1	009	47
14	168	14	9	832	163	14	10	837	995	14	1	005	46
15	209	15	10	791	207	15	11	793	10. 01999	15	1	9. 98001	45
16	249	16	11	751	252	16	12	748	10. 02003	16	1	9. 97997	44
17	290	17	11	710	296	17	12	704	007	17	1	993	43
18	9. 47330	18	12	10. 52670	341	18	13	659	011	18	1	989	42
19	371	19	13	629	385	19	14	615	014	19	1	986	41
20	411	20	13	589	430	20	15	570	018	20	1	982	40
21	452	21	14	548	9. 49474	21	15	10. 50526	022	21	1	978	39
22	492	22	15	508	519	22	16	481	026	22	1	974	38
23	533	23	15	467	563	23	17	437	030	23	2	970	37
24	573	24	16	427	607	24	18	393	10. 02034	24	2	9. 97966	36
25	613	25	17	387	652	25	18	348	038	25	2	962	35
26	9. 47654	26	17	10. 52346	696	26	19	304	042	26	2	958	34
27	694	27	18	306	740	27	20	260	046	27	2	954	33
28	734	28	19	266	784	28	21	216	050	28	2	950	32
29	774	29	19	226	828	29	21	172	054	29	2	946	31
30	814	30	20	186	872	30	22	128	058	30	2	942	30
31	854	31	21	146	916	31	23	084	062	31	2	938	29
32	894	32	21	106	9. 49960	32	24	10. 50040	066	32	2	934	28
33	934	33	22	066	9. 50004	33	24	10. 49996	10. 02070	33	2	9. 97930	27
34	9. 47974	34	23	10. 52026	048	34	25	952	074	34	2	926	26
35	9. 48014	35	23	10. 51986	092	35	26	908	078	35	2	922	25
36	054	36	24	946	136	36	26	864	082	36	2	918	24
37	094	37	25	906	180	37	27	820	086	37	2	914	23
38	133	38	25	867	223	38	28	777	090	38	3	910	22
39	173	39	26	827	267	39	29	733	094	39	3	906	21
40	213	40	27	787	311	40	29	689	098	40	3	902	20
41	252	41	27	748	355	41	30	645	102	41	3	898	19
42	292	42	28	708	398	42	31	602	10. 02106	42	3	9. 97894	18
43	9. 48332	43	29	10. 51668	442	43	32	558	110	43	3	890	17
44	371	44	29	629	9. 50485	44	32	10. 49515	114	44	3	886	16
45	411	45	30	589	529	45	33	471	118	45	3	882	15
46	450	46	31	550	572	46	34	428	122	46	3	878	14
47	490	47	31	510	616	47	35	384	126	47	3	874	13
48	529	48	32	471	659	48	35	341	130	48	3	870	12
49	568	49	33	432	703	49	36	297	134	49	3	866	11
50	607	50	33	393	746	50	37	254	139	50	3	861	10
51	9. 48647	51	34	10. 51353	789	51	37	211	10. 02143	51	3	9. 97857	9
52	686	52	35	314	833	52	38	167	147	52	3	853	8
53	725	53	35	275	876	53	39	124	151	53	4	849	7
54	764	54	36	236	919	54	40	081	155	54	4	845	6
55	803	55	37	197	9. 50962	55	40	10. 49038	159	55	4	841	5
56	842	56	37	158	9. 51005	56	41	10. 48995	163	56	4	837	4
57	881	57	38	119	048	57	42	952	167	57	4	833	3
58	920	58	39	080	092	58	43	908	171	58	4	829	2
59	959	59	39	041	135	59	43	865	175	59	4	825	1
60	9. 48998	60	40	10. 51002	9. 51178	60	44	10. 48822	10. 02179	60	4	9. 97821	0
′ ↑ 107°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←72°

Logarithms of Trigonometric Functions.

18°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←161° ′
0	9. 48998	0	0	10. 51002	9. 51178	0	0	10. 48822	10. 02179	0	0	9. 97821	60
1	9. 49037	1	1	10. 50963	221	1	1	779	183	1	0	817	59
2	076	2	1	924	264	2	1	736	188	2	0	812	58
3	115	3	2	885	306	3	2	694	192	3	0	808	57
4	153	4	3	847	349	4	3	651	196	4	0	804	56
5	192	5	3	808	392	5	3	608	200	5	0	800	55
6	231	6	4	769	435	6	4	565	204	6	0	796	54
7	269	7	4	731	478	7	5	522	208	7	0	792	53
8	308	8	5	692	520	8	6	480	212	8	1	788	52
9	347	9	6	653	563	9	6	437	216	9	1	784	51
10	9. 49385	10	6	10. 50615	9. 51606	10	7	10. 48394	10. 02221	10	1	9. 97779	50
11	424	11	7	576	648	11	8	352	225	11	1	775	49
12	462	12	8	538	691	12	8	309	229	12	1	771	48
13	500	13	8	500	734	13	9	266	233	13	1	767	47
14	539	14	9	461	776	14	10	224	237	14	1	763	46
15	577	15	9	423	819	15	10	181	241	15	1	759	45
16	615	16	10	385	861	16	11	139	246	16	1	754	44
17	654	17	11	346	903	17	12	097	250	17	1	750	43
18	9. 49692	18	11	10. 50308	946	18	13	054	254	18	1	746	42
19	730	19	12	270	9. 51988	19	13	10. 48012	258	19	1	742	41
20	768	20	13	232	9. 52031	20	14	10. 47969	10. 02262	20	1	9. 97738	40
21	806	21	13	194	073	21	15	927	266	21	1	734	39
22	844	22	14	156	115	22	15	885	271	22	2	729	38
23	882	23	14	118	157	23	16	843	275	23	2	725	37
24	920	24	15	080	200	24	17	800	279	24	2	721	36
25	958	25	16	042	242	25	17	758	283	25	2	717	35
26	9. 49996	26	16	10. 50004	284	26	18	716	287	26	2	713	34
27	9. 50034	27	17	10. 49966	9. 52326	27	19	10. 47674	292	27	2	708	33
28	072	28	18	928	368	28	20	632	296	28	2	704	32
29	110	29	18	890	410	29	20	590	300	29	2	700	31
30	148	30	19	852	452	30	21	548	10. 02304	30	2	9. 97696	30
31	185	31	20	815	494	31	22	506	309	31	2	691	29
32	223	32	20	777	536	32	22	464	313	32	2	687	28
33	261	33	21	739	578	33	23	422	317	33	2	683	27
34	298	34	21	702	620	34	24	380	321	34	2	679	26
35	9. 50336	35	22	10. 49664	9. 52661	35	24	10. 47339	326	35	2	674	25
36	374	36	23	626	703	36	25	297	330	36	3	670	24
37	411	37	23	589	745	37	26	255	334	37	3	666	23
38	449	38	24	551	787	38	27	213	338	38	3	662	22
39	486	39	25	514	829	39	27	171	343	39	3	657	21
40	523	40	25	477	870	40	28	130	10. 02347	40	3	9. 97653	20
41	561	41	26	439	912	41	29	088	351	41	3	649	19
42	598	42	26	402	953	42	29	047	355	42	3	645	18
43	635	43	27	365	9. 52995	43	30	10. 47005	360	43	3	640	17
44	9. 50673	44	28	10. 49327	9. 53037	44	31	10. 46963	364	44	3	636	16
45	710	45	28	290	078	45	31	922	368	45	3	632	15
46	747	46	29	253	120	46	32	880	372	46	3	628	14
47	784	47	30	216	161	47	33	839	377	47	3	623	13
48	821	48	30	179	202	48	34	798	381	48	3	619	12
49	858	49	31	142	244	49	34	756	385	49	3	615	11
50	896	50	31	104	285	50	35	715	10. 02390	50	4	9. 97610	10
51	933	51	32	067	327	51	36	673	394	51	4	606	9
52	9. 50970	52	33	10. 49030	9. 53368	52	36	10. 46632	398	52	4	602	8
53	9. 51007	53	33	10. 48993	409	53	37	591	403	53	4	597	7
54	043	54	34	957	450	54	38	550	407	54	4	593	6
55	080	55	35	920	492	55	38	508	411	55	4	589	5
56	117	56	35	883	533	56	39	467	416	56	4	584	4
57	154	57	36	846	574	57	40	426	420	57	4	580	3
58	191	58	37	809	615	58	41	385	424	58	4	576	2
59	227	59	37	773	656	59	41	344	429	59	4	571	1
60	9. 51264	60	38	10. 48736	9. 53697	60	42	10. 46303	10. 02433	60	4	9. 97567	0
′													′
108°→ cos		″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	←71°

TABLE 33.

Logarithms of Trigonometric Functions.

19°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←160° ′
0	9. 51264	0	0	10. 48736	9. 53697	0	0	10. 46303	10. 02433	0	0	9. 97567	60
1	301	1	1	699	738	1	1	262	437	1	0	563	59
2	338	2	1	662	779	2	1	221	442	2	0	558	58
3	374	3	2	626	820	3	2	180	446	3	0	554	57
4	411	4	2	589	861	4	3	139	450	4	0	550	56
5	447	5	3	553	902	5	3	098	455	5	0	545	55
6	484	6	4	516	943	6	4	057	459	6	0	541	54
7	520	7	4	480	9. 53984	7	5	10. 46016	464	7	1	536	53
8	557	8	5	443	9. 54025	8	5	10. 45975	468	8	1	532	52
9	593	9	5	407	065	9	6	935	472	9	1	528	51
10	9. 51629	10	6	10. 48371	106	10	7	894	10. 02477	10	1	9. 97523	50
11	666	11	7	334	147	11	7	853	481	11	1	519	49
12	702	12	7	298	187	12	8	813	485	12	1	515	48
13	738	13	8	262	228	13	9	772	490	13	1	510	47
14	774	14	8	226	269	14	9	731	494	14	1	506	46
15	811	15	9	189	309	15	10	691	499	15	1	501	45
16	847	16	10	153	9. 54350	16	11	10. 45650	503	16	1	497	44
17	883	17	10	117	390	17	11	610	508	17	1	492	43
18	919	18	11	081	431	18	12	569	512	18	1	488	42
19	955	19	11	045	471	19	13	529	516	19	1	484	41
20	9. 51991	20	12	10. 48009	512	20	13	488	10. 02521	20	1	9. 97479	40
21	9. 52027	21	12	10. 47973	552	21	14	448	525	21	2	475	39
22	063	22	13	937	593	22	15	407	530	22	2	470	38
23	099	23	14	901	633	23	15	367	534	23	2	466	37
24	135	24	14	865	9. 54673	24	16	10. 45327	539	24	2	461	36
25	171	25	15	829	714	25	17	286	543	25	2	457	35
26	207	26	15	793	754	26	17	246	547	26	2	453	34
27	242	27	16	758	794	27	18	206	552	27	2	448	33
28	278	28	17	722	835	28	19	165	556	28	2	444	32
29	314	29	17	686	875	29	19	125	561	29	2	439	31
30	9. 52350	30	18	10. 47650	915	30	20	085	10. 02565	30	2	9. 97435	30
31	385	31	18	615	955	31	21	045	570	31	2	430	29
32	421	32	19	579	9. 54995	32	21	10. 45005	574	32	2	426	28
33	456	33	20	544	9. 55035	33	22	10. 44965	579	33	2	421	27
34	492	34	20	508	075	34	23	925	583	34	3	417	26
35	527	35	21	473	115	35	23	885	588	35	3	412	25
36	563	36	21	437	155	36	24	845	592	36	3	408	24
37	598	37	22	402	195	37	25	805	597	37	3	403	23
38	634	38	23	366	235	38	25	765	601	38	3	399	22
39	9. 52669	39	23	10. 47331	275	39	26	725	606	39	3	394	21
40	705	40	24	295	315	40	27	685	10. 02610	40	3	9. 97390	20
41	740	41	24	260	9. 55355	41	27	10. 44645	615	41	3	385	19
42	775	42	25	225	395	42	28	605	619	42	3	381	18
43	811	43	26	189	434	43	29	566	624	43	3	376	17
44	846	44	26	154	474	44	29	526	628	44	3	372	16
45	881	45	27	119	514	45	30	486	633	45	3	367	15
46	916	46	27	084	554	46	31	446	637	46	3	363	14
47	951	47	28	049	593	47	31	407	642	47	3	358	13
48	9. 52986	48	29	10. 47014	633	48	32	367	647	48	4	353	12
49	9. 53021	49	29	10. 46979	9. 55673	49	33	10. 44327	651	49	4	349	11
50	056	50	30	944	712	50	33	288	10. 02656	50	4	9. 97344	10
51	092	51	30	908	752	51	34	248	660	51	4	340	9
52	126	52	31	874	791	52	35	209	665	52	4	335	8
53	161	53	32	839	831	53	35	169	669	53	4	331	7
54	196	54	32	804	870	54	36	130	674	54	4	326	6
55	231	55	33	769	910	55	37	090	678	55	4	322	5
56	266	56	33	734	949	56	37	051	683	56	4	317	4
57	301	57	34	699	9. 55989	57	38	10. 44011	688	57	4	312	3
58	336	58	34	664	9. 56028	58	39	10. 43972	692	58	4	308	2
59	370	59	35	630	067	59	39	933	697	59	4	303	1
60	9. 53405	60	36	10. 46595	9. 56107	60	40	10. 43893	10. 02701	60	4	9. 97299	0
′ ↑ 109°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←70°

Logarithms of Trigonometric Functions.

20°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos ←159° ′
0	9. 53405	0	0	10. 46595	9. 56107	0	0	10. 43893	10. 02701	0	0	9. 97299	60
1	440	1	1	560	146	1	1	854	706	1	0	294	59
2	475	2	1	525	185	2	1	815	711	2	0	289	58
3	509	3	2	491	224	3	2	776	715	3	0	285	57
4	544	4	2	456	264	4	3	736	720	4	0	280	56
5	578	5	3	422	303	5	3	697	724	5	0	276	55
6	613	6	3	387	342	6	4	658	729	6	0	271	54
7	647	7	4	353	9. 56381	7	4	10. 43619	734	7	1	266	53
8	682	8	5	318	420	8	5	580	738	8	1	262	52
9	9. 53716	9	5	10. 46284	459	9	6	541	743	9	1	257	51
10	751	10	6	249	498	10	6	502	10. 02748	10	1	9. 97252	50
11	785	11	6	215	537	11	7	463	752	11	1	248	49
12	819	12	7	181	576	12	8	424	757	12	1	243	48
13	854	13	7	146	615	13	8	385	762	13	1	238	47
14	888	14	8	112	654	14	9	346	766	14	1	234	46
15	922	15	8	078	9. 56693	15	10	10. 43307	771	15	1	229	45
16	957	16	9	043	732	16	10	268	776	16	1	224	44
17	9. 53991	17	10	10. 46009	771	17	11	229	780	17	1	220	43
18	9. 54025	18	10	10. 45975	810	18	12	190	785	18	1	215	42
19	059	19	11	941	849	19	12	151	790	19	1	210	41
20	093	20	11	907	887	20	13	113	10. 02794	20	2	9. 97206	40
21	127	21	12	873	926	21	13	074	799	21	2	201	39
22	161	22	12	839	9. 56965	22	14	10. 43035	804	22	2	196	38
23	195	23	13	805	9. 57004	23	15	10. 42996	808	23	2	192	37
24	229	24	14	771	042	24	15	958	813	24	2	187	36
25	263	25	14	737	081	25	16	919	818	25	2	182	35
26	9. 54297	26	15	10. 45703	120	26	17	880	822	26	2	178	34
27	331	27	15	669	158	27	17	842	827	27	2	173	33
28	365	28	16	635	197	28	18	803	832	28	2	168	32
29	399	29	16	601	235	29	19	765	837	29	2	163	31
30	433	30	17	567	274	30	19	726	10. 02841	30	2	9. 97159	30
31	466	31	17	534	312	31	20	688	846	31	2	154	29
32	9. 54500	32	18	10. 45500	9. 57351	32	21	10. 42649	851	32	3	149	28
33	534	33	19	466	389	33	21	611	855	33	3	145	27
34	567	34	19	433	428	34	22	572	860	34	3	140	26
35	601	35	20	399	466	35	22	534	865	35	3	135	25
36	635	36	20	365	504	36	23	496	870	36	3	130	24
37	668	37	21	332	543	37	24	457	874	37	3	126	23
38	702	38	21	298	581	38	24	419	879	38	3	121	22
39	735	39	22	265	619	39	25	381	884	39	3	116	21
40	9. 54769	40	23	10. 45231	9. 57658	40	26	10. 42342	10. 02889	40	3	9. 97111	20
41	802	41	23	198	696	41	26	304	893	41	3	107	19
42	836	42	24	164	734	42	27	266	898	42	3	102	18
43	869	43	24	131	772	43	28	228	903	43	3	097	17
44	903	44	25	097	810	44	28	190	908	44	3	092	16
45	936	45	25	064	849	45	29	151	913	45	4	087	15
46	9. 54969	46	26	10. 45031	887	46	30	113	917	46	4	083	14
47	9. 55003	47	26	10. 44997	925	47	30	075	922	47	4	078	13
48	036	48	27	964	9. 57963	48	31	10. 42037	927	48	4	073	12
49	069	49	28	931	9. 58001	49	31	10. 41999	932	49	4	068	11
50	102	50	28	898	039	50	32	961	10. 02937	50	4	9. 97063	10
51	136	51	29	864	077	51	33	923	941	51	4	059	9
52	169	52	29	831	115	52	33	885	946	52	4	054	8
53	9. 55202	53	30	798	153	53	34	847	951	53	4	049	7
54	235	54	30	10. 44765	191	54	35	809	956	54	4	044	6
55	268	55	31	732	9. 58229	55	35	10. 41771	961	55	4	039	5
56	301	56	32	699	267	56	36	733	965	56	4	035	4
57	334	57	32	666	304	57	37	696	970	57	4	030	3
58	367	58	33	633	342	58	37	658	975	58	5	025	2
59	400	59	33	600	380	59	38	620	980	59	5	020	1
60	9. 55433	60	34	10. 44567	9. 58418	60	39	10. 41582	10. 02985	60	5	9. 97015	0
′													′
110°→ cos		″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin ←69°

TABLE 33.

Logarithms of Trigonometric Functions.

21°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos ←158° ′
0	9. 55433	0	0	10. 44567	9. 58418	0	0	10. 41582	10. 02985	0	0	9. 97015	60
1	466	1	1	534	455	1	1	545	990	1	0	010	59
2	499	2	1	501	493	2	1	507	995	2	0	005	58
3	532	3	2	468	531	3	2	469	10. 02999	3	0	9. 97001	57
4	564	4	2	436	569	4	2	431	10. 03004	4	0	9. 96996	56
5	597	5	3	403	606	5	3	394	009	5	0	991	55
6	630	6	3	370	644	6	4	356	014	6	0	986	54
7	663	7	4	337	681	7	4	319	019	7	1	981	53
8	695	8	4	305	9. 58719	8	5	10. 41281	024	8	1	976	52
9	9. 55728	9	5	10. 44272	757	9	6	243	029	9	1	971	51
10	761	10	5	239	794	10	6	206	034	10	1	966	50
11	793	11	6	207	832	11	7	168	038	11	1	962	49
12	826	12	6	174	869	12	7	131	043	12	1	957	48
13	858	13	7	142	907	13	8	093	10. 03048	13	1	9. 96952	47
14	891	14	7	109	944	14	9	056	053	14	1	947	46
15	923	15	8	077	9. 58981	15	9	10. 41019	058	15	1	942	45
16	956	16	9	044	9. 59019	16	10	10. 40981	063	16	1	937	44
17	9. 55988	17	9	10. 44012	056	17	10	944	068	17	1	932	43
18	9. 56021	18	10	10. 43979	094	18	11	906	073	18	1	927	42
19	053	19	10	947	131	19	12	869	078	19	2	922	41
20	085	20	11	915	168	20	12	832	083	20	2	917	40
21	118	21	11	882	205	21	13	795	088	21	2	912	39
22	150	22	12	850	243	22	14	757	10. 03093	22	2	9. 96907	38
23	182	23	12	818	280	23	14	720	097	23	2	903	37
24	215	24	13	785	317	24	15	683	102	24	2	898	36
25	247	25	13	753	9. 59354	25	15	10. 40646	107	25	2	893	35
26	279	26	14	721	391	26	16	609	112	26	2	888	34
27	311	27	14	689	429	27	17	571	117	27	2	883	33
28	9. 56343	28	15	10. 43657	466	28	17	534	122	28	2	878	32
29	375	29	16	625	503	29	18	497	127	29	2	873	31
30	408	30	16	592	540	30	19	460	132	30	2	868	30
31	440	31	17	560	577	31	19	423	10. 03137	31	3	9. 96863	29
32	472	32	17	528	614	32	20	386	142	32	3	858	28
33	504	33	18	496	9. 59651	33	20	10. 40349	147	33	3	853	27
34	536	34	18	464	688	34	21	312	152	34	3	848	26
35	568	35	19	432	725	35	22	275	157	35	3	843	25
36	599	36	19	401	762	36	22	238	162	36	3	838	24
37	631	37	20	369	799	37	23	201	167	37	3	833	23
38	9. 56663	38	20	10. 43337	835	38	23	165	172	38	3	828	22
39	695	39	21	305	872	39	24	128	177	39	3	823	21
40	727	40	21	273	909	40	25	091	10. 03182	40	3	9. 96818	20
41	759	41	22	241	946	41	25	054	187	41	3	813	19
42	790	42	22	210	9. 59983	42	26	10. 40017	192	42	3	808	18
43	822	43	23	178	9. 60019	43	27	10. 39981	197	43	4	803	17
44	854	44	24	146	056	44	27	944	202	44	4	798	16
45	886	45	24	114	093	45	28	907	207	45	4	793	15
46	917	46	25	083	130	46	28	870	212	46	4	788	14
47	949	47	25	051	166	47	29	834	217	47	4	783	13
48	9. 56980	48	26	10. 43020	203	48	30	797	222	48	4	778	12
49	9. 57012	49	26	10. 42988	240	49	30	760	228	49	4	772	11
50	044	50	27	956	276	50	31	724	10. 03233	50	4	9. 96767	10
51	075	51	27	925	9. 60313	51	31	10. 39687	238	51	4	762	9
52	107	52	28	893	349	52	32	651	243	52	4	757	8
53	138	53	28	862	386	53	33	614	248	53	4	752	7
54	169	54	29	831	422	54	33	578	253	54	4	747	6
55	201	55	29	799	459	55	34	541	258	55	5	742	5
56	232	56	30	768	495	56	35	505	263	56	5	737	4
57	264	57	30	736	532	57	35	468	268	57	5	732	3
58	295	58	31	705	568	58	36	432	273	58	5	727	2
59	326	59	32	674	605	59	36	395	278	59	5	722	1
60	9. 57358	60	32	10. 42642	9. 60641	60	37	10. 39359	10. 03283	60	5	9. 96717	0
′													′
111°→ cos		″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin ←68°

Logarithms of Trigonometric Functions.

22°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←157° ′
0	9. 57358	0	0	10. 42642	9. 60641	0	0	10. 39359	10. 03283	0	0	9. 96717	60
1	389	1	1	611	677	1	1	323	289	1	0	711	59
2	420	2	1	580	714	2	1	286	294	2	0	706	58
3	451	3	2	549	750	3	2	250	299	3	0	701	57
4	482	4	2	518	786	4	2	214	304	4	0	696	56
5	514	5	3	486	823	5	3	177	309	5	0	691	55
6	545	6	3	455	859	6	4	141	314	6	1	686	54
7	576	7	4	424	895	7	4	105	319	7	1	681	53
8	607	8	4	393	931	8	5	069	324	8	1	676	52
9	638	9	5	362	9. 60967	9	5	10. 39033	330	9	1	670	51
10	9. 57669	10	5	10. 42331	9. 61004	10	6	10. 38996	10. 03335	10	1	9. 96665	50
11	700	11	6	300	040	11	7	960	340	11	1	660	49
12	731	12	6	269	076	12	7	924	345	12	1	655	48
13	762	13	7	238	112	13	8	888	350	13	1	650	47
14	793	14	7	207	148	14	8	852	355	14	1	645	46
15	824	15	8	176	184	15	9	816	360	15	1	640	45
16	855	16	8	145	220	16	10	780	366	16	1	634	44
17	885	17	9	115	9. 61256	17	10	10. 38744	371	17	1	629	43
18	916	18	9	084	292	18	11	708	376	18	2	624	42
19	947	19	10	053	328	19	11	672	381	19	2	619	41
20	9. 57978	20	10	10. 42022	364	20	12	636	10. 03386	20	2	9. 96614	40
21	9. 58008	21	11	10. 41992	400	21	13	600	392	21	2	608	39
22	039	22	11	961	436	22	13	564	397	22	2	603	38
23	070	23	12	930	472	23	14	528	402	23	2	598	37
24	101	24	12	899	9. 61508	24	14	10. 38492	407	24	2	593	36
25	131	25	13	869	544	25	15	456	412	25	2	588	35
26	162	26	13	838	579	26	15	421	418	26	2	582	34
27	192	27	14	808	615	27	16	385	423	27	2	577	33
28	223	28	14	777	651	28	17	349	428	28	2	572	32
29	9. 58253	29	15	10. 41747	687	29	17	313	433	29	3	567	31
30	284	30	15	716	722	30	18	278	10. 03438	30	3	9. 96562	30
31	314	31	16	686	9. 61758	31	18	10. 38242	444	31	3	556	29
32	345	32	16	655	794	32	19	206	449	32	3	551	28
33	375	33	17	625	830	33	20	170	454	33	3	546	27
34	406	34	17	594	865	34	20	135	459	34	3	541	26
35	436	35	18	564	901	35	21	099	465	35	3	535	25
36	467	36	18	533	936	36	21	064	470	36	3	530	24
37	9. 58497	37	19	10. 41503	9. 61972	37	22	10. 38028	475	37	3	525	23
38	527	38	19	473	9. 62008	38	23	10. 37992	480	38	3	520	22
39	557	39	20	443	043	39	23	957	486	39	3	514	21
40	588	40	20	412	079	40	24	921	10. 03491	40	3	9. 96509	20
41	618	41	21	382	114	41	24	886	496	41	4	504	19
42	648	42	21	352	150	42	25	850	502	42	4	498	18
43	678	43	22	322	185	43	26	815	507	43	4	493	17
44	709	44	22	291	221	44	26	779	512	44	4	488	16
45	9. 58739	45	23	10. 41261	9. 62256	45	27	10. 37744	517	45	4	483	15
46	769	46	23	231	292	46	27	708	523	46	4	477	14
47	799	47	24	201	327	47	28	673	528	47	4	472	13
48	829	48	24	171	362	48	29	638	533	48	4	467	12
49	859	49	25	141	398	49	29	602	539	49	4	461	11
50	889	50	25	111	433	50	30	567	10. 03544	50	4	9. 96456	10
51	919	51	26	081	468	51	30	532	549	51	4	451	9
52	949	52	26	051	9. 62504	52	31	10. 37496	555	52	5	445	8
53	9. 58979	53	27	10. 41021	539	53	32	461	560	53	5	440	7
54	9. 59009	54	27	10. 40991	574	54	32	426	565	54	5	435	6
55	039	55	28	961	609	55	33	391	571	55	5	429	5
56	069	56	28	931	645	56	33	355	576	56	5	424	4
57	098	57	29	902	680	57	34	320	581	57	5	419	3
58	128	58	29	872	715	58	35	285	587	58	5	413	2
59	158	59	30	842	750	59	35	250	592	59	5	408	1
60	9. 59188	60	31	10. 40812	9. 62785	60	36	10. 37215	10. 03597	60	5	9. 96403	0
↑ ′ 112°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	←67° ↑ ′

TABLE 33.

Logarithms of Trigonometric Functions.

23°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←156° ′ ↓
0	9. 59188	*0*	0	10. 40812	9. 62785	*0*	0	10. 37215	10. 03597	*0*	0	9. 96403	**60**
1	218	*1*	0	782	820	*1*	1	180	603	*1*	0	397	59
2	247	*2*	1	753	855	*2*	1	145	608	*2*	0	392	58
3	277	*3*	1	723	890	*3*	2	110	613	*3*	0	387	57
4	307	*4*	2	693	926	*4*	2	074	619	*4*	0	381	56
5	336	*5*	2	664	961	*5*	3	039	624	*5*	0	376	55
6	366	*6*	3	634	9. 62996	*6*	3	10. 37004	630	*6*	1	370	54
7	396	*7*	3	604	9. 63031	*7*	4	10. 36969	635	*7*	1	365	53
8	425	*8*	4	575	066	*8*	5	934	640	*8*	1	360	52
9	9. 59455	*9*	4	10. 40545	101	*9*	5	899	646	*9*	1	354	51
10	484	*10*	5	516	135	*10*	6	865	10. 03651	*10*	1	9. 96349	**50**
11	514	*11*	5	486	170	*11*	6	830	657	*11*	1	343	49
12	543	*12*	6	457	205	*12*	7	795	662	*12*	1	338	48
13	573	*13*	6	427	240	*13*	7	760	667	*13*	1	333	47
14	602	*14*	7	398	275	*14*	8	725	673	*14*	1	327	46
15	632	*15*	7	368	310	*15*	9	690	678	*15*	1	322	45
16	661	*16*	8	339	9. 63345	*16*	9	10. 36655	684	*16*	1	316	44
17	690	*17*	8	310	379	*17*	10	621	689	*17*	2	311	43
18	9. 59720	*18*	9	10. 40280	414	*18*	10	586	695	*18*	2	305	42
19	749	*19*	9	251	449	*19*	11	551	700	*19*	2	300	41
20	778	*20*	10	222	484	*20*	12	516	10. 03706	*20*	2	9. 96294	**40**
21	808	*21*	10	192	519	*21*	12	481	711	*21*	2	289	39
22	837	*22*	11	163	553	*22*	13	447	716	*22*	2	284	38
23	866	*23*	11	134	588	*23*	13	412	722	*23*	2	278	37
24	895	*24*	12	105	623	*24*	14	377	727	*24*	2	273	36
25	924	*25*	12	076	9. 63657	*25*	14	10. 36343	733	*25*	2	267	35
26	954	*26*	13	046	692	*26*	15	308	738	*26*	2	262	34
27	9. 59983	*27*	13	10. 40017	726	*27*	16	274	744	*27*	2	256	33
28	9. 60012	*28*	14	10. 39988	761	*28*	16	239	749	*28*	3	251	32
29	041	*29*	14	959	796	*29*	17	204	755	*29*	3	245	31
30	070	*30*	15	930	830	*30*	17	170	10. 03760	*30*	3	9. 96240	**30**
31	099	*31*	15	901	865	*31*	18	135	766	*31*	3	234	29
32	128	*32*	15	872	899	*32*	18	101	771	*32*	3	229	28
33	157	*33*	16	843	934	*33*	19	066	777	*33*	3	223	27
34	186	*34*	16	814	9. 63968	*34*	20	10. 36032	782	*34*	3	218	26
35	215	*35*	17	785	9. 64003	*35*	20	10. 35997	788	*35*	3	212	25
36	244	*36*	17	756	037	*36*	21	963	793	*36*	3	207	24
37	273	*37*	18	727	072	*37*	21	928	799	*37*	3	201	23
38	302	*38*	18	698	106	*38*	22	894	804	*38*	3	196	22
39	9. 60331	*39*	19	10. 39669	140	*39*	22	860	810	*39*	4	190	21
40	359	*40*	19	641	175	*40*	23	825	10. 03815	*40*	4	9. 96185	**20**
41	388	*41*	20	612	209	*41*	24	791	821	*41*	4	179	19
42	417	*42*	20	583	243	*42*	24	757	826	*42*	4	174	18
43	446	*43*	21	554	9. 64278	*43*	25	10. 35722	832	*43*	4	168	17
44	474	*44*	21	526	312	*44*	25	688	838	*44*	4	162	16
45	503	*45*	22	497	346	*45*	26	654	843	*45*	4	157	15
46	532	*46*	22	468	381	*46*	26	619	849	*46*	4	151	14
47	561	*47*	23	439	415	*47*	27	585	854	*47*	4	146	13
48	589	*48*	23	411	449	*48*	28	551	860	*48*	4	140	12
49	9. 60618	*49*	24	10. 39382	483	*49*	28	517	865	*49*	4	135	11
50	646	*50*	24	354	517	*50*	29	483	10. 03871	*50*	5	9. 96129	**10**
51	675	*51*	25	325	9. 64552	*51*	29	10. 35448	877	*51*	5	123	9
52	704	*52*	25	296	586	*52*	30	414	882	*52*	5	118	8
53	732	*53*	26	268	620	*53*	31	380	888	*53*	5	112	7
54	761	*54*	26	239	654	*54*	31	346	893	*54*	5	107	6
55	789	*55*	27	211	688	*55*	32	312	899	*55*	5	101	5
56	818	*56*	27	182	722	*56*	32	278	905	*56*	5	095	4
57	846	*57*	28	154	756	*57*	33	244	910	*57*	5	090	3
58	875	*58*	28	125	790	*58*	33	210	916	*58*	5	084	2
59	903	*59*	29	097	824	*59*	34	176	921	*59*	5	079	1
60	9. 60931	*60*	29	10. 39069	9. 64858	*60*	35	10. 35142	10. 03927	*60*	6	9. 96073	**0**
′ ↑ 113°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←66°

Logarithms of Trigonometric Functions.

24°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←155° ′ ↓
0	9. 60931	0	0	10. 39069	9. 64858	0	0	10. 35142	10. 03927	0	0	9. 96073	60
1	960	1	0	040	892	1	1	108	933	1	0	067	59
2	9. 60988	2	1	10. 39012	926	2	1	074	938	2	0	062	58
3	9. 61016	3	1	10. 38984	960	3	2	040	944	3	0	056	57
4	045	4	2	955	9. 64994	4	2	10. 35006	950	4	0	050	56
5	073	5	2	927	9. 65028	5	3	10. 34972	955	5	0	045	55
6	101	6	3	899	062	6	3	938	10. 03961	6	1	9. 96039	54
7	129	7	3	871	096	7	4	904	966	7	1	034	53
8	158	8	4	842	130	8	4	870	972	8	1	028	52
9	186	9	4	814	164	9	5	836	978	9	1	022	51
10	214	10	5	786	197	10	6	803	983	10	1	017	50
11	242	11	5	758	231	11	6	769	989	11	1	011	49
12	9. 61270	12	6	10. 38730	265	12	7	735	10. 03995	12	1	005	48
13	298	13	6	702	299	13	7	701	10. 04000	13	1	9. 96000	47
14	326	14	6	674	9. 65333	14	8	10. 34667	. 006	14	1	9. 95994	46
15	354	15	7	646	366	15	8	634	012	15	1	988	45
16	382	16	7	618	400	16	9	600	018	16	2	982	44
17	411	17	8	589	434	17	9	566	023	17	2	977	43
18	438	18	8	562	467	18	10	533	029	18	2	971	42
19	466	19	9	534	501	19	11	499	035	19	2	965	41
20	494	20	9	506	535	20	11	465	040	20	2	960	40
21	9. 61522	21	10	10. 38478	568	21	12	432	046	21	2	954	39
22	550	22	10	450	602	22	12	398	10. 04052	22	2	9. 95948	38
23	578	23	11	422	636	23	13	364	058	23	2	942	37
24	606	24	11	394	9. 65669	24	13	10. 34331	063	24	2	937	36
25	634	25	12	366	703	25	14	297	069	25	2	931	35
26	662	26	12	338	736	26	15	264	075	26	2	925	34
27	689	27	12	311	770	27	15	230	080	27	3	920	33
28	717	28	13	283	803	28	16	197	086	28	3	914	32
29	9. 61745	29	13	10. 38255	837	29	16	163	092	29	3	908	31
30	773	30	14	227	870	30	17	130	098	30	3	902	30
31	800	31	14	200	904	31	17	096	10. 04103	31	3	9. 95897	29
32	828	32	15	172	937	32	18	063	109	32	3	891	28
33	856	33	15	144	9. 65971	33	18	10. 34029	115	33	3	885	27
34	883	34	16	117	9. 66004	34	19	10. 33996	121	34	3	879	26
35	911	35	16	089	038	35	20	962	127	35	3	873	25
36	939	36	17	061	071	36	20	929	132	36	3	868	24
37	966	37	17	034	104	37	21	896	138	37	4	862	23
38	9. 61994	38	18	10. 38006	138	38	21	862	144	38	4	856	22
39	9. 62021	39	18	10. 37979	171	39	22	829	150	39	4	850	21
40	049	40	18	951	204	40	22	796	10. 04156	40	4	9. 95844	20
41	076	41	19	924	238	41	23	762	161	41	4	839	19
42	104	42	19	896	271	42	23	729	167	42	4	833	18
43	131	43	20	869	9. 66304	43	24	10. 33696	173	43	4	827	17
44	159	44	20	841	337	44	25	663	179	44	4	821	16
45	186	45	21	814	371	45	25	629	185	45	4	815	15
46	214	46	21	786	404	46	26	596	190	46	4	810	14
47	241	47	22	759	437	47	26	563	196	47	5	804	13
48	268	48	22	732	470	48	27	530	202	48	5	798	12
49	296	49	23	704	503	49	27	497	208	49	5	792	11
50	9. 62323	50	23	10. 37677	537	50	28	463	10. 04214	50	5	9. 95786	10
51	350	51	24	650	570	51	28	430	220	51	5	780	9
52	377	52	24	623	9. 66603	52	29	10. 33397	225	52	5	775	8
53	405	53	24	595	636	53	30	364	231	53	5	769	7
54	432	54	25	568	669	54	30	331	237	54	5	763	6
55	459	55	25	541	702	55	31	298	243	55	5	757	5
56	486	56	26	514	735	56	31	265	249	56	5	751	4
57	513	57	26	487	768	57	32	232	255	57	5	745	3
58	541	58	27	459	801	58	32	199	261	58	6	739	2
59	568	59	27	432	834	59	33	166	267	59	6	733	1
60	9. 62595	60	28	10. 37405	9. 66867	60	33	10. 33133	10. 04272	60	6	9. 95728	0
′ ↑ 114°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←65°

TABLE 33.

Logarithms of Trigonometric Functions.

25°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos ←154° ′
0	9. 62595	0	0	10. 37405	9. 66867	0	0	10. 33133	10. 04272	0	0	9. 95728	60
1	622	1	0	378	900	1	1	100	278	1	0	722	59
2	649	2	1	351	933	2	1	067	284	2	0	716	58
3	676	3	1	324	966	3	2	034	290	3	0	710	57
4	703	4	2	297	9. 66999	4	2	10. 33001	296	4	0	704	56
5	730	5	2	270	9. 67032	5	3	10. 32968	302	5	1	698	55
6	757	6	3	243	065	6	3	935	308	6	1	692	54
7	9. 62784	7	3	10. 37216	098	7	4	902	314	7	1	686	53
8	811	8	4	189	131	8	4	869	320	8	1	680	52
9	838	9	4	162	163	9	5	837	326	9	1	674	51
10	865	10	4	135	196	10	5	804	10. 04332	10	1	9. 95668	50
11	892	11	5	108	229	11	6	771	337	11	1	663	49
12	918	12	5	082	262	12	7	738	343	12	1	657	48
13	945	13	6	055	295	13	7	705	349	13	1	651	47
14	972	14	6	028	327	14	8	673	355	14	1	645	46
15	9. 62999	15	7	10. 37001	9. 67360	15	8	10. 32640	361	15	2	639	45
16	9. 63026	16	7	10. 36974	393	16	9	607	367	16	2	633	44
17	052	17	8	948	426	17	9	574	373	17	2	627	43
18	079	18	8	921	458	18	10	542	379	18	2	621	42
19	106	19	8	894	491	19	10	509	385	19	2	615	41
20	133	20	9	867	524	20	11	476	10. 04391	20	2	9. 95609	40
21	159	21	9	841	556	21	11	444	397	21	2	603	39
22	186	22	10	814	589	22	12	411	403	22	2	597	38
23	213	23	10	787	622	23	12	378	409	23	2	591	37
24	239	24	11	761	654	24	13	346	415	24	2	585	36
25	9. 63266	25	11	10. 36734	9. 67687	25	14	10. 32313	421	25	3	579	35
26	292	26	11	708	719	26	14	281	427	26	3	573	34
27	319	27	12	681	752	27	15	248	433	27	3	567	33
28	345	28	12	655	785	28	15	215	439	28	3	561	32
29	372	29	13	628	817	29	16	183	445	29	3	555	31
30	398	30	13	602	850	30	16	150	10. 04451	30	3	9. 95549	30
31	425	31	14	575	882	31	17	118	457	31	3	543	29
32	451	32	14	549	915	32	17	085	463	32	3	537	28
33	478	33	15	522	947	33	18	053	469	33	3	531	27
34	9. 63504	34	15	10. 36496	9. 67980	34	18	10. 32020	475	34	3	525	26
35	531	35	15	469	9. 68012	35	19	10. 31988	481	35	4	519	25
36	557	36	16	443	044	36	20	956	487	36	4	513	24
37	583	37	16	417	077	37	20	923	493	37	4	507	23
38	610	38	17	390	109	38	21	891	500	38	4	500	22
39	636	39	17	364	142	39	21	858	506	39	4	494	21
40	662	40	18	338	9. 68174	40	22	826	10. 04512	40	4	9. 95488	20
41	689	41	18	311	206	41	22	794	518	41	4	482	19
42	715	42	19	285	239	42	23	761	524	42	4	476	18
43	9. 63741	43	19	10. 36259	271	43	23	729	530	43	4	470	17
44	767	44	19	233	9. 68303	44	24	10. 31697	536	44	4	464	16
45	794	45	20	206	336	45	24	664	542	45	5	458	15
46	820	46	20	180	368	46	25	632	548	46	5	452	14
47	846	47	21	154	400	47	25	600	554	47	5	446	13
48	872	48	21	128	432	48	26	568	560	48	5	440	12
49	898	49	22	102	465	49	27	535	566	49	5	434	11
50	924	50	22	076	497	50	27	503	10. 04573	50	5	9. 95427	10
51	950	51	23	050	529	51	28	471	579	51	5	421	9
52	9. 63976	52	23	10. 36024	9. 68561	52	28	10. 31439	585	52	5	415	8
53	9. 64002	53	23	10. 35998	593	53	29	407	591	53	5	409	7
54	028	54	24	972	626	54	29	374	597	54	5	403	6
55	054	55	24	946	658	55	30	342	603	55	6	397	5
56	080	56	25	920	690	56	30	310	609	56	6	391	4
57	106	57	25	894	722	57	31	278	616	57	6	384	3
58	132	58	26	868	754	58	31	246	622	58	6	378	2
59	158	59	26	842	786	59	32	214	628	59	6	372	1
60	9. 64184	60	26	10. 35816	9. 68818	60	33	10. 31182	10. 04634	60	6	9. 95366	0
′													′
115°→ cos		″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin ←64°

Logarithms of Trigonometric Functions.

26°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←153° ′
0	9. 64184	0	0	10. 35816	9. 68818	0	0	10. 31182	10. 04634	0	0	9. 95366	60
1	210	1	0	790	850	1	1	150	640	1	0	360	59
2	236	2	1	764	882	2	1	118	646	2	0	354	58
3	262	3	1	738	914	3	2	086	652	3	0	348	57
4	288	4	2	712	946	4	2	054	659	4	0	341	56
5	313	5	2	687	9. 68978	5	3	10. 31022	665	5	1	335	55
6	339	6	3	661	9. 69010	6	3	10. 30990	671	6	1	329	54
7	365	7	3	635	042	7	4	958	677	7	1	323	53
8	9. 64391	8	3	10. 35609	074	8	4	926	683	8	1	317	52
9	417	9	4	583	106	9	5	894	690	9	1	310	51
10	442	10	4	558	138	10	5	862	10. 04696	10	1	9. 95304	50
11	468	11	5	532	170	11	6	830	702	11	1	298	49
12	494	12	5	506	202	12	6	798	708	12	1	292	48
13	519	13	5	481	234	13	7	766	714	13	1	286	47
14	545	14	6	455	9. 69266	14	7	10. 30734	721	14	1	279	46
15	9. 64571	15	6	10. 35429	298	15	8	702	727	15	2	273	45
16	596	16	7	404	329	16	8	671	733	16	2	267	44
17	622	17	7	378	361	17	9	639	739	17	2	261	43
18	647	18	8	353	393	18	9	607	746	18	2	254	42
19	673	19	8	327	425	19	10	575	752	19	2	248	41
20	698	20	8	302	457	20	11	543	10. 04758	20	2	9. 95242	40
21	724	21	9	276	488	21	11	512	764	21	2	236	39
22	749	22	9	251	9. 69520	22	12	10. 30480	771	22	2	229	38
23	9. 64775	23	10	10. 35225	552	23	12	448	777	23	2	223	37
24	800	24	10	200	584	24	13	416	783	24	3	217	36
25	826	25	11	174	615	25	13	385	789	25	3	211	35
26	851	26	11	149	647	26	14	353	796	26	3	204	34
27	877	27	11	123	679	27	14	321	802	27	3	198	33
28	902	28	12	098	710	28	15	290	808	28	3	192	32
29	927	29	12	073	742	29	15	258	815	29	3	185	31
30	953	30	13	047	9. 69774	30	16	10. 30226	10. 04821	30	3	9. 95179	30
31	9. 64978	31	13	10. 35022	805	31	16	195	827	31	3	173	29
32	9. 65003	32	14	10. 34997	837	32	17	163	833	32	3	167	28
33	029	33	14	971	868	33	17	132	840	33	3	160	27
34	054	34	14	946	900	34	18	100	846	34	4	154	26
35	079	35	15	921	932	35	18	068	852	35	4	148	25
36	104	36	15	896	963	36	19	037	859	36	4	141	24
37	130	37	16	870	9. 69995	37	20	10. 30005	865	37	4	135	23
38	155	38	16	845	9. 70026	38	20	10. 29974	871	38	4	129	22
39	9. 65180	39	16	10. 34820	058	39	21	942	878	39	4	122	21
40	205	40	17	795	089	40	21	911	10. 04884	40	4	9. 95116	20
41	230	41	17	770	121	41	22	879	890	41	4	110	19
42	255	42	18	745	152	42	22	848	897	42	4	103	18
43	281	43	18	719	184	43	23	816	903	43	5	097	17
44	306	44	19	694	215	44	23	785	910	44	5	090	16
45	331	45	19	669	9. 70247	45	24	10. 29753	916	45	5	084	15
46	9. 65356	46	19	10. 34644	278	46	24	722	922	46	5	078	14
47	381	47	20	619	309	47	25	691	929	47	5	071	13
48	406	48	20	594	341	48	25	659	935	48	5	065	12
49	431	49	21	569	372	49	26	628	10. 04941	49	5	9. 95059	11
50	456	50	21	544	404	50	26	596	948	50	5	052	10
51	481	51	22	519	435	51	27	565	954	51	5	046	9
52	506	52	22	494	466	52	27	534	961	52	5	039	8
53	9. 65531	53	22	10. 34469	9. 70498	53	28	10. 29502	967	53	6	033	7
54	556	54	23	444	529	54	28	471	973	54	6	027	6
55	580	55	23	420	560	55	29	440	980	55	6	020	5
56	605	56	24	395	592	56	30	408	986	56	6	014	4
57	630	57	24	370	623	57	30	377	993	57	6	007	3
58	655	58	25	345	654	58	31	346	10. 04999	58	6	9. 95001	2
59	680	59	25	320	685	59	31	315	10. 05005	59	6	9. 94995	1
60	9. 65705	60	25	10. 34295	9. 70717	60	32	10. 29283	10 05012	60	6	9. 94988	0
′													′
↑ 116°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	↑ ←63°

TABLE 33.

Logarithms of Trigonometric Functions.

27°→ ↓ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos ←152° ↓ ′
0	9. 65705	0	0	10. 34295	9. 70717	0	0	10. 29283	10. 05012	0	0	9. 94988	60
1	729	1	0	271	748	1	1	252	018	1	0	982	59
2	754	2	1	246	779	2	1	221	025	2	0	975	58
3	779	3	1	221	810	3	2	190	031	3	0	969	57
4	804	4	2	196	841	4	2	159	038	4	0	962	56
5	9. 65828	5	2	172	873	5	3	127	044	5	1	956	55
6	853	6	2	147	904	6	3	096	051	6	1	949	54
7	878	7	3	122	935	7	4	065	057	7	1	943	53
8	902	8	3	098	966	8	4	034	064	8	1	936	52
9	927	9	4	073	9. 70997	9	5	10. 29003	070	9	1	930	51
10	952	10	4	048	9. 71028	10	5	10. 28972	10. 05077	10	1	9. 94923	50
11	9. 65976	11	4	10. 34024	059	11	6	941	083	11	1	917	49
12	9. 66001	12	5	10. 33999	090	12	6	910	089	12	1	911	48
13	025	13	5	975	121	13	7	879	096	13	1	904	47
14	050	14	6	950	153	14	7	847	102	14	2	898	46
15	075	15	6	925	184	15	8	816	109	15	2	891	45
16	099	16	6	901	215	16	8	785	115	16	2	885	44
17	124	17	7	876	246	17	9	754	122	17	2	878	43
18	148	18	7	852	277	18	9	723	129	18	2	871	42
19	173	19	8	827	308	19	10	692	135	19	2	865	41
20	197	20	8	803	9. 71339	20	10	10. 28661	10. 05142	20	2	9. 94858	40
21	221	21	8	779	370	21	11	630	148	21	2	852	39
22	9. 66246	22	9	10. 33754	401	22	11	599	155	22	2	845	38
23	270	23	9	730	431	23	12	569	161	23	3	839	37
24	295	24	10	705	462	24	12	538	168	24	3	832	36
25	319	25	10	681	493	25	13	507	174	25	3	826	35
26	343	26	11	657	524	26	13	476	181	26	3	819	34
27	368	27	11	632	555	27	14	445	187	27	3	813	33
28	392	28	11	608	586	28	14	414	194	28	3	806	32
29	416	29	12	584	617	29	15	383	201	29	3	799	31
30	441	30	12	559	9. 71648	30	15	10. 28352	10. 05207	30	3	9. 94793	30
31	465	31	13	535	679	31	16	321	214	31	3	786	29
32	9. 66489	32	13	10. 33511	709	32	16	291	220	32	4	780	28
33	513	33	13	487	740	33	17	260	227	33	4	773	27
34	537	34	14	463	771	34	17	229	233	34	4	767	26
35	562	35	14	438	802	35	18	198	240	35	4	760	25
36	586	36	15	414	833	36	19	167	247	36	4	753	24
37	610	37	15	390	863	37	19	137	253	37	4	747	23
38	634	38	15	366	894	38	20	106	260	38	4	740	22
39	658	39	16	342	925	39	20	075	266	39	4	734	21
40	682	40	16	318	955	40	21	045	10. 05273	40	4	9. 94727	20
41	706	41	17	294	9. 71986	41	21	10. 28014	280	41	4	720	19
42	9. 66731	42	17	10. 33269	9. 72017	42	22	10. 27983	286	42	5	714	18
43	755	43	17	245	048	43	22	952	293	43	5	707	17
44	779	44	18	221	078	44	23	922	300	44	5	700	16
45	803	45	18	197	109	45	23	891	306	45	5	694	15
46	827	46	19	173	140	46	24	860	313	46	5	687	14
47	851	47	19	149	170	47	24	830	320	47	5	680	13
48	875	48	19	125	201	48	25	799	326	48	5	674	12
49	899	49	20	101	231	49	25	769	333	49	5	667	11
50	922	50	20	078	262	50	26	738	10. 05340	50	5	9. 94660	10
51	946	51	21	054	9. 72293	51	26	10. 27707	346	51	6	654	9
52	970	52	21	030	323	52	27	677	353	52	6	647	8
53	9. 66994	53	21	10. 33006	354	53	27	646	360	53	6	640	7
54	9. 67018	54	22	10. 32982	384	54	28	616	366	54	6	634	6
55	042	55	22	958	415	55	28	585	373	55	6	627	5
56	066	56	23	934	445	56	29	555	380	56	6	620	4
57	090	57	23	910	476	57	29	524	386	57	6	614	3
58	113	58	23	887	506	58	30	494	393	58	6	607	2
59	137	59	24	863	537	59	30	463	400	59	6	600	1
60	9. 67161	60	24	10. 32839	9. 72567	60	31	10. 27433	10. 05407	60	7	9. 94593	0
↑ 117°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin ←62° ↑

Logarithms of Trigonometric Functions.

28°→ ′	sin	″	Diff.	csc	tan	″	Diff.	cot	sec	″	Diff.	cos	←151° ′
0	9. 67161	0	0	10. 32839	9. 72567	0	0	10. 27433	10. 05407	0	0	9. 94593	60
1	185	1	0	815	598	1	1	402	413	1	0	587	59
2	208	2	1	792	628	2	1	372	420	2	0	580	58
3	232	3	1	768	659	3	2	341	427	3	0	573	57
4	256	4	2	744	689	4	2	311	433	4	0	567	56
5	280	5	2	720	720	5	3	280	440	5	1	560	55
6	303	6	2	697	750	6	3	250	447	6	1	553	54
7	9. 67327	7	3	10. 32673	9. 72780	7	4	10. 27220	454	7	1	546	53
8	350	8	3	650	811	8	4	189	460	8	1	540	52
9	374	9	3	626	841	9	5	159	467	9	1	533	51
10	398	10	4	602	872	10	5	128	10. 05474	10	1	9. 94526	50
11	421	11	4	579	902	11	6	098	481	11	1	519	49
12	445	12	5	555	932	12	6	068	487	12	1	513	48
13	468	13	5	532	963	13	7	037	494	13	1	506	47
14	9. 67492	14	5	10. 32508	9. 72993	14	7	10. 27007	501	14	2	499	46
15	515	15	6	485	9. 73023	15	8	10. 26977	508	15	2	492	45
16	539	16	6	461	054	16	8	946	515	16	2	485	44
17	562	17	7	438	084	17	9	916	521	17	2	479	43
18	586	18	7	414	114	18	9	886	528	18	2	472	42
19	609	19	7	391	144	19	10	856	535	19	2	465	41
20	633	20	8	367	175	20	10	825	10. 05542	20	2	9. 94458	40
21	9. 67656	21	8	10. 32344	205	21	11	795	549	21	2	451	39
22	680	22	9	320	235	22	11	765	555	22	3	445	38
23	703	23	9	297	9. 73265	23	12	10. 26735	562	23	3	438	37
24	726	24	9	274	295	24	12	705	569	24	3	431	36
25	750	25	10	250	326	25	13	674	576	25	3	424	35
26	773	26	10	227	356	26	13	644	583	26	3	417	34
27	796	27	10	204	386	27	14	614	590	27	3	410	33
28	9. 67820	28	11	10. 32180	416	28	14	584	596	28	3	404	32
29	843	29	11	157	446	29	15	554	603	29	3	397	31
30	866	30	12	134	476	30	15	524	10. 05610	30	3	9. 94390	30
31	890	31	12	110	507	31	16	493	617	31	4	383	29
32	913	32	12	087	9. 73537	32	16	10. 26463	624	32	4	376	28
33	936	33	13	064	567	33	17	433	631	33	4	369	27
34	959	34	13	041	597	34	17	403	638	34	4	362	26
35	9. 67982	35	14	10. 32018	627	35	18	373	645	35	4	355	25
36	9. 68006	36	14	10. 31994	657	36	18	343	651	36	4	349	24
37	029	37	14	971	687	37	19	313	658	37	4	342	23
38	052	38	15	948	717	38	19	283	665	38	4	335	22
39	075	39	15	925	747	39	20	253	672	39	4	328	21
40	098	40	16	902	9. 73777	40	20	10. 26223	10. 05679	40	5	9. 94321	20
41	121	41	16	879	807	41	21	193	686	41	5	314	19
42	144	42	16	856	837	42	21	163	693	42	5	307	18
43	167	43	17	833	867	43	22	133	700	43	5	300	17
44	9. 68190	44	17	10. 31810	897	44	22	103	707	44	5	293	16
45	213	45	17	787	927	45	23	073	714	45	5	286	15
46	237	46	18	763	957	46	23	043	721	46	5	279	14
47	260	47	18	740	9. 73987	47	24	10. 26013	727	47	5	273	13
48	283	48	19	717	9. 74017	48	24	10. 25983	734	48	5	266	12
49	305	49	19	695	047	49	25	953	741	49	6	259	11
50	328	50	19	672	077	50	25	923	10. 05748	50	6	9. 94252	10
51	351	51	20	649	107	51	26	893	755	51	6	245	9
52	9. 68374	52	20	10. 31626	137	52	26	863	762	52	6	238	8
53	397	53	21	603	166	53	27	834	769	53	6	231	7
54	420	54	21	580	196	54	27	10. 25804	776	54	6	224	6
55	443	55	21	557	9. 74226	55	28	774	783	55	6	217	5
56	466	56	22	534	256	56	28	744	790	56	6	210	4
57	489	57	22	511	286	57	29	714	797	57	7	203	3
58	512	58	22	488	316	58	29	684	804	58	7	196	2
59	534	59	23	466	345	59	30	655	811	59	7	189	1
60	9. 68557	60	23	10. 31443	9. 74375	60	30	10. 25625	10. 05818	60	7	9. 94182	0
′		″	Diff.	sec	cot	″	Diff.	tan	csc	″	Diff.	sin	′
118°→	cos												←61°

TABLE 33.

Logarithms of Trigonometric Functions.

29°→ ′ ↓	sin	″	Diff.	csc	tan	″	Diff.	cot	sec	″	Diff.	cos	←150° ′ ↓
0	9. 68557	0	0	10. 31443	9. 74375	0	0	10. 25625	10. 05818	0	0	9. 94182	60
1	580	1	0	420	405	1	0	595	825	1	0	175	59
2	603	2	1	397	435	2	1	565	832	2	0	168	58
3	625	3	1	375	465	3	1	535	839	3	0	161	57
4	648	4	1	352	494	4	2	506	846	4	0	154	56
5	671	5	2	329	524	5	2	476	853	5	1	147	55
6	694	6	2	306	554	6	3	446	860	6	1	140	54
7	716	7	3	284	583	7	3	417	867	7	1	133	53
8	739	8	3	261	613	8	4	387	10. 05874	8	1	9. 94126	52
9	762	9	3	238	643	9	4	357	881	9	1	119	51
10	9. 68784	10	4	10. 31216	9. 74673	10	5	10. 25327	888	10	1	112	50
11	807	11	4	193	702	11	5	298	895	11	1	105	49
12	829	12	4	171	732	12	6	268	902	12	1	098	48
13	852	13	5	148	762	13	6	238	910	13	2	090	47
14	875	14	5	125	791	14	7	209	917	14	2	083	46
15	897	15	6	103	821	15	7	179	924	15	2	076	45
16	920	16	6	080	851	16	8	149	10. 05931	16	2	9. 94069	44
17	942	17	6	058	880	17	8	120	938	17	2	062	43
18	965	18	7	035	910	18	9	090	945	18	2	055	42
19	9. 68987	19	7	10. 31013	939	19	9	061	952	19	2	048	41
20	9. 69010	20	7	10. 30990	969	20	10	031	959	20	2	041	40
21	032	21	8	968	9. 74998	21	10	10. 25002	966	21	3	034	39
22	055	22	8	945	9. 75028	22	11	10. 24972	973	22	3	027	38
23	077	23	9	923	058	23	11	942	980	23	3	020	37
24	100	24	9	900	087	24	12	913	988	24	3	012	36
25	122	25	9	878	117	25	12	883	10. 05995	25	3	9. 94005	35
26	144	26	10	856	146	26	13	854	10. 06002	26	3	9. 93998	34
27	167	27	10	833	176	27	13	824	009	27	3	991	33
28	189	28	10	811	205	28	14	795	016	28	3	984	32
29	212	29	11	788	235	29	14	765	023	29	3	977	31
30	9. 69234	30	11	10. 30766	9. 75264	30	15	10. 24736	030	30	4	970	30
31	256	31	12	744	294	31	15	706	037	31	4	963	29
32	279	32	12	721	323	32	16	677	045	32	4	955	28
33	301	33	12	699	353	33	16	647	052	33	4	948	27
34	323	34	13	677	382	34	17	618	059	34	4	941	26
35	345	35	13	655	411	35	17	589	10. 06066	35	4	9. 93934	25
36	368	36	13	632	441	36	18	559	073	36	4	927	24
37	390	37	14	610	470	37	18	530	080	37	4	920	23
38	412	38	14	588	9. 75500	38	19	10. 24500	088	38	5	912	22
39	434	39	15	566	529	39	19	471	095	39	5	905	21
40	9. 69456	40	15	10. 30544	558	40	20	442	102	40	5	898	20
41	479	41	15	521	588	41	20	412	109	41	5	891	19
42	501	42	16	499	617	42	21	383	116	42	5	884	18
43	523	43	16	477	647	43	21	353	10. 06124	43	5	9. 93876	17
44	545	44	16	455	676	44	22	324	131	44	5	869	16
45	567	45	17	433	705	45	22	295	138	45	5	862	15
46	589	46	17	411	9. 75735	46	23	10. 24265	145	46	5	855	14
47	611	47	17	389	764	47	23	236	153	47	6	847	13
48	633	48	18	367	793	48	24	207	160	48	6	840	12
49	655	49	18	345	822	49	24	178	167	49	6	833	11
50	9. 69677	50	19	10. 30323	852	50	25	148	174	50	6	826	10
51	699	51	19	301	881	51	25	119	10. 06181	51	6	9. 93819	9
52	721	52	19	279	910	52	26	090	189	52	6	811	8
53	743	53	20	257	939	53	26	061	196	53	6	804	7
54	765	54	20	235	969	54	27	031	203	54	6	797	6
55	787	55	20	213	9. 75998	55	27	10. 24002	211	55	7	789	5
56	809	56	21	191	9. 76027	56	28	10. 23973	218	56	7	782	4
57	831	57	21	169	056	57	28	944	225	57	7	775	3
58	853	58	22	147	086	58	29	914	232	58	7	768	2
59	875	59	22	125	115	59	29	885	240	59	7	760	1
60	9. 69897	60	22	10. 30103	9. 76144	60	29	10. 23856	10. 06247	60	7	9. 93753	0
′ ↑ 119°→	cos	″	Diff.	sec	cot	″	Diff.	tan	csc	″	Diff.	sin	←60° ′ ↑

Logarithms of Trigonometric Functions.

30°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←149° ′
0	9.69897	0	0	10.30103	9.76144	0	0	10.23856	10.06247	0	0	9.93753	60
1	919	1	0	081	173	1	0	827	254	1	0	746	59
2	941	2	1	059	202	2	1	798	262	2	0	738	58
3	963	3	1	037	231	3	1	769	269	3	0	731	57
4	9.69984	4	1	10.30016	261	4	2	739	276	4	0	724	56
5	9.70006	5	2	10.29994	290	5	2	710	283	5	1	717	55
6	028	6	2	972	319	6	3	681	291	6	1	709	54
7	050	7	3	950	348	7	3	652	298	7	1	702	53
8	072	8	3	928	377	8	4	623	305	8	1	695	52
9	093	9	3	907	406	9	4	594	313	9	1	687	51
10	115	10	4	885	9.76435	10	5	10.23565	10.06320	10	1	9.93680	50
11	137	11	4	863	464	11	5	536	327	11	1	673	49
12	159	12	4	841	493	12	6	507	335	12	1	665	48
13	9.70180	13	5	10.29820	522	13	6	478	342	13	2	658	47
14	202	14	5	798	551	14	7	449	350	14	2	650	46
15	224	15	5	776	580	15	7	420	357	15	2	643	45
16	245	16	6	755	609	16	8	391	364	16	2	636	44
17	267	17	6	733	639	17	8	361	372	17	2	628	43
18	288	18	6	712	668	18	9	332	379	18	2	621	42
19	310	19	7	690	697	19	9	303	386	19	2	614	41
20	332	20	7	668	9.76725	20	10	10.23275	10.06394	20	2	9.93606	40
21	9.70353	21	8	10.29647	754	21	10	246	401	21	3	599	39
22	375	22	8	625	783	22	11	217	409	22	3	591	38
23	396	23	8	604	812	23	11	188	416	23	3	584	37
24	418	24	9	582	841	24	12	159	423	24	3	577	36
25	439	25	9	561	870	25	12	130	431	25	3	569	35
26	461	26	9	539	899	26	13	101	438	26	3	562	34
27	482	27	10	518	928	27	13	072	446	27	3	554	33
28	9.70504	28	10	10.29496	957	28	13	043	453	28	3	547	32
29	525	29	10	475	9.76986	29	14	10.23014	461	29	4	539	31
30	547	30	11	453	9.77015	30	14	10.22985	10.06468	30	4	9.93532	30
31	568	31	11	432	044	31	15	956	475	31	4	525	29
32	590	32	11	410	073	32	15	927	483	32	4	517	28
33	611	33	12	389	101	33	16	899	490	33	4	510	27
34	633	34	12	367	130	34	16	870	498	34	4	502	26
35	654	35	13	346	159	35	17	841	505	35	4	495	25
36	9.70675	36	13	10.29325	188	36	17	812	513	36	4	487	24
37	697	37	13	303	217	37	18	783	520	37	5	480	23
38	718	38	14	282	246	38	18	754	528	38	5	472	22
39	739	39	14	261	274	39	19	726	535	39	5	465	21
40	761	40	14	239	9.77303	40	19	10.22697	10.06543	40	5	9.93457	20
41	782	41	15	218	332	41	20	668	550	41	5	450	19
42	803	42	15	197	361	42	20	639	558	42	5	442	18
43	9.70824	43	15	10.29176	390	43	21	610	565	43	5	435	17
44	846	44	16	154	418	44	21	582	573	44	5	427	16
45	867	45	16	133	447	45	22	553	580	45	6	420	15
46	888	46	16	112	476	46	22	524	588	46	6	412	14
47	909	47	17	091	505	47	23	495	595	47	6	405	13
48	931	48	17	069	533	48	23	467	603	48	6	397	12
49	952	49	18	048	562	49	24	438	610	49	6	390	11
50	973	50	18	027	9.77591	50	24	10.22409	10.06618	50	6	9.93382	10
51	9.70994	51	18	10.29006	619	51	25	381	625	51	6	375	9
52	9.71015	52	19	10.28985	648	52	25	352	633	52	6	367	8
53	036	53	19	964	677	53	26	323	640	53	7	360	7
54	058	54	19	942	706	54	26	294	648	54	7	352	6
55	079	55	20	921	734	55	26	266	656	55	7	344	5
56	100	56	20	900	763	56	27	237	663	56	7	337	4
57	121	57	20	879	791	57	27	209	671	57	7	329	3
58	142	58	21	858	820	58	28	180	678	58	7	322	2
59	163	59	21	837	849	59	28	151	686	59	7	314	1
60	9.71184	60	21	10.28816	9.77877	60	29	10.22123	10.06693	60	7	9.93307	0
′													′
120°→ cos		″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	←59°

TABLE 33.

Logarithms of Trigonometric Functions.

31°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←148° ′
0	9.71184	0	0	10.28816	9.77877	0	0	10.22123	10.06693	0	0	9.93307	60
1	205	1	0	795	906	1	0	094	701	1	0	299	59
2	226	2	1	774	935	2	1	065	709	2	0	291	58
3	247	3	1	753	963	3	1	037	716	3	0	284	57
4	268	4	1	732	9.77992	4	2	10.22008	724	4	1	276	56
5	289	5	2	711	9.78020	5	2	10.21980	731	5	1	269	55
6	310	6	2	690	049	6	3	951	739	6	1	261	54
7	331	7	2	669	077	7	3	923	747	7	1	253	53
8	352	8	3	648	106	8	4	894	754	8	1	246	52
9	373	9	3	627	135	9	4	865	762	9	1	238	51
10	9.71393	10	3	10.28607	163	10	5	837	10.06770	10	1	9.93230	50
11	414	11	4	586	192	11	5	808	777	11	1	223	49
12	435	12	4	565	220	12	6	780	785	12	2	215	48
13	456	13	4	544	249	13	6	751	793	13	2	207	47
14	477	14	5	523	9.78277	14	7	10.21723	800	14	2	200	46
15	498	15	5	502	306	15	7	694	808	15	2	192	45
16	519	16	5	481	334	16	8	666	816	16	2	184	44
17	539	17	6	461	363	17	8	637	823	17	2	177	43
18	560	18	6	440	391	18	9	609	831	18	2	169	42
19	581	19	7	419	419	19	9	581	839	19	2	161	41
20	9.71602	20	7	10.28398	448	20	9	552	10.06846	20	3	9.93154	40
21	622	21	7	378	476	21	10	524	854	21	3	146	39
22	643	22	8	357	9.78505	22	10	10.21495	862	22	3	138	38
23	664	23	8	336	533	23	11	467	869	23	3	131	37
24	685	24	8	315	562	24	11	438	877	24	3	123	36
25	705	25	9	295	590	25	12	410	885	25	3	115	35
26	726	26	9	274	618	26	12	382	892	26	3	108	34
27	747	27	9	253	647	27	13	353	900	27	3	100	33
28	767	28	10	233	675	28	13	325	908	28	4	092	32
29	788	29	10	212	704	29	14	296	916	29	4	084	31
30	9.71809	30	10	10.28191	9.78732	30	14	10.21268	10.06923	30	4	9.93077	30
31	829	31	11	171	760	31	15	240	931	31	4	069	29
32	850	32	11	150	789	32	15	211	939	32	4	061	28
33	870	33	11	130	817	33	16	183	947	33	4	053	27
34	891	34	12	109	845	34	16	155	954	34	4	046	26
35	911	35	12	089	874	35	17	126	962	35	5	038	25
36	932	36	12	068	902	36	17	098	970	36	5	030	24
37	952	37	13	048	930	37	17	070	978	37	5	022	23
38	973	38	13	027	959	38	18	041	986	38	5	014	22
39	9.71994	39	13	10.28006	9.78987	39	18	10.21013	10.06993	39	5	9.93007	21
40	9.72014	40	14	10.27986	9.79015	40	19	10.20985	10.07001	40	5	9.92999	20
41	034	41	14	966	043	41	19	957	009	41	5	991	19
42	055	42	14	945	072	42	20	928	017	42	5	983	18
43	075	43	15	925	100	43	20	900	024	43	6	976	17
44	096	44	15	904	128	44	21	872	032	44	6	968	16
45	116	45	15	884	156	45	21	844	040	45	6	960	15
46	137	46	16	863	185	46	22	815	048	46	6	952	14
47	157	47	16	843	213	47	22	787	056	47	6	944	13
48	177	48	16	823	241	48	23	759	064	48	6	936	12
49	198	49	17	802	269	49	23	731	071	49	6	929	11
50	9.72218	50	17	10.27782	9.79297	50	24	10.20703	10.07079	50	6	9.92921	10
51	238	51	18	762	326	51	24	674	087	51	7	913	9
52	259	52	18	741	354	52	25	646	095	52	7	905	8
53	279	53	18	721	382	53	25	618	103	53	7	897	7
54	299	54	19	701	410	54	26	590	111	54	7	889	6
55	320	55	19	680	438	55	26	562	119	55	7	881	5
56	340	56	19	660	466	56	26	534	126	56	7	874	4
57	360	57	20	640	495	57	27	505	134	57	7	866	3
58	381	58	20	619	523	58	27	477	142	58	7	858	2
59	401	59	20	599	551	59	28	449	150	59	8	850	1
60	9.72421	60	21	10.27579	9.79579	60	28	10.20421	10.07158	60	8	9.92842	0
′													′
121°→ cos		″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	←58°

Logarithms of Trigonometric Functions.

32°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos ←147° ′	
0	9. 72421	0	0	10. 27579	9. 79579	0	0	10. 20421	10. 07158	0	0	9. 92842	60
1	441	1	0	559	607	1	0	393	166	1	0	834	59
2	461	2	1	539	635	2	1	365	174	2	0	826	58
3	482	3	1	518	663	3	1	337	182	3	0	818	57
4	502	4	1	498	691	4	2	309	190	4	1	810	56
5	522	5	2	478	719	5	2	281	197	5	1	803	55
6	542	6	2	458	747	6	3	253	205	6	1	795	54
7	9. 72562	7	2	10. 27438	9. 79776	7	3	10. 20224	213	7	1	787	53
8	582	8	3	418	804	8	4	196	221	8	1	779	52
9	602	9	3	398	832	9	4	168	229	9	1	771	51
10	622	10	3	378	860	10	5	140	10. 07237	10	1	9. 92763	50
11	643	11	4	357	888	11	5	112	245	11	1	755	49
12	663	12	4	337	916	12	6	084	253	12	2	747	48
13	683	13	4	317	944	13	6	056	261	13	2	739	47
14	9. 72703	14	5	10. 27297	9. 79972	14	7	028	269	14	2	731	46
15	723	15	5	277	9. 80000	15	7	10. 20000	277	15	2	723	45
16	743	16	5	257	028	16	7	10. 19972	285	16	2	715	44
17	763	17	6	237	056	17	8	944	293	17	2	707	43
18	783	18	6	217	084	18	8	916	301	18	2	699	42
19	803	19	6	197	112	19	9	888	309	19	3	691	41
20	823	20	7	177	140	20	9	860	10. 07317	20	3	9. 92683	40
21	9. 72843	21	7	10. 27157	168	21	10	832	325	21	3	675	39
22	863	22	7	137	9. 80195	22	10	10. 19805	333	22	3	667	38
23	883	23	8	117	223	23	11	777	341	23	3	659	37
24	902	24	8	098	251	24	11	749	349	24	3	651	36
25	922	25	8	078	279	25	12	721	357	25	3	643	35
26	942	26	9	058	307	26	12	693	365	26	3	635	34
27	962	27	9	038	335	27	13	665	373	27	4	627	33
28	9. 72982	28	9	10. 27018	363	28	13	637	381	28	4	619	32
29	9. 73002	29	10	10. 26998	9. 80391	29	13	10. 19609	389	29	4	611	31
30	022	30	10	978	419	30	14	581	10. 07397	30	4	9. 92603	30
31	041	31	10	959	447	31	14	553	405	31	4	595	29
32	061	32	11	939	474	32	15	526	413	32	4	587	28
33	081	33	11	919	502	33	15	498	421	33	4	579	27
34	101	34	11	899	530	34	16	470	429	34	5	571	26
35	121	35	12	879	558	35	16	442	437	35	5	563	25
36	140	36	12	860	9. 80586	36	17	10. 19414	445	36	5	555	24
37	160	37	12	840	614	37	17	386	454	37	5	546	23
38	180	38	13	820	642	38	18	358	462	38	5	538	22
39	200	39	13	800	669	39	18	331	470	39	5	530	21
40	9. 73219	40	13	10. 26781	697	40	19	303	10. 07478	40	5	9. 92522	20
41	239	41	14	761	725	41	19	275	486	41	6	514	19
42	259	42	14	741	753	42	20	247	494	42	6	506	18
43	278	43	14	722	9. 80781	43	20	10. 19219	502	43	6	498	17
44	298	44	15	702	808	44	20	192	510	44	6	490	16
45	318	45	15	682	836	45	21	164	518	45	6	482	15
46	337	46	15	663	864	46	21	136	527	46	6	473	14
47	357	47	16	643	892	47	22	108	535	47	6	465	13
48	377	48	16	623	919	48	22	081	543	48	6	457	12
49	396	49	16	604	947	49	23	053	551	49	7	449	11
50	9. 73416	50	17	10. 26584	9. 80975	50	23	10. 19025	10. 07559	50	7	9. 92441	10
51	435	51	17	565	9. 81003	51	24	10. 18997	567	51	7	433	9
52	455	52	17	545	030	52	24	970	575	52	7	425	8
53	474	53	18	526	058	53	25	942	584	53	7	416	7
54	494	54	18	506	086	54	25	914	592	54	7	408	6
55	513	55	18	487	113	55	26	887	600	55	7	400	5
56	533	56	19	467	141	56	26	859	608	56	8	392	4
57	552	57	19	448	169	57	26	831	616	57	8	384	3
58	572	58	19	428	196	58	27	804	624	58	8	376	2
59	591	59	20	409	224	59	27	776	633	59	8	367	1
60	9. 73611	60	20	10. 26389	9. 81252	60	28	10. 18748	10. 07641	60	8	9. 92359	0
′ ↑ 122°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin ←57° ′ ↑	

TABLE 33.

Logarithms of Trigonometric Functions.

33°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←146° ′
0	9. 73611	0	0	10. 26389	9. 81252	0	0	10. 18748	10. 07641	0	0	9. 92359	60
1	630	1	0	370	279	1	0	721	649	1	0	351	59
2	650	2	1	350	307	2	1	693	657	2	0	343	58
3	669	3	1	331	335	3	1	665	665	3	0	335	57
4	689	4	1	311	362	4	2	638	674	4	1	326	56
5	708	5	2	292	390	5	2	610	682	5	1	318	55
6	727	6	2	273	418	6	3	582	690	6	1	310	54
7	747	7	2	253	445	7	3	555	698	7	1	302	53
8	766	8	3	234	473	8	4	527	10. 07707	8	1	9. 92293	52
9	785	9	3	215	9. 81500	9	4	10. 18500	715	9	1	285	51
10	9. 73805	10	3	10. 26195	528	10	5	472	723	10	1	277	50
11	824	11	3	176	556	11	5	444	731	11	2	269	49
12	843	12	4	157	583	12	5	417	740	12	2	260	48
13	863	13	4	137	611	13	6	389	748	13	2	252	47
14	882	14	4	118	638	14	6	362	756	14	2	244	46
15	901	15	5	099	666	15	7	334	765	15	2	235	45
16	921	16	5	079	693	16	7	307	773	16	2	227	44
17	940	17	5	060	721	17	8	279	10. 07781	17	2	9. 92219	43
18	959	18	6	041	9. 81748	18	8	10. 18252	789	18	3	211	42
19	978	19	6	022	776	19	9	224	798	19	3	202	41
20	9. 73997	20	6	10. 26003	803	20	9	197	806	20	3	194	40
21	9. 74017	21	7	10. 25983	831	21	10	169	814	21	3	186	39
22	036	22	7	964	858	22	10	142	823	22	3	177	38
23	055	23	7	945	886	23	11	114	831	23	3	169	37
24	074	24	8	926	913	24	11	087	839	24	3	161	36
25	093	25	8	907	941	25	11	059	848	25	3	152	35
26	113	26	8	887	968	26	12	032	10. 07856	26	4	9. 92144	34
27	132	27	9	868	9. 81996	27	12	10. 18004	864	27	4	136	33
28	151	28	9	849	9. 82023	28	13	10. 17977	873	28	4	127	32
29	170	29	9	830	051	29	13	949	881	29	4	119	31
30	9. 74189	30	10	10. 25811	078	30	14	922	889	30	4	111	30
31	208	31	10	792	106	31	14	894	898	31	4	102	29
32	227	32	10	773	133	32	15	867	906	32	4	094	28
33	246	33	10	754	161	33	15	839	914	33	5	086	27
34	265	34	11	735	188	34	16	812	923	34	5	077	26
35	284	35	11	716	215	35	16	785	10. 07931	35	5	9. 92069	25
36	303	36	11	697	243	36	16	757	940	36	5	060	24
37	322	37	12	678	270	37	17	730	948	37	5	052	23
38	341	38	12	659	298	38	17	702	956	38	5	044	22
39	360	39	12	640	9. 82325	39	18	10. 17675	965	39	5	035	21
40	9. 74379	40	13	10. 25621	352	40	18	648	973	40	6	027	20
41	398	41	13	602	380	41	19	620	982	41	6	018	19
42	417	42	13	583	407	42	19	593	990	42	6	010	18
43	436	43	14	564	435	43	20	565	10. 07998	43	6	9. 92002	17
44	455	44	14	545	462	44	20	538	10. 08007	44	6	9. 91993	16
45	474	45	14	526	489	45	21	511	015	45	6	985	15
46	493	46	15	507	517	46	21	483	024	46	6	976	14
47	512	47	15	488	544	47	22	456	032	47	7	968	13
48	531	48	15	469	571	48	22	429	041	48	7	959	12
49	549	49	16	451	9. 82599	49	22	10. 17401	049	49	7	951	11
50	9. 74568	50	16	10. 25432	626	50	23	374	058	50	7	942	10
51	587	51	16	413	653	51	23	347	066	51	7	934	9
52	606	52	17	394	681	52	24	319	10. 08075	52	7	9. 91925	8
53	625	53	17	375	708	53	24	292	083	53	7	917	7
54	644	54	17	356	735	54	25	265	092	54	8	908	6
55	662	55	17	338	762	55	25	238	100	55	8	900	5
56	681	56	18	319	790	56	26	210	109	56	8	891	4
57	700	57	18	300	817	57	26	183	117	57	8	883	3
58	719	58	18	281	844	58	27	156	126	58	8	874	2
59	737	59	19	263	871	59	27	129	134	59	8	866	1
60	9. 74756	60	19	10. 25244	9. 82899	60	27	10. 17101	10. 08143	60	8	9. 91857	0
′ ↑ 123°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←56°

Logarithms of Trigonometric Functions.

34°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←145° ′ ↓
0	9. 74756	0	0	10. 25244	9. 82899	0	0	10. 17101	10. 08143	0	0	9. 91857	60
1	775	1	0	225	926	1	0	074	151	1	0	849	59
2	794	2	1	206	953	2	1	047	160	2	0	840	58
3	812	3	1	188	9. 82980	3	1	10. 17020	168	3	0	832	57
4	831	4	1	169	9. 83008	4	2	10. 16992	177	4	1	823	56
5	850	5	2	150	035	5	2	965	185	5	1	815	55
6	9. 74868	6	2	10. 25132	062	6	3	938	194	6	1	806	54
7	887	7	2	113	089	7	3	911	202	7	1	798	53
8	906	8	2	094	117	8	4	883	211	8	1	789	52
9	924	9	3	076	144	9	4	856	219	9	1	781	51
10	943	10	3	057	171	10	5	829	10. 08228	10	1	9. 91772	50
11	961	11	3	039	9. 83198	11	5	10. 16802	237	11	2	763	49
12	980	12	4	020	225	12	5	775	245	12	2	755	48
13	9. 74999	13	4	10. 25001	252	13	6	748	254	13	2	746	47
14	9. 75017	14	4	10. 24983	280	14	6	720	262	14	2	738	46
15	036	15	5	964	307	15	7	693	271	15	2	729	45
16	054	16	5	946	334	16	7	666	280	16	2	720	44
17	073	17	5	927	361	17	8	639	288	17	2	712	43
18	091	18	6	909	9. 83388	18	8	10. 16612	297	18	3	703	42
19	110	19	6	890	415	19	9	585	305	19	3	695	41
20	128	20	6	872	442	20	9	558	10. 08314	20	3	9. 91686	40
21	147	21	6	853	470	21	9	530	323	21	3	677	39
22	9. 75165	22	7	10. 24835	497	22	10	503	331	22	3	669	38
23	184	23	7	816	524	23	10	476	340	23	3	660	37
24	202	24	7	798	551	24	11	449	349	24	3	651	36
25	221	25	8	779	578	25	11	422	357	25	4	643	35
26	239	26	8	761	9. 83605	26	12	10. 16395	366	26	4	634	34
27	258	27	8	742	632	27	12	368	375	27	4	625	33
28	276	28	9	724	659	28	13	341	383	28	4	617	32
29	294	29	9	706	686	29	13	314	392	29	4	608	31
30	9. 75313	30	9	10. 24687	713	30	14	287	10. 08401	30	4	9. 91599	30
31	331	31	9	669	740	31	14	260	409	31	4	591	29
32	350	32	10	650	768	32	14	232	418	32	5	582	28
33	368	33	10	632	9. 83795	33	15	10. 16205	427	33	5	573	27
34	386	34	10	614	822	34	15	178	435	34	5	565	26
35	405	35	11	595	849	35	16	151	444	35	5	556	25
36	423	36	11	577	876	36	16	124	453	36	5	547	24
37	9. 75441	37	11	10. 24559	903	37	17	097	462	37	5	538	23
38	459	38	12	541	930	38	17	070	470	38	5	530	22
39	478	39	12	522	957	39	18	043	479	39	6	521	21
40	496	40	12	504	9. 83984	40	18	10. 16016	10. 08488	40	6	9. 91512	20
41	514	41	13	486	9. 84011	41	18	10. 15989	496	41	6	504	19
42	533	42	13	467	038	42	19	962	505	42	6	495	18
43	551	43	13	449	065	43	19	935	514	43	6	486	17
44	9. 75569	44	13	10. 24431	092	44	20	908	523	44	6	477	16
45	587	45	14	413	119	45	20	881	531	45	7	469	15
46	605	46	14	395	146	46	21	854	540	46	7	460	14
47	624	47	14	376	173	47	21	827	549	47	7	451	13
48	642	48	15	358	200	48	22	800	558	48	7	442	12
49	660	49	15	340	227	49	22	773	567	49	7	433	11
50	678	50	15	322	9. 84254	50	23	10. 15746	10. 08575	50	7	9. 91425	10
51	696	51	16	304	280	51	23	720	584	51	7	416	9
52	9. 75714	52	16	10. 24286	307	52	23	693	593	52	8	407	8
53	733	53	16	267	334	53	24	666	602	53	8	398	7
54	751	54	17	249	361	54	24	639	611	54	8	389	6
55	769	55	17	231	388	55	25	612	619	55	8	381	5
56	787	56	17	213	415	56	25	585	628	56	8	372	4
57	805	57	17	195	442	57	26	558	637	57	8	363	3
58	823	58	18	177	469	58	26	531	646	58	8	354	2
59	841	59	18	159	496	59	27	504	655	59	9	345	1
60	9. 75859	60	18	10. 24141	9. 84523	60	27	10. 15477	10. 08664	60	9	9. 91336	0
′ ↑ 124°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←55°

TABLE 33.

Logarithms of Trigonometric Functions.

35°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←144° ′
0	9. 75859	0	0	10. 24141	9. 84523	0	0	10. 15477	10. 08664	0	0	9. 91336	60
1	877	1	0	123	550	1	0	450	672	1	0	328	59
2	895	2	1	105	576	2	1	424	681	2	0	319	58
3	913	3	1	087	603	3	1	397	690	3	0	310	57
4	931	4	1	069	630	4	2	370	699	4	1	301	56
5	949	5	1	051	657	5	2	343	708	5	1	292	55
6	967	6	2	033	9. 84684	6	3	10. 15316	717	6	1	283	54
7	9. 75985	7	2	10. 24015	711	7	3	289	726	7	1	274	53
8	9. 76003	8	2	10. 23997	738	8	4	262	10. 08734	8	1	9. 91266	52
9	021	9	3	979	764	9	4	236	743	9	1	257	51
10	039	10	3	961	791	10	4	209	752	10	2	248	50
11	057	11	3	943	9. 84818	11	5	10. 15182	761	11	2	239	49
12	075	12	4	925	845	12	5	155	770	12	2	230	48
13	093	13	4	907	872	13	6	128	779	13	2	221	47
14	111	14	4	889	899	14	6	101	788	14	2	212	46
15	129	15	4	871	925	15	7	075	10. 08797	15	2	9. 91203	45
16	146	16	5	854	952	16	7	048	806	16	2	194	44
17	164	17	5	836	9. 84979	17	8	10. 15021	815	17	3	185	43
18	182	18	5	818	9. 85006	18	8	10. 14994	824	18	3	176	42
19	9. 76200	19	6	10. 23800	033	19	8	967	833	19	3	167	41
20	218	20	6	782	059	20	9	941	842	20	3	158	40
21	236	21	6	764	086	21	9	914	851	21	3	149	39
22	253	22	6	747	113	22	10	887	10. 08859	22	3	9. 91141	38
23	271	23	7	729	140	23	10	860	868	23	3	132	37
24	289	24	7	711	166	24	11	834	877	24	4	123	36
25	307	25	7	693	193	25	11	807	886	25	4	114	35
26	324	26	8	676	9. 85220	26	12	10. 14780	895	26	4	105	34
27	342	27	8	658	247	27	12	753	904	27	4	096	33
28	360	28	8	640	273	28	12	727	913	28	4	087	32
29	378	29	9	622	300	29	13	700	10. 08922	29	4	9. 91078	31
30	9. 76395	30	9	10. 23605	327	30	13	673	931	30	5	069	30
31	413	31	9	587	354	31	14	646	940	31	5	060	29
32	431	32	9	569	380	32	14	620	949	32	5	051	28
33	448	33	10	552	9. 85407	33	15	10. 14593	958	33	5	042	27
34	466	34	10	534	434	34	15	566	967	34	5	033	26
35	484	35	10	516	460	35	16	540	977	35	5	023	25
36	501	36	11	499	487	36	16	513	986	36	5	014	24
37	519	37	11	481	514	37	16	486	10. 08995	37	6	9. 91005	23
38	537	38	11	463	540	38	17	460	10. 09004	38	6	9. 90996	22
39	554	39	12	446	567	39	17	433	013	39	6	987	21
40	9. 76572	40	12	10. 23428	594	40	18	406	022	40	6	978	20
41	590	41	12	410	9. 85620	41	18	10. 14380	031	41	6	969	19
42	607	42	12	393	647	42	19	353	040	42	6	960	18
43	625	43	13	375	674	43	19	326	049	43	6	951	17
44	642	44	13	358	700	44	20	300	058	44	7	942	16
45	660	45	13	340	727	45	20	273	10. 09067	45	7	9. 90933	15
46	677	46	14	323	754	46	20	246	076	46	7	924	14
47	695	47	14	305	780	47	21	220	085	47	7	915	13
48	712	48	14	288	9. 85807	48	21	10. 14193	094	48	7	906	12
49	730	49	14	270	834	49	22	166	104	49	7	896	11
50	9. 76747	50	15	10. 23253	860	50	22	140	113	50	8	887	10
51	765	51	15	235	887	51	23	113	122	51	8	878	9
52	782	52	15	218	913	52	23	087	131	52	8	869	8
53	800	53	16	200	940	53	24	060	10. 09140	53	8	9. 90860	7
54	817	54	16	183	967	54	24	033	149	54	8	851	6
55	835	55	16	165	9. 85993	55	24	10. 14007	158	55	8	842	5
56	852	56	17	148	9. 86020	56	25	10. 13980	168	56	8	832	4
57	870	57	17	130	046	57	25	954	177	57	9	823	3
58	887	58	17	113	073	58	26	927	186	58	9	814	2
59	904	59	17	096	100	59	26	900	195	59	9	805	1
60	9. 76922	60	18	10. 23078	9. 86126	60	27	10. 13874	10. 09204	60	9	9. 90796	0
′													′
↑ 125°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	←54° ↑

Logarithms of Trigonometric Functions.

36°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←143° ′ ↓
0	9. 76922	0	0	10. 23078	9. 86126	0	0	10. 13874	10. 09204	0	0	9. 90796	60
1	939	1	0	061	153	1	0	847	213	1	0	787	59
2	957	2	1	043	179	2	1	821	223	2	0	777	58
3	974	3	1	026	206	3	1	794	232	3	0	768	57
4	9. 76991	4	1	10. 23009	232	4	2	768	241	4	1	759	56
5	9. 77009	5	1	10. 22991	259	5	2	741	250	5	1	750	55
6	026	6	2	974	285	6	3	715	259	6	1	741	54
7	043	7	2	957	312	7	3	688	269	7	1	731	53
8	061	8	2	939	338	8	4	662	278	8	1	722	52
9	078	9	3	922	365	9	4	635	287	9	1	713	51
10	095	10	3	905	392	10	4	608	10. 09296	10	2	9. 90704	50
11	112	11	3	888	9. 86418	11	5	10. 13582	306	11	2	694	49
12	130	12	3	870	445	12	5	555	315	12	2	685	48
13	147	13	4	853	471	13	6	529	324	13	2	676	47
14	9. 77164	14	4	10. 22836	498	14	6	502	333	14	2	667	46
15	181	15	4	819	524	15	7	476	343	15	2	657	45
16	199	16	5	801	551	16	7	449	352	16	2	648	44
17	216	17	5	784	577	17	7	423	361	17	3	639	43
18	233	18	5	767	603	18	8	397	370	18	3	630	42
19	250	19	5	750	630	19	8	370	380	19	3	620	41
20	268	20	6	732	656	20	9	344	10. 09389	20	3	9. 90611	40
21	285	21	6	715	9. 86683	21	9	317	398	21	3	602	39
22	302	22	6	698	709	22	10	10. 13291	408	22	3	592	38
23	9. 77319	23	7	10. 22681	736	23	10	264	417	23	4	583	37
24	336	24	7	664	762	24	11	238	426	24	4	574	36
25	353	25	7	647	789	25	11	211	435	25	4	565	35
26	370	26	7	630	815	26	11	185	445	26	4	555	34
27	387	27	8	613	842	27	12	158	454	27	4	546	33
28	405	28	8	595	868	28	12	132	463	28	4	537	32
29	422	29	8	578	894	29	13	106	473	29	5	527	31
30	439	30	9	561	921	30	13	079	10. 09482	30	5	9. 90518	30
31	456	31	9	544	947	31	14	053	491	31	5	509	29
32	473	32	9	527	9. 86974	32	14	026	501	32	5	499	28
33	9. 77490	33	9	10. 22510	9. 87000	33	15	10. 13000	510	33	5	490	27
34	507	34	10	493	027	34	15	10. 12973	520	34	5	480	26
35	524	35	10	476	053	35	15	947	529	35	5	471	25
36	541	36	10	459	079	36	16	921	538	36	6	462	24
37	558	37	11	442	106	37	16	894	548	37	6	452	23
38	575	38	11	425	132	38	17	868	557	38	6	443	22
39	592	39	11	408	158	39	17	842	566	39	6	434	21
40	609	40	11	391	185	40	18	815	10. 09576	40	6	9. 90424	20
41	626	41	12	374	211	41	18	789	585	41	6	415	19
42	9. 77643	42	12	10. 22357	9. 87238	42	18	762	595	42	7	405	18
43	660	43	12	340	264	43	19	10. 12736	604	43	7	396	17
44	677	44	13	323	290	44	19	710	614	44	7	386	16
45	694	45	13	306	317	45	20	683	623	45	7	377	15
46	711	46	13	289	343	46	20	657	632	46	7	368	14
47	728	47	13	272	369	47	21	631	642	47	7	358	13
48	744	48	14	256	396	48	21	604	651	48	7	349	12
49	761	49	14	239	422	49	22	578	661	49	8	339	11
50	778	50	14	222	448	50	22	552	10. 09670	50	8	9. 90330	10
51	9. 77795	51	15	10. 22205	9. 87475	51	22	10. 12525	680	51	8	320	9
52	812	52	15	188	501	52	23	499	689	52	8	311	8
53	829	53	15	171	527	53	23	473	699	53	8	301	7
54	846	54	15	154	554	54	24	446	708	54	8	292	6
55	862	55	16	138	580	55	24	420	718	55	9	282	5
56	879	56	16	121	606	56	25	394	727	56	9	273	4
57	896	57	16	104	633	57	25	367	737	57	9	263	3
58	913	58	16	087	659	58	26	341	746	58	9	254	2
59	930	59	17	070	685	59	26	315	756	59	9	244	1
60	9. 77946	60	17	10. 22054	9. 87711	60	26	10. 12289	10. 09765	60	9	9. 90235	0
′ ↑ 126°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←53°

TABLE 33.

Logarithms of Trigonometric Functions.

37°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos ←142° ′ ↓
0	9. 77946	0	0	10. 22054	9. 87711	0	0	10. 12289	10. 09765	0	0	9. 90235	60
1	963	1	0	037	738	1	0	262	775	1	0	225	59
2	980	2	1	020	764	2	1	236	784	2	0	216	58
3	9. 77997	3	1	10. 22003	790	3	1	210	794	3	0	206	57
4	9. 78013	4	1	10. 21987	817	4	2	183	803	4	1	197	56
5	030	5	1	970	843	5	2	157	813	5	1	187	55
6	047	6	2	953	869	6	3	131	822	6	1	178	54
7	063	7	2	937	895	7	3	105	832	7	1	168	53
8	080	8	2	920	922	8	3	078	10. 09841	8	1	9. 90159	52
9	097	9	2	903	948	9	4	052	851	9	1	149	51
10	113	10	3	887	9. 87974	10	4	026	861	10	2	139	50
11	130	11	3	870	9. 88000	11	5	10. 12000	870	11	2	130	49
12	9. 78147	12	3	10. 21853	027	12	5	10. 11973	880	12	2	120	48
13	163	13	4	837	053	13	6	947	889	13	2	111	47
14	180	14	4	820	079	14	6	921	899	14	2	101	46
15	197	15	4	803	105	15	7	895	909	15	2	091	45
16	213	16	4	787	131	16	7	869	10. 09918	16	3	9. 90082	44
17	230	17	5	770	158	17	7	842	928	17	3	072	43
18	246	18	5	754	184	18	8	816	937	18	3	063	42
19	263	19	5	737	210	19	8	790	947	19	3	053	41
20	9. 78280	20	5	10. 21720	236	20	9	764	957	20	3	043	40
21	296	21	6	704	9. 88262	21	9	10. 11738	966	21	3	034	39
22	313	22	6	687	289	22	10	711	976	22	4	024	38
23	329	23	6	671	315	23	10	685	986	23	4	014	37
24	346	24	7	654	341	24	10	659	10. 09995	24	4	9. 90005	36
25	362	25	7	638	367	25	11	633	10. 10005	25	4	9. 89995	35
26	379	26	7	621	393	26	11	607	015	26	4	985	34
27	395	27	7	605	420	27	12	580	024	27	4	976	33
28	9. 78412	28	8	10. 21588	446	28	12	554	034	28	5	966	32
29	428	29	8	572	472	29	13	528	044	29	5	956	31
30	445	30	8	555	9. 88498	30	13	10. 11502	053	30	5	947	30
31	461	31	9	539	524	31	14	476	063	31	5	937	29
32	478	32	9	522	550	32	14	450	10. 10073	32	5	9. 89927	28
33	494	33	9	506	577	33	14	423	082	33	5	918	27
34	510	34	9	490	603	34	15	397	092	34	5	908	26
35	527	35	10	473	629	35	15	371	102	35	6	898	25
36	9. 78543	36	10	10. 21457	655	36	16	345	112	36	6	888	24
37	560	37	10	440	681	37	16	319	121	37	6	879	23
38	576	38	10	424	707	38	17	293	131	38	6	869	22
39	592	39	11	408	733	39	17	267	10. 10141	39	6	9. 89859	21
40	609	40	11	391	9. 88759	40	17	10. 11241	151	40	6	849	20
41	625	41	11	375	786	41	18	214	160	41	7	840	19
42	642	42	12	358	812	42	18	188	170	42	7	830	18
43	658	43	12	342	838	43	19	162	180	43	7	820	17
44	9. 78674	44	12	10. 21326	864	44	19	136	190	44	7	810	16
45	691	45	12	309	890	45	20	110	199	45	7	801	15
46	707	46	13	293	916	46	20	084	10. 10209	46	7	9. 89791	14
47	723	47	13	277	942	47	20	058	219	47	8	781	13
48	739	48	13	261	968	48	21	032	229	48	8	771	12
49	756	49	13	244	9. 88994	49	21	10. 11006	239	49	8	761	11
50	772	50	14	228	9. 89020	50	22	10. 10980	248	50	8	752	10
51	788	51	14	212	046	51	22	954	258	51	8	742	9
52	9. 78805	52	14	10. 21195	073	52	23	927	268	52	8	732	8
53	821	53	15	179	099	53	23	901	10. 10278	53	9	9. 89722	7
54	837	54	15	163	125	54	24	875	288	54	9	712	6
55	853	55	15	147	151	55	24	849	298	55	9	702	5
56	869	56	15	131	177	56	24	823	307	56	9	693	4
57	886	57	16	114	203	57	25	797	317	57	9	683	3
58	902	58	16	098	229	58	25	771	327	58	9	673	2
59	918	59	16	082	255	59	26	745	337	59	10	663	1
60	9. 78934	60	16	10. 21066	9. 89281	60	26	10. 10719	10. 10347	60	10	9. 89653	0
′ ↑ 127°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin ′ ↑ ←52°

Logarithms of Trigonometric Functions.

38°→ ↓ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos ←141° ↓ ′	
0	9. 78934	0	0	10. 21066	9. 89281	0	0	10. 10719	10. 10347	0	0	9. 89653	60
1	950	1	0	050	307	1	0	693	357	1	0	643	59
2	967	2	1	033	333	2	1	667	367	2	0	633	58
3	983	3	1	017	359	3	1	641	376	3	1	624	57
4	9. 78999	4	1	10. 21001	385	4	2	615	386	4	1	614	56
5	9. 79015	5	1	10. 20985	411	5	2	589	396	5	1	604	55
6	031	6	2	969	437	6	3	563	406	6	1	594	54
7	047	7	2	953	9. 89463	7	3	10. 10537	416	7	1	584	53
8	063	8	2	937	489	8	3	511	426	8	1	574	52
9	079	9	2	921	515	9	4	485	436	9	2	564	51
10	095	10	3	905	541	10	4	459	10. 10446	10	2	9. 89554	50
11	111	11	3	889	567	11	5	433	456	11	2	544	49
12	128	12	3	872	593	12	5	407	466	12	2	534	48
13	9. 79144	13	3	10. 20856	619	13	6	381	476	13	2	524	47
14	160	14	4	840	9. 89645	14	6	10. 10355	486	14	2	514	46
15	176	15	4	824	671	15	6	329	496	15	3	504	45
16	192	16	4	808	697	16	7	303	505	16	3	495	44
17	208	17	5	792	723	17	7	277	515	17	3	485	43
18	224	18	5	776	749	18	8	251	525	18	3	475	42
19	240	19	5	760	775	19	8	225	535	19	3	465	41
20	256	20	5	744	801	20	9	199	10. 10545	20	3	9. 89455	40
21	9. 79272	21	6	10. 20728	9. 89827	21	9	10. 10173	555	21	4	445	39
22	288	22	6	712	853	22	10	147	565	22	4	435	38
23	304	23	6	696	879	23	10	121	575	23	4	425	37
24	319	24	6	681	905	24	10	095	585	24	4	415	36
25	335	25	7	665	931	25	11	069	595	25	4	405	35
26	351	26	7	649	957	26	11	043	605	26	4	395	34
27	367	27	7	633	9. 89983	27	12	10. 10017	615	27	5	385	33
28	383	28	7	617	9. 90009	28	12	10. 09991	625	28	5	375	32
29	9. 79399	29	8	10. 20601	035	29	13	965	636	29	5	364	31
30	415	30	8	585	061	30	13	939	10. 10646	30	5	9. 89354	30
31	431	31	8	569	086	31	13	914	656	31	5	344	29
32	447	32	8	553	112	32	14	888	666	32	5	334	28
33	463	33	9	537	138	33	14	862	676	33	6	324	27
34	478	34	9	522	164	34	15	836	686	34	6	314	26
35	494	35	9	506	190	35	15	810	696	35	6	304	25
36	9. 79510	36	10	10. 20490	9. 90216	36	16	10. 09784	706	36	6	294	24
37	526	37	10	474	242	37	16	758	716	37	6	284	23
38	542	38	10	458	268	38	16	732	726	38	6	274	22
39	558	39	10	442	294	39	17	706	736	39	7	264	21
40	573	40	11	427	320	40	17	680	10. 10746	40	7	9. 89254	20
41	589	41	11	411	346	41	18	654	756	41	7	244	19
42	605	42	11	395	371	42	18	629	767	42	7	233	18
43	621	43	11	379	397	43	19	603	777	43	7	223	17
44	9. 79636	44	12	10. 20364	9. 90423	44	19	10. 09577	787	44	7	213	16
45	652	45	12	348	449	45	19	551	797	45	8	203	15
46	668	46	12	332	475	46	20	525	807	46	8	193	14
47	684	47	12	316	501	47	20	499	817	47	8	183	13
48	699	48	13	301	527	48	21	473	827	48	8	173	12
49	715	49	13	285	553	49	21	447	838	49	8	162	11
50	731	50	13	269	578	50	22	422	10. 10848	50	8	9. 89152	10
51	746	51	14	254	604	51	22	396	858	51	9	142	9
52	9. 79762	52	14	10. 20238	630	52	22	370	868	52	9	132	8
53	778	53	14	222	9. 90656	53	23	10. 09344	878	53	9	122	7
54	793	54	14	207	682	54	23	318	888	54	9	112	6
55	809	55	15	191	708	55	24	292	899	55	9	101	5
56	825	56	15	175	734	56	24	266	909	56	9	091	4
57	840	57	15	160	759	57	25	241	919	57	10	081	3
58	856	58	15	144	785	58	25	215	929	58	10	071	2
59	872	59	16	128	811	59	26	189	940	59	10	060	1
60	9. 79887	60	16	10. 20113	9. 90837	60	26	10. 09163	10. 10950	60	10	9. 89050	0
′ ↑ 128°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin ←51°	′ ↑

TABLE 33.

Logarithms of Trigonometric Functions.

39°→ ′	sin	″	Diff.	csc	tan	″	Diff.	cot	sec	″	Diff.	cos	←140° ′
0	9.79887	0	0	10.20113	9.90837	0	0	10.09163	10.10950	0	0	9.89050	60
1	903	1	0	097	863	1	0	137	960	1	0	040	59
2	918	2	1	082	889	2	1	111	970	2	0	030	58
3	934	3	1	066	914	3	1	086	980	3	1	020	57
4	950	4	1	050	940	4	2	060	10.10991	4	1	9.89009	56
5	965	5	1	035	966	5	2	034	10.11001	5	1	9.88999	55
6	981	6	2	019	9.90992	6	3	10.09008	011	6	1	989	54
7	9.79996	7	2	10.20004	9.91018	7	3	10.08982	022	7	1	978	53
8	9.80012	8	2	10.19988	043	8	3	957	032	8	1	968	52
9	027	9	2	973	069	9	4	931	042	9	2	958	51
10	043	10	3	957	095	10	4	905	052	10	2	948	50
11	058	11	3	942	121	11	5	879	063	11	2	937	49
12	074	12	3	926	147	12	5	853	073	12	2	927	48
13	089	13	3	911	172	13	6	828	083	13	2	917	47
14	105	14	4	895	198	14	6	802	10.11094	14	2	9.88906	46
15	120	15	4	880	9.91224	15	6	10.08776	104	15	3	896	45
16	136	16	4	864	250	16	7	750	114	16	3	886	44
17	151	17	4	849	276	17	7	724	125	17	3	875	43
18	166	18	5	834	301	18	8	699	135	18	3	865	42
19	9.80182	19	5	10.19818	327	19	8	673	145	19	3	855	41
20	197	20	5	803	353	20	9	647	156	20	3	844	40
21	213	21	5	787	379	21	9	621	166	21	4	834	39
22	228	22	6	772	404	22	9	596	176	22	4	824	38
23	244	23	6	756	430	23	10	570	10.11187	23	4	9.88813	37
24	259	24	6	741	456	24	10	544	197	24	4	803	36
25	274	25	6	726	9.91482	25	11	10.08518	207	25	4	793	35
26	290	26	7	710	507	26	11	493	218	26	5	782	34
27	305	27	7	695	533	27	12	467	228	27	5	772	33
28	320	28	7	680	559	28	12	441	239	28	5	761	32
29	336	29	7	664	585	29	12	415	249	29	5	751	31
30	9.80351	30	8	10.19649	610	30	13	390	259	30	5	741	30
31	366	31	8	634	636	31	13	364	270	31	5	730	29
32	382	32	8	618	662	32	14	338	10.11280	32	6	9.88720	28
33	397	33	8	603	688	33	14	312	291	33	6	709	27
34	412	34	9	588	713	34	15	287	301	34	6	699	26
35	428	35	9	572	9.91739	35	15	10.08261	312	35	6	688	25
36	443	36	9	557	765	36	15	235	322	36	6	678	24
37	458	37	9	542	791	37	16	209	332	37	6	668	23
38	473	38	10	527	816	38	16	184	343	38	7	657	22
39	489	39	10	511	842	39	17	158	353	39	7	647	21
40	9.80504	40	10	10.19496	868	40	17	132	364	40	7	636	20
41	519	41	10	481	893	41	18	107	10.11374	41	7	9.88626	19
42	534	42	11	466	919	42	18	081	385	42	7	615	18
43	550	43	11	450	945	43	18	055	395	43	7	605	17
44	565	44	11	435	971	44	19	029	406	44	8	594	16
45	580	45	12	420	9.91996	45	19	10.08004	416	45	8	584	15
46	595	46	12	405	9.92022	46	20	10.07978	427	46	8	573	14
47	610	47	12	390	048	47	20	952	437	47	8	563	13
48	625	48	12	375	073	48	21	927	448	48	8	552	12
49	641	49	13	359	099	49	21	901	458	49	9	542	11
50	9.80656	50	13	10.19344	125	50	21	875	10.11469	50	9	9.88531	10
51	671	51	13	329	150	51	22	850	479	51	9	521	9
52	686	52	13	314	176	52	22	824	490	52	9	510	8
53	701	53	14	299	9.92202	53	23	10.07798	501	53	9	499	7
54	716	54	14	284	227	54	23	773	511	54	9	489	6
55	731	55	14	269	253	55	24	747	522	55	10	478	5
56	746	56	14	254	279	56	24	721	532	56	10	468	4
57	762	57	15	238	304	57	24	696	543	57	10	457	3
58	777	58	15	223	330	58	25	670	553	58	10	447	2
59	792	59	15	208	356	59	25	644	564	59	10	436	1
60	9.80807	60	15	10.19193	9.92381	60	26	10.07619	10.11575	60	10	9.88425	0
′		″	Diff.	sec	cot	″	Diff.	tan	csc	″	Diff.	sin	←50° ′
↑ 129° →cos													

Logarithms of Trigonometric Functions.

40°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos ←139° ′	
0	9. 80807	0	0	10. 19193	9. 92381	0	0	10. 07619	10. 11575	0	0	9. 88425	60
1	822	1	0	178	407	1	0	593	585	1	0	415	59
2	837	2	0	163	433	2	1	567	596	2	0	404	58
3	852	3	1	148	458	3	1	542	606	3	1	394	57
4	867	4	1	133	484	4	2	516	617	4	1	383	56
5	882	5	1	118	510	5	2	490	628	5	1	372	55
6	9. 80897	6	1	10. 19103	9. 92535	6	3	10. 07465	638	6	1	362	54
7	912	7	2	088	561	7	3	439	649	7	1	351	53
8	927	8	2	073	587	8	3	413	660	8	1	340	52
9	942	9	2	058	612	9	4	388	670	9	2	330	51
10	957	10	2	043	638	10	4	362	10. 11681	10	2	9. 88319	50
11	972	11	3	028	663	11	5	337	692	11	2	308	49
12	9. 80987	12	3	10. 19013	9. 92689	12	5	10. 07311	702	12	2	298	48
13	9. 81002	13	3	10. 18998	715	13	6	285	713	13	2	287	47
14	017	14	3	983	740	14	6	260	724	14	3	276	46
15	032	15	4	968	766	15	6	234	734	15	3	266	45
16	047	16	4	953	792	16	7	208	745	16	3	255	44
17	061	17	4	939	817	17	7	183	756	17	3	244	43
18	076	18	4	924	9. 92843	18	8	10. 07157	766	18	3	234	42
19	091	19	5	909	868	19	8	132	777	19	3	223	41
20	106	20	5	894	894	20	9	106	10. 11788	20	4	9. 88212	40
21	9. 81121	21	5	10. 18879	920	21	9	080	799	21	4	201	39
22	136	22	5	864	945	22	9	055	809	22	4	191	38
23	151	23	6	849	971	23	10	029	820	23	4	180	37
24	166	24	6	834	9. 92996	24	10	10. 07004	831	24	4	169	36
25	180	25	6	820	9. 93022	25	11	10. 06978	842	25	4	158	35
26	195	26	6	805	048	26	11	952	852	26	5	148	34
27	210	27	7	790	073	27	12	927	863	27	5	137	33
28	225	28	7	775	099	28	12	901	874	28	5	126	32
29	9. 81240	29	7	10. 18760	124	29	12	876	885	29	5	115	31
30	254	30	7	746	150	30	13	850	10. 11895	30	5	9. 88105	30
31	269	31	8	731	175	31	13	825	906	31	6	094	29
32	284	32	8	716	9. 93201	32	14	10. 06799	917	32	6	083	28
33	299	33	8	701	227	33	14	773	928	33	6	072	27
34	314	34	8	686	252	34	14	748	939	34	6	061	26
35	328	35	9	672	278	35	15	722	949	35	6	051	25
36	343	36	9	657	303	36	15	697	960	36	6	040	24
37	9. 81358	37	9	10. 18642	329	37	16	671	971	37	7	029	23
38	372	38	9	628	354	38	16	646	982	38	7	018	22
39	387	39	10	613	9. 93380	39	17	10. 06620	10. 11993	39	7	9. 88007	21
40	402	40	10	598	406	40	17	594	10. 12004	40	7	9. 87996	20
41	417	41	10	583	431	41	17	569	015	41	7	985	19
42	431	42	10	569	457	42	18	543	025	42	8	975	18
43	446	43	11	554	482	43	18	518	036	43	8	964	17
44	9. 81461	44	11	10. 18539	508	44	19	492	047	44	8	953	16
45	475	45	11	525	533	45	19	467	058	45	8	942	15
46	490	46	11	510	9. 93559	46	20	10. 06441	069	46	8	931	14
47	505	47	12	495	584	47	20	416	080	47	8	920	13
48	519	48	12	481	610	48	20	390	091	48	9	909	12
49	534	49	12	466	636	49	21	364	102	49	9	898	11
50	549	50	12	451	661	50	21	339	10. 12113	50	9	9. 87887	10
51	563	51	13	437	687	51	22	313	123	51	9	877	9
52	9. 81578	52	13	10. 18422	712	52	22	288	134	52	9	866	8
53	592	53	13	408	9. 93738	53	23	10. 06262	145	53	10	855	7
54	607	54	13	393	763	54	23	237	156	54	10	844	6
55	622	55	14	378	789	55	23	211	167	55	10	833	5
56	636	56	14	364	814	56	24	186	178	56	10	822	4
57	651	57	14	349	840	57	24	160	189	57	10	811	3
58	665	58	14	335	865	58	25	135	200	58	10	800	2
59	680	59	15	320	891	59	25	109	211	59	11	789	1
60	9. 81694	60	15	10. 18306	9. 93916	60	26	10. 06084	10. 12222	60	11	9. 87778	0
′ ↑ 130°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin ←49°	′ ↑

TABLE 33.

Logarithms of Trigonometric Functions.

41°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←138° ′ ↓
0	9. 81694	0	0	10. 18306	9. 93916	0	0	10. 06084	10. 12222	0	0	9. 87778	60
1	709	1	0	291	942	1	0	058	233	1	0	767	59
2	723	2	0	277	967	2	1	033	244	2	0	756	58
3	738	3	1	262	9. 93993	3	1	10. 06007	255	3	1	745	57
4	752	4	1	248	9. 94018	4	2	10. 05982	266	4	1	734	56
5	767	5	1	233	044	5	2	956	277	5	1	723	55
6	781	6	1	219	069	6	3	931	288	6	1	712	54
7	9. 81796	7	2	10. 18204	095	7	3	905	299	7	1	701	53
8	810	8	2	190	120	8	3	880	310	8	1	690	52
9	825	9	2	175	146	9	4	854	321	9	2	679	51
10	839	10	2	161	171	10	4	829	10. 12332	10	2	9. 87668	50
11	854	11	3	146	197	11	5	803	343	11	2	657	49
12	868	12	3	132	9. 94222	12	5	10. 05778	354	12	2	646	48
13	882	13	3	118	248	13	6	752	365	13	2	635	47
14	9. 81897	14	3	10. 18103	273	14	6	727	376	14	3	624	46
15	911	15	4	089	299	15	6	701	387	15	3	613	45
16	926	16	4	074	324	16	7	676	399	16	3	601	44
17	940	17	4	060	350	17	7	650	410	17	3	590	43
18	955	18	4	045	375	18	8	625	421	18	3	579	42
19	969	19	5	031	9. 94401	19	8	10. 05599	432	19	4	568	41
20	983	20	5	017	426	20	8	574	10. 12443	20	4	9. 87557	40
21	9. 81998	21	5	10. 18002	452	21	9	548	454	21	4	546	39
22	9. 82012	22	5	10. 17988	477	22	9	523	465	22	4	535	38
23	026	23	5	974	503	23	10	497	476	23	4	524	37
24	041	24	6	959	528	24	10	472	487	24	4	513	36
25	055	25	6	945	554	25	11	446	499	25	5	501	35
26	069	26	6	931	579	26	11	421	510	26	5	490	34
27	084	27	6	916	9. 94604	27	11	10. 05396	521	27	5	479	33
28	098	28	7	902	630	28	12	370	532	28	5	468	32
29	112	29	7	888	655	29	12	345	543	29	5	457	31
30	9. 82126	30	7	10. 17874	681	30	13	319	10. 12554	30	6	9. 87446	30
31	141	31	7	859	706	31	13	294	566	31	6	434	29
32	155	32	8	845	732	32	14	268	577	32	6	423	28
33	169	33	8	831	757	33	14	243	588	33	6	412	27
34	184	34	8	816	9. 94783	34	14	10. 05217	599	34	6	401	26
35	198	35	8	802	808	35	15	192	610	35	7	390	25
36	212	36	9	788	834	36	15	166	622	36	7	378	24
37	226	37	9	774	859	37	16	141	633	37	7	367	23
38	9. 82240	38	9	10. 17760	884	38	16	116	644	38	7	356	22
39	255	39	9	745	910	39	17	090	655	39	7	345	21
40	269	40	10	731	935	40	17	065	10. 12666	40	7	9. 87334	20
41	283	41	10	717	961	41	17	039	678	41	8	322	19
42	297	42	10	703	9. 94986	42	18	10. 05014	689	42	8	311	18
43	311	43	10	689	9. 95012	43	18	10. 04988	700	43	8	300	17
44	326	44	10	674	037	44	19	963	712	44	8	288	16
45	9. 82340	45	11	10. 17660	062	45	19	938	723	45	8	277	15
46	354	46	11	646	088	46	20	912	734	46	9	266	14
47	368	47	11	632	113	47	20	887	745	47	9	255	13
48	382	48	11	618	139	48	20	861	757	48	9	243	12
49	396	49	12	604	164	49	21	836	768	49	9	232	11
50	410	50	12	590	190	50	21	810	10. 12779	50	9	9. 87221	10
51	424	51	12	576	9. 95215	51	22	10. 04785	791	51	10	209	9
52	9. 82439	52	12	10. 17561	240	52	22	760	802	52	10	198	8
53	453	53	13	547	266	53	22	734	813	53	10	187	7
54	467	54	13	533	291	54	23	709	825	54	10	175	6
55	481	55	13	519	317	55	23	683	836	55	10	164	5
56	495	56	13	505	342	56	24	658	847	56	10	153	4
57	509	57	14	491	368	57	24	632	859	57	11	141	3
58	523	58	14	477	393	58	25	607	870	58	11	130	2
59	537	59	14	463	418	59	25	582	881	59	11	119	1
60	9. 82551	60	14	10. 17449	9. 95444	60	25	10. 04556	10. 12893	60	11	9. 87107	0
′ ↑ 131°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←48°

Logarithms of Trigonometric Functions.

42°→ ′ ↓	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←137° ′ ↓
0	9. 82551	0	0	10. 17449	9. 95444	0	0	10. 04556	10. 12893	0	0	9. 87107	60
1	565	1	0	435	469	1	0	531	904	1	0	096	59
2	579	2	0	421	495	2	1	505	915	2	0	085	58
3	593	3	1	407	520	3	1	480	927	3	1	073	57
4	607	4	1	393	545	4	2	455	938	4	1	062	56
5	621	5	1	379	571	5	2	429	950	5	1	050	55
6	635	6	1	365	596	6	3	404	961	6	1	039	54
7	9. 82649	7	2	10. 17351	9. 95622	7	3	10. 04378	972	7	1	028	53
8	663	8	2	337	647	8	3	353	984	8	2	016	52
9	677	9	2	323	672	9	4	328	10. 12995	9	2	9. 87005	51
10	691	10	2	309	698	10	4	302	10. 13007	10	2	9. 86993	50
11	705	11	3	295	723	11	5	277	018	11	2	982	49
12	719	12	3	281	748	12	5	252	030	12	2	970	48
13	9. 82733	13	3	10. 17267	774	13	5	226	041	13	3	959	47
14	747	14	3	253	9. 95799	14	6	10. 04201	053	14	3	947	46
15	761	15	3	239	825	15	6	175	064	15	3	936	45
16	775	16	4	225	850	16	7	150	076	16	3	924	44
17	788	17	4	212	875	17	7	125	087	17	3	913	43
18	802	18	4	198	901	18	8	099	098	18	3	902	42
19	9. 82816	19	4	10. 17184	926	19	8	074	110	19	4	890	41
20	830	20	5	170	952	20	8	048	10. 13121	20	4	9. 86879	40
21	844	21	5	156	9. 95977	21	9	10. 04023	133	21	4	867	39
22	858	22	5	142	9. 96002	22	9	10. 03998	145	22	4	855	38
23	872	23	5	128	028	23	10	972	156	23	4	844	37
24	885	24	6	115	053	24	10	947	168	24	5	832	36
25	9. 82899	25	6	10. 17101	078	25	11	922	179	25	5	821	35
26	913	26	6	087	104	26	11	896	191	26	5	809	34
27	927	27	6	073	129	27	11	871	202	27	5	798	33
28	941	28	6	059	155	28	12	845	214	28	5	786	32
29	955	29	7	045	180	29	12	820	225	29	6	775	31
30	968	30	7	032	205	30	13	795	10. 13237	30	6	9. 86763	30
31	982	31	7	018	231	31	13	769	248	31	6	752	29
32	9. 82996	32	7	10. 17004	9. 96256	32	14	10. 03744	260	32	6	740	28
33	9. 83010	33	8	10. 16990	281	33	14	719	272	33	6	728	27
34	023	34	8	977	307	34	14	693	283	34	7	717	26
35	037	35	8	963	332	35	15	668	295	35	7	705	25
36	051	36	8	949	357	36	15	643	306	36	7	694	24
37	065	37	8	935	383	37	16	617	318	37	7	682	23
38	078	38	9	922	408	38	16	592	330	38	7	670	22
39	092	39	9	908	433	39	16	567	341	39	8	659	21
40	9. 83106	40	9	10. 16894	459	40	17	541	10. 13353	40	8	9. 86647	20
41	120	41	9	880	484	41	17	516	365	41	8	635	19
42	133	42	10	867	9. 96510	42	18	10. 03490	376	42	8	624	18
43	147	43	10	853	535	43	18	465	388	43	8	612	17
44	161	44	10	839	560	44	19	440	400	44	8	600	16
45	174	45	10	826	586	45	19	414	411	45	9	589	15
46	188	46	11	812	611	46	19	389	423	46	9	577	14
47	9. 83202	47	11	10. 16798	636	47	20	364	435	47	9	565	13
48	215	48	11	785	662	48	20	338	446	48	9	554	12
49	229	49	11	771	687	49	21	313	458	49	9	542	11
50	242	50	11	758	712	50	21	288	10. 13470	50	10	9. 86530	10
51	256	51	12	744	9. 96738	51	22	10. 03262	482	51	10	518	9
52	270	52	12	730	763	52	22	237	493	52	10	507	8
53	9. 83283	53	12	10. 16717	788	53	22	212	505	53	10	495	7
54	297	54	12	703	814	54	23	186	517	54	10	483	6
55	310	55	13	690	839	55	23	161	528	55	11	472	5
56	324	56	13	676	864	56	24	136	540	56	11	460	4
57	338	57	13	662	890	57	24	110	552	57	11	448	3
58	351	58	13	649	915	58	25	085	564	58	11	436	2
59	365	59	14	635	940	59	25	060	575	59	11	425	1
60	9. 83378	60	14	10. 16622	9. 96966	60	25	10. 03034	10. 13587	60	12	9. 86413	0
′ ↑ 132°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←47°

TABLE 33.

Logarithms of Trigonometric Functions.

43°→ ′	sin	″ Diff.		csc	tan	″ Diff.		cot	sec	″ Diff.		cos	←136° ′
0	9. 83378	0	0	10. 16622	9. 96966	0	0	10. 03034	10. 13587	0	0	9. 86413	60
1	392	1	0	608	9. 96991	1	0	10. 03009	599	1	0	401	59
2	405	2	0	595	9. 97016	2	1	10. 02984	611	2	0	389	58
3	419	3	1	581	042	3	1	958	623	3	1	377	57
4	432	4	1	568	067	4	2	933	634	4	1	366	56
5	446	5	1	554	092	5	2	908	646	5	1	354	55
6	459	6	1	541	118	6	3	882	658	6	1	342	54
7	473	7	2	527	143	7	3	857	670	7	1	330	53
8	9. 83486	8	2	10. 16514	168	8	3	832	682	8	2	318	52
9	500	9	2	500	9. 97193	9	4	10. 02807	10. 13694	9	2	9. 86306	51
10	513	10	2	487	219	10	4	781	705	10	2	295	50
11	527	11	2	473	244	11	5	756	717	11	2	283	49
12	540	12	3	460	269	12	5	731	729	12	2	271	48
13	554	13	3	446	295	13	5	705	741	13	3	259	47
14	567	14	3	433	320	14	6	680	753	14	3	247	46
15	9. 83581	15	3	10. 16419	345	15	6	655	765	15	3	235	45
16	594	16	4	406	9. 97371	16	7	10. 02629	777	16	3	223	44
17	608	17	4	392	396	17	7	604	10. 13789	17	3	9. 86211	43
18	621	18	4	379	421	18	8	579	800	18	4	200	42
19	634	19	4	366	447	19	8	553	812	19	4	188	41
20	648	20	4	352	472	20	8	528	824	20	4	176	40
21	661	21	5	339	497	21	9	503	836	21	4	164	39
22	674	22	5	326	523	22	9	477	848	22	4	152	38
23	9. 83688	23	5	10. 16312	548	23	10	452	860	23	5	140	37
24	701	24	5	299	9. 97573	24	10	10. 02427	872	24	5	128	36
25	715	25	6	285	598	25	11	402	10. 13884	25	5	9. 86116	35
26	728	26	6	272	624	26	11	376	896	26	5	104	34
27	741	27	6	259	649	27	11	351	908	27	5	092	33
28	755	28	6	245	674	28	12	326	920	28	6	080	32
29	768	29	6	232	700	29	12	300	932	29	6	068	31
30	9. 83781	30	7	10. 16219	725	30	13	275	944	30	6	056	30
31	795	31	7	205	750	31	13	250	956	31	6	044	29
32	808	32	7	192	9. 97776	32	13	10. 02224	968	32	6	032	28
33	821	33	7	179	801	33	14	199	980	33	7	020	27
34	834	34	8	166	826	34	14	174	10. 13992	34	7	9. 86008	26
35	848	35	8	152	851	35	15	149	10. 14004	35	7	9. 85996	25
36	861	36	8	139	877	36	15	123	016	36	7	984	24
37	874	37	8	126	902	37	16	098	028	37	7	972	23
38	9. 83887	38	8	10. 16113	927	38	16	073	040	38	8	960	22
39	901	39	9	099	953	39	16	047	052	39	8	948	21
40	914	40	9	086	9. 97978	40	17	10. 02022	064	40	8	936	20
41	927	41	9	073	9. 98003	41	17	10. 01997	076	41	8	924	19
42	940	42	9	060	029	42	18	971	088	42	8	912	18
43	954	43	10	046	054	43	18	946	10. 14100	43	9	9. 85900	17
44	967	44	10	033	079	44	19	921	112	44	9	888	16
45	980	45	10	020	104	45	19	896	124	45	9	876	15
46	9. 83993	46	10	10. 16007	130	46	19	870	136	46	9	864	14
47	9. 84006	47	10	10. 15994	155	47	20	845	149	47	9	851	13
48	020	48	11	980	9. 98180	48	20	10. 01820	161	48	10	839	12
49	033	49	11	967	206	49	21	794	173	49	10	827	11
50	046	50	11	954	231	50	21	769	185	50	10	815	10
51	059	51	11	941	256	51	22	744	197	51	10	803	9
52	072	52	12	928	281	52	22	719	10. 14209	52	10	9. 85791	8
53	9. 84085	53	12	10. 15915	307	53	22	693	221	53	11	779	7
54	098	54	12	902	9. 98332	54	23	10. 01668	234	54	11	766	6
55	112	55	12	888	357	55	23	643	246	55	11	754	5
56	125	56	12	875	383	56	24	617	258	56	11	742	4
57	138	57	13	862	408	57	24	592	270	57	11	730	3
58	151	58	13	849	433	58	24	567	282	58	12	718	2
59	164	59	13	836	458	59	25	542	294	59	12	706	1
60	9. 84177	60	13	10. 15823	9. 98484	60	25	10. 01516	10. 14307	60	12	9. 85693	0
′ ↑ 133°→	cos	″ Diff.		sec	cot	″ Diff.		tan	csc	″ Diff.		sin	′ ↑ ←46°

Logarithms of Trigonometric Functions.

44°→ ′ ↓	sin	″	Diff.	csc	tan	″	Diff.	cot	sec	″	Diff.	cos	←135° ′ ↓
0	9. 84177	0	0	10. 15823	9. 98484	0	0	10. 01516	10. 14307	0	0	9. 85693	60
1	190	1	0	810	509	1	0	491	319	1	0	681	59
2	203	2	0	797	534	2	1	466	331	2	0	669	58
3	216	3	1	784	560	3	1	440	343	3	1	657	57
4	229	4	1	771	585	4	2	415	355	4	1	645	56
5	242	5	1	758	610	5	2	390	368	5	1	632	55
6	255	6	1	745	635	6	3	365	380	6	1	620	54
7	269	7	2	731	661	7	3	339	392	7	1	608	53
8	282	8	2	718	686	8	3	314	404	8	2	596	52
9	295	9	2	705	711	9	4	289	10. 14417	9	2	9. 85583	51
10	9. 84308	10	2	10. 15692	9. 98737	10	4	10. 01263	429	10	2	571	50
11	321	11	2	679	762	11	5	238	441	11	2	559	49
12	334	12	3	666	787	12	5	213	453	12	2	547	48
13	347	13	3	653	812	13	5	188	466	13	3	534	47
14	360	14	3	640	838	14	6	162	478	14	3	522	46
15	373	15	3	627	863	15	6	137	490	15	3	510	45
16	385	16	3	615	888	16	7	112	503	16	3	497	44
17	398	17	4	602	913	17	7	087	515	17	4	485	43
18	411	18	4	589	939	18	8	061	10. 14527	18	4	9. 85473	42
19	424	19	4	576	964	19	8	036	540	19	4	460	41
20	9. 84437	20	4	10. 15563	9. 98989	20	8	10. 01011	552	20	4	448	40
21	450	21	5	550	9. 99015	21	9	10. 00985	564	21	4	436	39
22	463	22	5	537	040	22	9	960	577	22	5	423	38
23	476	23	5	524	065	23	10	935	589	23	5	411	37
24	489	24	5	511	090	24	10	910	601	24	5	399	36
25	502	25	5	498	116	25	11	884	10. 14614	25	5	9. 85386	35
26	515	26	6	485	141	26	11	859	626	26	5	374	34
27	528	27	6	472	166	27	11	834	639	27	6	361	33
28	540	28	6	460	191	28	12	809	651	28	6	349	32
29	553	29	6	447	217	29	12	783	663	29	6	337	31
30	9. 84566	30	6	10. 15434	9. 99242	30	13	10. 00758	676	30	6	324	30
31	579	31	7	421	267	31	13	733	10. 14688	31	6	9. 85312	29
32	592	32	7	408	293	32	13	707	701	32	7	299	28
33	605	33	7	395	318	33	14	682	713	33	7	287	27
34	618	34	7	382	343	34	14	657	726	34	7	274	26
35	630	35	8	370	368	35	15	632	738	35	7	262	25
36	643	36	8	357	394	36	15	606	750	36	7	250	24
37	656	37	8	344	419	37	16	581	10. 14763	37	8	9. 85237	23
38	669	38	8	331	444	38	16	556	775	38	8	225	22
39	682	39	8	318	469	39	16	531	788	39	8	212	21
40	9. 84694	40	9	10. 15306	9. 99495	40	17	10. 00505	800	40	8	200	20
41	707	41	9	293	520	41	17	480	813	41	8	187	19
42	720	42	9	280	545	42	18	455	825	42	9	175	18
43	733	43	9	267	570	43	18	430	838	43	9	162	17
44	745	44	9	255	596	44	19	404	850	44	9	150	16
45	758	45	10	242	621	45	19	379	863	45	9	137	15
46	771	46	10	229	646	46	19	354	10. 14875	46	10	9. 85125	14
47	784	47	10	216	672	47	20	328	888	47	10	112	13
48	796	48	10	204	697	48	20	303	900	48	10	100	12
49	809	49	11	191	722	49	21	278	913	49	10	087	11
50	9. 84822	50	11	10. 15178	9. 99747	50	21	10. 00253	926	50	10	074	10
51	835	51	11	165	773	51	21	227	938	51	11	062	9
52	847	52	11	153	798	52	22	202	951	52	11	049	8
53	860	53	11	140	823	53	22	177	963	53	11	037	7
54	873	54	12	127	848	54	23	152	976	54	11	024	6
55	885	55	12	115	874	55	23	126	10. 14988	55	11	9. 85012	5
56	898	56	12	102	899	56	24	101	10. 15001	56	12	9. 84999	4
57	911	57	12	089	924	57	24	076	014	57	12	986	3
58	923	58	12	077	949	58	24	051	026	58	12	974	2
59	936	59	13	064	9. 99975	59	25	025	039	59	12	961	1
60	9. 84949	60	13	10. 15051	10. 00000	60	25	10. 00000	10. 15051	60	12	9. 84949	0
′ ↑ 134°→	cos	″	Diff.	sec	cot	″	Diff.	tan	csc	″	Diff.	sin	′ ↑ ←45°

TABLE 34.

Haversines.

s ′	0h 0m 0° 0′ Log. Hav.	Nat. Hav.	0h 2m 0° 30′ Log. Hav.	Nat. Hav.	0h 4m 1° 0′ Log. Hav.	Nat. Hav.	0h 6m 1° 30′ Log. Hav.	Nat. Hav.	0h 8m 2° 0′ Log. Hav.	Nat. Hav.	s
0 0	—00	0.00000	5.27963	0.00002	5.88168	0.00008	6.23385	0.00017	6.48371	0.00030	60
2	1.72333	.00000	.29399	.00002	.88889	.00008	.23866	.00017	.48732	.00031	58
4+ 1	2.32539	.00000	.30811	.00002	.89604	.00008	.24345	.00018	.49092	.00031	56
6	2.67757	.00000	.32201	.00002	.90313	.00008	.24821	.00018	.49450	.00031	54
8+ 2	2.92745	0.00000	5.33569	0.00002	5.91016	0.00008	6.25294	0.00018	6.49807	0.00031	52
10	3.12127	.00000	.34916	.00002	.91714	.00008	.25765	.00018	.50162	.00032	50
12+ 3	3.27963	.00000	.36242	.00002	.92406	.00008	.26233	.00018	.50516	.00032	48
14	3.41353	.00000	.37548	.00002	.93093	.00009	.26699	.00018	.50868	.00032	46
16+ 4	3.52951	0.00000	5.38835	0.00002	5.93774	0.00009	6.27162	0.00019	6.51219	0.00033	44
18	3.63182	.00000	.40103	.00003	.94450	.00009	.27623	.00019	.51568	.00033	42
20+ 5	3.72333	.00000	.41352	.00003	.95121	.00009	.28081	.00019	.51916	.00033	40
22	3.80612	.00000	.42585	.00003	.95786	.00009	.28537	.00019	.52263	.00033	38
24+ 6	3.88169	0.00000	5.43799	0.00003	5.96447	0.00009	6.28991	0.00019	6.52608	0.00034	36
26	3.95122	.00000	.44997	.00003	.97102	.00009	29442	.00020	.52952	.00034	34
28+ 7	4.01559	.00000	.46179	.00003	.97753	.00010	.29891	.00020	.53295	.00034	32
30	4.07551	.00000	.47345	.00003	.98399	.00010	.30337	.00020	.53636	.00034	30
32+ 8	4.13157	0.00000	5.48496	0.00003	5.99040	0.00010	6.30781	0.00020	6.53976	0.00035	28
34	.18423	.00000	.49631	.00003	5.99676	.00010	.31223	.00021	.54315	.00035	26
36+ 9	.23388	.00000	.50752	.00003	6.00308	.00010	.31663	.00021	.54652	.00035	24
38	.28084	.00000	.51858	.00003	.00935	.00010	.32101	.00021	.54988	.00035	22
40+10	4.32539	0.00000	5.52951	0.00003	6.01557	0.00010	6.32536	0.00021	6.55323	0.00036	20
42	.36777	.00000	.54030	.00003	.02176	.00011	.32969	.00021	.55656	.00036	18
44+11	.40818	.00000	.55095	.00004	.02789	.00011	.33400	.00022	.55988	.00036	16
46	.44679	.00000	.56148	.00004	.03399	.00011	.33829	.00022	.56319	.00037	14
48+12	4.48375	0.00000	5.57189	0.00004	6.04004	0.00011	6.34256	0.00022	6.56649	0.00037	12
50	.51921	.00000	.58216	.00004	.04605	.00011	.34681	.00022	.56977	.00037	10
52+13	.55328	.00000	.59232	.00004	.05202	.00011	.35103	.00022	.57304	.00037	8
54	.58606	.00000	.60236	.00004	.05795	.00011	.35524	.00023	.57630	.00038	6
56+14	4.61765	0.00000	5.61229	0.00004	6.06384	0.00012	6.35943	0.00023	6.57955	0.00038	4
58	4.64813	0.00000	5.62211	0.00004	6.06969	0.00012	6.36359	0.00023	6.58278	0.00038	2
	23h 59m		23h 57m		23h 55m		23h 53m		23h 51m		

s ′	0h 1m 0° 0′		0h 3m 0° 30′		0h 5m 1° 0′		0h 7m 1° 30′		0h 9m 2° 0′		s
0+15	4.67757	0.00000	5.63181	0.00004	6.07550	0.00012	6.36774	0.00023	6.58600	0.00039	60
2	.70605	.00000	.64141	.00004	.08127	.00012	.37186	.00024	.58921	.00039	58
4+16	.73363	.00001	.65090	.00004	.08700	.00012	.37597	.00024	.59241	.00039	56
6	.76036	.00001	.66029	.00005	.09270	.00012	.38006	.00024	.59560	.00039	54
8+17	4.78629	0.00001	5.66958	0.00005	6.09836	0.00013	6.38412	0.00024	6.59878	0.00040	52
10	.81147	.00001	.67877	.00005	.10398	.00013	.38817	.00024	.60194	.00040	50
12+18	.83594	.00001	.68787	.00005	.10956	.00013	.39220	.00025	.60509	.00040	48
14	.85973	.00001	.69687	.00005	.11511	.00013	.39622	.00025	.60823	.00041	46
16+19	4.88290	0.00001	5.70578	0.00005	6.12063	0.00013	6.40021	0.00025	6.61136	0.00041	44
18	.90546	.00001	.71460	.00005	.12611	.00013	.40418	.00025	.61448	.00041	42
20+20	.92745	.00001	.72332	.00005	.13155	.00014	.40814	.00026	.61759	.00041	40
22	.94890	.00001	.73197	.00005	.13696	.00014	.41208	.00026	.62068	.00042	38
24+21	4.96983	0.00001	5.74052	0.00006	6.14234	0.00014	6.41600	0.00026	6.62377	0.00042	36
26	4.99027	.00001	.74900	.00006	.14769	.00014	.41990	.00026	.62684	.00042	34
28+22	5.01024	.00001	.75739	.00006	.15300	.00014	.42379	.00027	.62991	.00043	32
30	.02976	.00001	.76570	.00006	.15828	.00014	.42766	.00027	.63296	.00043	30
32+23	5.04885	0.00001	5.77394	0.00006	6.16353	0.00015	6.43151	0.00027	6.63600	0.00043	28
34	.06753	.00001	.78209	.00006	.16874	.00015	.43534	.00027	.63903	.00044	26
36+24	.08581	.00001	.79017	.00006	.17393	.00015	.43916	.00027	.64205	.00044	24
38	.10372	.00001	.79818	.00006	.17908	.00015	.44296	.00028	.64504	.00044	22
40+25	5.12127	0.00001	5.80611	0.00006	6.18421	0.00015	6.44675	0.00028	6.64806	0.00044	20
42	.13847	.00001	.81397	.00007	.18930	.00015	.45052	.00028	.65105	.00045	18
44+26	.15534	.00001	.82176	.00007	.19437	.00016	.45427	.00028	.65403	.00045	16
46	.17188	.00001	.82948	.00007	.19940	.00016	.45800	.00029	.65700	.00045	14
48+27	5.18812	0.00002	5.83713	0.00007	6.20441	0.00016	6.46172	0.00029	6.65996	0.00046	12
50	.20406	.00002	.84472	.00007	.20938	.00016	.46543	.00029	.66291	.00046	10
52+28	.21971	.00002	.85224	.00007	.21433	.00016	.46911	.00029	.66585	.00046	8
54	.23508	.00002	.85969	.00007	.21925	.00017	.47279	.00030	.66878	.00047	6
56+29	5.25019	0.00002	5.86709	0.00007	6.22415	0.00017	6.47644	0.00030	6.67170	0.00047	4
58	.26503	.00002	.87442	.00008	.22901	.00017	.48008	.00030	.67461	.00047	2
60+30	5.27963	0.00002	5.88168	0.00008	6.23385	0.00017	6.48371	0.00030	6.67751	0.00048	0
	23h 58m		23h 56m		23h 54m		23h 52m		23h 50m		

Haversines.

° ′	0h 10m 2° 30′		0h 12m 3° 0′		0h 14m 3° 30′		0h 16m 4° 0′		0h 18m 4° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0 0	6.67751	0.00048	6.83584	0.00069	6.96970	0.00093	7.08564	0.00122	7.18790	0.00154	60
2	.68040	.00048	.83825	.00069	.97176	.00094	.08745	.00122	.18950	.00155	58
4+ 1	.68328	.00048	.84065	.00069	.97382	.00094	.08925	.00123	.19111	.00155	56
6	.68615	.00049	.84304	.00070	.97588	.00095	.09105	.00123	.19271	.00156	54
8+ 2	6.68901	0.00049	6.84543	0.00070	6.97793	0.00095	7.09284	0.00124	7.19430	0.00156	52
10	.69186	.00049	.84782	.00070	.97997	.00095	.09464	.00124	.19590	.00157	50
12+ 3	.69470	.00050	.85019	.00071	.98201	.00096	.09642	.00125	.19749	.00158	48
14	.69754	.00050	.85256	.00071	.98405	.00096	.09821	.00125	.19908	.00158	46
16+ 4	6.70036	0.00050	6.85492	0.00072	6.98608	0.00097	7.09999	0.00126	7.20066	0.00159	44
18	.70318	.00050	.85728	.00072	.98811	.00097	.10177	.00126	.20225	.00159	42
20+ 5	.70598	.00051	.85963	.00072	.99013	.00098	.10354	.00127	.20383	.00160	40
22	.70878	.00051	.86197	.00073	.99214	.00098	.10531	.00127	.20540	.00160	38
24+ 6	6.71157	0.00051	6.86431	0.00073	6.99416	0.00099	7.10708	0.00128	7.20698	0.00161	36
26	.71435	.00052	.86664	.00074	6.99616	.00099	.10884	.00128	.20855	.00162	34
28+ 7	.71712	.00052	.86897	.00074	6.99817	.00100	.11060	.00129	.21012	.00162	32
30	.71988	.00052	.87129	.00074	7.00017	.00100	.11236	.00130	.21168	.00163	30
32+ 8	6.72263	0.00053	6.87360	0.00075	7.00216	0.00101	7.11411	0.00130	7.21325	0.00163	28
34	.72537	.00053	.87591	.00075	.00415	.00101	.11586	.00131	.21481	.00164	26
36+ 9	.72811	.00053	.87821	.00076	.00613	.00101	.11760	.00131	.21636	.00165	24
38	.73084	.00054	.88050	.00076	.00811	.00102	.11934	.00132	.21792	.00165	22
40+10	6.73355	0.00054	6.88279	0.00076	7.01009	0.00102	7.12108	0.00132	7.21947	0.00166	20
42	.73626	.00054	.88507	.00077	.01206	.00103	.12282	.00133	.22102	.00166	18
44+11	.73896	.00055	.88735	.00077	.01403	.00103	.12455	.00133	.22256	.00167	16
46	.74166	.00055	.88962	.00078	.01599	.00104	.12627	.00134	.22411	.00168	14
48+12	6.74434	0.00056	6.89188	0.00078	7.01795	0.00104	7.12800	0.00134	7.22565	0.00168	12
50	.74702	.00056	.89414	.00078	.01990	.00105	.12972	.00135	.22718	.00169	10
52+13	.74969	.00056	.89639	.00079	.02185	.00105	.13144	.00135	.22872	.00169	8
54	.75235	.00057	.89864	.00079	.02379	.00106	.13315	.00136	.23025	.00170	6
56+14	6.75500	0.00057	6.90088	0.00080	7.02573	0.00106	7.13486	0.00136	7.23178	0.00171	4
58	6.75764	0.00057	6.90312	0.00080	7.02767	0.00107	7.13657	0.00137	7.23331	0.00171	2
	23h 49m		23h 47m		23h 45m		23h 43m		23h 41m		

° ′	0h 11m 2° 30′		0h 13m 3° 0′		0h 15m 3° 30′		0h 17m 4° 0′		0h 19m 4° 30′		s
0+15	6.76028	0.00058	6.90535	0.00080	7.02960	0.00107	7.13827	0.00137	7.23483	0.00172	60
2	.76290	.00058	.90757	.00081	.03153	.00108	.13997	.00138	.23635	.00172	58
4+16	.76552	.00058	.90979	.00081	.03345	.00108	.14167	.00139	.23787	.00173	56
6	.76814	.00059	.91200	.00082	.03537	00108	.14337	.00139	.23939	.00174	54
8+17	6.77074	0.00059	6.91421	0.00082	7.03729	0.00109	7.14506	0.00140	7.24090	0.00174	52
10	.77334	.00059	.91641	.00082	.03920	.00109	.14674	.00140	.24241	.00175	50
12+18	.77592	.00060	.91860	.00083	.04110	.00110	.14843	.00141	.24392	.00175	48
14	.77851	.00060	.92079	.00083	.04300	.00110	.15011	.00141	.24543	.00176	46
16+19	6.78108	0.00060	6.92298	0.00084	7.04490	0.00111	7.15179	0.00142	7.24693	0.00177	44
18	.78364	.00061	.92516	.00084	.04680	.00111	.15346	.00142	.24843	.00177	42
20+20	.78620	.00061	.92733	.00085	.04869	.00112	.15513	.00143	.24993	.00178	40
22	.78875	.00061	.92950	.00085	.05057	.00112	.15680	.00143	.25143	.00178	38
24+21	6.79129	0.00062	6.93166	0.00085	7.05245	0.00113	7.15846	0.00144	7.25292	0.00179	36
26	.79383	.00062	.93382	.00086	.05433	.00113	.16013	.00145	.25441	.00180	34
28+22	.79630	.00063	.93597	.00086	.05620	.00114	.16178	.00145	.25590	.00180	32
30	.79888	.00063	.93812	.00087	.05807	.00114	.16344	.00146	.25738	.00181	30
32+23	6.80139	0.00063	6.94026	0.00087	7.05994	0.00115	7.16509	0.00146	7.25886	0.00181	28
34	.80390	.00064	.94239	.00088	.06180	.00115	.16674	.00147	.26034	.00182	26
36+24	.80640	.00064	.94453	.00088	.06366	.00116	.16839	.00147	.26182	.00183	24
38	.80889	.00064	.94665	.00088	.06551	.00116	.17003	.00148	.26330	.00183	22
40+25	6.81137	0.00065	6.94877	0.00089	7.06736	0.00117	7.17167	0.00148	7.26477	0.00184	20
42	.81385	.00065	.95089	.00089	.06920	.00117	.17331	.00149	.26624	.00185	18
44+26	.81632	.00066	.95300	.00090	.07105	.00118	.17494	.00150	.26771	.00185	16
46	.81879	.00066	.95510	.00090	.07288	.00118	.17657	.00150	.26917	.00186	14
48+27	6.82124	0.00066	6.95720	0.00091	7.07472	0.00119	7.17820	0.00151	7.27064	0.00186	12
50	.82369	.00067	.95930	.00091	.07655	.00119	.17982	.00151	.27210	.00187	10
52+28	.82614	.00067	.96139	.00091	.07837	.00120	.18144	.00152	.27355	.00188	8
54	.82857	.00067	.96347	.00092	.08019	.00120	.18306	.00152	.27501	.00188	6
56+29	6.83100	0.00068	6.96555	0.00092	7.08201	0.00121	7.18468	0.00153	7.27646	0.00189	4
58	.83342	.00068	.96763	.00093	.08383	.00121	.18629	.00154	.27791	.00190	2
60+30	6.83584	0.00069	6.96970	0.00093	7.08564	0.00122	7.18790	0.00154	7.27936	0.00190	0
	23h 48m		23h 46m		23h 44m		23h 42m		23h 40m		

TABLE 34.

Haversines.

s ′	0h 20m 5° 0′		0h 22m 5° 30′		0h 24m 6° 0′		0h 26m 6° 30′		0h 28m 7° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0 0	7.27936	0.00190	7.36209	0.00230	7.43760	0.00274	7.50706	0.00321	7.57135	0.00373	60
2	.28080	.00191	.36340	.00231	.43880	.00275	.50817	.00322	.57238	.00374	58
4+ 1	.28225	.00192	.36471	.00232	.44001	.00275	.50928	.00323	.57341	.00374	56
6	.28369	.00192	.36602	.00232	.44121	.00276	.51039	.00324	.57444	.00375	54
8+ 2	7.28513	0.00193	7.36733	0.00233	7.44241	0.00277	7.51149	0.00325	7.57547	0.00376	52
10	.28656	.00193	.36864	.00234	.44361	.00278	.51260	.00326	.57650	.00377	50
12+ 3	.28800	.00194	.36994	.00234	.44480	.00278	.51370	.00326	.57752	.00378	48
14	.28943	.00195	.37124	.00235	.44600	.00279	.51481	.00327	.57855	.00379	46
16+ 4	7.29086	0.00195	7.37254	0.00236	7.44719	0.00280	7.51591	0.00328	7.57957	0.00380	44
18	.29228	.00196	.37384	.00237	.44838	.00281	.51701	.00329	.58060	.00381	42
20+ 5	.29371	.00197	.37514	.00237	.44957	.00282	.51811	.00330	.58162	.00382	40
22	.29513	.00197	.37643	.00238	.45076	.00282	.51921	.00331	.58264	.00383	38
24+ 6	7.29655	0.00198	7.37773	0.00239	7.45194	0.00283	7.52030	0.00331	7.58366	0.00383	36
26	.29797	.00199	.37902	.00239	.45313	.00284	.52140	.00332	.58467	.00384	34
28+ 7	.29938	.00199	.38030	.00240	.45431	.00285	.52249	.00333	.58569	.00385	32
30	.30079	.00200	.38159	.00241	.45549	.00285	.52358	.00334	.58670	.00386	30
32+ 8	7.30220	0.00201	7.38288	0.00241	7.45667	0.00286	7.52467	0.00335	7.58772	0.00387	28
34	.30361	.00201	.38416	.00242	.45785	.00287	.52576	.00336	.58873	.00388	26
36+ 9	.30502	.00202	.38544	.00243	.45903	.00288	.52685	.00336	.58974	.00389	24
38	.30642	.00203	.38672	.00244	.46020	.00289	.52794	.00337	.59075	.00390	22
40+10	7.30782	0.00203	7.38800	0.00244	7.46138	0.00289	7.52902	0.00338	7.59176	0.00391	20
42	.30922	.00204	.38927	.00245	.46255	.00290	.53011	.00339	.59277	.00392	18
44+11	.31062	.00204	.39054	.00246	.46372	.00291	.53119	.00340	.59378	.00392	16
46	.31201	.00205	.39182	.00247	.46489	.00292	.53227	.00341	.59478	.00393	14
48+12	7.31340	0.00206	7.39309	0.00247	7.46605	0.00292	7.53335	0.00341	7.59579	0.00394	12
50	.31479	.00206	.39435	.00248	.46722	.00293	.53443	.00342	.59679	.00395	10
52+13	.31618	.00207	.39562	.00249	.46838	.00294	.53550	.00343	.59779	.00396	8
54	.31757	.00208	.39688	.00249	.46955	.00295	.53658	.00344	.59879	.00397	6
56+14	7.31895	0.00208	7.39815	0.00250	7.47071	0.00296	7.53766	0.00345	7.59979	0.00398	4
58	7.32033	0.00209	7.39941	0.00251	7.47187	0.00296	7.53873	0.00346	7.60079	0.00399	2
	23h 39m		23h 37m		23h 35m		23h 33m		23h 31m		

s ′	0h 21m 5° 0′		0h 23m 5° 30′		0h 25m 6° 0′		0h 27m 6° 30′		0h 29m 7° 0′		s
0+15	7.32171	0.00210	7.40067	0.00252	7.47302	0.00297	7.53980	0.00347	7.60179	0.00400	60
2	.32309	.00210	.40192	.00252	.47418	.00298	.54087	.00347	.60279	.00401	58
4+16	.32446	.00211	.40318	.00253	.47533	.00299	.54194	.00348	.60378	.00402	56
6	.32583	.00212	.40443	.00254	.47649	.00300	.54301	.00349	.60478	.00403	54
8+17	7.32720	0.00212	7.40568	0.00255	7.47764	0.00300	7.54407	0.00350	7.60577	0.00403	52
10	.32857	.00213	.40693	.00255	.47879	.00301	.54514	.00351	.60676	.00404	50
12+18	.32994	.00214	.40818	.00256	.47994	.00302	.54620	.00352	.60775	.00405	48
14	.33130	.00214	.40943	.00257	.48109	.00303	.54727	.00353	.60874	.00406	46
16+19	7.33266	0.00215	7.41067	0.00257	7.48223	0.00304	7.54833	0.00353	7.60973	0.00407	44
18	.33402	.00216	.41191	.00258	.48337	.00304	.54939	.00354	.61072	.00408	42
20+20	.33538	.00216	.41315	.00259	.48452	.00305	.55045	.00355	.61170	.00409	40
22	.33673	.00217	.41439	.00260	.48566	.00306	.55150	.00356	.61269	.00410	38
24+21	7.33809	0.00218	7.41563	0.00260	7.48680	0.00307	7.55256	0.00357	7.61367	0.00411	36
26	.33944	.00218	.41686	.00261	.48794	.00308	.55361	.00358	.61466	.00412	34
28+22	.34079	.00219	.41810	.00262	.48907	.00308	.55467	.00359	.61564	.00413	32
30	.34213	.00220	.41933	.00263	.49021	.00309	.55572	.00360	.61662	.00414	30
32+23	7.34348	0.00221	7.42056	0.00263	7.49134	0.00310	7.55677	0.00360	7.61760	0.00415	28
34	.34482	.00221	.42179	.00264	.49247	.00311	.55782	.00361	.61858	.00416	26
36+24	.34616	.00222	.42301	.00265	.49360	.00312	.55887	.00362	.61955	.00416	24
38	.34750	.00223	.42424	.00266	.49473	.00312	.55992	.00363	.62053	.00417	22
40+25	7.34884	0.00223	7.42546	0.00266	7.49586	0.00313	7.56096	0.00364	7.62151	0.00418	20
42	.35017	.00224	.42668	.00267	.49699	.00314	.56201	.00365	.62248	.00419	18
44+26	.35150	.00225	.42790	.00268	.49811	.00315	.56305	.00366	.62345	.00420	16
46	.35283	.00225	.42912	.00269	.49923	.00316	.56409	.00367	.62442	.00421	14
48+27	7.35416	0.00226	7.43034	0.00269	7.50036	0.00316	7.56513	0.00367	7.62540	0.00422	12
50	.35549	.00227	.43155	.00270	.50148	.00317	.56617	.00368	.62636	.00423	10
52+28	.35681	.00227	.43277	.00271	.50259	.00318	.56721	.00369	.62733	.00424	8
54	.35813	.00228	.43398	.00272	.50371	.00319	.56825	.00370	.62830	.00425	6
56+29	7.35945	0.00229	7.43519	0.00272	7.50483	0.00320	7.56928	0.00371	7.62927	0.00426	4
58	.36077	.00229	.43639	.00273	.50594	.00321	.57032	.00372	.63023	.00427	2
60+30	7.36209	0.00230	7.43760	0.00274	7.50706	0.00321	7.57135	0.00373	7.63120	0.00428	0
	23h 38m		23h 36m		23h 34m		23h 32m		23h 30m		

TABLE 34.

Haversines.

s ′	0h 30m 7° 30′		0h 32m 8° 0′		0h 34m 8° 30′		0h 36m 9° 0′		0h 38m 9° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0 0	7.63120	0.00428	7.68717	0.00487	7.73974	0.00549	7.78929	0.00616	7.83615	0.00686	60
2	.63216	.00429	.68807	.00488	.74059	.00550	.79009	.00617	.83691	.00687	58
4+ 1	.63312	.00430	.68897	.00489	.74143	.00551	.79089	.00618	.83767	.00688	56
6	.63408	.00431	.68987	.00490	.74228	.00552	.79169	.00619	.83842	.00689	54
8+ 2	7.63504	0.00432	7.69077	0.00491	7.74313	0.00554	7.79249	0.00620	7.83918	0.00691	52
10	.63600	.00433	.69167	.00492	.74398	.00555	.79329	.00621	.83994	.00692	50
12+ 3	.63696	.00433	.69257	.00493	.74482	.00556	.79409	.00622	.84070	.00693	48
14	.63792	.00434	.69347	.00494	.74567	.00557	.79489	.00624	.84145	.00694	46
16+ 4	7.63887	0.00435	7.69437	0.00495	7.74651	0.00558	7.79568	0.00625	7.84221	0.00695	44
18	.63983	.00436	.69526	.00496	74735	.00559	.79648	.00626	.84296	.00697	42
20+ 5	.64078	.00437	.69616	.00497	.74819	.00560	.79728	.00627	.84372	.00698	40
22	.64173	.00438	.69705	.00498	.74904	.00561	.79807	.00628	.84447	.00699	38
24+ 6	7.64269	0.00439	7.69794	0.00499	7.74988	0.00562	7.79886	0.00629	7.84522	0.00700	36
26	.64364	.00440	.69883	.00500	.75072	.00563	.79966	.00630	.84597	.00701	34
28+ 7	.64458	.00441	.69972	.00501	.75155	.00564	.80045	.00632	.84672	.00703	32
30	.64553	.00442	.70061	.00502	.75239	.00565	.80124	.00633	.84747	.00704	30
32+ 8	7.64648	0.00443	7.70150	0.00503	7.75323	0.00567	7.80203	0.00634	7.84822	0.00705	28
34	.64743	.00444	.70239	.00504	.75407	.00568	.80282	.00635	.84897	.00706	26
36+ 9	.64837	.00445	.70328	.00505	.75490	.00569	.80361	.00636	.84972	.00707	24
38	.64932	.00446	.70416	.00506	.75574	.00570	.80440	.00637	.85047	.00709	22
40+10	7.65026	0.00447	7.70505	0.00507	7.75657	0.00571	7.80519	0.00639	7.85122	0.00710	20
42	.65120	.00448	.70593	.00508	.75740	.00572	.80598	.00640	.85196	.00711	18
44+11	.65214	.00449	.70682	.00509	.75824	.00573	.80677	.00641	.85271	.00712	16
46	.65308	.00450	.70770	.00510	.75907	.00574	.80755	.00642	.85346	.00714	14
48+12	7.65402	0.00451	7.70858	0.00511	7.75990	0.00575	7.80834	0.00643	7.85420	0.00715	12
50	.65496	.00452	.70946	.00512	.76073	.00576	.80912	.00644	.85494	.00716	10
52+13	.65590	.00453	.71034	.00513	.76156	.00578	.80991	.00646	.85569	.00717	8
54	.65683	.00454	.71122	.00514	.76239	.00579	.81069	.00647	.85643	.00719	6
56+14	7.65777	0.00455	7.71210	0.00515	7.76321	0.00580	7.81147	0.00648	7.85717	0.00720	4
58	7.65870	0.00456	7.71298	0.00516	7.76404	0.00581	7.81225	0.00649	7.85791	0.00721	2
	23h 29m		23h 27m		23h 25m		23h 23m		23h 21m		

s ′	0h 31m 7° 30′		0h 33m 8° 0′		0h 35m 8° 30′		0h 37m 9° 0′		0h 39m 9° 30′		s
0+15	7.65964	0.00457	7.71385	0.00517	7.76487	0.00582	7.81303	0.00650	7.85866	0.00722	60
2	.66057	.00458	.71473	.00518	.76569	.00583	.81382	.00651	.85940	.00723	58
4+16	.66150	.00459	.71560	.00520	.76652	.00584	.81459	.00653	.86014	.00725	56
6	.66243	.00460	.71648	.00521	.76734	.00585	.81537	.00654	.86087	.00726	54
8+17	7.66336	0.00461	7.71735	0.00522	7.76816	0.00586	7.81615	0.00655	7.86161	0.00727	52
10	.66429	.00462	.71822	.00523	.76898	.00587	.81693	.00656	.86235	.00728	50
12+18	.66521	.00463	.71909	.00524	.76981	.00589	.81771	.00657	.86309	.00730	48
14	.66614	.00464	.71996	.00525	.77063	.00590	.81848	.00658	.86382	.00731	46
16+19	7.66706	0.00465	7.72083	0.00526	7.77145	0.00591	7.81926	0.00660	7.86456	0.00732	44
18	.66799	.00466	.72170	.00527	.77227	.00592	.82003	.00661	.86530	.00733	42
20+20	.66891	.00467	.72257	.00528	.77308	.00593	.82081	.00662	.86603	.00735	40
22	.66983	.00468	.72343	.00529	.77390	.00594	.82158	.00663	.86676	.00736	38
24+21	7.67075	0.00469	7.72430	0.00530	7.77472	0.00595	7.82235	0.00664	7.86750	0.00737	36
26	.67167	.00470	.72516	.00531	.77553	.00596	.82313	.00665	.86823	.00738	34
28+22	.67259	.00471	.72603	.00532	.77635	.00598	.82390	.00667	.86896	.00740	32
30	.67351	.00472	.72689	.00533	.77716	.00599	.82467	.00668	.86969	.00741	30
32+23	7.67443	0.00473	7.72775	0.00534	7.77798	0.00600	7.82544	0.00669	7.87042	0.00742	28
34	.67535	.00474	.72861	.00535	.77879	.00601	.82621	.00670	.87115	.00743	26
36+24	.67626	.00475	.72948	.00536	.77960	.00602	.82698	.00671	.87188	.00745	24
38	.67718	.00476	.73034	.00537	.78041	.00603	.82774	.00673	.87261	.00746	22
40+25	7.67809	0.00477	7.73119	0.00539	7.78122	0.00604	7.82851	0.00674	7.87334	0.00747	20
42	.67900	.00478	.73205	.00540	.78203	.00605	.82928	.00675	.87407	.00748	18
44+26	.67991	.00479	.73291	.00541	.78284	.00607	.83004	.00676	.87480	.00750	16
46	.68082	.00480	.73377	.00542	.78365	.00608	.83081	.00677	.87552	.00751	14
48+27	7.68173	0.00481	7.73462	0.00543	7.78446	0.00609	7.83157	0.00679	7.87625	0.00752	12
50	.68264	.00482	.73548	.00544	.78526	.00610	.83234	.00680	.87697	.00753	10
52+28	.68355	.00483	.73633	.00545	.78607	.00611	.83310	.00681	.87770	.00755	8
54	.68445	.00484	.73718	.00546	.78688	.00612	.83386	.00682	.87842	.00756	6
56+29	7.68536	0.00485	7.73803	0.00547	7.78768	0.00613	7.83463	0.00683	7.87915	0.00757	4
58	.68627	.00486	.73889	.00548	.78848	.00614	.83539	.00685	.87987	.00758	2
60+30	7.68717	0.00487	7.73974	0.00549	7.78929	0.00616	7.83615	0.00686	7.88059	0.00760	0
	23h 28m		23h 26m		23h 24m		23h 22m		23h 20m		

TABLE 34.

Haversines.

s ′	0h 40m 10° 0′ Log. Hav.	Nat. Hav.	0h 42m 10° 30′ Log. Hav.	Nat. Hav.	0h 44m 11° 0′ Log. Hav.	Nat. Hav.	0h 46m 11° 30′ Log. Hav.	Nat. Hav.	0h 48m 12° 0′ Log. Hav.	Nat. Hav.	s
0 0	7.88059	0.00760	7.92286	0.00837	7.96315	0.00919	8.00163	0.01004	8.03847	0.01093	60
2	.88131	.00761	.92354	.00839	.96380	.00920	.00226	.01005	.03907	.01094	58
4+ 1	.88203	.00762	.92423	.00840	.96446	.00921	.00289	.01007	.03967	.01096	56
6	.88276	.00763	.92492	.00841	.96511	.00923	.00351	.01008	.04027	.01097	54
8+ 2	7.88348	0.00765	7.92560	0.00843	7.96577	0.00924	8.00414	0.01010	8.04087	0.01099	52
10	.88419	.00766	.92629	.00844	.96642	.00926	.00476	.01011	.04147	.01100	50
12+ 3	.88491	.00767	.92697	.00845	.96707	.00927	.00539	.01012	.04207	.01102	48
14	.88563	.00768	.92766	.00847	.96773	.00928	.00601	.01014	.04267	.01103	46
16+ 4	7.88635	0.00770	7.92834	0.00848	7.96838	0.00930	8.00664	0.01015	8.04326	0.01105	44
18	.88707	.00771	.92902	.00849	.96903	.00931	.00726	.01017	.04386	.01106	42
20+ 5	88778	.00772	.92970	.00851	.96968	.00933	.00788	.01018	.04446	.01108	40
22	.88850	.00774	.93039	.00852	.97033	.00934	.00851	.01020	.04506	.01109	38
24+ 6	7.88921	0.00775	7.93107	0.00853	7.97098	0.00935	8.00913	0.01021	8.04565	0.01111	36
26	.88993	.00776	.93175	.00855	.97163	.00937	.00975	.01023	.04625	.01112	34
28+ 7	.89064	.00777	.93243	.00856	.97228	.00938	.01037	.01024	.04684	.01114	32
30	.89135	.00779	.93311	.00857	.97293	.00940	.01099	.01026	.04744	.01115	30
32+ 8	7.89207	0.00780	7.93379	0.00859	7.97358	0.00941	8.01161	0.01027	8.04803	0.01117	28
34	.89278	.00781	.93447	.00860	.97423	.00942	.01223	.01029	.04863	.01118	26
36+ 9	.89349	.00783	.93514	.00861	.97478	.00944	.01285	.01030	.04922	.01120	24
38	.89420	.00784	.93582	.00863	.97552	.00945	.01347	.01032	.04981	.01122	22
40+10	7.89491	0.00785	7.93650	0.00864	7.97617	0.00947	8.01409	0.01033	8.05041	0.01123	20
42	.89562	.00786	.93717	.00865	.97681	.00948	.01471	.01034	.05100	.01125	18
44+11	.89633	.00788	.93785	.00867	.97746	.00949	.01532	.01036	.05159	.01126	16
46	.89704	.00789	.93852	.00868	.97810	.00951	.01594	.01037	.05218	.01128	14
48+12	7.89775	0.00790	7.93920	0.00869	7.97875	0.00952	8.01656	0.01039	8.05277	0.01129	12
50	.89846	.00792	.93987	.00871	.97939	.00954	.01717	.01040	.05336	.01131	10
52+13	.89916	.00793	.94055	.00872	.98003	.00955	.01779	.01042	.05395	.01132	8
54	.89987	.00794	.94122	.00873	.98068	.00956	.01840	.01043	.05454	.01134	6
56+14	7.90057	0.00795	7.94189	0.00875	7.98132	0.00958	8.01902	0.01045	8.05513	0.01135	4
58	7.90128	0.00797	7.94257	0.00876	7.98196	0.00959	8.01963	0.01046	8.05572	0.01137	2
	23h 19m		23h 17m		23h 15m		23h 13m		23h 11m		

s ′	0h 41m 10° 0′ Log. Hav.	Nat. Hav.	0h 43m 10° 30′ Log. Hav.	Nat. Hav.	0h 45m 11° 0′ Log. Hav.	Nat. Hav.	0h 47m 11° 30′ Log. Hav.	Nat. Hav.	0h 49m 12° 0′ Log. Hav.	Nat. Hav.	s
0+15	7.90198	0.00798	7.94324	0.00877	7.98260	0.00961	8.02025	0.01048	8.05631	0.01138	60
2	.90269	.00799	.94391	.00879	.98325	.00962	.02086	.01049	.05690	.01140	58
4+16	.90339	.00801	.94458	.00880	.98389	.00964	.02148	.01051	.05749	.01142	56
6	.90409	.00802	.94525	.00882	.98453	.00965	.02209	.01052	.05808	.01143	54
8+17	7.90480	0.00803	7.94592	0.00883	7.98517	0.00966	8.02270	0.01054	8.05866	0.01145	52
10	.90550	.00804	.94659	.00884	.98581	.00968	.02331	.01055	.05925	.01146	50
12+18	.90620	.00806	.94726	.00886	.98644	.00969	.02392	.01057	.05984	.01148	48
14	.90690	.00807	.94792	.00887	.98708	.00971	.02453	.01058	.06042	.01149	46
16+19	7.90760	0.00808	7.94859	0.00888	7.98772	0.00972	8.02515	0.01060	8.06101	0.01151	44
18	.90830	.00810	.94926	.00890	.98836	.00974	.02576	.01061	.06159	.01152	42
20+20	.90900	.00811	.94992	.00891	.98899	.00975	.02637	.01063	.06218	.01154	40
22	.90970	.00812	.95059	.00892	.98963	.00976	.02697	.01064	.06276	.01155	38
24+21	7.91039	0.00814	7.95126	0.00894	7.99027	0.00978	8.02758	0.01066	8.06335	0.01157	36
26	.91109	.00815	.95192	.00895	99090	.00979	.02819	.01067	.06393	.01159	34
28+22	.91179	.00816	.95259	.00897	.99154	.00981	.02880	.01069	.06451	.01160	32
30	.91248	.00817	.95325	.00898	.99217	.00982	.02941	.01070	.06510	.01162	30
32+23	7.91318	0.00819	7.95391	0.00899	7.99281	0.00984	8.03001	0.01072	8.06568	0.01163	28
34	.91387	.00820	.95458	.00901	.99344	.00985	.03062	.01073	.06626	.01165	26
36+24	.91457	.00821	.95524	.00902	.99407	.00986	.03123	.01075	.06684	.01166	24
38	.91526	.00823	.95590	.00903	.99470	.00988	.03183	.01076	.06742	.01168	22
40+25	7.91596	0.00824	7.95656	0.00905	7.99534	0.00989	8.03244	0.01078	8.06800	0.01170	20
42	.91665	.00825	.95722	.00906	.99597	.00991	.03304	.01079	.06859	.01171	18
44+26	.91734	.00827	.95788	.00908	.99660	.00992	.03365	.01081	.06917	.01173	16
46	.91803	.00828	.95854	.00909	.99723	.00994	.03425	.01082	.06975	.01174	14
48+27	7.91872	0.00829	7.95920	0.00910	7.99786	0.00995	8.03486	0.01084	8.07032	0.01176	12
50	.91941	.00831	.95986	.00912	.99849	.00997	.03546	.01085	.07090	.01177	10
52+28	.92010	.00832	.96052	.00913	.99912	.00998	.03606	.01087	.07148	.01179	8
54	.92079	.00833	.96118	.00914	7.99975	.00999	.03666	.01088	.07206	.01180	6
56+29	7.92148	0.00835	7.96183	0.00916	8.00038	0.01001	8.03727	0.01090	8.07264	0.01182	4
58	.92217	.00836	.96249	.00917	.00100	.01002	.03787	.01091	.07322	.01184	2
60+30	7.92286	0.00837	7.96315	0.00919	8.00163	0.01004	8.03847	0.01093	8.07379	0.01185	0
	23h 18m		23h 16m		23h 14m		23h 12m		23h 10m		

Haversines.

s ′	0h 50m 12° 30′ Log. Hav.	Nat. Hav.	0h 52m 13° 0′ Log. Hav.	Nat. Hav.	0h 54m 13° 30′ Log. Hav.	Nat. Hav.	0h 56m 14° 0′ Log. Hav.	Nat. Hav.	0h 58m 14° 30′ Log. Hav.	Nat. Hav.	s
0 0	8.07379	**0.01185**	8.10772	**0.01282**	8.14035	**0.01382**	8.17179	**0.01485**	8.20211	**0.01593**	60
2	.07437	**.01187**	.10827	**.01283**	.14089	**.01383**	.17230	**.01487**	.20261	**.01594**	58
4+ 1	.07494	**.01188**	.10883	**.01285**	.14142	**.01385**	.17282	**.01489**	.20310	**.01596**	56
6	.07552	**.01190**	.10938	**.01286**	.14195	**.01387**	.17333	**.01491**	.20360	**.01598**	54
8+ 2	8.07610	**0.01192**	8.10993	**0.01288**	8.14248	**0.01388**	8.17384	**0.01492**	8.20410	**0.01600**	52
10	.07667	**.01193**	.11049	**.01290**	.14302	**.01390**	.17436	**.01494**	.20459	**.01602**	50
12+ 3	.07725	**.01195**	.11104	**.01291**	.14355	**.01392**	.17487	**.01496**	.20509	**.01604**	48
14	.07782	**.01196**	.11159	**.01293**	.14408	**.01393**	.17538	**.01498**	.20558	**.01605**	46
16+ 4	8.07839	**0.01198**	8.11214	**0.01295**	8.14461	**0.01395**	8.17590	**0.01499**	8.20608	**0.01607**	44
18	.07897	**.01199**	.11269	**.01296**	.14514	**.01397**	.17641	**.01501**	.20657	**.01609**	42
20+ 5	.07954	**.01201**	.11324	**.01298**	.14567	**.01399**	.17692	**.01503**	.20706	**.01611**	40
22	.08011	**.01203**	.11379	**.01300**	.14620	**.01400**	.17743	**.01505**	.20756	**.01613**	38
24+ 6	8.08069	**0.01204**	8.11435	**0.01301**	8.14673	**0.01402**	8.17794	**0.01506**	8.20805	**0.01615**	36
26	.08126	**.01206**	.11490	**.01303**	.14726	**.01404**	.17845	**.01508**	.20854	**.01616**	34
28+ 7	.08183	**.01207**	.11544	**.01305**	.14779	**.01405**	.17896	**.01510**	.20904	**.01618**	32
30	.08240	**.01209**	.11599	**.01306**	.14832	**.01407**	.17947	**.01512**	.20953	**.01620**	30
32+ 8	8.08297	**0.01211**	8.11654	**0.01308**	8.14885	**0.01409**	8.17998	**0.01513**	8.21002	**0.01622**	28
34	.08354	**.01212**	.11709	**.01309**	.14938	**.01411**	.18049	**.01515**	.21051	**.01624**	26
36+ 9	.08411	**.01214**	.11764	**.01311**	.14991	**.01412**	.18100	**.01517**	.21100	**.01626**	24
38	.08468	**.01215**	.11819	**.01313**	.15043	**.01414**	.18151	**.01519**	.21149	**.01627**	22
40+10	8.08525	**0.01217**	8.11873	**0.01314**	8.15096	**0.01416**	8.18202	**0.01521**	8.21199	**0.01629**	20
42	.08582	**.01218**	.11928	**.01316**	.15149	**.01417**	.18253	**.01522**	.21248	**.01631**	18
44+11	.08639	**.01220**	.11983	**.01317**	.15201	**.01419**	.18303	**.01524**	.21297	**.01633**	16
46	.08696	**.01222**	.12038	**.01319**	.15254	**.01421**	.18354	**.01526**	.21346	**.01635**	14
48+12	8.08752	**0.01223**	8.12092	**0.01321**	8.15307	**0.01423**	8.18405	**0.01528**	8.21395	**0.01637**	12
50	.08809	**.01225**	.12147	**.01323**	.15359	**.01424**	.18455	**.01530**	.21444	**.01638**	10
52+13	.08866	**.01226**	.12201	**.01324**	.15412	**.01426**	.18506	**.01531**	.21493	**.01640**	8
54	.08922	**.01228**	.12256	**.01326**	.15464	**.01428**	.18557	**.01533**	.21541	**.01642**	6
56+14	8.08979	**0.01230**	8.12310	**0.01328**	8.15517	**0.01429**	8.18607	**0.01535**	8.21590	**0.01644**	4
58	8.09036	**0.01231**	8.12365	**0.01329**	8.15569	**0.01431**	8.18658	**0.01537**	8.21639	**0.01646**	2
	23h 9m		23h 7m		23h 5m		23h 3m		23h 1m		

s ′	0h 51m 12° 30′ Log. Hav.	Nat. Hav.	0h 53m 13° 0′ Log. Hav.	Nat. Hav.	0h 55m 13° 30′ Log. Hav.	Nat. Hav.	0h 57m 14° 0′ Log. Hav.	Nat. Hav.	0h 59m 14° 30′ Log. Hav.	Nat. Hav.	s
0+15	8.09092	**0.01233**	8.12419	**0.01331**	8.15622	**0.01433**	8.18709	**0.01538**	8.21688	**0.01648**	60
2	.09149	**.01234**	.12473	**.01333**	.15674	**.01435**	.18759	**.01540**	.21737	**.01650**	58
4+16	.09205	**.01236**	.12528	**.01334**	.15726	**.01436**	.18810	**.01542**	.21785	**.01651**	56
6	.09262	**.01238**	.12582	**.01336**	.15779	**.01438**	.18860	**.01544**	.21834	**.01653**	54
8+17	8.09318	**0.01239**	8.12636	**0.01338**	8.15831	**0.01440**	8.18910	**0.01546**	8.21883	**0.01655**	52
10	.09374	**.01241**	.12691	**.01339**	.15883	**.01442**	.18961	**.01547**	.21932	**.01657**	50
12+18	.09431	**.01243**	.12745	**.01341**	.15935	**.01443**	.19011	**.01549**	.21980	**.01659**	48
14	.09487	**.01244**	.12799	**.01343**	.15987	**.01445**	.19062	**.01551**	.22029	**.01661**	46
16+19	8.09543	**0.01246**	8.12853	**0.01344**	8.16040	**0.01447**	8.19112	**0.01553**	8.22077	**0.01663**	44
18	.09600	**.01247**	.12907	**.01346**	.16092	**.01448**	.19162	**.01555**	.22126	**.01664**	42
20+20	.09656	**.01249**	.12961	**.01348**	.16144	**.01450**	.19212	**.01556**	.22175	**.01666**	40
22	.09712	**.01251**	.13015	**.01349**	.16196	**.01452**	.19263	**.01558**	.22223	**.01668**	38
24+21	8.09768	**0.01252**	8.13069	**0.01351**	8.16248	**0.01454**	8.19313	**0.01560**	8.22272	**0.01670**	36
26	.09824	**.01254**	.13123	**.01353**	.16300	**.01455**	.19363	**.01562**	.22320	**.01672**	34
28+22	.09880	**.01255**	.13177	**.01354**	.16352	**.01457**	.19413	**.01564**	.22368	**.01674**	32
30	.09936	**.01257**	.13231	**.01356**	.16404	**.01459**	.19463	**.01565**	.22417	**.01676**	30
32+23	8.09992	**0.01259**	8.13285	**0.01358**	8.16456	**0.01461**	8.19513	**0.01567**	8.22465	**0.01677**	28
34	.10048	**.01260**	.13339	**.01360**	.16508	**.01462**	.19563	**.01569**	.22514	**.01679**	26
36+24	.10104	**.01262**	.13392	**.01361**	.16559	**.01464**	.19613	**.01571**	.22562	**.01681**	24
38	.10160	**.01264**	.13446	**.01363**	.16611	**.01466**	.19663	**.01573**	.22610	**.01683**	22
40+25	8.10216	**0.01265**	8.13500	**0.01365**	8.16663	**0.01468**	8.19713	**0.01574**	8.22658	**0.01685**	20
42	.10271	**.01267**	.13554	**.01366**	.16715	**.01469**	.19763	**.01576**	.22707	**.01687**	18
44+26	.10327	**.01268**	.13607	**.01368**	.16766	**.01471**	.19813	**.01578**	.22755	**.01689**	16
46	.10383	**.01270**	.13661	**.01370**	.16818	**.01473**	.19863	**.01580**	.22803	**.01691**	14
48+27	8.10439	**0.01272**	8.13714	**0.01371**	8.16870	**0.01475**	8.19913	**0.01582**	8.22851	**0.01692**	12
50	.10494	**.01273**	.13768	**.01373**	.16921	**.01476**	.19963	**.01584**	.22899	**.01694**	10
52+28	.10550	**.01275**	.13822	**.01375**	.16973	**.01478**	.20012	**.01585**	.22947	**.01696**	8
54	.10605	**.01277**	.13875	**.01376**	.17024	**.01480**	.20062	**.01587**	.22996	**.01698**	6
56+29	8.10661	**0.01278**	8.13928	**0.01378**	8.17076	**0.01482**	8.20112	**0.01589**	8.23044	**0.01700**	4
58	.10716	**.01280**	.13982	**.01380**	.17127	**.01483**	.20162	**.01591**	.23092	**.01702**	2
60+30	8.10772	**0.01282**	8.14035	**0.01382**	8.17179	**0.01485**	8.20211	**0.01593**	8.23140	**0.01704**	0
	23h 8m		23h 6m		23h 4m		23h 2m		23h 0m		

TABLE 34.

Haversines.

s	1h 0m 15° 0′		1h 1m 15° 15′		1h 2m 15° 30′		1h 3m 15° 45′		1h 4m 16° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	8.23140	.01704	8.24567	.01761	8.25971	.01818	8.27352	.01877	8.28711	.01937	60
1	.23164	.01705	.24591	.01762	.25994	.01819	.27375	.01878	.28734	.01938	59
2	.23188	.01706	.24614	.01763	.26017	.01820	.27398	.01879	.28756	.01939	58
3	.23212	.01707	.24638	.01764	.26040	.01821	.27420	.01880	.28779	.01940	57
+ 1′	8.23235	.01707	8.24661	.01764	8.26064	.01822	8.27443	.01881	8.28801	.01941	56
5	.23259	.01708	.24685	.01765	.26087	.01823	.27466	.01882	.28823	.01942	55
6	.23283	.01709	.24708	.01766	.26110	.01824	.27489	.01883	.28846	.01943	54
7	.23307	.01710	.24732	.01767	.26133	.01825	.27512	.01884	.28868	.01944	53
+ 2′	8.23331	.01711	8.24755	.01768	8.26156	.01826	8.27534	.01885	8.28891	.01945	52
9	.23355	.01712	.24779	.01769	.26179	.01827	.27557	.01886	.28913	.01946	51
10	.23379	.01713	.24803	.01770	.26203	.01828	.27580	.01887	.28936	.01947	50
11	.23403	.01714	.24826	.01771	.26226	.01829	.27603	.01888	.28958	.01948	49
+ 3′	8.23427	.01715	8.24850	.01772	8.26249	.01830	8.27626	.01889	8.28980	.01949	48
13	.23451	.01716	.24873	.01773	.26272	.01831	.27648	.01890	.29003	.01950	47
14	.23475	.01717	.24897	.01774	.26295	.01832	.27671	.01891	.29025	.01951	46
15	.23499	.01718	.24920	.01775	.26318	.01833	.27694	.01892	.29048	.01952	45
+ 4′	8.23523	.01719	8.24944	.01776	8.26341	.01834	8.27717	.01893	8.29070	.01953	44
17	.23546	.01720	.24967	.01777	.26364	.01835	.27739	.01894	.29092	.01954	43
18	.23570	.01721	.24991	.01778	.26388	.01836	.27762	.01895	.29115	.01955	42
19	.23594	.01722	.25014	.01779	.26411	.01837	.27785	.01896	.29137	.01956	41
+ 5′	8.23618	.01723	8.25037	.01780	8.26434	.01838	8.27807	.01897	8.29159	.01957	40
21	.23642	.01724	.25061	.01781	.26457	.01839	.27830	.01898	.29182	.01958	39
22	.23666	.01724	.25084	.01782	.26480	.01840	.27853	.01899	.29204	.01959	38
23	.23690	.01725	.25108	.01783	.26503	.01841	.27876	.01900	.29226	.01960	37
+ 6′	8.23713	.01726	8.25131	.01784	8.26526	.01842	8.27898	.01901	8.29249	.01961	36
25	.23737	.01727	.25155	.01785	.26549	.01843	.27921	.01902	.29271	.01962	35
26	.23761	.01728	.25178	.01786	.26572	.01844	.27944	.01903	.29293	.01963	34
27	.23785	.01729	.25202	.01787	.26595	.01845	.27966	.01904	.29316	.01964	33
+ 7′	8.23809	.01730	8.25225	.01788	8.26618	.01846	8.27989	.01905	8.29338	.01965	32
29	.23832	.01731	.25248	.01789	.26641	.01847	.28012	.01906	.29360	.01966	31
30	.23856	.01732	.25272	.01789	.26664	.01848	.28034	.01907	.29383	.01967	30
31	.23880	.01733	.25295	.01790	.26687	.01849	.28057	.01908	.29405	.01968	29
+ 8′	8.23904	.01734	8.25319	.01791	8.26710	.01850	8.28080	.01909	8.29427	.01969	28
33	.23928	.01735	.25342	.01792	.26733	.01851	.28102	.01910	.29449	.01970	27
34	.23951	.01736	.25365	.01793	.26756	.01852	.28125	.01911	.29472	.01971	26
35	.23975	.01737	.25389	.01794	.26779	.01853	.28147	.01912	.29494	.01972	25
+ 9′	8.23999	.01738	8.25412	.01795	8.26802	.01854	8.28170	.01913	8.29516	.01973	24
37	.24022	.01739	.25435	.01796	.26825	.01855	.28193	.01914	.29539	.01974	23
38	.24046	.01740	.25459	.01797	.26848	.01856	.28215	.01915	.29561	.01975	22
39	.24070	.01741	.25482	.01798	.26871	.01857	.28238	.01916	.29583	.01976	21
+ 10′	8.24094	.01742	8.25505	.01799	8.26894	.01858	8.28260	.01917	8.29605	.01977	20
41	.24118	.01743	.25529	.01800	.26917	.01859	.28283	.01918	.29628	.01978	19
42	.24141	.01743	.25552	.01801	.26940	.01860	.28306	.01919	.29650	.01979	18
43	.24165	.01744	.25575	.01802	.26963	.01861	.28328	.01920	.29672	.01980	17
+ 11′	8.24189	.01745	8.25599	.01803	8.26986	.01861	8.28351	.01921	8.29694	.01981	16
45	.24212	.01746	.25622	.01804	.27009	.01862	.28373	.01922	.29716	.01982	15
46	.24236	.01747	.25645	.01805	.27032	.01863	.28396	.01923	.29739	.01983	14
47	.24260	.01748	.25669	.01806	.27055	.01864	.28418	.01924	.29761	.01984	13
+ 12′	8.24283	.01749	8.25692	.01807	8.27078	.01865	8.28441	.01925	8.29783	.01985	12
49	.24307	.01750	.25715	.01808	.27100	.01866	.28464	.01926	.29805	.01986	11
50	.24331	.01751	.25738	.01809	.27123	.01867	.28486	.01927	.29827	.01987	10
51	.24354	.01752	.25762	.01810	.27146	.01868	.28509	.01928	.29850	.01988	9
+ 13′	8.24378	.01753	8.25785	.01811	8.27169	.01869	8.28531	.01929	8.29872	.01989	8
53	.24402	.01754	.25808	.01812	.27192	.01870	.28554	.01930	.29894	.01990	7
54	.24425	.01755	.25831	.01813	.27215	.01871	.28576	.01931	.29916	.01991	6
55	.24449	.01756	.25855	.01814	.27238	.01872	.28599	.01932	.29938	.01992	5
+ 14′	8.24473	.01757	8.25878	.01815	8.27261	.01873	8.28621	.01933	8.29960	.01993	4
57	.24496	.01758	.25901	.01816	.27283	.01874	.28644	.01934	.29982	.01994	3
58	.24520	.01759	.25924	.01817	.27306	.01875	.28666	.01935	.30005	.01995	2
59	.24543	.01760	.25948	.01818	.27329	.01876	.28689	.01936	.30027	.01997	1
+ 15′	8.24567	.01761	8.25971	.01818	8.27352	.01877	8.28711	.01937	8.30049	.01998	0
	22h 59m		22h 58m		22h 57m		22h 56m		22h 55m		

Haversines.

s	1h 5m 16° 15′		1h 6m 16° 30′		1h 7m 16° 45′		1h 8m 17° 0′		1h 9m 17° 15′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	8.30049	.01998	8.31366	.02059	8.32663	.02121	8.33940	.02185	8.35199	.02249	60
1	.30071	.01999	.31388	.02060	.32684	.02122	.33962	.02186	.35220	.02250	59
2	.30093	.02000	.31410	.02061	.32706	.02124	.33983	.02187	.35241	.02251	58
3	.30115	.02001	.31431	.02062	.32727	.02125	.34004	.02188	.35261	.02252	57
+ 1′	8.30137	.02002	8.31453	.02063	8.32749	.02126	8.34025	.02189	8.35282	.02253	56
5	.30159	.02003	.31475	.02064	.32770	.02127	.34046	.02190	.35303	.02254	55
6	.30182	.02004	.31497	.02065	.32792	.02128	.34067	.02191	.35324	.02255	54
7	.30204	.02005	.31518	.02066	.32813	.02129	.34088	.02192	.35345	.02257	53
+ 2′	8.30226	.02006	8.31540	.02067	8.32834	.02130	8.34109	.02193	8.35365	.02258	52
9	.30248	.02007	.31562	.02068	.32856	.02131	.34130	.02194	.35386	.02259	51
10	.30270	.02008	.31584	.02069	.32877	.02132	.34152	.02195	.35407	.02260	50
11	.30292	.02009	.31605	.02070	.32899	.02133	.34173	.02196	.35428	.02261	49
+ 3′	8.30314	.02010	8.31627	.02071	8.32920	.02134	8.34194	.02198	8.35449	.02262	48
13	.30336	.02011	.31649	.02072	.32941	.02135	.34215	.02199	.35469	.02263	47
14	.30358	.02012	.31670	.02074	.32963	.02136	.34236	.02200	.35490	.02264	46
15	.30380	.02013	.31692	.02075	.32984	.02137	.34257	.02201	.35511	.02265	45
+ 4′	8.30402	.02014	8.31714	.02076	8.33006	.02138	8.34278	.02202	8.35532	.02266	44
17	.30424	.02015	.31735	.02077	.33027	.02139	.34299	.02203	.35552	.02267	43
18	.30446	.02016	.31757	.02078	.33048	.02140	.34320	.02204	.35573	.02268	42
19	.30468	.02017	.31779	.02079	.33070	.02141	.34341	.02205	.35594	.02270	41
+ 5′	8.30490	.02018	8.31800	.02080	8.33091	.02142	8.34362	.02206	8.35614	.02271	40
21	.30512	.02019	.31822	.02081	.33112	.02143	.34383	.02207	.35635	.02272	39
22	.30534	.02020	.31844	.02082	.33134	.02145	.34404	.02208	.35656	.02273	38
23	.30556	.02021	.31865	.02083	.33155	.02146	.34425	.02209	.35677	.02274	37
+ 6′	8.30578	.02022	8.31887	.02084	8.33176	.02147	8.34446	.02210	8.35697	.02275	36
25	.30600	.02023	.31909	.02085	.33198	.02148	.34467	.02211	.35718	.02276	35
26	.30622	.02024	.31930	.02086	.33219	.02149	.34488	.02212	.35739	.02277	34
27	.30644	.02025	.31952	.02087	.33240	.02150	.34509	.02214	.35759	.02278	33
+ 7′	8.30666	.02026	8.31974	.02088	8.33262	.02151	8.34530	.02215	8.35780	.02279	32
29	.30688	.02027	.31995	.02089	.33283	.02152	.34551	.02216	.35801	.02280	31
30	.30710	.02028	.32017	.02090	.33304	.02153	.34572	.02217	.35821	.02281	30
31	.30732	.02029	.32039	.02091	.33325	.02154	.34593	.02218	.35842	.02283	29
+ 8′	8.30754	.02030	8.32060	.02092	8.33347	.02155	8.34614	.02219	8.35863	.02284	28
33	.30776	.02031	.32082	.02093	.33368	.02156	.34635	.02220	.35883	.02285	27
34	.30798	.02032	.32103	.02094	.33389	.02157	.34656	.02221	.35904	.02286	26
35	.30820	.02033	.32125	.02095	.33411	.02158	.34677	.02222	.35925	.02287	25
+ 9′	8.30842	.02034	8.32147	.02096	8.33432	.02159	8.34698	.02223	8.35945	.02288	24
37	.30863	.02035	.32168	.02097	.33453	.02160	.34719	.02224	.35966	.02289	23
38	.30885	.02036	.32190	.02098	.33474	.02161	.34740	.02225	.35987	.02290	22
39	.30907	.02037	.32211	.02099	.33496	.02162	.34761	.02226	.36007	.02291	21
+ 10′	8.30929	.02038	8.32233	.02101	8.33517	.02164	8.34782	.02227	8.36028	.02292	20
41	.30951	.02039	.32254	.02102	.33538	.02165	.34803	.02229	.36048	.02293	19
42	.30973	.02040	.32276	.02103	.33559	.02166	.34823	.02230	.36069	.02295	18
43	.30995	.02042	.32297	.02104	.33580	.02167	.34844	.02231	.36090	.02296	17
+ 11′	8.31017	.02043	8.32319	.02105	8.33602	.02168	8.34865	.02232	8.36110	.02297	16
45	.31039	.02044	.32341	.02106	.33623	.02169	.34886	.02233	.36131	.02298	15
46	.31060	.02045	.32362	.02107	.33644	.02170	.34907	.02234	.36151	.02299	14
47	.31082	.02046	.32384	.02108	.33665	.02171	.34928	.02235	.36172	.02300	13
+ 12′	8.31104	.02047	8.32405	.02109	8.33686	.02172	8.34949	.02236	8.36193	.02301	12
49	.31126	.02048	.32427	.02110	.33708	.02173	.34970	.02237	.36213	.02302	11
50	.31148	.02049	.32448	.02111	.33729	.02174	.34991	.02238	.36234	.02303	10
51	.31170	.02050	.32470	.02112	.33750	.02175	.35011	.02239	.36254	.02304	9
+ 13′	8.31192	.02051	8.32491	.02113	8.33771	.02176	8.35032	.02240	8.36275	.02305	8
53	.31213	.02052	.32513	.02114	.33792	.02177	.35053	.02241	.36295	.02307	7
54	.31235	.02053	.32534	.02115	.33814	.02178	.35074	.02243	.36316	.02308	6
55	.31257	.02054	.32556	.02116	.33835	.02179	.35095	.02244	.36337	.02309	5
+ 14′	8.31279	.02055	8.32577	.02117	8.33856	.02181	8.35116	.02245	8.36357	.02310	4
57	.31301	.02056	.32599	.02118	.33877	.02182	.35137	.02246	.36378	.02311	3
58	.31322	.02057	.32620	.02119	.33898	.02183	.35157	.02247	.36398	.02312	2
59	.31344	.02058	.32642	.02120	.33919	.02184	.35178	.02248	.36419	.02313	1
+ 15′	8.31366	.02059	8.32663	.02121	8.33940	.02185	8.35199	.02249	8.36439	.02314	0
	22h 54m		22h 53m		22h 52m		22h 51m		22h 50m		

TABLE 34.

Haversines.

s	1h 10m 17° 30′		1h 11m 17° 45′		1h 12m 18° 0′		1h 13m 18° 15′		1h 14m 18° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	8.36439	.02314	8.37662	.02380	8.38867	.02447	8.40055	.02515	8.41226	.02584	60
1	.36460	.02315	.37682	.02381	.38886	.02448	.40074	.02516	.41246	.02585	59
2	.36480	.02316	.37702	.02382	.38906	.02449	.40094	.02517	.41265	.02586	58
3	.36501	.02317	.37722	.02384	.38926	.02451	.40114	.02518	.41284	.02587	57
+ 1′	8.36521	.02319	8.37742	.02385	8.38946	.02452	8.40133	.02520	8.41304	.02588	56
5	.36542	.02320	.37763	.02386	.38966	.02453	.40153	.02521	.41323	.02590	55
6	.36562	.02321	.37783	.02387	.38986	.02454	.40172	.02522	.41343	.02591	54
7	.36583	.02322	.37803	.02388	.39006	.02455	.40192	.02523	.41362	.02592	53
+ 2′	8.36603	.02323	8.37823	.02389	8.39026	.02456	8.40212	.02524	8.41381	.02593	52
9	.36624	.02324	.37843	.02390	.39046	.02457	.40231	.02525	.41401	.02594	51
10	.36644	.02325	.37864	.02391	.39066	.02458	.40251	.02526	.41420	.02595	50
11	.36665	.02326	.37884	.02392	.39086	.02460	.40271	.02528	.41439	.02597	49
+ 3′	8.36685	.02327	8.37904	.02394	8.39105	.02461	8.40290	.02529	8.41459	.02598	48
13	.36706	.02328	.37924	.02395	.39125	.02462	.40310	.02530	.41478	.02599	47
14	.36726	.02329	.37944	.02396	.39145	.02463	.40329	.02531	.41497	.02600	46
15	.36746	.02331	.37964	.02397	.39165	.02464	.40349	.02532	.41517	.02601	45
+ 4′	8.36767	.02332	8.37985	.02398	8.39185	.02465	8.40369	.02533	8.41536	.02602	44
17	.36787	.02333	.38005	.02399	.39205	.02466	.40388	.02534	.41555	.02603	43
18	.36808	.02334	.38025	.02400	.39225	.02467	.40408	.02536	.41575	.02605	42
19	.36828	.02335	.38045	.02401	.39245	.02469	.40427	.02537	.41594	.02606	41
+ 5′	8.36849	.02336	8.38065	.02402	8.39264	.02470	8.40447	.02538	8.41613	.02607	40
21	.36869	.02337	.38085	.02404	.39284	.02471	.40467	.02539	.41632	.02608	39
22	.36889	.02338	.38105	.02405	.39304	.02472	.40486	.02540	.41652	.02609	38
23	.36910	.02339	.38126	.02406	.39324	.02473	.40506	.02541	.41671	.02610	37
+ 6′	8.36930	.02340	8.38146	.02407	8.39344	.02474	8.40525	.02542	8.41690	.02612	36
25	.36951	.02342	.38166	.02408	.39364	.02475	.40545	.02544	.41710	.02613	35
26	.36971	.02343	.38186	.02409	.39384	.02476	.40564	.02545	.41729	.02614	34
27	.36991	.02344	.38206	.02410	.39403	.02478	.40584	.02546	.41748	.02615	33
+ 7′	8.37012	.02345	8.38226	.02411	8.39423	.02479	8.40603	.02547	8.41767	.02616	32
29	.37032	.02346	.38246	.02412	.39443	.02480	.40623	.02548	.41787	.02617	31
30	.37053	.02347	.38266	.02414	.39463	.02481	.40642	.02549	.41806	.02619	30
31	.37073	.02348	.38286	.02415	.39482	.02482	.40662	.02550	.41825	.02620	29
+ 8′	8.37093	.02349	8.38306	.02416	8.39502	.02483	8.40681	.02552	8.41845	.02621	28
33	.37114	.02350	.38326	.02417	.39522	.02484	.40701	.02553	.41864	.02622	27
34	.37134	.02351	.38346	.02418	.39542	.02486	.40721	.02554	.41883	.02623	26
35	.37154	.02353	.38367	.02419	.39562	.02487	.40740	.02555	.41902	.02624	25
+ 9′	8.37175	.02354	8.38387	.02420	8.39581	.02488	8.40760	.02556	8.41921	.02626	24
37	.37195	.02355	.38407	.02421	.39601	.02489	.40779	.02557	.41941	.02627	23
38	.37215	.02356	.38427	.02423	.39621	.02490	.40799	.02559	.41960	.02628	22
39	.37236	.02357	.38447	.02424	.39641	.02491	.40818	.02560	.41979	.02629	21
+ 10′	8.37256	.02358	8.38467	.02425	8.39660	.02492	8.40837	.02561	8.41998	.02630	20
41	.37276	.02359	.38487	.02426	.39680	.02493	.40857	.02562	.42018	.02631	19
42	.37297	.02360	.38507	.02427	.39700	.02495	.40876	.02563	.42037	.02633	18
43	.37317	.02361	.38527	.02428	.39720	.02496	.40896	.02564	.42056	.02634	17
+ 11′	8.37337	.02363	8.38547	.02429	8.39739	.02497	8.40915	.02565	8.42075	.02635	16
45	.37358	.02364	.38567	.02430	.39759	.02498	.40935	.02567	.42095	.02636	15
46	.37378	.02365	.38587	.02431	.39779	.02499	.40954	.02568	.42114	.02637	14
47	.37398	.02366	.38607	.02433	.39799	.02500	.40974	.02569	.42133	.02638	13
+ 12′	8.37419	.02367	8.38627	.02434	8.39818	.02501	8.40993	.02570	8.42152	.02639	12
49	.37439	.02368	.38647	.02435	.39838	.02503	.41013	.02571	.42171	.02641	11
50	.37459	.02369	.38667	.02436	.39858	.02504	.41032	.02572	.42190	.02642	10
51	.37479	.02370	.38687	.02437	.39877	.02505	.41052	.02573	.42210	.02643	9
+ 13′	8.37500	.02371	8.38707	.02438	8.39897	.02506	8.41071	.02575	8.42229	.02644	8
53	.37520	.02372	.38727	.02439	.39917	.02507	.41090	.02576	.42248	.02645	7
54	.37540	.02374	.38747	.02440	.39937	.02508	.41110	.02577	.42267	.02646	6
55	.37560	.02375	.38767	.02442	.39956	.02509	.41129	.02578	.42286	.02648	5
+ 14′	8.37581	.02376	8.38787	.02443	8.39976	.02510	8.41149	.02579	8.42305	.02649	4
57	.37601	.02377	.38807	.02444	.39996	.02512	.41168	.02580	.42324	.02650	3
58	.37621	.02378	.38827	.02445	.40015	.02513	.41187	.02582	.42344	.02651	2
59	.37641	.02379	.38847	.02446	.40035	.02514	.41207	.02583	.42363	.02652	1
+ 15′	8.37662	.02380	8.38867	.02447	8.40055	.02515	8.41226	.02584	8.42382	.02653	0
	22h 49m		22h 48m		22h 47m		22h 46m		22h 45m		

TABLE 34.

Haversines.

′	1h 15m 18° 45′		1h 16m 19° 0′		1h 17m 19° 15′		1h 18m 19° 30′		1h 19m 19° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	8.42382	.02653	8.43522	.02724	8.44647	.02796	8.45757	.02868	8.46852	.02941	60
1	.42401	.02655	.43541	.02725	.44665	.02797	.45775	.02869	.46871	.02942	59
2	.42420	.02656	.43560	.02726	.44684	.02798	.45794	.02870	.46889	.02944	58
3	.42439	.02657	.43578	.02728	.44703	.02799	.45812	.02871	.46907	.02945	57
+ 1′	8.42458	.02658	8.43597	.02729	8.44721	.02800	8.45830	.02873	8.46925	.02946	56
5	.42477	.02659	.43616	.02730	.44740	.02802	.45849	.02874	.46943	.02947	55
6	.42497	.02661	.43635	.02731	.44758	.02803	.45867	.02875	.46961	.02949	54
7	.42516	.02662	.43654	.02732	.44777	.02804	.45885	.02876	.46979	.02950	53
+ 2′	8.42535	.02663	8.43673	.02734	8.44796	.02805	8.45904	.02878	8.46998	.02951	52
9	.42554	.02664	.43692	.02735	.44814	.02806	.45922	.02879	.47016	.02952	51
10	.42573	.02665	.43710	.02736	.44833	.02808	.45940	.02880	.47034	.02954	50
11	.42592	.02666	.43729	.02737	.44851	.02809	.45959	.02881	.47052	.02955	49
+ 3′	8.42611	.02668	8.43748	.02738	8.44870	.02810	8.45977	.02883	8.47070	.02956	48
13	.42630	.02669	.43767	.02739	.44889	.02811	.45995	.02884	.47088	.02957	47
14	.42649	.02670	.43786	.02741	.44907	.02812	.46014	.02885	.47106	.02958	46
15	.42668	.02671	.43805	.02742	.44926	.02814	.46032	.02886	.47124	.02960	45
+ 4′	8.42687	.02672	8.43823	.02743	8.44944	.02815	8.46050	.02887	8.47142	.02961	44
17	.42706	.02673	.43842	.02744	.44963	.02816	.46069	.02889	.47160	.02962	43
18	.42725	.02675	.43861	.02745	.44981	.02817	.46087	.02890	.47178	.02963	42
19	.42745	.02676	.43880	.02747	.45000	.02818	.46105	.02891	.47197	.02965	41
+ 5′	8.42764	.02677	8.43899	.02748	8.45018	.02820	8.46124	.02892	8.47215	.02966	40
21	.42783	.02678	.43917	.02749	.45037	.02821	.46142	.02893	.47233	.02967	39
22	.42802	.02679	.43936	.02750	.45055	.02822	.46160	.02895	.47251	.02968	38
23	.42821	.02680	.43955	.02751	.45074	.02823	.46179	.02896	.47269	.02970	37
+ 6′	8.42840	.02682	8.43974	.02753	8.45093	.02824	8.46197	.02897	8.47287	.02971	36
25	.42859	.02683	.43992	.02754	.45111	.02826	.46215	.02898	.47305	.02972	35
26	.42878	.02684	.44011	.02755	.45130	.02827	.46233	.02900	.47323	.02973	34
27	.42897	.02685	.44030	.02756	.45148	.02828	.46252	.02901	.47341	.02974	33
+ 7′	8.42916	.02686	8.44049	.02757	8.45167	.02829	8.46270	.02902	8.47359	.02976	32
29	.42935	.02688	.44067	.02759	.45185	.02830	.46288	.02903	.47377	.02977	31
30	.42954	.02689	.44086	.02760	.45204	.02832	.46306	.02904	.47395	.02978	30
31	.42973	.02690	.44105	.02761	.45222	.02833	.46325	.02906	.47413	.02979	29
+ 8′	8.42992	.02691	8.44124	.02762	8.45241	.02834	8.46343	.02907	8.47431	.02981	28
33	.43011	.02692	.44142	.02763	.45259	.02835	.46361	.02908	.47449	.02982	27
34	.43030	.02693	.44161	.02764	.45278	.02836	.46379	.02909	.47467	.02983	26
35	.43049	.02695	.44180	.02766	.45296	.02838	.46398	.02911	.47485	.02984	25
+ 9′	8.43068	.02696	8.44199	.02767	8.45315	.02839	8.46416	.02912	8.47503	.02986	24
37	.43087	.02697	.44217	.02768	.45333	.02840	.46434	.02913	.47521	.02987	23
38	.43106	.02698	.44236	.02769	.45352	.02841	.46452	.02914	.47539	.02988	22
39	.43125	.02699	.44255	.02771	.45370	.02842	.46471	.02915	.47557	.02989	21
+ 10′	8.43144	.02700	8.44273	.02772	8.45388	.02844	8.46489	.02917	8.47575	.02991	20
41	.43163	.02702	.44292	.02773	.45407	.02845	.46507	.02918	.47593	.02992	19
42	.43181	.02703	.44311	.02774	.45425	.02846	.46525	.02919	.47611	.02993	18
43	.43200	.02704	.44330	.02775	.45444	.02847	.46544	.02920	.47629	.02994	17
+ 11′	8.43219	.02705	8.44348	.02776	8.45462	.02849	8.46562	.02922	8.47647	.02996	16
45	.43238	.02706	.44367	.02778	.45481	.02850	.46580	.02923	.47665	.02997	15
46	.43257	.02708	.44386	.02779	.45499	.02851	.46598	.02924	.47683	.02998	14
47	.43276	.02709	.44404	.02780	.45518	.02852	.46616	.02925	.47701	.02999	13
+ 12′	8.43295	.02710	8.44423	.02781	8.45536	.02853	8.46634	.02926	8.47719	.03000	12
49	.43314	.02711	.44442	.02782	.45554	.02855	.46653	.02928	.47737	.03002	11
50	.43333	.02712	.44460	.02784	.45573	.02856	.46671	.02929	.47755	.03003	10
51	.43352	.02713	.44479	.02785	.45591	.02857	.46689	.02930	.47773	.03004	9
+ 13′	8.43371	.02715	8.44498	.02786	8.45610	.02858	8.46707	.02931	8.47791	.03005	8
53	.43390	.02716	.44516	.02787	.45628	.02859	.46725	.02933	.47809	.03007	7
54	.43409	.02717	.44535	.02788	.45646	.02861	.46744	.02934	.47827	.03008	6
55	.43427	.02718	.44554	.02790	.45665	.02862	.46762	.02935	.47844	.03009	5
+ 14′	8.43446	.02719	8.44572	.02791	8.45683	.02863	8.46780	.02936	8.47862	.03010	4
57	.43465	.02721	.44591	.02792	.45702	.02864	.46798	.02938	.47880	.03012	3
58	.43484	.02722	.44610	.02793	.45720	.02866	.46816	.02939	.47898	.03013	2
59	.43503	.02723	.44628	.02794	.45738	.02867	.46834	.02940	.47916	.03014	1
+ 15′	8.43522	.02724	8.44647	.02796	8.45757	.02868	8.46852	.02941	8.47934	.03015	0
	22h 44m		22h 43m		22h 42m		22h 41m		22h 40m		

TABLE 34.

Haversines.

s	1h 20m 20° 0′ Log. Hav.	Nat. Hav.	1h 21m 20° 15′ Log. Hav.	Nat. Hav.	1h 22m 20° 30′ Log. Hav.	Nat. Hav.	1h 23m 20° 45′ Log. Hav.	Nat. Hav.	1h 24m 21° 0′ Log. Hav.	Nat. Hav.	s
0	8.47934	.03015	8.49002	.03090	8.50056	.03166	8.51098	.03243	8.52127	.03321	60
1	.47952	.03017	.49020	.03092	.50074	.03168	.51115	.03245	.52144	.03322	59
2	.47970	.03018	.49037	.03093	.50091	.03169	.51132	.03246	.52161	.03324	58
3	.47988	.03019	.49055	.03094	.50109	.03170	.51150	.03247	.52178	.03325	57
+ 1′	8.48006	.03020	8.49073	.03095	8.50126	.03171	8.51167	.03248	8.52195	.03326	56
5	.48024	.03022	.49090	.03097	.50144	.03173	.51184	.03250	.52212	.03328	55
6	.48041	.03023	.49108	.03098	.50161	.03174	.51201	.03251	.52229	.03329	54
7	.48059	.03024	.49126	.03099	.50179	.03175	.51219	.03252	.52246	.03330	53
+ 2′	8.48077	.03025	8.49143	.03101	8.50196	.03177	8.51236	.03254	8.52263	.03331	52
9	.48095	.03027	.49161	.03102	.50214	.03178	.51253	.03255	.52280	.03333	51
10	.48113	.03028	.49179	.03103	.50231	.03179	.51270	.03256	.52297	.03334	50
11	.48131	.03029	.49196	.03104	.50248	.03180	.51287	.03257	.52314	.03335	49
+ 3′	8.48149	.03030	8.49214	.03106	8.50266	.03182	8.51305	.03259	8.52331	.03337	48
13	.48167	.03032	.49232	.03107	.50283	.03183	.51322	.03260	.52348	.03338	47
14	.48184	.03033	.49249	.03108	.50301	.03184	.51339	.03261	.52365	.03339	46
15	.48202	.03034	.49267	.03109	.50318	.03186	.51356	.03263	.52382	.03341	45
+ 4′	8.48220	.03035	8.49284	.03111	8.50335	.03187	8.51374	.03264	8.52399	.03342	44
17	.48238	.03037	.49302	.03112	.50353	.03188	.51391	.03265	.52416	.03343	43
18	.48256	.03038	.49320	.03113	.50370	.03189	.51408	.03266	.52433	.03344	42
19	.48274	.03039	.49337	.03114	.50388	.03191	.51425	.03268	.52450	.03346	41
+ 5′	8.48292	.03040	8.49355	.03116	8.50405	.03192	8.51442	.03269	8.52467	.03347	40
21	.48309	.03042	.49373	.03117	.50422	.03193	.51459	.03270	.52484	.03348	39
22	.48327	.03043	.49390	.03118	.50440	.03194	.51477	.03272	.52501	.03350	38
23	.48345	.03044	.49408	.03119	.50457	.03196	.51494	.03273	.52518	.03351	37
+ 6′	8.48363	.03045	8.49425	.03121	8.50475	.03197	8.51511	.03274	8.52535	.03352	36
25	.48381	.03047	.49443	.03122	.50492	.03198	.51528	.03275	.52552	.03354	35
26	.48399	.03048	.49461	.03123	.50509	.03200	.51545	.03277	.52569	.03355	34
27	.48416	.03049	.49478	.03125	.50527	.03201	.51562	.03278	.52585	.03356	33
+ 7′	8.48434	.03050	8.49496	.03126	8.50544	.03202	8.51580	.03279	8.52602	.03358	32
29	.48452	.03052	.49513	.03127	.50561	.03204	.51597	.03281	.52619	.02359	31
30	.48470	.03053	.49531	.03128	.50579	.03205	.51614	.03282	.52636	.03360	30
31	.48488	.03054	.49548	.03130	.50596	.03206	.51631	.03283	.52653	.03361	29
+ 8′	8.48505	.03055	8.49566	.03131	8.50614	.03207	8.51648	.03285	8.52670	.03363	28
33	.48523	.03057	.49584	.03132	.50631	.03209	.51665	.03286	.52687	.03364	27
34	.48541	.03058	.49601	.03133	.50648	.03210	.51682	.03287	.52704	.03365	26
35	.48559	.03059	.49619	.03135	.50666	.03211	.51700	.03288	.52721	.03367	25
+ 9′	8.48576	.03060	8.49636	.03136	8.50683	.03212	8.51717	.03290	8.52738	.03368	24
37	.48594	.03062	.49654	.03137	.50700	.03214	.51734	.03291	.52755	.03369	23
38	.48612	.03063	.49671	.03138	.50718	.03215	.51751	.03292	.52772	.03371	22
39	.48630	.03064	.49689	.03140	.50735	.03216	.51768	.03294	.52789	.03372	21
+ 10′	8.48648	.03065	8.49706	.03141	8.50752	.03218	8.51785	.03295	8.52806	.03373	20
41	.48665	.03067	.49724	.03142	.50770	.03219	.51802	.03296	.52822	.03375	19
42	.48683	.03068	.49742	.03144	.50787	.03220	.51819	.03298	.52839	.03376	18
43	.48701	.03069	.49759	.03145	.50804	.03221	.51836	.03299	.52856	.03377	17
+ 11′	8.48719	.03070	8.49777	.03146	8.50821	.03223	8.51854	.03300	8.52873	.03379	16
45	.48736	.03072	.49794	.03147	.50839	.03224	.51871	.03301	.52890	.03380	15
46	.48754	.03073	.49812	.03149	.50856	.03225	.51888	.03303	.52907	.03381	14
47	.48772	.03074	.49829	.03150	.50873	.03227	.51905	.03304	.52924	.03382	13
+ 12′	8.48789	.03075	8.49847	.03151	8.50891	.03228	8.51922	.03305	8.52941	.03384	12
49	.48807	.03077	.49864	.03152	.50908	.03229	.51939	.03307	.52958	.03385	11
50	.48825	.03078	.49882	.03154	.50925	.03230	.51956	.03308	.52974	.03386	10
51	.48843	.03079	.49899	.03155	.50943	.03232	.51973	.03309	.52991	.03388	9
+ 13′	8.48860	.03080	8.49917	.03156	8.50960	.03233	8.51990	.03311	8.53008	.03389	8
53	.48878	.03082	.49934	.03157	.50977	.03234	.52007	.03312	.53025	.03390	7
54	.48896	.03083	.49952	.03159	.50994	.03236	.52024	.03313	.53042	.03392	6
55	.48914	.03084	.49969	.03160	.51012	.03237	.52041	.03314	.53059	.03393	5
+ 14′	8.48931	.03085	8.49987	.03161	8.51029	.03238	8.52058	.03316	8.53076	.03394	4
57	.48949	.03087	.50004	.03163	.51046	.03239	.52076	.03317	.53092	.03396	3
58	.48967	.03088	.50022	.03164	.51063	.03241	.52093	.03318	.53109	.03397	2
59	.48984	.03089	.50039	.03165	.51081	.03242	.52110	.03320	.53126	.03398	1
+ 15′	8.49002	.03090	8.50056	.03166	8.51098	.03243	8.52127	.03321	8.53143	.03400	0
	22h 39m		22h 38m		22h 37m		22h 36m		22h 35m		

Haversines.

s	1h 25m 21° 15′		1h 26m 21° 30′		1h 27m 21° 45′		1h 28m 22° 0′		1h 29m 22° 15′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	8.53143	.03400	8.54147	.03479	8.55139	.03560	8.56120	.03641	8.57089	.03723	60
1	.53160	.03401	.54164	.03480	.55156	.03561	.56136	.03642	.57105	.03724	59
2	.53177	.03402	.54180	.03482	55172	.03562	.56152	.03644	.57121	.03726	58
3	.53193	.03404	.54197	.03483	.55189	.03564	.56169	.03645	.57137	.03727	57
+ 1′	8.53210	.03405	8.54214	.03484	8.55205	.03565	8.56185	.03646	8.57153	.03728	56
5	.53227	.03406	.54230	.03486	.55221	.03566	.56201	.03648	.57169	.03730	55
6	.53244	.03408	.54247	.03487	55238	.03568	.56217	.03649	.57185	.03731	54
7	.53261	.03409	.54263	.03488	.55254	.03569	.56233	.03650	.57201	.03733	53
+ 2′	8.53277	.03410	8.54280	.03490	8.55271	.03570	8.56250	.03652	8.57217	.03734	52
9	.53294	.03411	.54297	.03491	.55287	.03572	.56266	.03653	.57233	.03735	51
10	.53311	.03413	.54313	.03492	.55303	.03573	.56282	.03654	.57250	.03737	50
11	.53328	.03414	.54330	.03494	.55320	.03574	.56298	.03656	.57266	.03738	49
+ 3′	8.53345	.03415	8.54346	.03495	8.55336	.03576	8.56315	.03657	8.57282	.03740	48
13	.53361	.03417	.54363	.03496	.55353	.03577	.56331	.03659	.57298	.03741	47
14	.53378	.03418	.54380	.03498	.55369	.03578	.56347	.03660	.57314	.03742	46
15	.53395	.03419	.54396	.03499	.55385	.03580	.56363	.03661	.57330	.03744	45
+ 4′	8.53412	.03421	8.54413	.03500	8.55402	.03581	8.56379	.03663	8.57346	.03745	44
17	.53429	.03422	.54429	.03502	.55418	.03582	.56396	.03664	.57362	.03746	43
18	.53445	.03423	.54446	.03503	.55435	.03584	.56412	.03665	.57378	.03748	42
19	.53462	.03425	.54462	.03504	.55451	.03585	.56428	.03667	.57394	.03749	41
+ 5′	8.53479	.03426	8.54479	.03506	8.55467	.03587	8.56444	.03668	8.57410	.03751	40
21	.53496	.03427	.54496	.03507	.55484	.03588	.56460	.03669	.57426	.03752	39
22	.53512	.03429	.54512	.03509	.55500	.03589	.56477	.03671	.57442	.03753	38
23	.53529	.03430	.54529	.03510	.55516	.03591	.56493	.03672	.57458	.03755	37
+ 6′	8.53546	.03431	8.54545	.03511	8.55533	.03592	8.56509	.03674	8.57474	.03756	36
25	.53563	.03433	.54562	.03513	.55549	.03593	.56525	.03675	.57490	.03757	35
26	.53580	.03434	.54578	.03514	.55566	.03595	.56541	.03676	.57506	.03759	34
27	.53596	.03435	.54595	.03515	.55582	.03596	.56557	.03678	.57522	.03760	33
+ 7′	8.53613	.03437	8.54612	.03517	8.55598	.03597	8.56574	.03679	8.57538	.03762	32
29	.53630	.03438	.54628	.03518	.55615	.03599	.56590	.03680	.57554	.03763	31
30	.53646	.03439	.54645	.03519	.55631	.03600	.56606	.03682	.57570	.03764	30
31	.53663	.03441	.54661	.03521	.55647	.03601	.56622	.03683	.57585	.03766	29
+ 8′	8.53680	.03442	8.54678	.03522	8.55664	.03603	8.56638	.03685	8.57601	.03767	28
33	.53697	.03443	.54694	.03523	.55680	.03604	.56654	.03686	.57617	.03769	27
34	.53713	.03445	.54711	.03525	.55696	.03605	.56670	.03687	.57633	.03770	26
35	.53730	.03446	.54727	.03526	.55713	.03607	.56687	.03689	.57649	.03771	25
+ 9′	8.53747	.03447	8.54744	.03527	8.55729	.03608	8.56703	.03690	8.57665	.03773	24
37	.53764	.03449	.54760	.03529	.55745	.03610	.56719	.03691	.57681	.03774	23
38	.53780	.03450	.54777	.03530	.55762	.03611	.56735	.03693	.57697	.03775	22
39	.53797	.03451	.54793	.03531	.55778	.03612	.56751	.03694	.57713	.03777	21
+ 10′	8.53814	.03453	8.54810	.03533	8.55794	.03614	8.56767	.03695	8.57729	.03778	20
41	.53830	.03454	.54826	.03534	.55811	.03615	.56783	.03697	.57745	.03780	19
42	.53847	.03455	.54843	.03535	.55827	.03616	.56799	.03698	.57761	.03781	18
43	.53864	.03457	.54859	.03537	.55843	.03618	.56816	.03700	.57777	.03782	17
+ 11′	8.53880	.03458	8.54876	.03538	8.55859	.03619	8.56832	.03701	8.57793	.03784	16
45	.53897	.03459	.54892	.03539	.55876	.03620	.56848	.03702	.57809	.03785	15
46	.53914	.03460	.54909	.03541	.55892	.03622	.56864	.03704	.57825	.03787	14
47	.53930	.03462	.54925	.03542	.55908	.03623	.56880	.03705	.57841	.03788	13
+ 12′	8.53947	.03463	8.54942	.03543	8.55925	.03624	8.56896	.03706	8.57856	.03789	12
49	.53964	.03464	.54958	.03545	55941	.03626	.56912	.03708	.57872	.03791	11
50	.53980	.03466	.54975	.03546	.55957	.03627	56928	.03709	.57888	.03792	10
51	.53997	.03467	.54991	.03547	.55973	.03629	.56944	.03711	.57904	.03794	9
+ 13′	8.54014	.03468	8.55008	.03549	8.55990	.03630	8.56960	.03712	8.57920	.03795	8
53	.54030	.03470	.55024	.03550	56006	.03631	56977	.03713	.57936	.03796	7
54	.54047	.03471	.55041	.03551	.56022	.03633	.56993	.03715	57952	.03798	6
55	.54064	.03472	.55057	.03553	.56039	.03634	.57009	.03716	.57968	.03799	5
+ 14′	8.54080	.03474	8.55073	.03554	8.56055	.03635	8.57025	.03717	8.57984	.03800	4
57	.54097	.03475	.55090	.03555	.56071	.03637	.57041	.03719	.58000	.03802	3
58	.54114	.03476	.55106	.03557	.56087	.03638	.57057	.03720	.58015	.03803	2
59	.54130	.03478	.55123	.03558	.56104	.03639	.57073	.03722	.58031	.03805	1
+ 15′	8.54147	.03479	8.55139	.03560	8.56120	.03641	8.57089	.03723	8.58047	.03806	0
	22h 34m		22h 33m		22h 32m		22h 31m		22h 30m		

TABLE 34.

Haversines.

s	1h 30m 22° 30′ Log. Hav.	Nat. Hav.	1h 31m 22° 45′ Log. Hav.	Nat. Hav.	1h 32m 23° 0′ Log. Hav.	Nat. Hav.	1h 33m 23° 15′ Log. Hav.	Nat. Hav.	1h 34m 23° 30′ Log. Hav.	Nat. Hav.	s
0	8.58047	.03806	8.58994	.03890	8.59931	.03975	8.60857	.04060	8.61773	.04147	60
1	.58063	.03807	.59010	.03891	.59947	.03976	.60873	.04062	.61789	.04148	59
2	.58079	.03809	.59026	.03893	.59962	.03978	.60888	.04063	.61804	.04150	58
3	.58095	.03810	.59042	.03894	.59978	.03979	.60903	.04065	.61819	.04151	57
+ 1′	8.58111	.03812	8.59057	.03896	8.59993	.03980	8.60919	.04066	8.61834	.04153	56
5	.58127	.03813	.59073	.03897	.60009	.03982	.60934	.04068	.61849	.04154	55
6	.58142	.03814	.59089	.03898	.60024	.03983	.60949	.04069	.61864	.04156	54
7	.58158	.03816	.59104	.03900	.60040	.03985	.60965	.04070	.61880	.04157	53
+ 2′	8.58174	.03817	8.59120	.03901	8.60055	.03986	8.60980	.04072	8.61895	.04159	52
9	.58190	.03819	.59136	.03903	.60071	.03988	.60995	.04073	.61910	.04160	51
10	.58206	.03820	.59151	.03904	.60086	.03989	.61011	.04075	.61925	.04162	50
11	.58222	.03821	.59167	.03905	.60102	.03990	.61026	.04076	.61940	.04163	49
+ 3′	8.58238	.03823	8.59183	.03907	8.60117	.03992	8.61041	.04078	8.61955	.04164	48
13	.58253	.03824	.59198	.03908	.60133	.03993	.61057	.04079	.61971	.04166	47
14	.58269	.03826	.59214	.03910	.60148	.03995	.61072	.04081	.61986	.04167	46
15	.58285	.03827	.59230	.03911	.60164	.03996	.61087	.04082	.62001	.04169	45
+ 4′	8.58301	.03828	8.59245	.03912	8.60179	.03998	8.61103	.04083	8.62016	.04170	44
17	.58317	.03830	.59261	.03914	.60195	.03999	.61118	.04085	.62031	.04172	43
18	.58333	.03831	.59277	.03915	.60210	.04000	.61133	.04086	.62046	04173	42
19	.58348	.03833	.59292	.03917	.60226	.04002	.61149	.04088	.62061	.04175	41
+ 5′	8.58364	.03834	8.59308	.03918	8.60241	.04003	8.61164	.04089	8.62077	.04176	40
21	.58380	.03835	.59323	.03920	.60256	.04005	.61179	.04091	.62092	.04177	39
22	.58396	.03837	.59339	.03921	.60272	.04006	.61194	.04092	.62107	.04179	38
23	.58412	.03838	.59355	.03922	.60287	.04007	.61210	.04094	.62122	.04180	37
+ 6′	8.58427	.03839	8.59370	.03924	8.60303	.04009	8.61225	.04095	8.62137	.04182	36
25	.58443	.03841	.59386	.03925	.60318	.04010	.61240	.04096	.62152	.04183	35
26	.58459	.03842	.59402	.03927	.60334	.04012	.61256	.04098	.62167	.04185	34
27	.58475	.03844	.59417	.03928	.60349	.04013	.61271	.04099	.62182	.04186	33
+ 7′	8.58491	.03845	8.59433	.03929	8.60365	.04015	8.61286	.04101	8.62197	.04188	32
29	.58506	.03846	.59448	.03931	.60380	.04016	.61301	.04102	.62213	.04189	31
30	.58522	.03848	.59464	.03932	.60396	.04017	.61317	.04104	.62228	.04191	30
31	.58538	.03849	.59480	.03934	.60411	.04019	.61332	.04105	.62243	.04192	29
+ 8′	8.58554	.03851	8.59495	.03935	8.60426	.04020	8.61347	.04106	8.62258	.04194	28
33	.58570	.03852	.59511	.03936	.60442	.04022	.61362	.04108	.62273	.04195	27
34	.58585	.03853	.59527	.03938	.60457	.04023	.61378	.04109	.62288	.04196	26
35	.58601	.03855	.59542	.03939	.60473	.04025	.61393	.04111	.62303	.04198	25
+ 9′	8.58617	.03856	8.59558	.03941	8.60488	.04026	8.61408	.04112	8.62318	.04199	24
37	.58633	.03858	.59573	.03942	.60504	.04027	.61423	.04114	.62333	.04201	23
38	.58648	.03859	.59589	.03944	.60519	.04029	.61439	.04115	.62348	.04202	22
39	.58664	.03860	.59604	.03945	.60534	.04030	.61454	.04117	.62363	.04204	21
+ 10′	8.58680	.03862	8.59620	.03946	8.60550	.04032	8.61469	.04118	8.62379	.04205	20
41	.58696	.03863	.59636	.03948	.60565	.04033	.61484	.04119	.62394	.04207	19
42	.58711	.03865	.59651	.03949	.60581	.04035	.61500	.04121	.62409	.04208	18
43	.58727	.03866	.59667	.03951	.60596	.04036	.61515	.04122	.62424	.04210	17
+ 11′	8.58743	.03867	8.59682	.03952	8.60611	.04038	8.61530	.04124	8.62439	.04211	16
45	.58759	.03869	.59698	.03953	.60627	.04039	.61545	.04125	.62454	.04212	15
46	.58774	.03870	.59714	.03955	.60642	.04040	.61561	.04127	.62469	.04214	14
47	.58790	.03872	.59729	.03956	.60658	.04042	.61576	.04128	.62484	.04215	13
+ 12′	8.58806	.03873	8.59745	.03958	8.60673	.04043	8.61591	.04130	8.62499	.04217	12
49	.58822	.03875	.59760	.03959	.60688	.04045	.61606	.04131	.62514	.04218	11
50	.58837	.03876	.59776	.03961	.60704	.04046	.61621	.04133	.62529	.04220	10
51	.58853	.03877	.59791	.03962	.60719	.04048	.61637	.04134	.62544	.04221	9
+ 13′	8.58869	.03879	8.59807	.03963	8.60734	.04049	8.61652	.04135	8.62559	.04223	8
53	.58885	.03880	.59822	.03965	.60750	.04050	.61667	.04137	.62574	.04224	7
54	.58900	.03882	.59838	.03966	.60765	.04052	.61682	.04138	.62589	.04226	6
55	.58916	.03883	.59853	.03968	.60781	.04053	.61697	.04140	.62604	.04227	5
+ 14′	8.58932	.03884	8.59869	.03969	8.60796	.04055	8.61713	.04141	8.62619	.04229	4
57	.58947	.03886	.59885	.03971	.60811	.04056	.61728	.04143	.62634	.04230	3
58	.58963	.03887	.59900	.03972	.60827	.04058	.61743	.04144	.62649	.04232	2
59	.58979	.03889	.59916	.03973	.60842	.04059	.61758	.04146	.62664	.04233	1
+ 15′	8.58994	.03890	8.59931	.03975	8.60857	.04060	8.61773	.04147	8.62680	.04234	0
	22h 29m		22h 28m		22h 27m		22h 26m		22h 25m		

Haversines.

s	1h 35m 23° 45′		1h 36m 24° 0′		1h 37m 24° 15′		1h 38m 24° 30′		1h 39m 24° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	8.62680	.04234	8.63576	.04323	8.64463	.04412	8.65340	.04502	8.66208	.04593	60
1	.62695	.04236	.63591	.04324	.64477	.04413	.65355	.04503	.66223	.04594	59
2	.62710	.04237	.63606	.04326	.64492	.04415	.65369	.04505	.66237	.04596	58
3	.62725	.04239	.63620	.04327	.64507	.04416	.65384	.04506	.66251	.04597	57
+ 1′	8.62740	.04240	8.63635	.04329	8.64521	.04418	8.65398	.04508	8.66266	.04599	56
5	.62755	.04242	.63650	.04330	.64536	.04419	.65413	.04509	.66280	.04600	55
6	.62770	.04243	.63665	.04332	.64551	.04421	.65427	.04511	.66295	.04602	54
7	.62785	.04245	.63680	.04333	.64565	.04422	.65442	.04512	.66309	.04604	53
+ 2′	8.62800	.04246	8.63695	.04335	8.64580	.04424	8.65456	.04514	8.66323	.04605	52
9	.62815	.04248	.63709	.04336	.64595	.04425	.65471	.04516	.66338	.04607	51
10	.62830	.04249	.63724	.04338	.64609	.04427	.65485	.04517	.66352	.04608	50
11	.62845	.04251	.63739	.04339	.64624	.04428	.65500	.04519	.66366	.04610	49
+ 3′	8.62860	.04252	8.63754	.04340	8.64639	.04430	8.65514	.04520	8.66381	.04611	48
13	.62875	.04253	.63769	.04342	.64653	.04431	.65529	.04522	.66395	.04613	47
14	.62890	.04255	.63784	.04343	.64668	.04433	.65543	.04523	.66409	.04614	46
15	.62904	.04256	.63798	.04345	.64683	.04434	.65558	.04525	.66424	.04616	45
+ 4′	8.62919	.04258	8.63813	.04346	8.64697	.04436	8.65572	.04526	8.66438	.04617	44
17	.62934	.04259	.63828	.04348	.64712	.04437	.65587	.04528	.66453	.04619	43
18	.62949	.04261	.63843	.04349	.64727	.04439	.65601	.04529	.66467	.04620	42
19	.62964	.04262	.63858	.04351	.64741	.04440	.65616	.04531	.66481	.04622	41
+ 5′	8.62979	.04264	8.63872	.04352	8.64756	.04442	8.65630	.04532	8.66496	.04623	40
21	.62994	.04265	.63887	.04354	.64771	.04443	.65645	.04534	.66510	.04625	39
22	.63009	.04267	.63902	.04355	.64785	.04445	.65659	.04535	.66524	.04626	38
23	.63024	.04268	.63917	.04357	.64800	.04446	.65674	.04537	.66539	.04628	37
+ 6′	8.63039	.04270	8.63932	.04358	8.64815	.04448	8.65688	.04538	8.66553	.04629	36
25	.63054	.04271	.63946	.04360	.64829	.04449	.65703	.04540	.66567	.04631	35
26	.63069	.04273	.63961	.04361	.64844	.04451	.65717	.04541	.66582	.04633	34
27	.63084	.04274	.63976	.04363	.64859	.04452	.65732	.04543	.66596	.04634	33
+ 7′	8.63099	.04276	8.63991	.04364	8.64873	.04454	8.65746	.04544	8.66610	.04636	32
29	.63114	.04277	.64006	.04366	.64888	.04455	.65761	.04546	.66625	.04637	31
30	.63129	.04278	.64020	.04367	.64902	.04457	.65775	.04547	.66639	.04639	30
31	.63144	.04280	.64035	.04369	.64917	.04458	.65790	.04549	.66653	.04640	29
+ 8′	8.63159	.04281	8.64050	.04370	8.64932	.04460	8.65804	.04550	8.66668	.04642	28
33	.63174	.04283	.64065	.04372	.64946	.04461	.65819	.04552	.66682	.04643	27
34	.63189	.04284	.64079	.04373	.64961	.04463	.65833	.04553	.66696	.04645	26
35	.63204	.04286	.64094	.04375	.64976	.04464	.65848	.04555	.66710	.04646	25
+ 9′	8.63218	.04287	8.64109	.04376	8.64990	.04466	8.65862	.04556	8.66725	.04648	24
37	.63233	.04289	.64124	.04378	.65005	.04467	.65876	.04558	.66739	.04649	23
38	.63248	.04290	.64139	.04379	.65019	.04469	.65891	.04559	.66753	.04651	22
39	.63263	.04292	.64153	.04381	.65034	.04470	.65905	.04561	.66768	.04652	21
+ 10′	8.63278	.04293	8.64168	.04382	8.65049	.04472	8.65920	.04562	8.66782	.04654	20
41	.63293	.04295	.64183	.04384	.65063	.04473	.65934	.04564	.66796	.04655	19
42	.63308	.04296	.64198	.04385	.65078	.04475	.65949	.04565	.66811	.04657	18
43	.63323	.04298	.64212	.04387	.65092	.04476	.65963	.04567	.66825	.04659	17
+ 11′	8.63338	.04299	8.64227	.04388	8.65107	.04478	8.65978	.04569	8.66839	.04660	16
45	.63353	.04301	.64242	.04390	.65122	.04479	.65992	.04570	.66853	.04662	15
46	.63368	.04302	.64257	.04391	.65136	.04481	.66006	.04572	.66868	.04663	14
47	.63382	.04304	.64271	.04393	.65151	.04482	.66021	.04573	.66882	.04665	13
+ 12′	8.63397	.04305	8.64286	.04394	8.65165	.04484	8.66035	.04575	8.66896	.04666	12
49	.63412	.04306	.64301	.04395	.65180	.04485	.66050	.04576	.66911	.04668	11
50	.63427	.04308	.64315	.04397	.65194	.04487	.66064	.04578	.66925	.04669	10
51	.63442	.04309	.64330	.04398	.65209	.04488	.66079	.04579	.66939	.04671	9
+ 13′	8.63457	.04311	8.64345	.04400	8.65224	.04490	8.66093	.04581	8.66953	.04672	8
53	.63472	.04312	.64360	.04401	.65238	.04491	.66107	.04582	.66968	.04674	7
54	.63487	.04314	.64374	.04403	.65253	.04493	.66122	.04584	.66982	.04675	6
55	.63502	.04315	.64389	.04404	.65267	.04494	.66136	.04585	.66996	.04677	5
+ 14′	8.63516	.04317	8.64404	.04405	8.65282	.04496	8.66151	.04587	8.67010	.04678	4
57	.63531	.04318	.64418	.04407	.65296	.04497	.66165	.04588	.67025	.04680	3
58	.63546	.04320	.64433	.04409	.65311	.04499	.66179	.04590	.67039	.04682	2
59	.63561	.04321	.64448	.04410	.65325	.04500	.66194	.04591	.67053	.04683	1
+ 15′	8.63576	.04323	8.64463	.04412	8.65340	.04502	8.66208	.04593	8.67067	.04685	0
	22h 24m		22h 23m		22h 22m		22h 21m		22h 20m		

TABLE 34.

Haversines.

s	1h 40m 25° 0′		1h 41m 25° 15′		1h 42m 25° 30′		1h 43m 25° 45′		1h 44m 26° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	8.67067	.04685	8.67918	.04777	8.68760	.04871	8.69593	.04965	8.70418	.05060	60
1	.67082	.04686	.67932	.04779	.68773	.04872	.69607	.04967	.70431	.05062	59
2	.67096	.04688	.67946	.04780	.68787	.04874	.69620	.04968	.70445	.05063	58
3	.67110	.04689	.67960	.04782	.68801	.04875	.69634	.04970	.70459	.05065	57
+ 1′	8.67124	.04691	8.67974	.04783	8.68815	.04877	8.69648	.04971	8.70472	.05067	56
5	.67139	.04692	.67988	.04785	.68829	.04879	.69662	.04973	.70486	.05068	55
6	.67153	.04694	.68002	.04787	.68843	.04880	.69676	.04975	.70500	.05070	54
7	.67167	.04695	.68016	.04788	.68857	.04882	.69690	.04976	.70513	.05071	53
+ 2′	8.67181	.04697	8.68030	.04790	8.68871	.04883	8.69703	.04978	8.70527	.05073	52
9	.67196	.04698	.68045	.04791	.68885	.04885	.69717	.04979	.70541	.05075	51
10	.67210	.04700	.68059	.04793	.68899	.04886	.69731	.04981	.70554	.05076	50
11	.67224	.04702	.68073	.04794	.68913	.04888	.69745	.04982	.70568	.05078	49
+ 3′	8.67238	.04703	8.68087	.04796	8.68927	.04890	8.69758	.04984	8.70582	.05079	48
13	.67252	.04705	.68101	.04797	.68941	.04891	.69772	.04986	.70595	.05081	47
14	.67267	.04706	.68115	.04799	.68955	.04893	.69786	.04987	.70609	.05083	46
15	.67281	.04708	.68129	.04801	.68969	.04894	.69800	.04989	.70623	.05084	45
+ 4′	8.67295	.04709	8.68143	.04802	8.68983	.04896	8.69814	.04990	8.70636	.05086	44
17	.67309	.04711	.68157	.04804	.68996	.04897	.69827	.04992	.70650	.05087	43
18	.67323	.04712	.68171	.04805	.69010	.04899	.69841	.04994	.70664	.05089	42
19	.67338	.04714	.68185	.04807	.69024	.04901	.69855	.04995	.70677	.05091	41
+ 5′	8.67352	.04715	8.68199	.04808	8.69038	.04902	8.69869	.04997	8.70691	.05092	40
21	.67366	.04717	.68213	.04810	.69052	.04904	.69882	.04998	.70704	.05094	39
22	.67380	.04718	.68227	.04811	.69066	.04905	.69896	.05000	.70718	.05095	38
23	.67394	.04720	.68241	.04813	.69080	.04907	.69910	.05001	.70732	.05097	37
+ 6′	8.67409	.04722	8.68256	.04815	8.69094	.04908	8.69924	.05003	8.70745	.05099	36
25	.67423	.04723	.68270	.04816	.69108	.04910	.69937	.05005	.70759	.05100	35
26	.67437	.04725	.68284	.04818	.69122	.04912	.69951	.05006	.70773	.05102	34
27	.67451	.04726	.68298	.04819	.69136	.04913	.69965	.05008	.70786	.05104	33
+ 7′	8.67465	.04728	8.68312	.04821	8.69149	.04915	8.69979	.05009	8.70800	.05105	32
29	.67480	.04729	.68326	.04822	.69163	.04916	.69992	.05011	.70813	.05107	31
30	.67494	.04731	.68340	.04824	.69177	.04918	.70006	.05013	.70827	.05108	30
31	.67508	.04732	.68354	.04825	.69191	.04919	.70020	.05014	.70841	.05110	29
+ 8′	8.67522	.04734	8.68368	.04827	8.69205	.04921	8.70034	.05016	8.70854	.05111	28
33	.67536	.04735	.68382	.04829	.69219	.04923	.70047	.05017	.70868	.05113	27
34	.67550	.04737	.68396	.04830	.69233	.04924	.70061	.05019	.70881	.05115	26
35	.67565	.04739	.68410	.04832	.69247	.04926	.70075	.05021	.70895	.05116	25
+ 9′	8.67579	.04740	8.68424	.04833	8.69260	.04927	8.70089	.05022	8.70909	.05118	24
37	.67593	.04742	.68438	.04835	.69274	.04929	.70102	.05024	.70922	.05119	23
38	.67607	.04743	.68452	.04836	.69288	.04930	.70116	.05025	.70936	.05121	22
39	.67621	.04745	.68466	.04838	.69302	.04932	.70130	.05027	.70949	.05123	21
+ 10′	8.67635	.04746	8.68480	.04839	8.69316	.04934	8.70144	.05028	8.70963	.05124	20
41	.67649	.04748	.68494	.04841	.69330	.04935	.70157	.05030	.70977	.05126	19
42	.67664	.04749	.68508	.04843	.69344	.04937	.70171	.05032	.70990	.05127	18
43	.67678	.04751	.68522	.04844	.69358	.04938	.70185	.05033	.71004	.05129	17
+ 11′	8.67692	.04752	8.68536	.04846	8.69371	.04940	8.70198	.05035	8.71017	.05131	16
45	.67706	.04754	.68550	.04847	.69385	.04941	.70212	.05036	.71031	.05132	15
46	.67720	.04756	.68564	.04849	.69399	.04943	.70226	.05038	.71045	.05134	14
47	.67734	.04757	.68578	.04850	.69413	.04945	.70240	.05040	.71058	.05135	13
+ 12′	8.67748	.04759	8.68592	.04852	8.69427	.04946	8.70253	.05041	8.71072	.05137	12
49	.67763	.04760	.68606	.04854	.69441	.04948	.70267	.05043	.71085	.05139	11
50	.67777	.04762	.68620	.04855	.69454	.04949	.70281	.05044	.71099	.05140	10
51	.67791	.04763	.68634	.04857	.69468	.04951	.70294	.05046	.71112	.05142	9
+ 13′	8.67805	.04765	8.68648	.04858	8.69482	.04952	8.70308	.05048	8.71126	.05144	8
53	.67819	.04766	.68662	.04860	.69496	.04954	.70322	.05049	.71140	.05145	7
54	.67833	.04768	.68676	.04861	.69510	.04956	.70336	.05051	.71153	.05147	6
55	.67847	.04769	.68690	.04863	.69524	.04957	.70349	.05052	.71167	.05148	5
+ 14′	8.67861	.04771	8.68704	.04864	8.69537	.04959	8.70363	.05054	8.71180	.05150	4
57	.67875	.04773	.68718	.04866	.69551	.04960	.70377	.05055	.71194	.05152	3
58	.67890	.04774	.68732	.04868	.69565	.04962	.70390	.05057	.71207	.05153	2
59	.67904	.04776	.68746	.04869	.69579	.04964	.70404	.05059	.71221	.05155	1
+ 15′	8.67918	.04777	8.68760	.04871	8.69593	.04965	8.70418	.05060	8.71234	.05156	0
	22h 19m		22h 18m		22h 17m		22h 16m		22h 15m		

Haversines.

	1h 45m 26° 15′		1h 46m 26° 30′		1h 47m 26° 45′		1h 48m 27° 0′		1h 49m 27° 15′		
s	Log. Hav.	Nat. Hav.	Log. Hav	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	8.71234	.05156	8.72043	.05253	8.72844	.05351	8.73637	.05450	8.74423	.05549	60
1	.71248	.05158	.72057	.05255	.72857	.05353	.73650	.05451	.74436	.05551	59
2	.71261	.05160	.72070	.05257	.72871	.05354	.73663	.05453	.74449	.05552	58
3	.71275	.05161	.72083	.05258	.72884	.05356	.73677	.05455	.74462	.05554	57
+ 1′	8.71289	.05163	8.72097	.05260	8.72897	.05358	8.73690	.05456	8.74475	.05556	56
5	.71302	.05164	.72110	.05261	.72910	.05359	.73703	.05458	.74488	.05557	55
6	.71316	.05166	.72124	.05263	.72924	.05361	.73716	.05460	.74501	.05559	54
7	.71329	.05168	.72137	.05265	.72937	.05363	.73729	.05461	.74514	.05561	53
+ 2′	8.71343	.05169	8.72150	.05266	8.72950	.05364	8.73742	.05463	8.74527	.05562	52
9	.71356	.05171	.72164	.05268	.72963	.05366	.73755	.05464	.74540	.05564	51
10	.71370	.05172	.72177	.05270	.72977	.05367	.73769	.05466	.74553	.05566	50
11	.71383	.05174	.72191	.05271	.72990	.05369	.73782	.05468	.74566	.05567	49
+ 3′	8.71397	.05176	8.72204	.05273	8.73003	.05371	8.73795	.05470	8.74579	.05569	48
13	.71410	.05177	.72217	.05274	.73016	.05372	.73808	.05471	.74592	.05571	47
14	.71424	.05179	.72231	.05276	.73030	.05374	.73821	.05473	.74605	.05572	46
15	.71437	.05181	.72244	.05278	.73043	.05376	.73834	.05474	.74618	.05574	45
+ 4′	8.71451	.05182	8.72257	.05279	8.73056	.05377	8.73847	.05476	8.74631	.05576	44
17	.71464	.05184	.72271	.05281	.73069	.05379	.73860	.05478	.74644	.05577	43
18	.71478	.05185	.72284	.05283	.73083	.05381	.73874	.05479	.74657	.05579	42
19	.71491	.05187	.72298	.05284	.73096	.05382	.73887	.05481	.74670	.05581	41
+ 5′	8.71505	.05189	8.72311	.05286	8.73109	.05384	8.73900	.05483	8.74683	.05582	40
21	.71518	.05190	.72324	.05287	.73122	.05385	.73913	.05484	.74696	.05584	39
22	.71532	.05192	.72338	.05289	.73136	.05387	.73926	.05486	.74709	.05586	38
23	.71545	.05193	.72351	.05291	.73149	.05389	.73939	.05488	.74722	.05587	37
+ 6′	8.71559	.05195	8.72364	.05292	8.73162	.05390	8.73952	.05489	8.74735	.05589	36
25	.71572	.05197	.72378	.05294	.73175	.05392	.73965	.05491	.74748	.05591	35
26	.71586	.05198	.72391	.05296	.73189	.05394	.73978	.05493	.74761	.05593	34
27	.71599	.05200	.72404	.05297	.73202	.05395	.73992	.05494	.74774	.05594	33
+ 7′	8.71613	.05201	8.72418	.05299	8.73215	.05397	8.74005	.05496	8.74787	.05596	32
29	.71626	.05203	.72431	.05300	.73228	.05399	.74018	.05498	.74800	.05597	31
30	.71640	.05205	.72445	.05302	.73241	.05400	.74031	.05499	.74813	.05599	30
31	.71653	.05206	.72458	.05304	.73255	.05402	.74044	.05501	.74826	.05601	29
+ 8′	8.71667	.05208	8.72471	.05305	8.73268	.05404	8.74057	.05503	8.74839	.05603	28
33	.71680	.05210	.72485	.05307	.73281	.05405	.74070	.05504	.74852	.05604	27
34	.71694	.05211	.72498	.05309	.73294	.05407	.74083	.05506	.74864	.05606	26
35	.71707	.05213	.72511	.05310	.73308	.05408	.74096	.05508	.74877	.05607	25
+ 9′	8.71721	.05214	8.72525	.05312	8.73321	.05410	8.74109	.05509	8.74890	.05609	24
37	.71734	.05216	.72538	.05314	.73334	.05412	.74122	.05511	.74903	.05611	23
38	.71748	.05218	.72551	.05315	.73347	.05413	.74135	.05513	.74916	.05613	22
39	.71761	.05219	.72565	.05317	.73360	.05415	.74149	.05514	.74929	.05614	21
+ 10′	8.71774	.05221	8.72578	.05318	8.73374	.05417	8.74162	.05516	8.74942	.05616	20
41	.71788	.05222	.72591	.05320	.73387	.05418	.74175	.05518	.74955	.05618	19
42	.71801	.05224	.72605	.05322	.73400	.05420	.74188	.05519	.74968	.05619	18
43	.71815	.05226	.72618	.05323	.73413	.05422	.74201	.05521	.74981	.05621	17
+ 11′	8.71828	.05227	8.72631	.05325	8.73426	.05423	8.74214	.05523	8.74994	.05623	16
45	.71842	.05229	.72644	.05326	.73440	.05425	.74227	.05524	.75007	.05624	15
46	.71855	.05231	.72658	.05328	.73453	.05427	.74240	.05526	.75020	.05626	14
47	.71869	.05232	.72671	.05330	.73466	.05428	.74253	.05528	.75033	.05628	13
+ 12′	8.71882	.05234	8.72684	.05331	8.73479	.05430	8.74266	.05529	8.75046	.05629	12
49	.71895	.05235	.72698	.05333	.73492	.05431	.74279	.05531	.75059	.05631	11
50	.71909	.05237	.72711	.05335	.73505	.05433	.74292	.05533	.75072	.05633	10
51	.71922	.05239	.72724	.05336	.73519	.05435	.74305	.05534	.75084	.05634	9
+ 13′	8.71936	.05240	8.72738	.05338	8.73532	.05436	8.74318	.05536	8.75097	.05636	8
53	.71949	.05242	.72751	.05340	.73545	.05438	.74331	.05537	.75110	.05638	7
54	.71963	.05244	.72764	.05341	.73558	.05440	.74344	.05539	.75123	.05639	6
55	.71976	.05245	.72778	.05343	.73571	.05441	.74357	.05541	.75136	.05641	5
+ 14′	8.71989	.05247	8.72791	.05345	8.73584	.05443	8.74371	.05542	8.75149	.05643	4
57	.72003	.05248	.72804	.05346	.73598	.05445	.74384	.05544	.75162	.05644	3
58	.72016	.05250	.72817	.05348	.73611	.05446	.74397	.05546	.75175	.05646	2
59	.72030	.05252	.72831	.05349	.73624	.05448	.74410	.05547	.75188	.05648	1
+ 15′	8.72043	.05253	8.72844	.05351	8.73637	.05450	8.74423	.05549	8.75201	.05649	0
	22h 14m		22h 13m		22h 12m		22h 11m		22h 10m		

TABLE 34.

Haversines.

	1h 50m 27° 30′		1h 51m 27° 45′		1h 52m 28° 0′		1h 53m 28° 15′		1h 54m 28° 30′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	8.75201	.05649	8.75972	.05751	8.76735	.05853	8.77492	.05955	8.78241	.06059	60
1	.75214	.05651	.75984	.05752	.76748	.05854	.77504	.05957	.78254	.06061	59
2	.75227	.05653	.75997	.05754	.76760	.05856	.77517	.05959	.78266	.06063	58
3	.75239	.05655	.76010	.05756	.76773	.05858	.77529	.05961	.78278	.06064	57
+ 1′	8.75252	.05656	8.76023	.05757	8.76786	.05859	8.77542	.05962	8.78291	.06066	56
5	.75265	.05658	.76035	.05759	.76798	.05861	.77554	.05964	.78303	.06068	55
6	.75278	.05660	.76048	.05761	76811	.05863	.77567	.05966	.78316	.06070	54
7	.75291	.05661	.76061	.05762	.76824	.05865	.77579	.05968	.78328	.06071	53
+ 2′	8.75304	.05663	8.76074	.05764	8.76836	.05866	8.77592	.05969	8.78341	.06073	52
9	.75317	.05665	.76086	.05766	.76849	.05868	.77604	.05971	.78353	.06075	51
10	.75330	.05666	.76099	.05768	.76862	.05870	.77617	.05973	.78365	.06077	50
11	.75343	.05668	.76112	.05769	.76874	.05871	.77630	.05974	.78378	.06078	49
+ 3′	8.75355	.05670	8.76125	.05771	8.76887	.05873	8.77642	.05976	8.78390	.06080	48
13	.75368	.05671	.76138	.05773	.76900	.05875	.77655	.05978	.78403	.06082	47
14	.75381	.05673	.76150	.05774	.76912	.05877	.77667	.05980	.78415	.06083	46
15	.75394	.05675	.76163	.05776	.76925	.05878	.77680	.05981	.78428	.06085	45
+ 4′	8.75407	.05676	8.76176	.05778	8.76938	.05880	8.77692	.05983	8.78440	.06087	44
17	.75420	.05678	.76189	.05779	.76950	.05882	.77705	.05985	.78452	.06089	43
18	.75433	.05680	.76201	.05781	.76963	.05883	.77717	.05986	.78465	.06090	42
19	.75446	.05681	.76214	.05783	.76975	.05885	.77730	.05988	.78477	.06092	41
+ 5′	8.75458	.05683	8.76227	.05785	8.76988	.05887	8.77742	.05990	8.78490	.06094	40
21	.75471	.05685	.76240	.05786	.77001	.05888	.77755	.05992	.78502	.06096	39
22	.75484	.05686	.76252	.05788	.77013	.05890	.77767	.05993	.78514	.06097	38
23	.75497	.05688	.76265	.05790	.77026	.05892	.77780	.05995	.78527	.06099	37
+ 6′	8.75510	.05690	8.76278	.05791	8.77039	.05894	8.77792	.05997	8.78539	.06101	36
25	.75523	.05691	.76291	.05793	.77051	.05895	.77805	.05999	.78551	.06103	35
26	.75536	.05693	.76303	.05795	.77064	.05897	.77817	.06000	.78564	.06104	34
27	.75548	.05695	.76316	.05796	.77076	.05899	.77830	.06002	.78576	.06106	33
+ 7′	8.75561	.05697	8.76329	.05798	8.77089	.05901	8.77842	.06004	8.78589	.06108	32
29	.75574	.05698	.76341	.05800	.77102	.05902	.77855	.06005	.78601	.06110	31
30.	.75587	.05700	.76354	.05802	.77114	.05904	.77867	.06007	.78613	.06111	30
31	.75600	.05702	.76367	.05803	.77127	.05906	.77880	.06009	.78626	.06113	29
+ 8′	8.75613	.05703	8.76380	.05805	8.77139	.05907	8.77892	.06011	8.78638	.06115	28
33	.75626	.05705	.76392	.05807	.77152	.05909	.77905	.06012	.78651	.06117	27
34	.75638	.05707	.76405	.05808	.77165	.05911	.77917	.06014	.78663	.06118	26
35	.75651	.05708	.76418	.05810	.77177	.05913	.77930	.06016	.78675	.06120	25
+ 9′	8.75664	.05710	8.76431	.05812	8.77190	.05914	8.77942	.06018	8.78688	.06122	24
37	.75677	.05712	.76443	.05813	.77202	.05916	.77955	.06019	.78700	.06124	23
38	.75690	.05713	.76456	.05815	.77215	.05918	.77967	.06021	.78712	.06125	22
39	.75703	.05715	.76469	.05817	.77228	.05919	.77980	.06023	.78725	.06127	21
+ 10′	8.75715	.05717	8.76481	.05819	8.77240	.05921	8.77992	.06024	8.78737	.06129	20
41	.75728	.05718	.76494	.05820	.77253	.05923	.78005	.06026	.78749	.06130	19
42	.75741	.05720	.76507	.05822	.77265	.05925	.78017	.06028	.78762	.06132	18
43	.75754	.05722	.76519	.05824	.77278	.05926	.78029	.06030	.78774	.06134	17
+ 11′	8.75767	.05724	8.76532	.05825	8.77291	.05928	8.78042	.06031	8.78787	.06136	16
45	.75779	.05725	.76545	.05827	.77303	.05930	.78054	.06033	.78799	.06137	15
46	.75792	.05727	.76558	.05829	.77316	.05931	.78067	.06035	.78811	.06139	14
47	.75805	.05729	.76570	.05830	.77328	.05933	.78079	.06037	.78824	.06141	13
+ 12′	8.75818	.05730	8.76583	.05832	8.77341	.05935	8.78092	.06038	8.78836	.06143	12
49	.75831	.05732	.76596	.05834	.77353	.05936	.78104	.06040	.78848	.06144	11
50	.75844	.05734	.76608	.05836	.77366	.05938	.78117	.06042	.78861	.06146	10
51	.75856	.05735	.76621	.05837	.77379	.05940	.78129	.06044	.78873	.06148	9
+ 13′	8.75869	.05737	8.76634	.05839	8.77391	.05942	8.78142	.06045	8.78885	.06150	8
53	.75882	.05739	.76646	.05841	.77404	.05943	.78154	.06047	.78898	.06151	7
54	.75895	.05740	.76659	.05842	.77416	.05945	.78167	.06049	.78910	.06153	6
55	.75908	.05742	.76672	.05844	.77429	.05947	.78179	.06050	.78922	.06155	5
+ 14′	8.75920	.05744	8.76684	.05846	8.77441	.05949	8.78191	.06052	8.78935	.06157	4
57	.75933	.05745	.76697	.05847	.77454	.05950	.78204	.06054	.78947	.06158	3
58	.75946	.05747	.76710	.05849	.77466	.05952	.78216	.06056	.78959	.06160	2
59	.75959	.05749	.76722	.05851	.77479	.05954	.78229	.06057	.78972	.06162	1
+ 15′	8.75972	.05751	8.76735	.05853	8.77492	.05955	8.78241	.06059	8.78984	.06164	0
	22h 9m		22h 8m		22h 7m		22h 6m		22h 5m		

TABLE 34.

Haversines.

s	1h 55m 28° 45′		1h 56m 29° 0′		1h 57m 29° 15′		1h 58m 29° 30′		1h 59m 29° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	8.78984	.06164	8.79720	.06269	8.80449	.06375	8.81172	.06482	8.81889	.06590	60
1	.78996	.06165	.79732	.06271	.80462	.06377	.81184	.06484	.81901	.06592	59
2	.79009	.06167	.79744	.06273	.80474	.06379	.81196	.06486	.81913	.06594	58
3	.79021	.06169	.79757	.06274	.80486	.06381	.81208	.06488	.81925	.06595	57
+ 1′	8.79033	.06171	8.79769	.06276	8.80498	.06382	8.81220	.06489	8.81937	.06597	56
5	.79046	.06172	.79781	.06278	.80510	.06384	.81232	.06491	.81948	.06599	55
6	.79058	.06174	.79793	.06280	.80522	.06386	.81244	.06493	.81960	.06601	54
7	.79070	.06176	.79805	.06281	.80534	.06388	.81256	.06495	.81972	.06603	53
+ 2′	8.79082	.06178	8.79818	.06283	8.80546	.06389	8.81268	.06497	8.81984	.06605	52
9	.79095	.06179	.79830	.06285	.80558	.06391	.81280	.06498	.81996	.06606	51
10	.79107	.06181	.79842	.06287	.80570	.06393	.81292	.06500	.82008	.06608	50
11	.79119	.06183	.79854	.06288	.80582	.06395	.81304	.06502	.82020	.06610	49
+ 3′	8.79132	.06185	8.79866	.06290	8.80595	.06397	8.81316	.06504	8.82032	.06612	48
13	.79144	.06186	.79879	.06292	.80607	.06398	.81328	.06505	.82043	.06614	47
14	.79156	.06188	.79891	.06294	.80619	.06400	.81340	.06507	.82055	.06615	46
15	.79169	.06190	.79903	.06295	.80631	.06402	.81352	.06509	.82067	.06617	45
+ 4′	8.79181	.06192	8.79915	.06297	8.80643	.06404	8.81364	.06511	8.82079	.06619	44
17	.79193	.06193	.79927	.06299	.80655	.06405	.81376	.06513	.82091	.06621	43
18	.79205	.06195	.79940	.06301	.80667	.06407	.81388	.06514	.82103	.06623	42
19	.79218	.06197	.79952	.06303	.80679	.06409	.81400	.06516	.82115	.06624	41
+ 5′	8.79230	.06199	8.79964	.06304	8.80691	.06411	8.81412	.06518	8.82126	.06626	40
21	.79242	.06200	.79976	.06306	.80703	.06413	.81424	.06520	.82138	.06628	39
22	.79255	.06202	.79988	.06308	.80715	.06414	.81436	.06522	.82150	.06630	38
23	.79267	.06204	.80000	.06310	.80727	.06416	.81448	.06523	.82162	.06632	37
+ 6′	8.79279	.06206	8.80013	.06311	8.80739	.06418	8.81460	.06525	8.82174	.06633	36
25	.79291	.06207	.80025	.06313	.80751	.06420	.81472	.06527	.82186	.06635	35
26	.79304	.06209	.80037	.06315	.80764	.06421	.81484	.06529	.82198	.06637	34
27	.79316	.06211	.80049	.06317	.80776	.06423	.81496	.06531	.82209	.06639	33
+ 7′	8.79328	.06213	8.80061	.06318	8.80788	.06425	8.81508	.06532	8.82221	.06641	32
29	.79341	.06214	.80073	.06320	.80800	.06427	.81520	.06534	.82233	.06642	31
30	.79353	.06216	.80086	.06322	.80812	.06429	.81531	.06536	.82245	.06644	30
31	.79365	.06218	.80098	.06324	.80824	.06430	.81543	.06538	.82257	.06646	29
+ 8′	8.79377	.06220	8.80110	.06326	8.80836	.06432	8.81555	.06540	8.82269	.06648	28
33	.79390	.06221	.80122	.06327	.80848	.06434	.81567	.06541	.82280	.06650	27
34	.79402	.06223	.80134	.06329	.80860	.06436	.81579	.06543	.82292	.06652	26
35	.79414	.06225	.80146	.06331	.80872	.06438	.81591	.06545	.82304	.06653	25
+ 9′	8.79426	.06227	8.80158	.06333	8.80884	.06439	8.81603	.06547	8.82316	.06655	24
37	.79439	.06229	.80171	.06334	.80896	.06441	.81615	.06549	.82328	.06657	23
38	.79451	.06230	.80183	.06336	.80908	.06443	.81627	.06550	.82340	.06659	22
39	.79463	.06232	.80195	.06338	.80920	.06445	.81639	.06552	.82351	.06661	21
+ 10′	8.79475	.06234	8.80207	.06340	8.80932	.06446	8.81651	.06554	8.82363	.06662	20
41	.79488	.06236	.80219	.06341	.80944	.06448	.81663	.06556	.82375	.06664	19
42	.79500	.06237	.80231	.06343	.80956	.06450	.81675	.06558	.82387	.06666	18
43	.79512	.06239	.80243	.06345	.80968	.06452	.81687	.06559	.82399	.06668	17
+ 11′	8.79524	.06241	8.80256	.06347	8.80980	.06454	8.81699	.06561	8.82410	.06670	16
45	.79537	.06243	.80268	.06349	.80992	.06455	.81710	.06563	.82422	.06671	15
46	.79549	.06244	.80280	.06350	.81004	.06457	.81722	.06565	.82434	.06673	14
47	.79561	.06246	.80292	.06352	.81016	.06459	.81734	.06567	.82446	.06675	13
+ 12′	8.79573	.06248	8.80304	.06354	8.81028	.06461	8.81746	.06568	8.82458	.06677	12
49	.79586	.06250	.80316	.06356	.81040	.06463	.81758	.06570	.82470	.06679	11
50	.79598	.06251	.80328	.06357	.81052	.06464	.81770	.06572	.82481	.06681	10
51	.79610	.06253	.80340	.06359	.81064	.06466	.81782	.06574	.82493	.06682	9
+ 13′	8.79622	.06255	8.80353	.06361	8.81076	.06468	8.81794	.06576	8.82505	.06684	8
53	.79634	.06257	.80365	.06363	.81088	.06470	.81806	.06577	.82517	.06686	7
54	.79647	.06258	.80377	.06365	.81100	.06471	.81818	.06579	.82529	.06688	6
55	.79659	.06260	.80389	.06366	.81112	.06473	.81830	.06581	.82540	.06690	5
+ 14′	8.79671	.06262	8.80401	.06368	8.81124	.06475	8.81841	.06583	8.82552	.06691	4
57	.79683	.06264	.80413	.06370	.81136	.06477	.81853	.06585	.82564	.06693	3
58	.79696	.06265	.80425	.06372	.81148	.06479	.81865	.06586	.82576	.06695	2
59	.79708	.06267	.80437	.06373	.81160	.06480	.81877	.06588	.82588	.06697	1
+ 15′	8.79720	.06269	8.80449	.06375	8.81172	.06482	8.81889	.06590	8.82599	.06699	0
	22h 4m		22h 3m		22h 2m		22h 1m		22h 0m		

TABLE 34.

Haversines.

	2h 0m 30° 0′		2h 1m 30° 15′		2h 2m 30° 30′		2h 3m 30° 45′		2h 4m 31° 0′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	8.82599	.06699	8.83303	.06808	8.84002	.06919	8.84694	.07030	8.85380	.07142	60
1	.82611	.06701	.83315	.06810	.84013	.06920	.84705	.07032	.85391	.07144	59
2	.82623	.06702	.83327	.06812	.84025	.06922	.84717	.07033	.85403	.07145	58
3	.82635	.06704	.83338	.06814	.84036	.06924	.84728	.07035	.85414	.07147	57
+ 1′	8.82646	.06706	8.83350	.06816	8.84048	.06926	8.84740	.07037	8.85425	.07149	56
5	.82658	.06708	.83362	.06817	.84059	.06928	.84751	.07039	.85437	.07151	55
6	.82670	.06710	.83374	.06819	.84071	.06930	.84762	.07041	.85448	.07153	54
7	.82682	.06711	.83385	.06821	.84083	.06931	.84774	.07043	.85459	.07155	53
+ 2′	8.82694	.06713	8.83397	.06823	8.84094	.06933	8.84785	.07045	8.85471	.07157	52
9	.82705	.06715	.83409	.06825	.84106	.06935	.84797	.07046	.85482	.07158	51
10	.82717	.06717	.83420	.06826	.84117	.06937	.84808	.07048	.85494	.07160	50
11	.82729	.06719	.83432	.06828	.84129	.06939	.84820	.07050	.85505	.07162	49
+ 3′	8.82741	.06721	8.83444	.06830	8.84140	.06941	8.84831	.07052	8.85516	.07164	48
13	.82752	.06722	.83455	.06832	.84152	.06943	.84843	.07054	.85528	.07166	47
14	.82764	.06724	.83467	.06834	.84164	.06944	.84854	.07056	.85539	.07168	46
15	.82776	.06726	.83479	.06836	.84175	.06946	.84866	.07058	.85550	.07170	45
+ 4′	8.82788	.06728	8.83490	.06838	8.84187	.06948	8.84877	.07059	8.85562	.07172	44
17	.82799	.06730	.83502	.06839	.84198	.06950	.84889	.07061	.85573	.07173	43
18	.82811	.06731	.83513	.06841	.84210	.06952	.84900	.07063	.85585	.07175	42
19	.82823	.06733	.83525	.06843	.84221	.06954	.84912	.07065	.85596	.07177	41
+ 5′	8.82835	.06735	8.83537	.06845	8.84233	.06956	8.84923	.07067	8.85607	.07179	40
21	.82846	.06737	.83548	.06847	.84244	.06957	.84934	.07069	.85619	.07181	39
22	.82858	.06739	.83560	.06849	.84256	.06959	.84946	.07071	.85630	.07183	38
23	.82870	.06741	.83572	.06850	.84268	.06961	.84957	.07073	.85641	.07185	37
+ 6′	8.82882	.06742	8.83583	.06852	8.84279	.06963	8.84969	.07074	8.85653	.07187	36
25	.82893	.06744	.83595	.06854	.84291	.06965	.84980	.07076	.85664	.07189	35
26	.82905	.06746	.83607	.06856	.84302	.06967	.84992	.07078	.85675	.07190	34
27	.82917	.06748	.83618	.06858	.84314	.06968	.85003	.07080	.85687	.07192	33
+ 7′	8.82929	.06750	8.83630	.06860	8.84325	.06970	8.85015	.07082	8.85698	.07194	32
29	.82940	.06752	.83642	.06861	.84337	.06972	.85026	.07084	.85709	.07196	31
30	.82952	.06753	.83653	.06863	.84348	.06974	.85037	.07086	.85721	.07198	30
31	.82964	.06755	.83665	.06865	.84360	.06976	.85049	.07087	.85732	.07200	29
+ 8′	8.82976	.06757	8.83676	.06867	8.84371	.06978	8.85060	.07089	8.85743	.07202	28
33	.82987	.06759	.83688	.06869	.84383	.06980	.85072	.07091	.85755	.07204	27
34	.82999	.06761	.83700	.06871	.84394	.06981	.85083	.07093	.85766	.07205	26
35	.83011	.06763	.83711	.06872	.84406	.06983	.85095	.07095	.85777	.07207	25
+ 9′	8.83023	.06764	8.83723	.06874	8.84417	.06985	8.85106	.07097	8.85789	.07209	24
37	.83034	.06766	.83735	.06876	.84429	.06987	.85117	.07099	.85800	.07211	23
38	.83046	.06768	.83746	.06878	.84441	.06989	.85129	.07100	.85811	.07213	22
39	.83058	.06770	.83758	.06880	.84452	.06991	.85140	.07102	.85823	.07215	21
+ 10′	8.83069	.06772	8.83769	.06882	8.84464	.06993	8.85152	.07104	8.85834	.07217	20
41	.83081	.06773	.83781	.06884	.84475	.06994	.85163	.07106	.85845	.07219	19
42	.83093	.06775	.83793	.06885	.84487	.06996	.85175	.07108	.85857	.07220	18
43	.83105	.06777	.83804	.06887	.84498	.06998	.85186	.07110	.85868	.07222	17
+ 11′	8.83116	.06779	8.83816	.06889	8.84510	.07000	8.85197	.07112	8.85879	.07224	16
45	.83128	.06781	.83828	.06891	.84521	.07002	.85209	.07114	.85891	.07226	15
46	.83140	.06783	.83839	.06893	.84533	.07004	.85220	.07115	.85902	.07228	14
47	.83151	.06784	.83851	.06895	.84544	.07006	.85232	.07117	.85913	.07230	13
+ 12′	8.83163	.06786	8.83862	.06896	8.84556	.07007	8.85243	.07119	8.85925	.07232	12
49	.83175	.06788	.83874	.06898	.84567	.07009	.85254	.07121	.85936	.07234	11
50	.83187	.06790	.83886	.06900	.84579	.07011	.85266	.07123	.85947	.07236	10
51	.83198	.06792	.83897	.06902	.84590	.07013	.85277	.07125	.85959	.07237	9
+ 13′	8.83210	.06794	8.83909	.06904	8.84602	.07015	8.85289	.07127	8.85970	.07239	8
53	.83222	.06795	.83920	.06906	.84613	.07017	.85300	.07129	.85981	.07241	7
54	.83233	.06797	.83932	.06907	.84625	.07019	.85311	.07130	.85992	.07243	6
55	.83245	.06799	.83944	.06909	.84636	.07020	.85323	.07132	.86004	.07245	5
+ 14′	8.83257	.06801	8.83955	.06911	8.84648	.07022	8.85334	.07134	8.86015	.07247	4
57	.83268	.06803	.83967	.06913	.84659	.07024	.85346	.07136	.86026	.07249	3
58	.83280	.06805	.83978	.06915	.84671	.07026	.85357	.07138	.86038	.07251	2
59	.83292	.06806	.83990	.06917	.84682	.07028	.85368	.07140	.86049	.07253	1
+ 15′	8.83303	.06808	8.84002	.06919	8.84694	.07030	8.85380	.07142	8.86060	.07254	0
	21h 59m		21h 58m		21h 57m		21h 56m		21h 55m		

TABLE 34.

Haversines.

s	2h 5m 31° 15′ Log. Hav.	Nat. Hav.	2h 6m 31° 30′ Log. Hav.	Nat. Hav.	2h 7m 31° 45′ Log. Nav.	Nat. Hav.	2h 8m 32° 0′ Log. Hav.	Nat. Hav.	2h 9m 32° 15′ Log. Hav.	Nat. Hav.	s
0	8.86060	.07254	8.86735	.07368	8.87404	.07482	8.88068	.07598	8.88726	.07714	60
1	.86072	.07256	.86746	.07370	.87415	.07484	.88079	.07600	.88737	.07716	59
2	.86085	.07258	.86757	.07372	.87426	.07486	.88090	.07601	.88748	.07717	58
3	.86094	.07260	.86769	.07374	.87437	.07488	.88101	.07603	.88759	.07719	57
+ 1′	8.86105	.07262	8.86780	.07376	8.87448	.07490	8.88112	.07605	8.88769	.07721	56
5	.86117	.07264	.86791	.07377	.87460	.07492	.88123	.07607	.88780	.07723	55
6	.86128	.07266	.86802	.07379	.87471	.07494	.88134	.07609	.88791	.07725	54
7	.86139	.07268	.86813	.07381	.87482	.07496	.88145	.07611	.88802	.07727	53
+ 2′	8.86151	.07270	8.86825	.07383	8.87493	.07498	8.88156	.07613	8.88813	.07729	52
9	.86162	.07271	.86836	.07385	.87504	.07500	.88167	.07615	.88824	.07731	51
10	.86173	.07273	.86847	.07387	.87515	.07502	.88178	.07617	.88835	.07733	50
11	.86184	.07275	.86858	.07389	.87526	.07503	.88189	.07619	.88846	.07735	49
+ 3′	8.86196	.07277	8.86869	.07391	8.87537	.07505	8.88200	.07621	8.88857	.07737	48
13	.86207	.07279	.86880	.07393	.87548	.07507	.88211	.07623	.88868	.07739	47
14	.86218	.07281	.86892	.07395	.87559	.07509	.88222	.07625	.88879	.07741	46
15	.86229	.07283	.86903	.07397	.87570	.07511	.88233	.07627	.88890	.07743	45
+ 4′	8.86241	.07285	8.86914	.07398	8.87582	.07513	8.88244	.07628	8.88900	.07745	44
17	.86252	.07287	.86925	.07400	.87593	.07515	.88255	.07630	.88911	.07747	43
18	.86263	.07288	.86936	.07402	.87604	.07517	.88266	.07632	.88922	.07749	42
19	.86275	.07290	.86947	.07404	.87615	.07519	.88277	.07634	.88933	.07751	41
+ 5′	8.86286	.07292	8.86959	.07406	8.87626	.07521	8.88288	.07636	8.88944	.07752	40
21	.86297	.07294	.86970	.07408	.87637	.07523	.88299	.07638	.88955	.07754	39
22	.86308	.07296	.86981	.07410	.87648	.07525	.88310	.07640	.88966	.07756	38
23	.86320	.07298	.86992	.07412	.87659	.07527	.88321	.07642	.88977	.07758	37
+ 6′	8.86331	.07300	8.87003	.07414	8.87670	.07528	8.88332	.07644	8.88988	.07760	36
25	.86342	.07302	.87014	.07416	.87681	.07530	.88343	.07646	.88998	.07762	35
26	.86353	.07304	.87026	.07417	.87692	.07532	.88354	.07648	.89009	.07764	34
27	.86365	.07305	.87037	.07419	.87703	.07534	.88364	.07650	.89020	.07766	33
+ 7′	8.86376	.07307	8.87048	.07421	8.87714	.07536	8.88375	.07652	8.89031	.07768	32
29	.86387	.07309	.87059	.07423	.87725	.07538	.88386	.07654	.89042	.07770	31
30	.86398	.07311	.87070	.07425	.87737	.07540	.88397	.07656	.89053	.07772	30
31	.86410	.07313	.87081	.07427	.87748	.07542	.88408	.07657	.89064	.07774	29
+ 8′	8.86421	.07315	8.87093	.07429	8.87759	.07544	8.88419	.07659	8.89075	.07776	28
33	.86432	.07317	.87104	.07431	.87770	.07546	.88430	.07661	.89086	.07778	27
34	.86443	.07319	.87115	.07433	.87781	.07548	.88441	.07663	.89096	.07780	26
35	.86455	.07321	.87126	.07435	.87792	.07549	.88452	.07665	.89107	.07782	25
+ 9′	8.86466	.07322	8.87137	.07437	8.87803	.07551	8.88463	.07667	8.89118	.07784	24
37	.86477	.07324	.87148	.07438	.87814	.07553	.88474	.07669	.89129	.07786	23
38	.86488	.07326	.87159	.07440	.87825	.07555	.88485	.07671	.89140	.07788	22
39	.86499	.07328	.87171	.07442	.87836	.07557	.88496	.07673	.89151	.07789	21
+ 10′	8.86511	.07330	8.87182	.07444	8.87847	.07559	8.88507	.07675	8.89162	.07791	20
41	.86522	.07332	.87193	.07446	.87858	.07561	.88518	.07677	.89172	.07793	19
42	.86533	.07334	.87204	.07448	.87869	.07563	.88529	.07679	.89183	.07795	18
43	.86544	.07336	.87215	.07450	.87880	.07565	.88540	.07681	.89194	.07797	17
+ 11′	8.86556	.07338	8.87226	.07452	8.87891	.07567	8.88551	.07683	8.89205	.07799	16
45	.86567	.07340	.87237	.07454	.87902	.07569	.88562	.07685	.89216	.07801	15
46	.86578	.07341	.87248	.07456	.87913	.07571	.88573	.07686	.89227	.07803	14
47	.86589	.07343	.87260	.07458	.87924	.07573	.88584	.07688	.89238	.07805	13
+ 12′	8.86600	.07345	8.87271	.07459	8.87935	.07574	8.88595	.07690	8.89248	.07807	12
49	.86611	.07347	.87282	.07461	.87946	.07576	.88606	.07692	.89259	.07809	11
50	.86623	.07349	.87293	.07463	.87957	.07578	.88616	.07694	.89270	.07811	10
51	.86634	.07351	.87304	.07465	.87968	.07580	.88627	.07696	.89281	.07813	9
+ 13′	8.86645	.07353	8.87315	.07467	8.87980	.07582	8.88638	.07698	8.89292	.07815	8
53	.86657	.07355	.87326	.07469	.87991	.07584	.88649	.07700	.89303	.07817	7
54	.86668	.07357	.87337	.07471	.88002	.07586	.88660	.07702	.89314	.07819	6
55	.86679	.07359	.87349	.07473	.88013	.07588	.88671	.07704	.89324	.07821	5
+ 14′	8.86690	.07360	8.87360	.07475	8.88024	.07590	8.88682	.07706	8.89335	.07823	4
57	.86701	.07362	.87371	.07477	.88035	.07592	.88693	.07708	.89346	.07825	3
58	.86713	.07364	.87382	.07479	.88046	.07594	.88704	.07710	.89357	.07827	2
59	.86724	.07366	.87393	.07480	.88057	.07596	.88715	.07712	.89368	.07829	1
+ 15′	8.86735	.07368	8.87404	.07482	8.88068	.07598	8.88726	.07714	8.89379	.07830	0
	21h 54m		21h 53m		21h 52m		21h 51m		21h 50m		

TABLE 34.

Haversines.

s	2h 10m 32° 30′		2h 11m 32° 45′		2h 12m 33° 0′		2h 13m 33° 15′		2h 14m 33° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	8.89379	.07830	8.90026	.07948	8.90668	.08066	8.91306	.08186	8.91938	.08306	60
1	.89389	.07832	.90037	.07950	.90679	.08068	.91316	.08188	.91948	.08308	59
2	.89400	.07834	.90048	.07952	.90690	.08070	.91327	.08190	.91959	.08310	58
3	.89411	.07836	.90058	.07954	.90700	.08072	.91337	.08192	.91969	.08312	57
+ 1′	8.89422	.07838	8.90069	.07956	8.90711	.08074	8.91348	.08194	8.91980	.08314	56
5	.89433	.07840	.90080	.07958	.90722	.08076	.91358	.08196	.91990	.08316	55
6	.89444	.07842	.90091	.07960	.90732	.08078	.91369	.08198	.92001	.08318	54
7	.89454	.07844	.90101	.07962	.90743	.08080	.91380	.08200	.92011	.08320	53
+ 2′	8.89465	.07846	8.90112	.07964	8.90754	.08082	8.91390	.08202	8.92022	.08322	52
9	.89476	.07848	.90123	.07966	.90764	.08084	.91401	.08204	.92032	.08324	51
10	.89487	.07850	.90134	.07968	.90775	.08086	.91411	.08206	.92043	.08326	50
11	.89498	.07852	.90144	.07970	.90786	.08088	.91422	.08208	.92053	.08328	49
+ 3′	8.89509	.07854	8.90155	.07972	8.90796	.08090	8.91432	.08210	8.92064	.08330	48
13	.89519	.07856	.90166	.07974	.90807	.08092	.91443	.08212	.92074	.08332	47
14	.89530	.07858	.90176	.07976	.90818	.08094	.91454	.08214	.92084	.08334	46
15	.89541	.07860	.90187	.07978	.90828	.08096	.91464	.08216	.92095	.08336	45
+ 4′	8.89552	.07862	8.90198	.07980	8.90839	.08098	8.91475	.08218	8.92105	.08338	44
17	.89563	.07864	.90209	.07982	.90849	.08100	.91485	.08220	.92116	.08340	43
18	.89573	.07866	.90219	.07983	.90860	.08102	.91496	.08222	.92126	.08342	42
19	.89584	.07868	.90230	.07985	.90871	.08104	.91506	.08224	.92137	.08344	41
+ 5′	8.89595	.07870	8.90241	.07987	8.90881	.08106	8.91517	.08226	8.92147	.08346	40
21	.89606	.07872	.90252	.07989	.90892	.08108	.91527	.08228	.92158	.08348	39
22	.89617	.07873	.90262	.07991	.90903	.08110	.91538	.08230	.92168	.08350	38
23	.89627	.07875	.90273	.07993	.90913	.08112	.91549	.08232	.92179	.08352	37
+ 6′	8.89638	.07877	8.90284	.07995	8.90924	.08114	8.91559	.08234	8.92189	.08354	36
25	.89649	.07879	.90294	.07997	.90935	.08116	.91570	.08236	.92200	.08356	35
26	.89660	.07881	.90305	.07999	.90945	.08118	.91580	.08238	.92210	.08358	34
27	.89671	.07883	.90316	.08001	.90956	.08120	.91591	.08240	.92221	.08360	33
+ 7′	8.89681	.07885	8.90326	.08003	8.90966	.08122	8.91601	.08242	8.92231	.08362	32
29	.89692	.07887	.90337	.08005	.90977	.08124	.91612	.08244	.92241	.08364	31
30	.89703	.07889	.90348	.08007	.90988	.08126	.91622	.08246	.92252	.08366	30
31	.89714	.07891	.90359	.08009	.90998	.08128	.91633	.08248	.92262	.08368	29
+ 8′	8.89725	.07893	8.90369	.08011	8.91009	.08130	8.91643	.08250	8.92273	.08370	28
33	.89735	.07895	.90380	.08013	.91019	.08132	.91654	.08252	.92283	.08372	27
34	.89746	.07897	.90391	.08015	.91030	.08134	.91664	.08254	.92294	.08374	26
35	.89757	.07899	.90401	.08017	.91041	.08136	.91675	.08256	.92304	.08376	25
+ 9′	8.89768	.07901	8.90412	.08019	8.91051	.08138	8.91685	.08258	8.92315	.08378	24
37	.89779	.07903	.90423	.08021	.91062	.08140	.91696	.08260	.92325	.08380	23
38	.89789	.07905	.90433	.08023	.91073	.08142	.91707	.08262	.92335	.08382	22
39	.89800	.07907	.90444	.08025	.91083	.08144	.91717	.08264	.92346	.08384	21
+ 10′	8.89811	.07909	8.90455	.08027	8.91094	.08146	8.91728	.08266	8.92356	.08386	20
41	.89822	.07911	.90466	.08029	.91104	.08148	.91738	.08268	.92367	.08388	19
42	.89832	.07913	.90476	.08031	.91115	.08150	.91749	.08270	.92377	.08390	18
43	.89843	.07915	.90487	.08033	.91126	.08152	.91759	.08272	.92388	.08392	17
+ 11′	8.89854	.07917	8.90498	.08035	8.91136	.08154	8.91770	.08274	8.92398	.08394	16
45	.89865	.07919	.90508	.08037	.91147	.08156	.91780	.08276	.92409	.08396	15
46	.89875	.07921	.90519	.08039	.91157	.08158	.91791	.08278	.92419	.08398	14
47	.89886	.07923	.90530	.08041	.91168	.08160	.91801	.08280	.92429	.08400	13
+ 12′	8.89897	.07924	8.90540	.08043	8.91179	.08162	8.91812	.08282	8.92440	.08402	12
49	.89908	.07926	.90551	.08045	.91189	.08164	.91822	.08284	.92450	.08404	11
50	.89919	.07928	.90562	.08047	.91200	.08166	.91833	.08286	.92461	.08406	10
51	.89929	.07930	.90572	.08049	.91210	.08168	.91843	.08288	.92471	.08408	9
+ 13′	8.89940	.07932	8.90583	.08051	8.91221	.08170	8.91854	.08290	8.92482	.08410	8
53	.89951	.07934	.90594	.08053	.91232	.08172	.91864	.08292	.92492	.08412	7
54	.89962	.07936	.90604	.08055	.91242	.08174	.91875	.08294	.92502	.08414	6
55	.89972	.07938	.90615	.08057	.91253	.08176	.91885	.08296	.92513	.08416	5
+ 14′	8.89983	.07940	8.90626	.08059	8.91263	.08178	8.91896	.08298	8.92523	.08418	4
57	.89994	.07942	.90636	.08061	.91274	.08180	.91906	.08300	.92534	.08420	3
58	.90005	.07944	.90647	.08063	.91284	.08182	.91917	.08302	.92544	.08422	2
59	.90015	.07946	.90658	.08065	.91295	.08184	.91927	.08304	.92554	.08425	1
+ 15′	8.90026	.07948	8.90668	.08066	8.91306	.08186	8.91938	.08306	8.92565	.08427	0
	21h 49m		21h 48m		21h 47m		21h 46m		21h 45m		

TABLE 34.

Haversines.

	2h 15m 33° 45′		2h 16m 34° 0′		2h 17m 34° 15′		2h 18m 34° 30′		2h 19m 34° 45′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	8.92565	.08427	8.93187	.08548	8.93805	.08671	8.94417	.08794	8.95025	.08918	60
1	.92575	.08429	.93197	.08550	.93815	.08673	.94427	.08796	.95035	.08920	59
2	.92586	.08431	.93208	.08552	.93825	.08675	.94438	.08798	.95045	.08922	58
3	.92596	.08433	.93218	.08554	.93835	.08677	.94448	.08800	.95055	.08924	57
+ 1′	8.92607	.08435	8.93228	.08556	8.93846	.08679	8.94458	.08802	8.95065	.08926	56
5	.92617	.08437	.93239	.08558	.93856	.08681	.94468	.08804	.95076	.08928	55
6	.92627	.08439	.93249	.08560	.93866	.08683	.94478	.08806	.95086	.08930	54
7	.92638	.08441	.93259	.08562	.93876	.08685	.94488	.08808	.95096	.08932	53
+ 2′	8.92648	.08443	8.93270	.08564	8.93886	.08687	8.94498	.08810	8.95106	.08934	52
9	.92659	.08445	.93280	.08566	.93897	.08689	.94509	.08812	.95116	.08936	51
10	.92669	.08447	.93290	.08568	.93907	.08691	.94519	.08814	.95126	.08938	50
11	.92679	.08449	.93301	.08571	.93917	.08693	.94529	.08816	.95136	.08940	49
+ 3′	8.92690	.08451	8.93311	.08573	8.93927	.08695	8.94539	.08818	8.95146	.08943	48
13	.92700	.08453	.93321	.08575	.93938	.08697	.94549	.08820	.95156	.08945	47
14	.92710	.08455	.93332	.08577	.93948	.08699	.94559	.08823	.95166	.08947	46
15	.92721	.08457	.93342	.08579	.93958	.08701	.94570	.08825	.95176	.08949	45
+ 4′	8.92731	.08459	8.93352	.08581	8.93968	.08703	8.94580	.08827	8.95186	.08951	44
17	.92742	.08461	.93363	.08583	.93979	.08705	.94590	.08829	.95197	.08953	43
18	.92752	.08463	.93373	.08585	.93989	.08707	.94600	.08831	.95207	.08955	42
19	.92762	.08465	.93383	.08587	.93999	.08709	.94610	.08833	.95217	.08957	41
+ 5′	8.92773	.08467	8.93393	.08589	8.94009	.08711	8.94620	.08835	8.95227	.08959	40
21	.92783	.08469	.93404	.08591	.94019	.08714	.94630	.08837	.95237	.08961	39
22	.92794	.08471	.93414	.08593	.94030	.08716	.94641	.08839	.95247	.08963	38
23	.92804	.08473	.93424	.08595	.94040	.08718	.94651	.08841	.95257	.08965	37
+ 6′	8.92814	.08475	8.93435	.08597	8.94050	.08720	8.94661	.08843	8.95267	.08967	36
25	.92825	.08477	.93445	.08599	.94060	.08722	.94671	.08845	.95277	.08970	35
26	.92835	.08479	.93455	.08601	.94071	.08724	.94681	.08847	.95287	.08972	34
27	.92845	.08481	.93466	.08603	.94081	.08726	.94691	.08849	.95297	.08974	33
+ 7′	8.92856	.08483	8.93476	.08605	8.94091	.08728	8.94701	.08851	8.95307	.08976	32
29	.92866	.08485	.93486	.08607	.94101	.08730	.94712	.08853	.95317	.08978	31
30	.92877	.08487	.93496	.08609	.94111	.08732	.94722	.08856	.95327	.08980	30
31	.92887	.08489	.93507	.08611	.94122	.08734	.94732	.08858	.95337	.08982	29
+ 8′	8.92897	.08491	8.93517	.08613	8.94132	.08736	8.94742	.08860	8.95347	.08984	28
33	.92908	.08493	.93527	.08615	.94142	.08738	.94752	.08862	.95357	.08986	27
34	.92918	.08495	.93538	.08617	.94152	.08740	.94762	.08864	.95368	.08988	26
35	.92928	.08497	.93548	.08619	.94162	.08742	.94772	.08866	.95378	.08990	25
+ 9′	8.92939	.08499	8.93558	.08621	8.94173	.08744	8.94782	.08868	8.95388	.08992	24
37	.92949	.08501	.93568	.08624	.94183	.08746	.94793	.08870	.95398	.08994	23
38	.92960	.08503	.93579	.08626	.94193	.08748	.94803	.08872	.95408	.08997	22
39	.92970	.08505	.93589	.08628	.94203	.08750	.94813	.08874	.95418	.08999	21
+ 10′	8.92980	.08508	8.93599	.08630	8.94213	.08753	8.94823	.08876	8.95428	.09001	20
41	.92991	.08510	.93610	.08632	.94224	.08755	.94833	.08878	.95438	.09003	19
42	.93001	.08512	.93620	.08634	.94234	.08757	.94843	.08880	.95448	.09005	18
43	.93011	.08514	.93630	.08636	.94244	.08759	.94853	.08882	.95458	.09007	17
+ 11′	8.93022	.08516	8.93640	.08638	8.94254	.08761	8.94863	.08885	8.95468	.09009	16
45	.93032	.08518	.93651	.08640	.94264	.08763	.94874	.08887	.95478	.09011	15
46	.93042	.08520	.93661	.08642	.94275	.08765	.94884	.08889	.95488	.09013	14
47	.93053	.08522	.93671	.08644	.94285	.08767	.94894	.08891	.95498	.09015	13
+ 12′	8.93063	.08524	8.93681	.08646	8.94295	.08769	8.94904	.08893	8.95508	.09017	12
49	.93073	.08526	.93692	.08648	.94305	.08771	.94914	.08895	.95518	.09019	11
50	.93084	.08528	.93702	.08650	.94315	.08773	.94924	.08897	.95528	.09022	10
51	.93094	.08530	.93712	.08652	.94326	.08775	.94934	.08899	.95538	.09024	9
+ 13′	8.93104	.08532	8.93722	.08654	8.94336	.08777	8.94944	.08901	8.95548	.09026	8
53	.93115	.08534	.93733	.08656	.94346	.08779	.94954	.08903	.95558	.09028	7
54	.93125	.08536	.93743	.08658	.94356	.08781	.94965	.08905	.95568	.09030	6
55	.93135	.08538	.93753	.08660	.94366	.08783	.94975	.08907	.95578	.09032	5
+ 14′	8.93146	.08540	8.93764	.08662	8.94376	.08785	8.94985	.08909	8.95588	.09034	4
57	.93156	.08542	.93774	.08664	.94387	.08788	.94995	.08911	.95598	.09036	3
58	.93166	.08544	.93784	.08666	.94397	.08790	.95005	.08914	.95608	.09038	2
59	.93177	.08546	.93794	.08668	.94407	.08792	.95015	.08916	.95618	.09040	1
+ 15′	8.93187	.08548	8.93805	.08671	8.94417	.08794	8.95025	.08918	8.95628	.09042	0
	21h 44m		21h 43m		21h 42m		21h 41m		21h 40m		

TABLE 34.

Haversines.

	2h 20m 35° 0′		2h 21m 35° 15′		2h 22m 35° 30′		2h 23m 35° 45′		2h 24m 36° 0′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	8.95628	.09042	8.96227	.09168	8.96821	.09294	8.97411	.09421	8.97997	.09549	60
1	.95638	.09044	.96237	.09170	.96831	.09296	.97421	.09423	.98006	.09551	59
2	.95648	.09047	.96247	.09172	.96841	.09298	.97431	.09426	.98016	.09553	58
3	.95658	.09049	.96257	.09174	.96851	.09301	.97441	.09428	.98026	.09556	57
+ 1′	8.95668	.09051	8.96267	.09176	8.96861	.09303	8.97450	.09430	8.98035	.09558	56
5	.95678	.09053	.96277	.09178	.96871	.09305	.97460	.09432	.98045	.09560	55
6	.95688	.09055	.96287	.09181	.96881	.09307	.97470	.09434	.98055	.09562	54
7	.95698	.09057	.96297	.09183	.96890	.09309	.97480	.09436	.98065	.09564	53
+ 2′	8.95709	.09059	8.96307	.09185	8.96900	.09311	8.97489	.09438	8.98074	.09566	52
9	.95719	.09061	.96317	.09187	.96910	.09313	.97499	.09440	.98084	.09568	51
10	.95729	.09063	.96326	.09189	.96920	.09315	.97509	.09443	.98094	.09571	50
11	.95739	.09065	.96336	.09191	.96930	.09317	.97519	.09445	.98103	.09573	49
+ 3′	8.95749	.09067	8.96346	.09193	8.96940	.09320	8.97529	.09447	8.98113	.09575	48
13	.95759	.09070	.96356	.09195	.96950	.09322	.97538	.09449	.98123	.09577	47
14	.95769	.09072	.96366	.09197	.96959	.09324	.97548	.09451	.98132	.09579	46
15	.95779	.09074	.96376	.09199	.96969	.09326	.97558	.09453	.98142	.09581	45
+ 4′	8.95789	.09076	8.96386	.09202	8.96979	.09328	8.97568	.09455	8.98152	.09583	44
17	.95799	.09078	.96396	.09204	.96989	.09330	.97577	.09457	.98162	.09586	43
18	.95809	.09080	.96406	.09206	.96999	.09332	.97587	.09460	.98171	.09588	42
19	.95819	.09082	.96416	.09208	.97009	.09334	.97597	.09462	.98181	.09590	41
+ 5′	8.95828	.09084	8.96426	.09210	8.97018	.09337	8.97607	.09464	8.98191	.09592	40
21	.95838	.09086	.96436	.09212	.97028	.09339	.97617	.09466	.98200	.09594	39
22	.95848	.09088	.96446	.09214	.97038	.09341	.97626	.09468	.98210	.09596	38
23	.95858	.09090	.96455	.09216	.97048	.09343	.97636	.09470	.98220	.09598	37
+ 6′	8.95868	.09093	8.96465	.09218	8.97058	.09345	8.97646	.09472	8.98229	.09601	36
25	.95878	.09095	.96475	.09220	.97068	.09347	.97656	.09474	.98239	.09603	35
26	.95888	.09097	.96485	.09223	.97077	.09349	.97665	.09477	.98249	.09605	34
27	.95898	.09099	.96495	.09225	.97087	.09351	.97675	.09479	.98259	.09607	33
+ 7′	8.95908	.09101	8.96505	.09227	8.97097	.09353	8.97685	.09481	8.98268	.09609	32
29	.95918	.09103	.96515	.09229	.97107	.09356	.97695	.09483	.98278	.09611	31
30	.95928	.09105	.96525	.09231	.97117	.09358	.97704	.09485	.98288	.09613	30
31	.95938	.09107	.96535	.09233	.97127	.09360	.97714	.09487	.98297	.09616	29
+ 8′	8.95948	.09109	8.96545	.09235	8.97136	.09362	8.97724	.09489	8.98307	.09618	28
33	.95958	.09111	.96555	.09237	.97146	.09364	.97734	.09492	.98317	.09620	27
34	.95968	.09113	.96564	.09239	.97156	.09366	.97743	.09494	.98326	.09622	26
35	.95978	.09116	.96574	.09242	.97166	.09368	.97753	.09496	.98336	.09624	25
+ 9′	8.95988	.09118	8.96584	.09244	8.97176	.09370	8.97763	.09498	8.98346	.09626	24
37	.95998	.09120	.96594	.09246	.97186	.09372	.97773	.09500	.98355	.09628	23
38	.96008	.09122	.96604	.09248	.97195	.09375	.97782	.09502	.98365	.09631	22
39	.96018	.09124	.96614	.09250	.97205	.09377	.97792	.09504	.98375	.09633	21
+ 10′	8.96028	.09126	8.96624	.09252	8.97215	.09379	8.97802	.09506	8.98384	.09635	20
41	.96038	.09128	.96634	.09254	.97225	.09381	.97812	.09509	.98394	.09637	19
42	.96048	.09130	.96644	.09256	.97235	.09383	.97821	.09511	.98404	.09639	18
43	.96058	.09132	.96653	.09258	.97244	.09385	.97831	.09513	.98413	.09641	17
+ 11′	8.96068	.09134	8.96663	.09260	8.97254	.09387	8.97841	.09515	8.98423	.09643	16
45	.96078	.09136	.96673	.09263	.97264	.09389	.97851	.09517	.98433	.09646	15
46	.96088	.09139	.96683	.09265	.97274	.09392	.97860	.09519	.98442	.09648	14
47	.96098	.09141	.96693	.09267	.97284	.09394	.97870	.09521	.98452	.09650	13
+ 12′	8.96108	.09143	8.96703	.09269	8.97294	.09396	8.97880	.09524	8.98462	.09652	12
49	.96118	.09145	.96713	.09271	.97303	.09398	.97890	.09526	.98471	.09654	11
50	.96128	.09147	.96723	.09273	.97313	.09400	.97899	.09528	.98481	.09656	10
51	.96138	.09149	.96733	.09275	.97323	.09402	.97909	.09530	.98491	.09658	9
+ 13′	8.96148	.09151	8.96742	.09277	8.97333	.09404	8.97919	.09532	8.98500	.09661	8
53	.96158	.09153	.96752	.09280	.97343	.09406	.97928	.09534	.98510	.09663	7
54	.96167	.09155	.96762	.09282	.97352	.09409	.97938	.09536	.98520	.09665	6
55	.96177	.09157	.96772	.09284	.97362	.09411	.97948	.09538	.98529	.09667	5
+ 14′	8.96187	.09160	8.96782	.09286	8.97372	.09413	8.97958	.09541	8.98539	.09669	4
57	.96197	.09162	.96792	.09288	.97382	.09415	.97967	.09543	.98549	.09671	3
58	.96207	.09164	.96802	.09290	.97392	.09417	.97977	.09545	.98558	.09673	2
59	.96217	.09166	.96812	.09292	.97401	.09419	.97987	.09547	.98568	.09676	1
+ 15′	8.96227	.09168	8.96821	.09294	8.97411	.09421	8.97997	.09549	8.98578	.09678	0
	21h 39m		21h 38m		21h 37m		21h 36m		21h 35m		

TABLE 34.

Haversines.

s	2h 25m 36° 15′		2h 26m 36° 30′		2h 27m 36° 45′		2h 28m 37° 0′		2h 29m 37° 15′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	8.98578	.09678	8.99154	.09807	8.99727	.09937	9.00295	.10068	9.00860	.10200	60
1	.98587	.09680	.99164	.09809	.99736	.09939	.00305	.10070	.00869	.10202	59
2	.98597	.09682	.99173	.09811	.99746	.09942	.00314	.10073	.00878	.10204	58
3	.98606	.09684	.99183	.09814	.99755	.09944	.00324	.10075	.00888	.10206	57
+ 1′	8.98616	.09686	8.99193	.09816	8.99765	.09946	9.00333	.10077	9.00897	.10209	56
5	.98626	.09689	.99202	.09818	.99774	.09948	.00342	.10079	.00906	.10211	55
6	.98635	.09691	.99212	.09820	.99784	.09950	.00352	.10081	.00916	.10213	54
7	.98645	.09693	.99221	.09822	.99793	.09953	.00361	.10084	.00925	.10215	53
+ 2′	8.98655	.09695	8.99231	.09824	8.99803	.09955	9.00371	.10086	9.00935	.10218	52
9	.98664	.09697	.99240	.09827	.99812	.09957	.00380	.10088	.00944	.10220	51
10	.98674	.09699	.99250	.09829	.99822	.09959	.00390	.10090	.00953	.10222	50
11	.98684	.09701	.99260	.09831	.99831	.09961	.00399	.10092	.00963	.10224	49
+ 3′	8.98693	.09704	8.99269	.09833	8.99841	.09963	9.00408	.10095	9.00972	.10226	48
13	.98703	.09706	.99279	.09835	.99850	.09966	.00418	.10097	.00981	.10228	47
14	.98712	.09708	.99288	.09837	.99860	.09968	.00427	.10099	.00991	.10231	46
15	.98722	.09710	.99298	.09840	.99869	.09970	.00437	.10101	.01000	.10233	45
+ 4′	8.98732	.09712	8.99307	.09842	8.99879	.09972	9.00446	.10103	9.01009	.10235	44
17	.98741	.09714	.99317	.09844	.99888	.09974	.00456	.10105	.01019	.10237	43
18	.98751	.09717	.99327	.09846	.99898	.09977	.00465	.10108	.01028	.10240	42
19	.98761	.09719	.99336	.09848	.99907	.09979	.00474	.10110	.01037	.10242	41
+ 5′	8.98770	.09721	8.99346	.09850	8.99917	.09981	9.00484	.10112	9.01047	.10244	40
21	.98780	.09723	.99355	.09853	.99926	.09983	.00493	.10114	.01056	.10246	39
22	.98790	.09725	.99365	.09855	.99936	.09985	.00503	.10116	.01065	.10248	38
23	.98799	.09727	.99374	.09857	.99945	.09987	.00512	.10119	.01075	.10251	37
+ 6′	8.98809	.09729	8.99384	.09859	8.99955	.09990	9.00522	.10121	9.01084	.10253	36
25	.98818	.09732	.99393	.09861	.99964	.09992	.00531	.10123	.01094	.10255	35
26	.98828	.09734	.99403	.09863	.99974	.09994	.00540	.10125	.01103	.10257	34
27	.98838	.09736	.99412	.09866	.99983	.09996	.00550	.10127	.01112	.10259	33
+ 7′	8.98847	.09738	8.99422	.09868	8.99993	.09998	9.00559	.10130	9.01122	.10262	32
29	.98857	.09740	.99432	.09870	9.00002	.10000	.00569	.10132	.01131	.10264	31
30	.98866	.09742	.99441	.09872	.00012	.10003	.00578	.10134	.01140	.10266	30
31	.98876	.09745	.99451	.09874	.00021	.10005	.00587	.10136	.01150	.10268	29
+ 8′	8.98886	.09747	8.99460	.09876	9.00031	.10007	9.00597	.10138	9.01159	.10270	28
33	.98895	.09749	.99470	.09879	.00040	.10009	.00606	.10141	.01168	.10273	27
34	.98905	.09751	.99479	.09881	.00049	.10011	.00616	.10143	.01178	.10275	26
35	.98915	.09753	.99489	.09883	.00059	.10014	.00625	.10145	.01187	.10277	25
+ 9′	8.98924	.09755	8.99498	.09885	9.00068	.10016	9.00634	.10147	9.01196	.10279	24
37	.98934	.09757	.99508	.09887	.00078	.10018	.00644	.10149	.01206	.10281	23
38	.98943	.09760	.99517	.09890	.00087	.10020	.00653	.10152	.01215	.10284	22
39	.98953	.09762	.99527	.09892	.00097	.10022	.00663	.10154	.01224	.10286	21
+ 10′	8.98963	.09764	8.99536	.09894	9.00106	.10025	9.00672	.10156	9.01234	.10288	20
41	.98972	.09766	.99546	.09896	.00116	.10027	.00681	.10158	.01243	.10290	19
42	.98982	.09768	.99556	.09898	.00125	.10029	.00691	.10160	.01252	.10293	18
43	.98991	.09770	.99565	.09900	.00135	.10031	.00700	.10163	.01262	.10295	17
+ 11′	8.99001	.09773	8.99575	.09903	9.00144	.10033	9.00710	.10165	9.01271	.10297	16
45	.99011	.09775	.99584	.09905	.00154	.10035	.00719	.10167	.01280	.10299	15
46	.99020	.09777	.99594	.09907	.00163	.10038	.00728	.10169	.01289	.10301	14
47	.99030	.09779	.99603	.09909	.00172	.10040	.00738	.10171	.01299	.10304	13
+ 12′	8.99039	.09781	8.99613	.09911	9.00182	.10042	9.00747	.10174	9.01308	.10306	12
49	.99049	.09783	.99622	.09913	.00191	.10044	.00756	.10176	.01317	.10308	11
50	.99058	.09786	.99632	.09916	.00201	.10046	.00766	.10178	.01327	.10310	10
51	.99068	.09788	.99641	.09918	.00210	.10049	.00775	.10180	.01336	.10312	9
+ 13′	8.99078	.09790	8.99651	.09920	9.00220	.10051	9.00785	.10182	9.01345	.10315	8
53	.99087	.09792	.99660	.09922	.00229	.10053	.00794	.10184	.01355	.10317	7
54	.99097	.09794	.99670	.09924	.00239	.10055	.00803	.10187	.01364	.10319	6
55	.99106	.09796	.99679	.09926	.00248	.10057	.00813	.10189	.01373	.10321	5
+ 14′	8.99116	.09799	8.99689	.09929	9.00258	.10059	9.00822	.10191	9.01383	.10323	4
57	.99126	.09801	.99698	.09931	.00267	.10062	.00831	.10193	.01392	.10326	3
58	.99135	.09803	.99708	.09933	.00276	.10064	.00841	.10196	.01401	.10328	2
59	.99145	.09805	.99717	.09935	.00286	.10066	.00850	.10198	.01411	.10330	1
+ 15′	8.99154	.09807	8.99727	.09937	9.00295	.10068	9.00860	.10200	9.01420	.10332	0
	21h 34m		21h 33m		21h 32m		21h 31m		21h 30m		

TABLE 34.

Haversines.

	2h 30m 37° 30′		2h 31m 37° 45′		2h 32m 38° 0′		2h 33m 38° 15′		2h 34m 38° 30′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Nav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.01420	.10332	9.01976	.10466	9.02528	.10599	9.03077	.10734	9.03621	.10870	60
1	.01429	.10335	.01985	.10468	.02538	.10602	.03086	.10736	.03630	.10872	59
2	.01438	.10337	.01995	.10470	.02547	.10604	.03095	.10739	.03639	.10874	58
3	.01448	.10339	.02004	.10472	.02556	.10606	.03104	.10741	.03648	.10876	57
+ 1′	9.01457	.10341	9.02013	.10474	9.02565	.10608	9.03113	.10743	9.03657	.10879	56
5	.01466	.10343	.02022	.10477	.02574	.10611	.03122	.10745	.03667	.10881	55
6	.01476	.10346	.02031	.10479	.02583	.10613	.03131	.10748	.03676	.10883	54
7	.01485	.10348	.02041	.10481	.02593	.10615	.03141	.10750	.03685	.10885	53
+ 2′	9.01494	.10350	9.02050	.10483	9.02602	.10617	9.03150	.10752	9.03694	.10888	52
9	.01504	.10352	.02059	.10486	.02611	.10620	.03159	.10754	.03703	.10890	51
10	.01513	.10354	.02068	.10488	.02620	.10622	.03168	.10757	.03712	.10892	50
11	.01522	.10357	.02078	.10490	.02629	.10624	.03177	.10759	.03721	.10895	49
+ 3′	9.01531	.10359	9.02087	.10492	9.02638	.10626	9.03186	.10761	9.03730	.10897	48
13	.01541	.10361	.02096	.10494	.02648	.10629	.03195	.10763	.03739	.10899	47
14	.01550	.10363	.02105	.10497	.02657	.10631	.03204	.10766	.03748	.10901	46
15	.01559	.10366	.02115	.10499	.02666	.10633	.03213	.10768	.03757	.10904	45
+ 4′	9.01569	.10368	9.02124	.10501	9.02675	.10635	9.03222	.10770	9.03766	.10906	44
17	.01578	.10370	.02133	.10503	.02684	.10638	.03231	.10772	.03775	.10908	43
18	.01587	.10372	.02142	.10506	.02693	.10640	.03241	.10775	.03784	.10910	42
19	.01596	.10374	.02151	.10508	.02702	.10642	.03250	.10777	.03793	.10913	41
+ 5′	9.01606	.10377	9.02161	.10510	9.02712	.10644	9.03259	.10779	9.03802	.10915	40
21	.01615	.10379	.02170	.10512	.02721	.10647	.03268	.10781	.03811	.10917	39
22	.01624	.10381	.02179	.10515	.02730	.10649	.03277	.10784	.03820	.10919	38
23	.01634	.10383	.02188	.10517	.02739	.10651	.03286	.10786	.03829	.10922	37
+ 6′	9.01643	.10386	9.02197	.10519	9.02748	.10653	9.03295	.10788	9.03838	.10924	36
25	.01652	.10388	.02207	.10521	.02757	.10655	.03304	.10790	.03847	.10926	35
26	.01661	.10390	.02216	.10523	.02767	.10658	.03313	.10793	.03856	.10929	34
27	.01671	.10392	.02225	.10526	.02776	.10660	.03322	.10795	.03865	.10931	33
+ 7′	9.01680	.10394	9.02234	.10528	9.02785	.10662	9.03331	.10797	9.03874	.10933	32
29	.01689	.10397	.02244	.10530	.02794	.10664	.03340	.10799	.03883	.10935	31
30	.01698	.10399	.02253	.10532	.02803	.10667	.03350	.10802	.03892	.10938	30
31	.01708	.10401	.02262	.10535	.02812	.10669	.03359	.10804	.03901	.10940	29
+ 8′	9.01717	.10403	9.02271	.10537	9.02821	.10671	9.03368	.10806	9.03910	.10942	28
33	.01726	.10405	.02280	.10539	.02830	.10673	.03377	.10809	.03919	.10944	27
34	.01736	.10408	.02290	.10541	.02840	.10676	.03386	.10811	.03928	.10947	26
35	.01745	.10410	.02299	.10544	.02849	.10678	.03395	.10813	.03937	.10949	25
+ 9′	9.01754	.10412	9.02308	.10546	9.02858	.10680	9.03404	.10815	9.03946	.10951	24
37	.01763	.10414	.02317	.10548	.02867	.10682	.03413	.10818	.03955	.10953	23
38	.01773	.10417	.02326	.10550	.02876	.10685	.03422	.10820	.03964	.10956	22
39	.01782	.10419	.02336	.10552	.02885	.10687	.03431	.10822	.03973	.10958	21
+ 10′	9.01791	.10421	9.02345	.10555	9.02894	.10689	9.03440	.10824	9.03982	.10960	20
41	.01800	.10423	.02354	.10557	.02904	.10691	.03449	.10827	.03991	.10963	19
42	.01810	.10425	.02363	.10559	.02913	.10694	.03458	.10829	.04000	.10965	18
43	.01819	.10428	.02372	.10561	.02922	.10696	.03467	.10831	.04009	.10967	17
+ 11′	9.01828	.10430	9.02381	.10564	9.02931	.10698	9.03476	.10833	9.04018	.10969	16
45	.01837	.10432	.02391	.10566	.02940	.10700	.03486	.10836	.04027	.10972	15
46	.01847	.10434	.02400	.10568	.02949	.10703	.03495	.10838	.04036	.10974	14
47	.01856	.10436	.02409	.10570	.02958	.10705	.03504	.10840	.04045	.10976	13
+ 12′	9.01865	.10439	9.02418	.10573	9.02967	.10707	9.03513	.10842	9.04054	.10978	12
49	.01874	.10441	.02427	.10575	.02977	.10709	.03522	.10845	.04063	.10981	11
50	.01884	.10443	.02437	.10577	.02986	.10712	.03531	.10847	.04072	.10983	10
51	.01893	.10445	.02446	.10579	.02995	.10714	.03540	.10849	.04081	.10985	9
+ 13′	9.01902	.10448	9.02455	.10582	9.03004	.10716	9.03549	.10851	9.04090	.10988	8
53	.01911	.10450	.02464	.10584	.03013	.10718	.03558	.10854	.04099	.10990	7
54	.01921	.10452	.02473	.10586	.03022	.10721	.03567	.10856	.04108	.10992	6
55	.01930	.10454	.02483	.10588	.03031	.10723	.03576	.10858	.04117	.10994	5
+ 14′	9.01939	.10457	9.02492	.10591	9.03040	.10725	9.03585	.10861	9.04126	.10997	4
57	.01948	.10459	.02501	.10593	.03050	.10727	.03594	.10863	.04135	.10999	3
58	.01958	.10461	.02510	.10595	.03059	.10730	.03603	.10865	.04144	.11001	2
59	.01967	.10463	.02519	.10597	.03068	.10732	.03612	.10867	.04153	.11004	1
+ 15′	9.01976	.10466	9.02528	.10599	9.03077	.10734	9.03621	.10870	9.04162	.11006	0
	21h 29m		21h 28m		21h 27m		21h 26m		21h 25m		

Haversines.

s	2h 35m 38° 45′ Log. Hav.	Nat. Hav.	2h 36m 39° 0′ Log. Hav.	Nat. Hav.	2h 37m 39° 15′ Log. Hav.	Nat. Hav.	2h 38m 39° 30′ Log. Hav.	Nat. Hav.	2h 39m 39° 45′ Log. Hav.	Nat. Hav.	s
0	9.04162	.11006	9.04699	.11143	9.05232	.11280	9.05762	.11419	9.06288	.11558	60
1	.04171	.11008	.04708	.11145	.05241	.11283	.05771	.11421	.06297	.11560	59
2	.04180	.11010	.04717	.11147	.05250	.11285	.05780	.11423	.06305	.11563	58
3	.04189	.11013	.04726	.11150	.05259	.11287	.05788	.11426	.06314	.11565	57
+ 1′	9.04198	.11015	9.04735	.11152	9.05268	.11290	9.05797	.11428	9.06323	.11567	56
5	.04207	.11017	.04744	.11154	.05277	.11292	.05806	.11430	.06332	.11569	55
6	.04216	.11019	.04753	.11156	.05285	.11294	.05815	.11433	.06340	.11572	54
7	.04225	.11022	.04761	.11159	.05294	.11296	.05823	.11435	.06349	.11574	53
+ 2′	9.04234	.11024	9.04770	.11161	9.05303	.11299	9.05832	.11437	9.06358	.11577	52
9	.04243	.11026	.04779	.11163	.05312	.11301	.05841	.11440	.06367	.11579	51
10	.04252	.11029	.04788	.11166	.05321	.11303	.05850	.11442	.06375	.11581	50
11	.04261	.11031	.04797	.11168	.05330	.11306	.05859	.11444	.06384	.11584	49
+ 3′	9.04270	.11033	9.04806	.11170	9.05339	.11308	9.05867	.11447	9.06393	.11586	48
13	.04279	.11035	.04815	.11172	.05347	.11310	.05876	.11449	.06401	.11588	47
14	.04288	.11038	.04824	.11175	.05356	.11313	.05885	.11451	.06410	.11590	46
15	.04297	.11040	.04833	.11177	.05365	.11315	.05894	.11453	.06419	.11593	45
+ 4′	9.04306	.11042	9.04842	.11179	9.05374	.11317	9.05903	.11456	9.06428	.11595	44
17	.04315	.11044	.04851	.11182	.05383	.11320	.05911	.11458	.06436	.11597	43
18	.04324	.11047	.04859	.11184	.05392	.11322	.05920	.11460	.06445	.11600	42
19	.04333	.11049	.04868	11186	.05400	.11324	.05929	.11463	.06454	.11602	41
+ 5′	9.04341	.11051	9.04877	.11189	9.05409	.11326	9.05938	.11465	9.06462	.11604	40
21	.04350	.11054	.04886	.11191	.05418	.11329	.05946	.11467	.06471	.11607	39
22	.04359	.11056	.04895	.11193	.05427	.11331	.05955	.11470	.06480	.11609	38
23	.04368	.11058	.04904	.11195	.05436	.11333	.05964	.11472	.06489	.11611	37
+ 6′	9.04377	.11060	9.04913	.11198	9.05445	.11336	9.05973	.11474	9.06497	.11614	36
25	.04386	.11063	.04922	.11200	.05453	.11338	.05982	.11477	.06506	.11616	35
26	.04395	.11065	.04931	.11202	.05462	.11340	.05990	.11479	.06515	.11618	34
27	.04404	.11067	.04939	.11205	.05471	.11343	.05999	.11481	.06523	.11621	33
+ 7′	9.04413	.11070	9.04948	.11207	9.05480	.11345	9.06008	.11484	9.06532	.11623	32
29	.04422	.11072	.04957	.11209	.05489	.11347	.06017	.11486	.06541	.11625	31
30	.04431	.11074	.04966	.11211	.05498	.11349	.06025	.11488	.06550	.11628	30
31	.04440	.11076	.04975	.11214	.05506	.11352	.06034	.11491	.06558	.11630	29
+ 8′	9.04449	.11079	9.04984	.11216	9.05515	.11354	9.06043	.11493	9.06567	.11632	28
33	.04458	.11081	.04993	.11218	.05524	.11356	.06052	.11495	.06576	.11635	27
34	.04467	.11083	.05002	.11221	.05533	.11359	.06060	.11498	.06584	.11637	26
35	.04476	.11086	.05011	.11223	.05542	.11361	.06069	.11500	.06593	.11639	25
+ 9′	9.04485	.11088	9.05019	.11225	9.05551	.11363	9.06078	.11502	9.06602	.11642	24
37	.04494	.11090	.05028	.11228	.05559	.11366	.06087	.11504	.06611	.11644	23
38	.04503	.11092	.05037	.11230	.05568	.11368	.06095	.11507	.06619	.11646	22
39	.04512	.11095	.05046	.11232	.05577	.11370	.06104	.11509	.06628	.11649	21
+ 10′	9.04520	.11097	9.05055	.11234	9.05586	.11373	9.06113	.11511	9.06637	.11651	20
41	.04529	.11099	.05064	.11237	.05595	.11375	.06122	.11514	.06645	.11653	19
42	.04538	.11102	.05073	.11239	.05603	.11377	.06131	.11516	.06654	.11656	18
43	.04547	.11104	.05082	.11241	.05612	.11379	.06139	.11518	.06663	.11658	17
+ 11′	9.04556	.11106	9.05090	.11244	9.05621	.11382	9.06148	.11521	9.06671	.11660	16
45	.04565	.11108	.05099	.11246	.05630	.11384	.06157	.11523	.06680	.11663	15
46	.04574	.11111	.05108	.11248	.05639	.11386	.06166	.11525	.06689	.11665	14
47	.04583	.11113	.05117	.11251	.05648	.11389	.06174	.11528	.06697	.11667	13
+ 12′	9.04592	.11115	9.05126	.11253	9.05656	.11391	9.06183	.11530	9.06706	.11670	12
49	.04601	.11117	.05135	.11255	.05665	.11393	.06192	.11532	.06715	.11672	11
50	.04610	.11120	.05144	.11257	.05674	.11396	.06201	.11535	.06724	.11674	10
51	.04619	.11122	.05153	.11260	.05683	.11398	.06209	.11537	.06732	.11677	9
+ 13′	9.04628	.11124	9.05161	.11262	9.05692	.11400	9.06218	.11539	9.06741	.11679	8
53	.04637	.11127	.05170	.11264	.05700	.11403	.06227	.11542	.06750	.11681	7
54	.04646	.11129	.05179	.11267	.05709	.11405	.06235	.11544	.06758	.11684	6
55	.04654	.11131	.05188	.11269	.05718	.11407	.06244	.11546	.06767	.11686	5
+ 14′	9.04663	.11134	9.05197	.11271	9.05727	.11410	9.06253	.11549	9.06776	.11688	4
57	.04672	.11136	.05206	.11274	.05736	.11412	.06262	.11551	.06784	.11691	3
58	.04681	.11138	.05215	.11276	.05744	.11414	.06270	.11553	.06793	.11693	2
59	.04690	.11140	.05223	.11278	.05753	.11416	.06279	.11556	.06802	.11695	1
+ 15′	9.04699	.11143	9.05232	.11280	9.05762	.11419	9.06288	.11558	9.06810	.11698	0
	21h 24m		21h 23m		21h 22m		21h 21m		21h 20m		

TABLE 34.

Haversines.

	2h 40m 40° 0′		2h 41m 40° 15′		2h 42m 40° 30′		2h 43m 40° 45′		2h 44m 41° 0′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.06810	.11698	9.07329	.11838	9.07845	.11980	9.08357	.12122	9.08865	.12265	60
1	.06819	.11700	.07338	.11841	.07853	.11982	.08365	.12124	.08874	.12267	59
2	.06828	.11702	.07346	.11843	.07862	.11984	.08374	.12127	.08882	.12269	58
3	.06836	.11705	.07355	.11845	.07870	.11987	.08382	.12129	.08890	.12272	57
+ 1′	9.06845	.11707	9.07364	.11848	9.07879	.11989	9.08391	.12131	9.08899	.12274	56
5	.06854	.11709	.07372	.11850	.07887	.11992	.08399	.12134	.08907	.12276	55
6	.06862	.11712	.07381	.11852	.07896	.11994	.08408	.12136	.08916	.12279	54
7	.06871	.11714	.07390	.11855	.07905	.11996	.08416	.12138	.08924	.12281	53
+ 2′	9.06880	.11716	9.07398	.11857	9.07913	.11999	9.08425	.12141	9.08933	.12284	52
9	.06888	.11719	.07407	.11860	.07922	.12001	.08433	.12143	.08941	.12286	51
10	.06897	.11721	.07415	.11862	.07930	.12003	.08442	.12146	.08949	.12288	50
11	.06906	.11724	.07424	.11864	.07939	.12006	.08450	.12148	.08958	.12291	49
+ 3′	9.06914	.11726	9.07433	.11867	9.07947	.12008	9.08459	.12150	9.08966	.12293	48
13	.06923	.11728	.07441	.11869	.07956	.12010	.08467	.12153	.08975	.12296	47
14	.06932	.11731	.07450	.11871	.07964	.12013	.08475	.12155	.08983	.12298	46
15	.06940	.11733	.07458	.11874	.07973	.12015	.08484	.12157	.08992	.12300	45
+ 4′	9.06949	.11735	9.07467	.11876	9.07981	.12018	9.08492	.12160	9.09000	.12303	44
17	.06958	.11738	.07476	.11878	.07990	.12020	.08501	.12162	.09009	.12305	43
18	.06966	.11740	.07484	.11881	.07999	.12022	.08509	.12165	.09017	.12307	42
19	.06975	.11742	.07493	.11883	.08007	.12025	.08518	.12167	.09025	.12310	41
+ 5′	9.06984	.11745	9.07501	.11885	9.08016	.12027	9.08526	.12169	9.09034	.12312	40
21	.06992	.11747	.07510	.11888	.08024	.12029	.08535	.12172	.09042	.12315	39
22	.07001	.11749	.07519	.11890	.08033	.12032	.08543	.12174	.09051	.12317	38
23	.07010	.11752	.07527	.11892	.08041	.12034	.08552	.12176	.09059	.12319	37
+ 6′	9.07018	.11754	9.07536	.11895	9.08050	.12036	9.08560	.12179	9.09068	.12322	36
25	.07027	.11756	.07544	.11897	.08058	.12039	.08569	.12181	.09076	.12324	35
26	.07036	.11759	.07553	.11900	.08067	.12041	.08577	.12184	.09084	.12327	34
27	.07044	.11761	.07562	.11902	.08075	.12044	.08586	.12186	.09093	.12329	33
+ 7′	9.07053	.11763	9.07570	.11904	9.08084	.12046	9.08594	.12188	9.09101	.12331	32
29	.07062	.11766	.07579	.11907	.08092	.12048	.08603	.12191	.09110	.12334	31
30	.07070	.11768	.07587	.11909	.08101	.12051	.08611	.12193	.09118	.12336	30
31	.07079	.11770	.07596	.11911	.08110	.12053	.08620	.12195	.09126	.12339	29
+ 8′	9.07088	.11773	9.07605	.11914	9.08118	.12055	9.08628	.12198	9.09135	.12341	28
33	.07096	.11775	.07613	.11916	.08127	.12058	.08637	.12200	.09143	.12343	27
34	.07105	.11777	.07622	.11918	.08135	.12060	.08645	.12203	.09152	.12346	26
35	.07113	.11780	.07630	.11921	.08144	.12062	.08654	.12205	.09160	.12348	25
+ 9′	9.07122	.11782	9.07639	.11923	9.08152	.12065	9.08662	.12207	9.09169	.12351	24
37	.07131	.11784	.07647	.11925	.08161	.12067	.08671	.12210	.09177	.12353	23
38	.07139	.11787	.07656	.11928	.08169	.12070	.08679	.12212	.09185	.12355	22
39	.07148	.11789	.07665	.11930	.08178	.12072	.08687	.12214	.09194	.12358	21
+ 10′	9.07157	.11791	9.07673	.11933	9.08186	.12074	9.08696	.12217	9.09202	.12360	20
41	.07165	.11794	.07682	.11935	.08195	.12077	.08704	.12219	.09211	.12363	19
42	.07174	.11796	.07690	.11937	.08203	.12079	.08713	.12222	.09219	.12365	18
43	.07183	.11798	.07699	.11940	.08212	.12081	.08721	.12224	.09227	.12367	17
+ 11′	9.07191	.11801	9.07708	.11942	9.08220	.12084	9.08730	.12226	9.09236	.12370	16
45	.07200	.11803	.07716	.11944	.08229	.12086	.08738	.12229	.09244	.12372	15
46	.07208	.11806	.07725	.11947	.08237	.12089	.08747	.12231	.09253	.12374	14
47	.07217	.11808	.07733	.11949	.08246	.12091	.08755	.12233	.09261	.12377	13
+ 12′	9.07226	.11810	9.07742	.11951	9.08254	.12093	9.08764	.12236	9.09269	.12379	12
49	.07234	.11813	.07750	.11954	.08263	.12096	.08772	.12238	.09278	.12382	11
50	.07243	.11815	.07759	.11956	.08271	.12098	.08781	.12241	.09286	.12384	10
51	.07252	.11817	.07768	.11958	.08280	.12100	.08789	.12243	.09295	.12386	9
+ 13′	9.07260	.11820	9.07776	.11961	9.08288	.12103	9.08797	.12245	9.09303	.12389	8
53	.07269	.11822	.07785	.11963	.08297	.12105	.08806	.12248	.09311	.12391	7
54	.07277	.11824	.07793	.11966	.08306	.12108	.08814	.12250	.09320	.12394	6
55	.07286	.11827	.07802	.11968	.08314	.12110	.08823	.12253	.09328	.12396	5
+ 14′	9.07295	.11829	9.07810	.11970	9.08323	.12112	9.08831	.12255	9.09337	.12398	4
57	.07303	.11831	.07819	.11973	.08331	.12115	.08840	.12257	.09345	.12401	3
58	.07312	.11834	.07827	.11975	.08340	.12117	.08848	.12260	.09353	.12403	2
59	.07321	.11836	.07836	.11977	.08348	.12119	.08857	.12262	.09362	.12406	1
+ 15′	9.07329	.11838	9.07845	.11980	9.08357	.12122	9.08865	.12265	9.09370	.12408	0
	21h 19m		21h 18m		21h 17m		21h 16m		21h 15m		

Haversines.

s	2h 45m 41° 15′ Log. Hav.	Nat. Hav.	2h 46m 41° 30′ Log. Hav.	Nat. Hav.	2h 47m 41° 45′ Log. Hav.	Nat. Hav.	2h 48m 42° 0′ Log. Hav.	Nat. Hav.	2h 49m 42° 15′ Log. Hav.	Nat. Hav.	s
0	9.09370	.12408	9.09872	.12552	9.10371	.12697	9.10866	.12843	9.11358	.12989	60
1	.09379	.12410	.09880	.12555	.10379	.12700	.10874	.12845	.11366	.12992	59
2	.09387	.12413	.09889	.12557	.10387	.12702	.10882	.12848	.11374	.12994	58
3	.09395	.12415	.09897	.12559	.10395	.12704	.10891	.12850	.11382	.12996	57
+ 1′	9.09404	.12418	9.09905	.12562	9.10404	.12707	9.10899	.12852	9.11391	.12999	56
5	.09412	.12420	.09914	.12564	.10412	.12709	.10907	.12855	.11399	.13001	55
6	.09421	.12422	.09922	.12567	.10420	.12712	.10915	.12857	.11407	.13004	54
7	.09429	.12425	.09930	.12569	.10429	.12714	.10923	.12860	.11415	.13006	53
+ 2′	9.09437	.12427	9.09939	.12572	9.10437	.12717	9.10932	.12862	9.11423	.13009	52
9	.09446	.12430	.09947	.12574	.10445	.12719	.10940	.12865	.11431	.13011	51
10	.09454	.12432	.09955	.12576	.10453	.12721	.10948	.12867	.11440	.13014	50
11	.09462	.12434	.09964	.12579	.10462	.12724	.10956	.12870	.11448	.13016	49
+ 3′	9.09471	.12437	9.09972	.12581	9.10470	.12726	9.10965	.12872	9.11456	.13018	48
13	.09479	.12439	.09980	.12584	.10478	.12729	.10973	.12874	.11464	.13021	47
14	.09488	.12442	.09989	.12586	.10486	.12731	.10981	.12877	.11472	.13023	46
15	.09496	.12444	.09997	.12588	.10495	.12733	.10989	.12879	.11480	.13026	45
+ 4′	9.09504	.12446	9.10005	.12591	9.10503	.12736	9.10997	.12882	9.11489	.13028	44
17	.09513	.12449	.10014	.12593	.10511	.12738	.11006	.12884	.11497	.13031	43
18	.09521	.12451	.10022	.12596	.10519	.12741	.11014	.12887	.11505	.13033	42
19	.09529	.12454	.10030	.12598	.10528	.12743	.11022	.12889	.11513	.13036	41
+ 5′	9.09538	.12456	9.10039	.12600	9.10536	.12746	9.11030	.12891	9.11521	.13038	40
21	.09546	.12458	.10047	.12603	.10544	.12748	.11038	.12894	.11529	.13041	39
22	.09555	.12461	.10055	.12605	.10553	.12750	.11047	.12896	.11538	.13043	38
23	.09563	.12463	.10064	.12608	.10561	.12753	.11055	.12899	.11546	.13045	37
+ 6′	9.09571	.12466	9.10072	.12610	9.10569	.12755	9.11063	.12901	9.11554	.13048	36
25	.09580	.12468	.10080	.12613	.10577	.12758	.11071	.12904	.11562	.13050	35
26	.09588	.12470	.10088	.12615	.10586	.12760	.11079	.12906	.11570	.13053	34
27	.09596	.12473	.10097	.12617	.10594	.12763	.11088	.12909	.11578	.13055	33
+ 7′	9.09605	.12475	9.10105	.12620	9.10602	.12765	9.11096	.12911	9.11586	.13058	32
29	.09613	.12478	.10113	.12622	.10610	.12767	.11104	.12913	.11595	.13060	31
30	.09622	.12480	.10122	.12625	.10619	.12770	.11112	.12916	.11603	.13063	30
31	.09630	.12482	.10130	.12627	.10627	.12772	.11120	.12918	.11611	.13065	29
+ 8′	9.09638	.12485	9.10138	.12629	9.10635	.12775	9.11129	.12921	9.11619	.13067	28
33	.09647	.12487	.10147	.12632	.10643	.12777	.11137	.12923	.11627	.13070	27
34	.09655	.12490	.10155	.12634	.10652	.12780	.11145	.12926	.11635	.13072	26
35	.09663	.12492	.10163	.12637	.10660	.12782	.11153	.12928	.11643	.13075	25
+ 9′	9.09672	.12494	9.10172	.12639	9.10668	.12784	9.11161	.12930	9.11652	.13077	24
37	.09680	.12497	.10180	.12641	.10676	.12787	.11170	.12933	.11660	.13080	23
38	.09688	.12499	.10188	.12644	.10685	.12789	.11178	.12935	.11668	.13082	22
39	.09697	.12502	.10196	.12646	.10693	.12792	.11186	.12938	.11676	.13085	21
+ 10′	9.09705	.12504	9.10205	.12649	9.10701	.12794	9.11194	.12940	9.11684	.13087	20
41	.09713	.12506	.10213	.12651	.10709	.12797	.11202	.12943	.11692	.13090	19
42	.09722	.12509	.10221	.12654	.10718	.12799	.11211	.12945	.11700	.13092	18
43	.09730	.12511	.10230	.12656	.10726	.12801	.11219	.12948	.11709	.13095	17
+ 11′	9.09739	.12514	9.10238	.12658	9.10734	.12804	9.11227	.12950	9.11717	.13097	16
45	.09747	.12516	.10246	.12661	.10742	.12806	.11235	.12952	.11725	.13099	15
46	.09755	.12519	.10255	.12663	.10751	.12809	.11243	.12955	.11733	.13102	14
47	.09764	.12521	.10263	.12666	.10759	.12811	.11252	.12957	.11741	.13104	13
+ 12′	9.09772	.12523	9.10271	.12668	9.10767	.12814	9.11260	.12960	9.11749	.13107	12
49	.09780	.12526	.10279	.12671	.10775	.12816	.11268	.12962	.11757	.13109	11
50	.09789	.12528	.10288	.12673	.10784	.12818	.11276	.12965	.11766	.13112	10
51	.09797	.12531	.10296	.12675	.10792	.12821	.11284	.12967	.11774	.13114	9
+ 13′	9.09805	.12533	9.10304	.12678	9.10800	.12823	9.11292	.12970	9.11782	.13116	8
53	.09814	.12536	.10313	.12680	.10808	.12826	.11301	.12972	.11790	.13119	7
54	.09822	.12538	.10321	.12683	.10816	.12828	.11309	.12974	.11798	.13121	6
55	.09830	.12540	.10329	.12685	.10825	.12831	.11317	.12977	.11806	.13124	5
+ 14′	9.09839	.12543	9.10337	.12687	9.10833	.12833	9.11325	.12979	9.11814	.13126	4
57	.09847	.12545	.10346	.12690	.10841	.12836	.11333	.12982	.11822	.13129	3
58	.09856	.12547	.10354	.12692	.10849	.12838	.11342	.12984	.11831	.13131	2
59	.09864	.12550	.10362	.12695	.10858	.12840	.11350	.12987	.11839	.13134	1
+ 15′	9.09872	.12552	9.10371	.12697	9.10866	.12843	9.11358	.12989	9.11847	.13136	0
	21h 14m		21h 13m		21h 12m		21h 11m		21h 10m		

TABLE 34.

Haversines.

s	2h 50m 42° 30′		2h 51m 42° 45′		2h 52m 43° 0′		2h 53m 43° 15′		2h 54m 43° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.11847	.13136	9.12332	.13284	9.12815	.13432	9.13295	.13581	9.13771	.13731	60
1	.11855	.13139	.12341	.13286	.12823	.13435	.13303	.13584	.13779	.13734	59
2	.11863	.13141	.12349	.13289	.12831	.13437	.13311	.13586	.13787	.13736	58
3	.11871	.13143	.12357	.13291	.12839	.13440	.13319	.13589	.13795	.13739	57
+ 1′	9.11879	.13146	9.12365	.13294	9.12847	.13442	9.13326	.13591	9.13803	.13741	56
5	.11887	.13148	.12373	.13296	.12855	.13445	.13334	.13594	.13811	.13744	55
6	.11895	.13151	.12381	.13299	.12863	.13447	.13342	.13596	.13819	.13746	54
7	.11904	.13153	.12389	.13301	.12871	.13450	.13350	.13599	.13827	.13749	53
+ 2′	9.11912	.13156	9.12397	.13304	9.12879	.13452	9.13358	.13601	9.13834	.13751	52
9	.11920	.13158	.12405	.13306	.12887	.13455	.13366	.13604	.13842	.13754	51
10	.11928	.13161	.12413	.13309	.12895	.13457	.13374	.13607	.13850	.13756	50
11	.11936	.13163	.12421	.13311	.12903	.13460	.13382	.13609	.13858	.13759	49
+ 3′	9.11944	.13166	9.12429	.13314	9.12911	.13462	9.13390	.13611	9.13866	.13761	48
13	.11952	.13168	.12437	.13316	.12919	.13465	.13398	.13614	.13874	.13764	47
14	.11960	.13171	.12445	.13318	.12927	.13467	.13406	.13616	.13882	.13766	46
15	.11968	.13173	.12453	.13321	.12935	.13470	.13414	.13619	.13890	.13769	45
+ 4′	9.11977	.13175	9.12461	.13323	9.12943	.13472	9.13422	.13621	9.13898	.13771	44
17	.11985	.13178	.12470	.13326	.12951	.13474	.13430	.13624	.13906	.13774	43
18	.11993	.13180	.12478	.13328	.12959	.13477	.13438	.13626	.13913	.13776	42
19	.12001	.13183	.12486	.13331	.12967	.13479	.13446	.13629	.13921	.13779	41
+ 5′	9.12009	.13185	9.12494	.13333	9.12975	.13482	9.13454	.13631	9.13929	.13781	40
21	.12017	.13188	.12502	.13336	.12983	.13484	.13462	.13634	.13937	.13784	39
22	.12025	.13190	.12510	.13338	.12991	.13487	.13470	.13636	.13945	.13786	38
23	.12033	.13193	.12518	.13341	.12999	.13489	.13478	.13639	.13953	.13789	37
+ 6′	9.12041	.13195	9.12526	.13343	9.13007	.13492	9.13486	.13641	9.13961	.13791	36
25	.12050	.13198	.12534	.13346	.13015	.13494	.13494	.13644	.13969	.13794	35
26	.12058	.13200	.12542	.13348	.13023	.13497	.13501	.13646	.13977	.13796	34
27	.12066	.13203	.12550	.13351	.13031	.13499	.13509	.13649	.13985	.13799	33
+ 7′	9.12074	.13205	9.12558	.13353	9.13039	.13502	9.13517	.13651	9.13992	.13801	32
29	.12082	.13207	.12566	.13356	.13047	.13504	.13525	.13654	.14000	.13804	31
30	.12090	.13210	.12574	.13358	.13055	.13507	.13533	.13656	.14008	.13806	30
31	.12098	.13212	.12582	.13360	.13063	.13509	.13541	.13659	.14016	.13809	29
+ 8′	9.12106	.13215	9.12590	.13363	9.13071	.13512	9.13549	.13661	9.14024	.13811	28
33	.12114	.13217	.12598	.13365	.13079	.13514	.13557	.13664	.14032	.13814	27
34	.12122	.13220	.12606	.13368	.13087	.13517	.13565	.13666	.14040	.13816	26
35	.12130	.13222	.12614	.13370	.13095	.13519	.13573	.13669	.14048	.13819	25
+ 9′	9.12139	.13225	9.12622	.13373	9.13103	.13522	9.13581	.13671	9.14056	.13822	24
37	.12147	.13227	.12630	.13375	.13111	.13524	.13589	.13674	.14063	.13824	23
38	.12155	.13230	.12638	.13378	.13119	.13527	.13597	.13676	.14071	.13827	22
39	.12163	.13232	.12647	.13380	.13127	.13529	.13605	.13679	.14079	.13829	21
+ 10′	9.12171	.13235	9.12655	.13383	9.13135	.13532	9.13613	.13681	9.14087	.13832	20
41	.12179	.13237	.12663	.13385	.13143	.13534	.13621	.13684	.14095	.13834	19
42	.12187	.13239	.12671	.13388	.13151	.13537	.13628	.13686	.14103	.13837	18
43	.12195	.13242	.12679	.13390	.13159	.13539	.13636	.13689	.14111	.13839	17
+ 11′	9.12203	.13244	9.12687	.13393	9.13167	.13542	9.13644	.13691	9.14119	.13842	16
45	.12211	.13247	.12695	.13395	.13175	.13544	.13652	.13694	.14127	.13844	15
46	.12219	.13249	.12703	.13398	.13183	.13547	.13660	.13696	.14134	.13847	14
47	.12228	.13252	.12711	.13400	.13191	.13549	.13668	.13699	.14142	.13849	13
+ 12′	9.12236	.13254	9.12719	.13403	9.13199	.13552	9.13676	.13701	9.14150	.13852	12
49	.12244	.13257	.12727	.13405	.13207	.13554	.13684	.13704	.14158	.13854	11
50	.12252	.13259	.12735	.13408	.13215	.13557	.13692	.13706	.14166	.13857	10
51	.12260	.13262	.12743	.13410	.13223	.13559	.13700	.13709	.14174	.13859	9
+ 13′	9.12268	.13264	9.12751	.13412	9.13231	.13562	9.13708	.13711	9.14182	.13862	8
53	.12276	.13267	.12759	.13415	.13239	.13564	.13716	.13714	.14190	.13864	7
54	.12284	.13269	.12767	.13417	.13247	.13567	.13724	.13716	.14197	.13867	6
55	.12292	.13272	.12775	.13420	.13255	.13569	.13732	.13719	.14205	.13869	5
+ 14′	9.12300	.13274	9.12783	.13422	9.13263	.13571	9.13739	.13721	9.14213	.13872	4
57	.12308	.13276	.12791	.13425	.13271	.13574	.13747	.13724	.14221	.13874	3
58	.12316	.13279	.12799	.13427	.13279	.13576	.13755	.13726	.14229	.13877	2
59	.12324	.13281	.12807	.13430	.13287	.13579	.13763	.13729	.14237	.13879	1
+ 15′	9.12332	.13284	9.12815	.13432	9.13295	.13581	9.13771	.13731	9.14245	.13882	0
	21h 9m		21h 8m		21h 7m		21h 6m		21h 5m		

Haversines.

s	2h 55m 43° 45′		2h 56m 44° 0′		2h 57m 44° 15′		2h 58m 44° 30′		2h 59m 44° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.14245	.13882	9.14715	.14033	9.15183	.14185	9.15647	.14337	9.16109	.14491	60
1	.14252	.13884	.14723	.14035	.15190	.14187	.15655	.14340	.16117	.14493	59
2	.14260	.13887	.14731	.14038	.15198	.14190	.15663	.14343	.16124	.14496	58
3	.14268	.13889	.14739	.14041	.15206	.14192	.15670	.14345	.16132	.14498	57
+ 1′	9.14276	.13892	9.14746	.14043	9.15214	.14195	9.15678	.14348	9.16140	.14501	56
5	.14284	.13894	.14754	.14046	.15221	.14198	.15686	.14350	.16147	.14504	55
6	.14292	.13897	.14762	.14048	.15229	.14200	.15694	.14353	.16155	.14506	54
7	.14300	.13899	.14770	.14051	.15237	.14203	.15701	.14355	.16163	.14509	53
+ 2′	9.14307	.13902	9.14778	.14053	9.15245	.14205	9.15709	.14358	9.16170	.14511	52
9	.14315	.13904	.14785	.14056	.15253	.14208	.15717	.14360	.16178	.14514	51
10	.14323	.13907	.14793	.14058	.15260	.14210	.15724	.14363	.16186	.14516	50
11	.14331	.13909	.14801	.14061	.15268	.14213	.15732	.14366	.16193	.14519	49
+ 3′	9.14339	.13912	9.14809	.14063	9.15276	.14215	9.15740	.14368	9.16201	.14521	48
13	.14347	.13914	.14817	.14066	.15284	.14218	.15748	.14371	.16209	.14524	47
14	.14355	.13917	.14824	.14068	.15291	.14220	.15755	.14373	.16216	.14527	46
15	.14362	.13920	.14832	.14071	.15299	.14223	.15763	.14376	.16224	.14529	45
+ 4′	9.14370	.13922	9.14840	.14073	9.15307	.14226	9.15771	.14378	9.16232	.14532	44
17	.14378	.13925	.14848	.14076	.15315	.14228	.15778	.14381	.16239	.14534	43
18	.14386	.13927	.14856	.14079	.15322	.14231	.15786	.14383	.16247	.14537	42
19	.14394	.13930	.14863	.14081	.15330	.14233	.15794	.14386	.16255	.14539	41
+ 5′	9.14402	.13932	9.14871	.14084	9.15338	.14236	9.15802	.14388	9.16262	.14542	40
21	.14410	.13935	.14879	.14086	.15346	.14238	.15809	.14391	.16270	.14545	39
22	.14417	.13937	.14887	.14089	.15353	.14241	.15817	.14394	.16278	.14547	38
23	.14425	.13940	.14895	.14091	.15361	.14243	.15825	.14396	.16285	.14550	37
+ 6′	9.14433	.13942	9.14902	.14094	9.15369	.14246	9.15832	.14399	9.16293	.14552	36
25	.14441	.13945	.14910	.14096	.15377	.14248	.15840	.14401	.16301	.14555	35
26	.14449	.13947	.14918	.14099	.15384	.14251	.15848	.14404	.16308	.14557	34
27	.14457	.13950	.14926	.14101	.15392	.14253	.15855	.14406	.16316	.14560	33
+ 7′	9.14465	.13952	9.14934	.14104	9.15400	.14256	9.15863	.14409	9.16324	.14562	32
29	.14472	.13955	.14941	.14106	.15408	.14259	.15871	.14411	.16331	.14565	31
30	.14480	.13957	.14949	.14109	.15415	.14261	.15879	.14414	.16339	.14568	30
31	.14488	.13960	.14957	.14111	.15423	.14264	.15886	.14417	.16346	.14570	29
+ 8′	9.14496	.13962	9.14965	.14114	9.15431	.14266	9.15894	.14419	9.16354	.14573	28
33	.14504	.13965	.14973	.14116	.15439	.14269	.15902	.14422	.16362	.14575	27
34	.14512	.13967	.14980	.14119	.15446	.14271	.15909	.14424	.16369	.14578	26
35	.14519	.13970	.14988	.14122	.15454	.14274	.15917	.14427	.16377	.14580	25
+ 9′	9.14527	.13972	9.14996	.14124	9.15462	.14276	9.15925	.14429	9.16385	.14583	24
37	.14535	.13975	.15004	.14127	.15470	.14279	.15932	.14432	.16392	.14586	23
38	.14543	.13977	.15012	.14129	.15477	.14281	.15940	.14434	.16400	.14588	22
39	.14551	.13980	.15019	.14132	.15485	.14284	.15948	.14437	.16408	.14591	21
+ 10′	9.14559	.13983	9.15027	.14134	9.15493	.14287	9.15955	.14440	9.16415	.14593	20
41	.14566	.13985	.15035	.14137	.15500	.14289	.15963	.14442	.16423	.14596	19
42	.14574	.13988	.15043	.14139	.15508	.14292	.15971	.14445	.16431	.14598	18
43	.14582	.13990	.15050	.14142	.15516	.14294	.15978	.14447	.16438	.14601	17
+ 11′	9.14590	.13993	9.15058	.14144	9.15524	.14297	9.15986	.14450	9.16446	.14604	16
45	.14598	.13995	.15066	.14147	.15531	.14299	.15994	.14452	.16453	.14606	15
46	.14606	.13998	.15074	.14149	.15539	.14302	.16002	.14455	.16461	.14609	14
47	.14613	.14000	.15082	.14152	.15547	.14304	.16009	.14457	.16469	.14611	13
+ 12′	9.14621	.14003	9.15089	.14154	9.15555	.14307	9.16017	.14460	9.16476	.14614	12
49	.14629	.14005	.15097	.14157	.15562	.14309	.16025	.14463	.16484	.14616	11
50	.14637	.14008	.15105	.14160	.15570	.14312	.16032	.14465	.16492	.14619	10
51	.14645	.14010	.15113	.14162	.15578	.14315	.16040	.14468	.16499	.14622	9
+ 13′	9.14653	.14013	9.15120	.14165	9.15585	.14317	9.16048	.14470	9.16507	.14624	8
53	.14660	.14015	.15128	.14167	.15593	.14320	.16055	.14473	.16515	.14627	7
54	.14668	.14018	.15136	.14170	.15601	.14322	.16063	.14475	.16522	.14629	6
55	.14676	.14020	.15144	.14172	.15609	.14325	.16071	.14478	.16530	.14632	5
+ 14′	9.14684	.14023	9.15152	.14175	9.15616	.14327	9.16078	.14480	9.16537	.14634	4
57	.14692	.14025	.15159	.14177	.15624	.14330	.16086	.14483	.16545	.14637	3
58	.14699	.14028	.15167	.14180	.15632	.14332	.16094	.14486	.16553	.14639	2
59	.14707	.14030	.15175	.14182	.15640	.14335	.16101	.14488	.16560	.14642	1
+ 15′	9.14715	.14033	9.15183	.14185	9.15647	.14337	9.16109	.14491	9.16568	.14645	0
	21h 4m		21h 3m		21h 2m		21h 1m		21h 0m		

TABLE 34.

Haversines.

s	3h 0m 45° 0′		3h 1m 45° 15′		3h 2m 45° 30′		3h 3m 45° 45′		3h 4m 46° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.16568	.14645	9.17024	.14799	9.17477	.14955	9.17928	.15110	9.18376	.15267	60
1	.16576	.14647	.17032	.14802	.17485	.14957	.17935	.15113	.18383	.15270	59
2	.16583	.14650	.17039	.14804	.17492	.14960	.17943	.15116	.18390	.15272	58
3	.16591	.14652	.17047	.14807	.17500	.14962	.17950	.15118	.18398	.15275	57
+ 1′	9.16598	.14655	9.17054	.14810	9.17507	.14965	9.17958	.15121	9.18405	.15278	56
5	.16606	.14658	.17062	.14812	.17515	.14968	.17965	.15123	.18413	.15280	55
6	.16614	.14660	.17069	.14815	.17522	.14970	.17973	.15126	.18420	.15283	54
7	.16621	.14663	.17077	.14817	.17530	.14973	.17980	.15129	.18428	.15285	53
+ 2′	9.16629	.14665	9.17085	.14820	9.17538	.14975	9.17988	.15131	9.18435	.15288	52
9	.16637	.14668	.17092	.14822	.17545	.14978	.17995	.15134	.18443	.15291	51
10	.16644	.14670	.17100	.14825	.17553	.14981	.18003	.15137	.18450	.15293	50
11	.16652	.14673	.17107	.14828	.17560	.14983	.18010	.15139	.18457	.15296	49
+ 3′	9.16659	.14676	9.17115	.14830	9.17568	.14986	9.18018	.15142	9.18465	.15298	48
13	.16667	.14678	.17122	.14833	.17575	.14988	.18025	.15144	.18472	.15301	47
14	.16675	.14681	.17130	.14835	.17583	.14991	.18033	.15147	.18480	.15304	46
15	.16682	.14683	.17138	.14838	.17590	.14993	.18040	.15150	.18487	.15306	45
+ 4′	9.16690	.14686	9.17145	.14841	9.17598	.14996	9.18048	.15152	9.18495	.15309	44
17	.16697	.14688	.17153	.14843	.17605	.14999	.18055	.15155	.18502	.15312	43
18	.16705	.14691	.17160	.14846	.17613	.15001	.18062	.15157	.18509	.15314	42
19	.16713	.14693	.17168	.14848	.17620	.15004	.18070	.15160	.18517	.15316	41
+ 5′	9.16720	.14696	9.17175	.14851	9.17628	.15006	9.18077	.15163	9.18524	.15319	40
21	.16728	.14699	.17183	.14853	.17635	.15009	.18085	.15165	.18532	.15322	39
22	.16735	.14701	.17191	.14856	.17643	.15012	.18092	.15168	.18539	.15325	38
23	.16743	.14704	.17198	.14859	.17650	.15014	.18100	.15170	.18547	.15327	37
+ 6′	9.16751	.14706	9.17206	.14861	9.17658	.15017	9.18107	.15173	9.18554	.15330	36
25	.16758	.14709	.17213	.14864	.17665	.15019	.18115	.15176	.18561	.15333	35
26	.16766	.14712	.17221	.14866	.17673	.15022	.18122	.15178	.18569	.15335	34
27	.16774	.14714	.17228	.14869	.17680	.15025	.18130	.15181	.18576	.15337	33
+ 7′	9.16781	.14717	9.17236	.14872	9.17688	.15027	9.18137	.15183	9.18584	.15340	32
29	.16789	.14719	.17243	.14874	.17695	.15030	.18145	.15186	.18591	.15343	31
30	.16796	.14722	.17251	.14877	.17703	.15032	.18152	.15189	.18598	.15346	30
31	.16804	.14724	.17259	.14879	.17710	.15035	.18160	.15191	.18606	.15348	29
+ 8′	9.16812	.14727	9.17266	.14882	9.17718	.15038	9.18167	.15194	9.18613	.15351	28
33	.16819	.14730	.17274	.14885	.17725	.15040	.18174	.15197	.18621	.15353	27
34	.16827	.14732	.17281	.14887	.17733	.15043	.18182	.15199	.18628	.15356	26
35	.16834	.14735	.17289	.14890	.17740	.15045	.18189	.15202	.18636	.15359	25
+ 9′	9.16842	.14737	9.17296	.14892	9.17748	.15048	9.18197	.15204	9.18643	.15361	24
37	.16850	.14740	.17304	.14895	.17755	.15051	.18204	.15207	.18650	.15364	23
38	.16857	.14743	.17311	.14898	.17763	.15053	.18212	.15210	.18658	.15367	22
39	.16865	.14745	.17319	.14900	.17770	.15056	.18219	.15212	.18665	.15369	21
+ 10′	9.16872	.14748	9.17327	.14903	9.17778	.15058	9.18227	.15215	9.18673	.15372	20
41	.16880	.14750	.17334	.14905	.17785	.15061	.18234	.15217	.18680	.15374	19
42	.16887	.14753	.17342	.14908	.17793	.15064	.18242	.15220	.18687	.15377	18
43	.16895	.14755	.17349	.14910	.17800	.15066	.18249	.15222	.18695	.15379	17
+ 11′	9.16903	.14758	9.17357	.14913	9.17808	.15069	9.18256	.15225	9.18702	.15382	16
45	.16910	.14760	.17364	.14916	.17815	.15071	.18264	.15228	.18710	.15385	15
46	.16918	.14763	.17372	.14918	.17823	.15074	.18271	.15230	.18717	.15388	14
47	.16925	.14766	.17379	.14921	.17830	.15077	.18279	.15233	.18724	.15390	13
+ 12′	9.16933	.14768	9.17387	.14923	9.17838	.15079	9.18286	.15236	9.18732	.15393	12
49	.16941	.14771	.17394	.14926	.17845	.15082	.18294	.15238	.18739	.15395	11
50	.16948	.14773	.17402	.14929	.17853	.15084	.18301	.15241	.18747	.15398	10
51	.16956	.14776	.17409	.14931	.17860	.15087	.18309	.15244	.18754	.15401	9
+ 13′	9.16963	.14779	9.17417	.14934	9.17868	.15090	9.18316	.15246	9.18762	.15403	8
53	.16971	.14781	.17425	.14936	.17875	.15092	.18324	.15249	.18769	.15406	7
54	.16979	.14784	.17432	.14939	.17883	.15095	.18331	.15251	.18776	.15409	6
55	.16986	.14786	.17440	.14942	.17890	.15097	.18338	.15254	.18784	.15411	5
+ 14′	9.16994	.14789	9.17447	.14944	9.17898	.15100	9.18346	.15257	9.18791	.15414	4
57	.17001	.14791	.17455	.14947	.17905	.15103	.18353	.15259	.18798	.15416	3
58	.17009	.14794	.17462	.14949	.17913	.15105	.18361	.15262	.18806	.15419	2
59	.17016	.14797	.17470	.14952	.17920	.15108	.18368	.15264	.18813	.15422	1
+ 15′	9.17024	.14799	9.17477	.14955	9.17928	.15110	9.18376	.15267	9.18821	.15424	0
	20h 59m		20h 58m		20h 57m		20h 56m		20h 55m		

Haversines.

	3h 5m 46° 15′		3h 6m 46° 30′		3h 7m 46° 45′		3h 8m 47° 0′		3h 9m 47° 15′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.18821	.15424	9.19263	.15582	9.19703	.15741	9.20140	.15900	9.20574	.16060	60
1	.18828	.15427	.19270	.15585	.19710	.15743	.20147	.15903	.20582	.16063	59
2	.18835	.15430	.19278	.15588	.19717	.15746	.20154	.15905	.20589	.16065	58
3	.18843	.15432	.19285	.15590	.19725	.15748	.20162	.15908	.20596	.16068	57
+ 1′	9.18850	.15435	9.19292	.15593	9.19732	.15751	9.20169	.15911	9.20603	.16071	56
5	.18858	.15437	.19300	.15595	.19739	.15754	.20176	.15913	.20611	.16073	55
6	.18865	.15440	.19307	.15598	.19747	.15757	.20184	.15916	.20618	.16076	54
7	.18872	.15443	.19315	.15601	.19754	.15759	.20191	.15919	.20625	.16079	53
+ 2′	9.18880	.15445	9.19322	.15603	9.19761	.15762	9.20198	.15921	9.20632	.16081	52
9	.18887	.15448	.19329	.15606	.19769	.15765	.20205	.15924	.20639	.16084	51
10	.18895	.15451	.19337	.15609	.19776	.15767	.20213	.15927	.20647	.16087	50
11	.18902	.15453	.19344	.15611	.19783	.15770	.20220	.15929	.20654	.16089	49
+ 3′	9.18909	.15456	9.19351	.15614	9.19790	.15773	9.20227	.15932	9.20661	.16092	48
13	.18917	.15458	.19359	.15617	.19798	.15775	.20234	.15935	.20668	.16095	47
14	.18924	.15461	.19366	.15619	.19805	.15778	.20242	.15937	.20675	.16097	46
15	.18932	.15464	.19373	.15622	.19812	.15781	.20249	.15940	.20683	.16100	45
+ 4′	9.18939	.15466	9.19381	.15625	9.19820	.15783	9.20256	.15943	9.20690	.16103	44
17	.18946	.15469	.19388	.15627	.19827	.15786	.20263	.15945	.20697	.16105	43
18	.18954	.15472	.19395	.15630	.19834	.15789	.20271	.15948	.20704	.16108	42
19	.18961	.15474	.19403	.15632	.19842	.15791	.20278	.15951	.20712	.16111	41
+ 5′	9.18968	.15477	9.19410	.15635	9.19849	.15794	9.20285	.15953	9.20719	.16113	40
21	.18976	.15479	.19417	.15638	.19856	.15796	.20292	.15956	.20726	.16116	39
22	.18983	.15482	.19425	.15640	.19863	.15799	.20300	.15959	.20733	.16119	38
23	.18991	.15485	.19432	.15643	.19871	.15802	.20307	.15961	.20740	.16121	37
+ 6′	9.18998	.15487	9.19439	.15646	9.19878	.15804	9.20314	.15964	9.20748	.16124	36
25	.19005	.15490	.19447	.15648	.19885	.15807	.20321	.15967	.20755	.16127	35
26	.19013	.15493	.19454	.15651	.19893	.15810	.20329	.15969	.20762	.16129	34
27	.19020	.15495	.19461	.15654	.19900	.15812	.20336	.15972	.20769	.16132	33
+ 7′	9.19027	.15498	9.19469	.15656	9.19907	.15815	9.20343	.15975	9.20776	.16135	32
29	.19035	.15501	.19476	.15659	.19914	.15818	.20350	.15977	.20784	.16137	31
30	.19042	.15503	.19483	.15662	.19922	.15820	.20358	.15980	.20791	.16140	30
31	.19050	.15506	.19491	.15664	.19929	.15823	.20365	.15983	.20798	.16143	29
+ 8′	9.19057	.15509	9.19498	.15667	9.19936	.15826	9.20372	.15985	9.20805	.16146	28
33	.19064	.15511	.19505	.15670	.19944	.15828	.20379	.15988	.20812	.16148	27
34	.19072	.15514	.19513	.15672	.19951	.15831	.20386	.15991	.20820	.16151	26
35	.19079	.15516	.19520	.15675	.19958	.15834	.20394	.15993	.20827	.16154	25
+ 9′	9.19086	.15519	9.19527	.15677	9.19965	.15836	9.20401	.15996	9.20834	.16156	24
37	.19094	.15522	.19535	.15680	.19973	.15839	.20408	.15999	.20841	.16159	23
38	.19101	.15524	.19542	.15683	.19980	.15842	.20415	.16001	.20848	.16162	22
39	.19109	.15527	.19549	.15685	.19987	.15844	.20423	.16004	.20856	.16164	21
+ 10′	9.19116	.15530	9.19557	.15688	9.19995	.15847	9.20430	.16007	9.20863	.16167	20
41	.19123	.15532	.19564	.15691	.20002	.15850	.20437	.16009	.20870	.16170	19
42	.19131	.15535	.19571	.15693	.20009	.15852	.20444	.16012	.20877	.16172	18
43	.19138	.15537	.19579	.15696	.20016	.15855	.20452	.16015	.20884	.16175	17
+ 11′	9.19145	.15540	9.19586	.15699	9.20024	.15858	9.20459	.16017	9.20891	.16178	16
45	.19153	.15543	.19593	.15701	.20031	.15860	.20466	.16020	.20899	.16180	15
46	.19160	.15545	.19600	.15704	.20038	.15863	.20473	.16023	.20906	.16183	14
47	.19167	.15548	.19608	.15706	.20045	.15866	.20481	.16025	.20913	.16186	13
+ 12′	9.19175	.15551	9.19615	.15709	9.20053	.15868	9.20488	.16028	9.20920	.16188	12
49	.19182	.15553	.19622	.15712	.20060	.15871	.20495	.16031	.20927	.16191	11
50	.19190	.15556	.19630	.15714	.20067	.15874	.20502	.16033	.20935	.16194	10
51	.19197	.15559	.19637	.15717	.20075	.15876	.20509	.16036	.20942	.16196	9
+ 13′	9.19204	.15561	9.19644	.15720	9.20082	.15879	9.20517	.16039	9.20949	.16199	8
53	.19212	.15564	.19652	.15722	.20089	.15881	.20524	.16041	.20956	.16202	7
54	.19219	.15566	.19659	.15725	.20096	.15884	.20531	.16044	.20963	.16204	6
55	.19226	.15569	.19666	.15728	.20104	.15887	.20538	.16047	.20971	.16207	5
+ 14′	9.19234	.15572	9.19674	.15730	9.20111	.15889	9.20546	.16049	9.20978	.16210	4
57	.19241	.15574	.19681	.15733	.20118	.15892	.20553	.16052	.20985	.16212	3
58	.19248	.15577	.19688	.15736	.20125	.15895	.20560	.16055	.20992	.16215	2
59	.19256	.15580	.19696	.15738	.20133	.15898	.20567	.16057	.20999	.16218	1
+ 15′	9.19263	.15582	9.19703	.15741	9.20140	.15900	9.20574	.16060	9.21006	.16220	0
	20h 54m		20h 53m		20h 52m		20h 51m		20h 50m		

TABLE 34.

Haversines.

s	3h 10m 47° 30′		3h 11m 47° 45′		3h 12m 48° 0′		3h 13m 48° 15′		3h 14m 48° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.21006	.16220	9.21436	.16382	9.21863	.16543	9.22287	.16706	9.22709	.16869	60
1	.21014	.16223	.21443	.16384	.21870	.16546	.22294	.16709	.22716	.16872	59
2	.21021	.16226	.21450	.16387	.21877	.16549	.22301	.16711	.22723	.16874	58
3	.21028	.16229	.21457	.16390	.21884	.16552	.22308	.16714	.22730	.16877	57
+ 1′	9.21035	.16231	9.21464	.16392	9.21891	.16554	9.22315	.16717	9.22737	.16880	56
5	.21042	.16234	.21471	.16395	.21898	.16557	.22322	.16720	.22744	.16883	55
6	.21049	.16237	.21479	.16398	.21905	.16560	.22329	.16722	.22751	.16885	54
7	.21057	.16239	.21486	.16401	.21912	.16562	.22336	.16725	.22758	.16888	53
+ 2′	9.21064	.16242	9.21493	.16403	9.21919	.16565	9.22343	.16728	9.22765	.16891	52
9	.21071	.16245	.21500	.16406	.21926	.16568	.22350	.16730	.22772	.16893	51
10	.21078	.16247	.21507	.16409	.21934	.16571	.22358	.16733	.22779	.16896	50
11	.21085	.16250	.21514	.16411	.21941	.16573	.22365	.16736	.22786	.16899	49
+ 3′	9.21092	.16253	9.21521	.16414	9.21948	.16576	9.22372	.16738	9.22793	.16902	48
13	.21100	.16255	.21529	.16417	.21955	.16579	.22379	.16741	.22800	.16904	47
14	.21107	.16258	.21536	.16419	.21962	.16581	.22386	.16744	.22807	.16907	46
15	.21114	.16261	.21543	.16422	.21969	.16584	.22393	.16747	.22814	.16910	45
+ 4′	9.21121	.16263	9.21550	.16425	9.21976	.16587	9.22400	.16749	9.22821	.16913	44
17	.21128	.16266	.21557	.16427	.21983	.16589	.22407	.16752	.22828	.16915	43
18	.21135	.16269	.21564	.16430	.21990	.16592	.22414	.16755	.22835	.16918	42
19	.21143	.16271	.21571	.16433	.21997	.16595	.22421	.16757	.22842	.16921	41
+ 5′	9.21150	.16274	9.21578	.16436	9.22004	.16598	9.22428	.16760	9.22849	.16924	40
21	.21157	.16277	.21585	.16438	.22011	.16600	.22435	.16763	.22856	.16926	39
22	.21164	.16280	.21593	.16441	.22019	.16603	.22442	.16766	.22863	.16929	38
23	.21171	.16282	.21600	.16444	.22026	.16606	.22449	.16768	.22870	.16932	37
+ 6′	9.21178	.16285	9.21607	.16446	9.22033	.16608	9.22456	.16771	9.22877	.16934	36
25	.21186	.16288	.21614	.16449	.22040	.16611	.22463	.16774	.22884	.16937	35
26	.21193	.16290	.21621	.16452	.22047	.16614	.22470	.16777	.22891	.16940	34
27	.21200	.16293	.21628	.16454	.22054	.16616	.22477	.16779	.22898	.16943	33
+ 7′	9.21207	.16296	9.21635	.16457	9.22061	.16619	9.22484	.16782	9.22905	.16945	32
29	.21214	.16298	.21642	.16460	.22068	.16622	.22491	.16785	.22912	.16948	31
30	.21221	.16301	.21650	.16462	.22075	.16625	.22498	.16787	.22919	.16951	30
31	.21229	.16304	.21657	.16465	.22082	.16627	.22505	.16790	.22926	.16953	29
+ 8′	9.21236	.16306	9.21664	.16468	9.22089	.16630	9.22512	.16793	9.22933	.16956	28
33	.21243	.16309	.21671	.16471	.22096	.16633	.22519	.16795	.22940	.16959	27
34	.21250	.16312	.21678	.16473	.22103	.16635	.22526	.16798	.22947	.16962	26
35	.21257	.16314	.21685	.16476	.22111	.16638	.22533	.16801	.22954	.16964	25
+ 9′	9.21264	.16317	9.21692	.16479	9.22118	.16641	9.22540	.16804	9.22961	.16967	24
37	.21272	.16320	.21699	.16481	.22125	.16644	.22547	.16806	.22968	.16970	23
38	.21279	.16323	.21706	.16484	.22132	.16646	.22555	.16809	.22975	.16973	22
39	.21286	.16325	.21714	.16487	.22139	.16649	.22562	.16812	.22982	.16975	21
+ 10′	9.21293	.16328	9.21721	.16489	9.22146	.16652	9.22569	.16815	9.22989	.16978	20
41	.21300	.16331	.21728	.16492	.22153	.16654	.22576	.16817	.22996	.16981	19
42	.21307	.16333	.21735	.16495	.22160	.16657	.22583	.16820	.23003	.16984	18
43	.21314	.16336	.21742	.16498	.22167	.16660	.22590	.16823	.23010	.16986	17
+ 11′	9.21322	.16339	9.21749	.16500	9.22174	.16663	9.22597	.16825	9.23017	.16989	16
45	.21329	.16341	.21756	.16503	.22181	.16665	.22604	.16828	.23024	.16992	15
46	.21336	.16344	.21763	.16506	.22188	.16668	.22611	.16831	.23031	.16994	14
47	.21343	.16347	.21770	.16508	.22195	.16671	.22618	.16834	.23038	.16997	13
+ 12′	9.21350	.16349	9.21778	.16511	9.22202	.16673	9.22625	.16836	9.23045	.17000	12
49	.21357	.16352	.21785	.16514	.22209	.16676	.22632	.16839	.23052	.17003	11
50	.21364	.16355	.21792	.16516	.22216	.16679	.22639	.16842	.23059	.17005	10
51	.21372	.16357	.21799	.16519	.22224	.16681	.22646	.16844	.23066	.17008	9
+ 13′	9.21379	.16360	9.21806	.16522	9.22231	.16684	9.22653	.16847	9.23073	.17011	8
53	.21386	.16363	.21813	.16524	.22238	.16687	.22660	.16850	.23080	.17014	7
54	.21393	.16366	.21820	.16527	.22245	.16690	.22667	.16853	.23087	.17016	6
55	.21400	.16368	.21827	.16530	.22252	.16692	.22674	.16855	.23094	.17019	5
+ 14′	9.21407	.16371	9.21834	.16533	9.22259	.16695	9.22681	.16858	9.23100	.17022	4
57	.21414	.16374	.21841	.16535	.22266	.16698	.22688	.16861	.23107	.17024	3
58	.21422	.16376	.21848	.16538	.22273	.16701	.22695	.16864	.23114	.17027	2
59	.21429	.16379	.21856	.16541	.22280	.16703	.22702	.16866	.23121	.17030	1
+ 15′	9.21436	.16382	9.21863	.16543	9.22287	.16706	9.22709	.16869	9.23128	.17033	0
	20h 49m		20h 48m		20h 47m		20h 46m		20h 45m		

Haversines.

s	3h 15m 48° 45′ Log. Hav.	Nat. Hav.	3h 16m 49° 0′ Log. Hav.	Nat. Hav.	3h 17m 49° 15′ Log. Hav.	Nat. Hav.	3h 18m 49° 30′ Log. Hav.	Nat. Hav.	3h 19m 49° 45′ Log. Hav.	Nat. Hav.	s
0	9.23128	.17033	9.23545	.17197	9.23960	.17362	9.24372	.17528	9.24782	.17694	60
1	.23135	.17035	.23552	.17200	.23967	.17365	.24379	.17530	.24789	.17697	59
2	.23142	.17038	.23559	.17203	.23974	.17368	.24386	.17533	.24796	.17699	58
3	.23149	.17041	.23566	.17205	.23981	.17370	.24393	.17536	.24803	.17702	57
+ 1′	9.23156	.17044	9.23573	.17208	9.23988	.17373	9.24400	.17539	9.24809	.17705	56
5	.23163	.17046	.23580	.17211	.23994	.17376	.24406	.17541	.24816	.17708	55
6	.23170	.17049	.23587	.17214	.24001	.17379	.24413	.17544	.24823	.17710	54
7	.23177	.17052	.23594	.17216	.24008	.17381	.24420	.17547	.24830	.17713	53
+ 2′	9.23184	.17055	9.23601	.17219	9.24015	.17384	9.24427	.17550	9.24837	.17716	52
9	.23191	.17057	.23608	.17222	.24022	.17387	.24434	.17552	.24843	.17719	51
10	.23198	.17060	.23615	.17225	.24029	.17390	.24441	.17555	.24850	.17722	50
11	.23205	.17063	.23622	.17227	.24036	.17392	.24448	.17558	.24857	.17724	49
+ 3′	9.23212	.17066	9.23629	.17230	9.24043	.17395	9.24454	.17561	9.24864	.17727	48
13	.23219	.17068	.23635	.17233	.24050	.17398	.24461	.17563	.24871	.17730	47
14	.23226	.17071	.23642	.17235	.24056	.17401	.24468	.17566	.24877	.17733	46
15	.23233	.17074	.23649	.17238	.24063	.17403	.24475	.17569	.24884	.17735	45
+ 4′	9.23240	.17076	9.23656	.17241	9.24070	.17406	9.24482	.17572	9.24891	.17738	44
17	.23247	.17079	.23663	.17244	.24077	.17409	.24489	.17575	.24898	.17741	43
18	.23254	.17082	.23670	.17246	.24084	.17412	.24495	.17577	.24905	.17744	42
19	.23261	.17085	.23677	.17249	.24091	.17414	.24502	.17580	.24911	.17746	41
+ 5′	9.23268	.17087	9.23684	.17252	9.24098	.17417	9.24509	.17583	9.24918	.17749	40
21	.23275	.17090	.23691	.17255	.24105	.17420	.24516	.17586	.24925	.17752	39
22	.23282	.17093	.23698	.17257	.24111	.17423	.24523	.17588	.24932	.17755	38
23	.23289	.17096	.23705	.17260	.24118	.17425	.24530	.17591	.24939	.17758	37
+ 6′	9.23295	.17098	9.23712	.17263	9.24125	.17428	9.24536	.17594	9.24945	.17760	36
25	.23302	.17101	.23718	.17266	.24132	.17431	.24543	.17597	.24952	.17763	35
26	.23309	.17104	.23725	.17268	.24139	.17434	.24550	.17600	.24959	.17766	34
27	.23316	.17107	.23732	.17271	.24146	.17436	.24557	.17602	.24966	.17769	33
+ 7′	9.23323	.17109	9.23739	.17274	9.24153	.17439	9.24564	.17605	9.24973	.17772	32
29	.23330	.17112	.23746	.17277	.24160	.17442	.24571	.17608	.24979	.17774	31
30	.23337	.17115	.23753	.17279	.24166	.17445	.24577	.17611	.24986	.17777	30
31	.23344	.17117	.23760	.17282	.24173	.17447	.24584	.17613	.24993	.17780	29
+ 8′	9.23351	.17120	9.23767	.17285	9.24180	.17450	9.24591	.17616	9.25000	.17783	28
33	.23358	.17123	.23774	.17288	.24187	.17453	.24598	.17619	.25007	.17785	27
34	.23365	.17126	.23781	.17290	.24194	.17456	.24605	.17622	.25013	.17788	26
35	.23372	.17128	.23788	.17293	.24201	.17458	.24612	.17624	.25020	.17791	25
+ 9′	9.23379	.17131	9.23794	.17296	9.24208	.17461	9.24618	.17627	9.25027	.17794	24
37	.23386	.17134	.23801	.17299	.24215	.17464	.24625	.17630	.25034	.17797	23
38	.23393	.17137	.23808	.17301	.24221	.17467	.24632	.17633	.25040	.17799	22
39	.23400	.17139	.23815	.17304	.24228	.17470	.24639	.17636	.25047	.17802	21
+ 10′	9.23407	.17142	9.23822	.17307	9.24235	.17472	9.24646	.17638	9.25054	.17805	20
41	.23414	.17145	.23829	.17310	.24242	.17475	.24653	.17641	.25061	.17808	19
42	.23421	.17148	.23836	.17313	.24249	.17478	.24659	.17644	.25068	.17811	18
43	.23427	.17150	.23843	.17315	.24256	.17481	.24666	.17647	.25074	.17813	17
+ 11′	9.23434	.17153	9.23850	.17318	9.24263	.17483	9.24673	.17649	9.25081	.17816	16
45	.23441	.17156	.23857	.17321	.24269	.17486	.24680	.17652	.25088	.17819	15
46	.23448	.17159	.23863	.17323	.24276	.17489	.24687	.17655	.25095	.17822	14
47	.23455	.17161	.23870	.17326	.24283	.17492	.24694	.17658	.25102	.17824	13
+ 12′	9.23462	.17164	9.23877	.17329	9.24290	.17494	9.24700	.17661	9.25108	.17827	12
49	.23469	.17167	.23884	.17332	.24297	.17497	.24707	.17663	.25115	.17830	11
50	.23476	.17170	.23891	.17335	.24304	.17500	.24714	.17666	.25122	.17833	10
51	.23483	.17172	.23898	.17337	.24311	.17503	.24721	.17669	.25129	.17836	9
+ 13′	9.23490	.17175	9.23905	.17340	9.24317	.17505	9.24728	.17672	9.25135	.17838	8
53	.23497	.17178	.23912	.17343	.24324	.17508	.24734	.17674	.25142	.17841	7
54	.23504	.17181	.23919	.17346	.24331	.17511	.24741	.17677	.25149	.17844	6
55	.23511	.17183	.23926	.17348	.24338	.17514	.24748	.17680	.25156	.17847	5
+ 14′	9.23518	.17186	9.23932	.17351	9.24345	.17517	9.24755	.17683	9.25163	.17849	4
57	.23525	.17189	.23939	.17354	.24352	.17519	.24762	.17686	.25169	.17852	3
58	.23532	.17192	.23946	.17357	.24359	.17522	.24768	.17688	.25176	.17855	2
59	.23538	.17194	.23953	.17359	.24365	.17525	.24775	.17691	.25183	.17858	1
+ 15′	9.23545	.17197	9.23960	.17362	9.24372	.17528	9.24782	.17694	9.25190	.17861	0
	20h 44m		20h 43m		20h 42m		20h 41m		20h 40m		

TABLE 34.

Haversines.

	3h 20m 50° 0′		3h 21m 50° 15′		3h 22m 50° 30′		3h 23m 50° 45′		3h 24m 51° 0′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.25190	.17861	9.25595	.18028	9.25998	.18196	9.26398	.18365	9.26797	.18534	60
1	.25196	.17863	.25602	.18031	.26005	.18199	.26405	.18368	.26804	.18537	59
2	.25203	.17866	.25608	.18034	.26011	.18202	.26412	.18370	.26810	.18540	58
3	.25210	.17869	.25615	.18036	.26018	.18205	.26418	.18373	.26817	.18542	57
+ 1′	9.25217	.17872	9.25622	.18039	9.26025	.18207	9.26425	.18376	9.26823	.18545	56
5	.25224	.17875	.25629	.18042	.26031	.18210	.26432	.18379	.26830	.18548	55
6	.25230	.17877	.25635	.18045	.26038	.18213	.26438	.18382	.26837	.18551	54
7	.25237	.17880	.25642	.18048	.26045	.18216	.26445	.18384	.26843	.18554	53
+ 2′	9.25244	.17883	9.25649	.18050	9.26051	.18219	9.26452	.18387	9.26850	.18557	52
9	.25251	.17886	.25655	.18053	.26058	.18221	.26458	.18390	.26856	.18559	51
10	.25257	.17888	.25662	.18056	.26065	.18224	.26465	.18393	.26863	.18562	50
11	.25264	.17891	.25669	.18059	.26071	.18227	.26472	.18396	.26870	.18565	49
+ 3′	9.25271	.17894	9.25676	.18062	9.26078	.18230	9.26478	.18399	9.26876	.18568	48
13	.25278	.17897	.25682	.18064	.26085	.18233	.26485	.18401	.26883	.18571	47
14	.25284	.17900	.25689	.18067	.26091	.18235	.26492	.18404	.26890	.18574	46
15	.25291	.17902	.25696	.18070	.26098	.18238	.26498	.18407	.26896	.18576	45
+ 4′	9.25298	.17905	9.25703	.18073	9.26105	.18241	9.26505	.18410	9.26903	.18579	44
17	.25305	.17908	.25709	.18076	.26112	.18244	.26512	.18413	.26909	.18582	43
18	.25311	.17911	.25716	.18078	.26118	.18247	.26518	.18415	.26916	.18585	42
19	.25318	.17914	.25723	.18081	.26125	.18249	.26525	.18418	.26923	.18588	41
+ 5′	9.25325	.17916	9.25729	.18084	9.26132	.18252	9.26532	.18421	9.26929	.18591	40
21	.25332	.17919	.25736	.18087	.26138	.18255	.26538	.18424	.26936	.18593	39
22	.25339	.17922	.25743	.18090	.26145	.18258	.26545	.18427	.26942	.18596	38
23	.25345	.17925	.25750	.18092	.26152	.18261	.26551	.18430	.26949	.18599	37
+ 6′	9.25352	.17928	9.25756	.18095	9.26158	.18263	9.26558	.18432	9.26956	.18602	36
25	.25359	.17930	.25763	.18098	.26165	.18266	.26565	.18435	.26962	.18605	35
26	.25366	.17933	.25770	.18101	.26172	.18269	.26571	.18438	.26969	.18608	34
27	.25372	.17936	.25776	.18104	.26178	.18272	.26578	.18441	.26975	.18610	33
+ 7′	9.25379	.17939	9.25783	.18106	9.26185	.18275	9.26585	.18444	9.26982	.18613	32
29	.25386	.17941	.25790	.18109	.26192	.18277	.26591	.18446	.26989	.18616	31
30	.25393	.17944	.25797	.18112	.26198	.18280	.26598	.18449	.26995	.18619	30
31	.25399	.17947	.25803	.18115	.26205	.18283	.26605	.18452	.27002	.18622	29
+ 8′	9.25406	.17950	9.25810	.18118	9.26212	.18286	9.26611	.18455	9.27008	.18624	28
33	.25413	.17953	.25817	.18120	.26218	.18289	.26618	.18458	.27015	.18627	27
34	.25420	.17955	.25823	.18123	.26225	.18292	.26625	.18461	.27022	.18630	26
35	.25426	.17958	.25830	.18126	.26232	.18294	.26631	.18463	.27028	.18633	25
+ 9′	9.25433	.17961	9.25837	.18129	9.26238	.18297	9.26638	.18466	9.27035	.18636	24
37	.25440	.17964	.25844	.18132	.26245	.18300	.26644	.18469	.27041	.18639	23
38	.25447	.17967	.25850	.18134	.26252	.18303	.26651	.18472	.27048	.18641	22
39	.25453	.17969	.25857	.18137	.26259	.18306	.26658	.18475	.27055	.18644	21
+ 10′	9.25460	.17972	9.25864	.18140	9.26265	.18308	9.26664	.18478	9.27061	.18647	20
41	.25467	.17975	.25870	.18143	.26272	.18311	.26671	.18480	.27068	.18650	19
42	.25474	.17978	.25877	.18146	.26279	.18314	.26678	.18483	.27074	.18653	18
43	.25480	.17981	.25884	.18148	.26285	.18317	.26684	.18486	.27081	.18656	17
+ 11′	9.25487	.17983	9.25891	.18151	9.26292	.18320	9.26691	.18489	9.27088	.18658	16
45	.25494	.17986	.25897	.18154	.26299	.18323	.26697	.18492	.27094	.18661	15
46	.25500	.17989	.25904	.18157	.26305	.18325	.26704	.18494	.27101	.18664	14
47	.25507	.17992	.25911	.18160	.26312	.18328	.26711	.18497	.27107	.18667	13
+ 12′	9.25514	.17995	9.25917	.18162	9.26319	.18331	9.26717	.18500	9.27114	.18670	12
49	.25521	.17997	.25924	.18165	.26325	.18334	.26724	.18503	.27121	.18673	11
50	.25528	.18000	.25931	.18168	.26332	.18337	.26731	.18506	.27127	.18675	10
51	.25534	.18003	.25938	.18171	.26339	.18339	.26737	.18509	.27134	.18678	9
+ 13′	9.25541	.18006	9.25944	.18174	9.26345	.18342	9.26744	.18511	9.27140	.18681	8
53	.25548	.18008	.25951	.18176	.26352	.18345	.26751	.18514	.27147	.18684	7
54	.25554	.18011	.25958	.18179	.26359	.18348	.26757	.18517	.27154	.18687	6
55	.25561	.18014	.25964	.18182	.26365	.18351	.26764	.18520	.27160	.18690	5
+ 14′	9.25568	.18017	9.25971	.18185	9.26372	.18353	9.26770	.18523	9.27167	.18692	4
57	.25575	.18020	.25978	.18188	.26378	.18356	.26777	.18526	.27173	.18695	3
58	.25581	.18022	.25984	.18190	.26385	.18359	.26784	.18528	.27180	.18698	2
59	.25588	.18025	.25991	.18193	.26392	.18362	.26790	.18531	.27186	.18701	1
+ 15′	9.25595	.18028	9.25998	.18196	9.26398	.18365	9.26797	.18534	9.27193	.18704	0
	20h 39m		20h 38m		20h 37m		20h 36m		20h 35m		

TABLE 34.

Haversines.

s	3h 25m 51° 15′ Log. Hav.	Nat. Hav.	3h 26m 51° 30′ Log. Hav.	Nat. Hav.	3h 27m 51° 45′ Log. Hav.	Nat. Hav.	3h 28m 52° 0′ Log. Hav.	Nat. Hav.	3h 29m 52° 15′ Log. Hav.	Nat. Hav.	s
0	9.27193	.18704	9.27587	.18874	9.27979	.19045	9.28368	.19217	9.28756	.19389	60
1	.27200	.18707	.27594	.18877	.27985	.19048	.28375	.19220	.28762	.19392	59
2	.27206	.18710	.27600	.18880	.27992	.19051	.28381	.19223	.28769	.19395	58
3	.27213	.18712	.27607	.18883	.27998	.19054	.28388	.19226	.28775	.19398	57
+ 1′	9.27219	.18715	9.27613	.18886	9.28005	.19057	9.28394	.19228	9.28782	.19401	56
5	.27226	.18718	.27620	.18888	.28011	.19060	.28401	.19231	.28788	.19404	55
6	.27233	.18721	.27626	.18891	.28018	.19062	.28407	.19234	.28794	.19406	54
7	.27239	.18724	.27633	.18894	.28024	.19065	.28414	.19237	.28801	.19409	53
+ 2′	9.27246	.18727	9.27639	.18897	9.28031	.19068	9.28420	.19240	9.28807	.19412	52
9	.27252	.18729	.27646	.18900	.28037	.19071	.28427	.19243	.28814	.19415	51
10	.27259	.18732	.27652	.18903	.28044	.19074	.28433	.19246	.28820	.19418	50
11	.27265	.18735	.27659	.18906	.28050	.19077	.28440	.19248	.28827	.19421	49
+ 3′	9.27272	.18738	9.27666	.18908	9.28057	.19080	9.28446	.19251	9.28833	.19424	48
13	.27279	.18741	.27672	.18912	.28063	.19082	.28453	.19254	.28840	.19427	47
14	.27285	.18744	.27679	.18914	.28070	.19085	.28459	.19257	.28846	.19429	46
15	.27292	.18746	.27685	.18917	.28076	.19088	.28465	.19260	.28852	.19432	45
+ 4′	9.27298	.18749	9.27692	.18920	9.28083	.19091	9.28472	.19263	9.28859	.19435	44
17	.27305	.18752	.27698	.18923	.28089	.19094	.28478	.19266	.28865	.19438	43
18	.27311	.18755	.27705	.18926	.28096	.19097	.28485	.19269	.28872	.19441	42
19	.27318	.18758	.27711	.18928	.28102	.19100	.28491	.19271	.28878	.19444	41
+ 5′	9.27325	.18761	9.27718	.18931	9.28109	.19102	9.28498	.19274	9.28885	.19447	40
21	.27331	.18763	.27724	.18934	.28115	.19105	.28504	.19277	.28891	.19450	39
22	.27338	.18766	.27731	.18937	.28122	.19108	.28511	.19280	.28897	.19452	38
23	.27344	.18769	.27737	.18940	.28128	.19111	.28517	.19283	.28904	.19455	37
+ 6′	9.27351	.18772	9.27744	.18943	9.28135	.19114	9.28524	.19286	9.28910	.19458	36
25	.27357	.18775	.27751	.18945	.28141	.19117	.28530	.19289	.28917	.19461	35
26	.27364	.18778	.27757	.18948	.28148	.19120	.28537	.19291	.28923	.19464	34
27	.27371	.18780	.27764	.18951	.28154	.19122	.28543	.19294	.28930	.19467	33
+ 7′	9.27377	.18783	9.27770	.18954	9.28161	.19125	9.28549	.19297	9.28936	.19470	32
29	.27384	.18786	.27777	.18957	.28167	.19128	.28556	.19300	.28942	.19473	31
30	.27390	.18789	.27783	.18960	.28174	.19131	.28562	.19303	.28949	.19475	30
31	.27397	.18792	.27790	.18963	.28180	.19134	.28569	.19306	.28955	.19478	29
+ 8′	9.27403	.18795	9.27796	.18965	9.28187	.19137	9.28575	.19309	9.28962	.19481	28
33	.27410	.18797	.27803	.18968	.28193	.19140	.28582	.19311	.28968	.19484	27
34	.27417	.18800	.27809	.18971	.28200	.19142	.28588	.19314	.28974	.19487	26
35	.27423	.18803	.27816	.18974	.28206	.19145	.28595	.19317	.28981	.19490	25
+ 9′	9.27430	.18806	9.27822	.18977	9.28213	.19148	9.28601	.19320	9.28987	.19493	24
37	.27436	.18809	.27829	.18980	.28219	.19151	.28608	.19323	.28994	.19496	23
38	.27443	.18812	.27835	.18983	.28226	.19154	.28614	.19326	.29000	.19499	22
39	.27449	.18815	.27842	.18985	.28232	.19157	.28620	.19329	.29007	.19501	21
+ 10′	9.27456	.18817	9.27848	.18988	9.28239	.19160	9.28627	.19332	9.29013	.19504	20
41	.27463	.18820	.27855	.18991	.28245	.19163	.28633	.19335	.29019	.19507	19
42	.27469	.18823	.27861	.18994	.28252	.19165	.28640	.19337	.29026	.19510	18
43	.27476	.18826	.27868	.18997	.28258	.19168	.28646	.19340	.29032	.19513	17
+ 11′	9.27482	.18829	9.27875	.19000	9.28265	.19171	9.28653	.19343	9.29039	.19516	16
45	.27489	.18832	.27881	.19002	.28271	.19174	.28659	.19346	.29045	.19519	15
46	.27495	.18834	.27888	.13005	.28278	.19177	.28666	.19349	.29051	.19522	14
47	.27502	.18837	.27894	.19008	.28284	.19180	.28672	.19352	.29058	.19524	13
+ 12′	9.27508	.18840	9.27901	.19011	9.28291	.19183	9.28679	.19355	9.29064	.19527	12
49	.27515	.18843	.27907	.19014	.28297	.19185	.28685	.19358	.29071	.19530	11
50	.27522	.18846	.27914	.19017	.28304	.19188	.28691	.19360	.29078	.19533	10
51	.27528	.18849	.27920	.19020	.28310	.19191	.28698	.19363	.29084	.19536	9
+ 13′	9.27535	.18852	9.27927	.19022	9.28317	.19194	9.28704	.19366	9.29090	.19539	8
53	.27541	.18854	.27933	.19025	.28323	.19197	.28711	.19369	.29096	.19542	7
54	.27548	.18857	.27940	.19028	.28330	.19200	.28717	.19372	.29103	.19545	6
55	.27554	.18860	.27946	.19031	.28336	.19203	.28724	.19375	.29109	.19548	5
+ 14′	9.27561	.18863	9.27953	.19034	9.28342	.19205	9.28730	.19378	9.29116	.19550	4
57	.27567	.18866	.27959	.19037	.28349	.19208	.28737	.19381	.29122	.19553	3
58	.27574	.18869	.27966	.19040	.28355	.19211	.28743	.19383	.29128	.19556	2
59	.27580	.18871	.27972	.19042	.28362	.19214	.28749	.19386	.29135	.19559	1
+ 15′	9.27587	.18874	9.27979	.19045	9.28368	.19217	9.28756	.19389	9.29141	.19562	0
	20h 34m		20h 33m		20h 32m		20h 31m		20h 30m		

TABLE 34.

Haversines.

s	3h 30m 52° 30′ Log. Hav.	Nat. Hav.	3h 31m 52° 45′ Log. Hav.	Nat. Hav.	3h 32m 53° 0′ Log. Hav.	Nat. Hav.	3h 33m 53° 15′ Log. Hav.	Nat. Hav.	3h 34m 53° 30′ Log. Hav.	Nat. Hav.	s
0	9.29141	.19562	9.29524	.19735	9.29906	.19909	9.30285	.20084	9.30662	.20259	60
1	.29148	.19565	.29531	.19738	.29912	.19912	.30291	.20087	.30668	.20262	59
2	.29154	.19568	.29537	.19741	.29918	.19915	.30297	.20090	.30674	.20265	58
3	.29160	.19571	.29543	.19744	.29925	.19918	.30303	.20093	.30680	.20268	57
+ 1′	9.29167	.19573	9.29550	.19747	9.29931	.19921	9.30310	.20095	9.30687	.20271	56
5	.29173	.19576	.29556	.19750	.29937	.19924	.30316	.20098	.30693	.20273	55
6	.29180	.19579	.29563	.19753	.29943	.19927	.30322	.20101	.30699	.20276	54
7	.29186	.19582	.29569	.19756	.29950	.19930	.30329	.20104	.30705	.20279	53
+ 2′	9.29192	.19585	9.29575	.19758	9.29956	.19932	9.30335	.20107	9.30712	.20282	52
9	.29199	.19588	.29582	.19761	.29962	.19935	.30341	.20110	.30718	.20285	51
10	.29205	.19591	.29588	.19764	.29969	.19938	.30348	.20113	.30724	.20288	50
11	.29212	.19594	.29594	.19767	.29975	.19941	.30354	.20116	.30730	.20291	49
+ 3′	9.29218	.19597	9.29601	.19770	9.29981	.19944	9.30360	.20119	9.30737	.20294	48
13	.29224	.19599	.29607	.19773	.29988	.19947	.30366	.20122	.30743	.20297	47
14	.29231	.19602	.29614	.19776	.29994	.19950	.30373	.20125	.30749	.20300	46
15	.29237	.19605	.29620	.19779	.30000	.19953	.30379	.20127	.30755	.20303	45
+ 4′	9.29244	.19608	9.29626	.19782	9.30007	.19956	9.30385	.20130	9.30762	.20306	44
17	.29250	.19611	.29633	.19785	.30013	.19959	.30392	.20133	.30768	.20309	43
18	.29256	.19614	.29639	.19787	.30019	.19962	.30398	.20136	.30774	.20312	42
19	.29263	.19617	.29645	.19790	.30026	.19964	.30404	.20139	.30780	.20314	41
+ 5′	9.29269	.19620	9.29652	.19793	9.30032	.19967	9.30410	.20142	9.30787	.20317	40
21	.29276	.19623	.29658	.19796	.30038	.19970	.30417	.20145	.30793	.20320	39
22	.29282	.19625	.29664	.19799	.30045	.19973	.30423	.20148	.30799	.20323	38
23	.29288	.19628	.29671	.19802	.30051	.19976	.30429	.20151	.30805	.20326	37
+ 6′	9.29295	.19631	9.29677	.19805	9.30057	.19979	9.30436	.20154	9.30812	.20329	36
25	.29301	.19634	.29683	.19808	.30064	.19982	.30442	.20157	.30818	.20332	35
26	.29307	.19637	.29690	.19811	.30070	.19985	.30448	.20160	.30824	.20335	34
27	.29314	.19640	.29696	.19814	.30076	.19988	.30454	.20162	.30830	.20338	33
+ 7′	9.29320	.19643	9.29703	.19816	9.30083	.19991	9.30461	.20165	9.30837	.20341	32
29	.29327	.19646	.29709	.19819	.30089	.19994	.30467	.20168	.30843	.20344	31
30	.29333	.19649	.29715	.19822	.30095	.19996	.30473	.20171	.30849	.20347	30
31	.29339	.19651	.29722	.19825	.30102	.19999	.30480	.20174	.30855	.20350	29
+ 8′	9.29346	.19654	9.29728	.19828	9.30108	.20002	9.30486	.20177	9.30862	.20352	28
33	.29352	.19657	.29734	.19831	.30114	.20005	.30492	.20180	.30868	.20355	27
34	.29359	.19660	.29741	.19834	.30121	.20008	.30498	.20183	.30874	.20358	26
35	.29365	.19663	.29747	.19837	.30127	.20011	.30505	.20186	.30880	.20361	25
+ 9′	9.29371	.19666	9.29753	.19840	9.30133	.20014	9.30511	.20189	9.30887	.20364	24
37	.29378	.19669	.29760	.19842	.30139	.20017	.30517	.20192	.30893	.20367	23
38	.29384	.19672	.29766	.19845	.30146	.20020	.30524	.20195	.30899	.20370	22
39	.29391	.19675	.29772	.19848	.30152	.20023	.30530	.20198	.30905	.20373	21
+ 10′	9.29397	.19677	9.29779	.19851	9.30158	.20026	9.30536	.20200	9.30912	.20376	20
41	.29403	.19680	.29785	.19854	.30165	.20028	.30542	.20203	.30918	.20379	19
42	.29410	.19683	.29791	.19857	.30171	.20031	.30549	.20206	.30924	.20382	18
43	.29416	.19686	.29798	.19860	.30177	.20034	.30555	.20209	.30930	.20385	17
+ 11′	9.29422	.19689	9.29804	.19863	9.30184	.20037	9.30561	.20212	9.30937	.20388	16
45	.29429	.19692	.29810	.19866	.30190	.20040	.30567	.20215	.30943	.20391	15
46	.29435	.19695	.29817	.19869	.30196	.20043	.30574	.20218	.30949	.20393	14
47	.29442	.19698	.29823	.19872	.30203	.20046	.30580	.20221	.30955	.20396	13
+ 12′	9.29448	.19701	9.29829	.19874	9.30209	.20049	9.30586	.20224	9.30962	.20399	12
49	.29454	.19703	.29836	.19877	.30215	.20052	.30593	.20227	.30968	.20402	11
50	.29461	.19706	.29842	.19880	.30222	.20055	.30599	.20230	.30974	.20405	10
51	.29467	.19709	.29848	.19883	.30228	.20058	.30605	.20233	.30980	.20408	9
+ 13′	9.29473	.19712	9.29855	.19886	9.30234	.20060	9.30611	.20235	9.30987	.20411	8
53	.29480	.19715	.29861	.19889	.30240	.20063	.30618	.20238	.30993	.20414	7
54	.29486	.19718	.29867	.19892	.30247	.20066	.30624	.20241	.30999	.20417	6
55	.29493	.19721	.29874	.19895	.30253	.20069	.30630	.20244	.31005	.20420	5
+ 14′	9.29499	.19724	9.29880	.19898	9.30259	.20072	9.30636	.20247	9.31012	.20423	4
57	.29505	.19727	.29886	.19901	.30266	.20075	.30643	.20250	.31018	.20426	3
58	.29512	.19730	.29893	.19903	.30272	.20078	.30649	.20253	.31024	.20429	2
59	.29518	.19732	.29899	.19906	.30278	.20081	.30655	.20256	.31030	.20432	1
+ 15′	9.29524	.19735	9.29906	.19909	9.30285	.20084	9.30662	.20259	9.31036	.20435	0
	20h 29m		20h 28m		20h 27m		20h 26m		20h 25m		

Haversines.

s	3h 35m 53° 45′		3h 36m 54° 0′		3h 37m 54° 15′		3h 38m 54° 30′		3h 39m 54° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.31036	.20435	9.31409	.20611	9.31780	.20788	9.32149	.20965	9.32516	.21143	60
1	.31043	.20437	.31416	.20614	.31786	.20790	.32155	.20968	.32522	.21146	59
2	.31049	.20440	.31422	.20617	.31793	.20793	.32161	.20971	.32528	.21149	58
3	.31055	.20443	.31428	.20620	.31799	.20796	.32168	.20974	.32534	.21152	57
+ 1′	9.31061	.20446	9.31434	.20623	9.31805	.20799	9.32174	.20977	9.32541	.21155	56
5	.31068	.20449	.31440	.20626	.31811	.20802	.32180	.20980	.32547	.21158	55
6	.31074	.20452	.31447	.20629	.31817	.20805	.32186	.20983	.32553	.21161	54
7	.31080	.20455	.31453	.20631	.31823	.20808	.32192	.20986	.32559	.21164	53
+ 2′	9.31086	.20458	9.31459	.20634	9.31830	.20811	9.32198	.20989	9.32565	.21167	52
9	.31093	.20461	.31465	.20637	.31836	.20814	.32204	.20991	.32571	.21169	51
10	.31099	.20464	.31471	.20640	.31842	.20817	.32210	.20994	.32577	.21172	50
11	.31105	.20467	.31478	.20643	.31848	.20820	.32217	.20997	.32583	.21175	49
+ 3′	9.31111	.20470	9.31484	.20646	9.31854	.20823	9.32223	.21000	9.32589	.21178	48
13	.31117	.20473	.31490	.20649	.31860	.20826	.32229	.21003	.32595	.21181	47
14	.31124	.20476	.31496	.20652	.31867	.20829	.32235	.21006	.32601	.21184	46
15	.31130	.20479	.31502	.20655	.31873	.20832	.32241	.21009	.32608	.21187	45
+ 4′	9.31136	.20481	9.31508	.20658	9.31879	.20835	9.32247	.21012	9.32614	.21190	44
17	.31142	.20484	.31515	.20661	.31885	.20838	.32253	.21015	.32620	.21193	43
18	.31149	.20487	.31521	.20664	.31891	.20841	.32259	.21018	.32626	.21196	42
19	.31155	.20490	.31527	.20667	.31897	.20844	.32266	.21021	.32632	.21199	41
+ 5′	9.31161	.20493	9.31533	.20670	9.31903	.20847	9.32272	.21024	9.32638	.21202	40
21	.31167	.20496	.31539	.20673	.31910	.20850	.32278	.21027	.32644	.21205	39
22	.31173	.20499	.31546	.20675	.31916	.20852	.32284	.21030	.32650	.21208	38
23	.31180	.20502	.31552	.20678	.31922	.20855	.32290	.21033	.32656	.21211	37
+ 6′	9.31186	.20505	9.31558	.20681	9.31928	.20858	9.32296	.21036	9.32662	.21214	36
25	.31192	.20508	.31564	.20684	.31934	.20861	.32302	.21039	.32668	.21217	35
26	.31198	.20511	.31570	.20687	.31940	.20864	.32308	.21042	.32675	.21220	34
27	.31205	.20514	.31577	.20690	.31947	.20867	.32315	.21045	.32681	.21223	33
+ 7′	9.31211	.20517	9.31583	.20693	9.31953	.20870	9.32321	.21048	9.32687	.21226	32
29	.31217	.20520	.31589	.20696	.31959	.20873	.32327	.21051	.32693	.21229	31
30	.31223	.20523	.31595	.20699	.31965	.20876	.32333	.21054	.32699	.21232	30
31	.31229	.20525	.31601	.20702	.31971	.20879	.32339	.21057	.32705	.21235	29
+ 8′	9.31236	.20528	9.31607	.20705	9.31977	.20882	9.32345	.21060	9.32711	.21238	28
33	.31242	.20531	.31614	.20708	.31983	.20885	.32351	.21063	.32717	.21241	27
34	.31248	.20534	.31620	.20711	.31990	.20888	.32357	.21066	.32723	.21244	26
35	.31254	.20537	.31626	.20714	.31996	.20891	.32363	.21069	.32729	.21247	25
+ 9′	9.31260	.20540	9.31632	.20717	9.32002	.20894	9.32370	.21072	9.32735	.21250	24
37	.31267	.20543	.31638	.20720	.32008	.20897	.32376	.21074	.32741	.21253	23
38	.31273	.20546	.31644	.20723	.32014	.20900	.32382	.21077	.32748	.21256	22
39	.31279	.20549	.31651	.20726	.32020	.20903	.32388	.21080	.32754	.21259	21
+ 10′	9.31285	.20552	9.31657	.20729	9.32026	.20906	9.32394	.21083	9.32760	.21262	20
41	.31291	.20555	.31663	.20731	.32033	.20909	.32400	.21086	.32766	.21265	19
42	.31298	.20558	.31669	.20734	.32039	.20912	.32406	.21089	.32772	.21268	18
43	.31304	.20561	.31675	.20737	.32045	.20915	.32412	.21092	.32778	.21271	17
+ 11′	9.31310	.20564	9.31682	.20740	9.32051	.20918	9.32418	.21095	9.32784	.21274	16
45	.31316	.20567	.31688	.20743	.32057	.20920	.32425	.21098	.32790	.21277	15
46	.31323	.20570	.31694	.20746	.32063	.20923	.32431	.21101	.32796	.21280	14
47	.31329	.20573	.31700	.20749	.32069	.20926	.32437	.21104	.32802	.21282	13
+ 12′	9.31335	.20575	9.31706	.20752	9.32076	.20929	9.32443	.21107	9.32808	.21285	12
49	.31341	.20578	.31712	.20755	.32082	.20932	.32449	.21110	.32814	.21288	11
50	.31347	.20581	.31719	.20758	.32088	.20935	.32455	.21113	.32820	.21291	10
51	.31354	.20584	.31725	.20761	.32094	.20938	.32461	.21116	.32827	.21294	9
+ 13′	9.31360	.20587	9.31731	.20764	9.32100	.20941	9.32467	.21119	9.32833	.21297	8
53	.31366	.20590	.31737	.20767	.32106	.20944	.32473	.21122	.32839	.21300	7
54	.31372	.20593	.31743	.20770	.32112	.20947	.32480	.21125	.32845	.21303	6
55	.31378	.20596	.31749	.20773	.32119	.20950	.32486	.21128	.32851	.21306	5
+ 14′	9.31385	.20599	9.31756	.20776	9.32125	.20953	9.32492	.21131	9.32857	.21309	4
57	.31391	.20602	.31762	.20779	.32131	.20956	.32498	.21134	.32863	.21312	3
58	.31397	.20605	.31768	.20782	.32137	.20959	.32504	.21137	.32869	.21315	2
59	.31403	.20608	.31774	.20785	.32143	.20962	.32510	.21140	.32875	.21318	1
+ 15′	9.31409	.20611	9.31780	.20788	9.32149	.20965	9.32516	.21143	9.32881	.21321	0
	20h 24m		20h 23m		20h 22m		20h 21m		20h 20m		

TABLE 34.

Haversines.

	3h 40m 55° 0′		3h 41m 55° 15′		3h 42m 55° 30′		3h 43m 55° 45′		3h 44m 56° 0′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.32881	.21321	9.33244	.21500	9.33605	.21680	9.33965	.21860	9.34322	.22040	60
1	.32887	.21324	.33250	.21503	.33611	.21683	.33971	.21863	.34328	.22043	59
2	.32893	.21327	.33256	.21506	.33617	.21686	.33976	.21866	.34334	.22046	58
3	.32899	.21330	.33262	.21509	.33623	.21689	.33982	.21869	.34340	.22049	57
+ 1′	9.32905	.21333	9.33268	.21512	9.33629	.21692	9.33988	.21872	9.34346	.22052	56
5	.32911	.21336	.33274	.21515	.33635	.21695	.33994	.21875	.34352	.22055	55
6	.32918	.21339	.33280	.21518	.33641	.21698	.34000	.21878	.34358	.22058	54
7	.32924	.21342	.33286	.21521	.33647	.21701	.34006	.21881	.34363	.22061	53
+ 2′	9.32930	.21345	9.33292	.21524	9.33653	.21704	9.34012	.21884	9.34369	.22064	52
9	.32936	.21348	.33298	.21527	.33659	.21707	.34018	.21887	.34375	.22067	51
10	.32942	.21351	.33305	.21530	.33665	.21710	.34024	.21890	.34381	.22071	50
11	.32948	.21354	.33311	.21533	.33671	.21713	.34030	.21893	.34387	.22074	49
+ 3′	9.32954	.21357	9.33317	.21536	9.33677	.21716	9.34036	.21896	9.34393	.22077	48
13	.32960	.21360	.33323	.21539	.33683	.21719	.34042	.21899	.34399	.22080	47
14	.32966	.21363	.33329	.21542	.33689	.21722	.34048	.21902	.34405	.22083	46
15	.32972	.21366	.33335	.21545	.33695	.21725	.34054	.21905	.34411	.22086	45
+ 4′	9.32978	.21369	9.33341	.21548	9.33701	.21728	9.34060	.21908	9.34417	.22089	44
17	.32984	.21372	.33347	.21551	.33707	.21731	.34066	.21911	.34423	.22092	43
18	.32990	.21375	.33353	.21554	.33713	.21734	.34072	.21914	.34429	.22095	42
19	.32996	.21378	.33359	.21557	.33719	.21737	.34078	.21917	.34435	.22098	41
+ 5′	9.33002	.21381	9.33365	.21560	9.33725	.21740	9.34084	.21920	9.34441	.22101	40
21	.33008	.21384	.33371	.21563	.33731	.21743	.34090	.21923	.34446	.22104	39
22	.33014	.21387	.33377	.21566	.33737	.21746	.34096	.21926	.34452	.22107	38
23	.33021	.21390	.33383	.21569	.33743	.21749	.34102	.21929	.34458	.22110	37
+ 6′	9.33027	.21393	9.33389	.21572	9.33749	.21752	9.34108	.21932	9.34464	.22113	36
25	.33033	.21396	.33395	.21575	.33755	.21755	.34114	.21935	.34470	.22116	35
26	.33039	.21399	.33401	.21578	.33761	.21758	.34120	.21938	.34476	.22119	34
27	.33045	.21402	.33407	.21581	.33767	.21761	.34126	.21941	.34482	.22122	33
+ 7′	9.33051	.21405	9.33413	.21584	9.33773	.21764	9.34132	.21944	9.34488	.22125	32
29	.33057	.21408	.33419	.21587	.33779	.21767	.34137	.21947	.34494	.22128	31
30	.33063	.21411	.33425	.21590	.33785	.21770	.34143	.21950	.34500	.22131	30
31	.33069	.21414	.33431	.21593	.33791	.21773	.34149	.21953	.34506	.22134	29
+ 8′	9.33075	.21417	9.33437	.21596	9.33797	.21776	9.34155	.21956	9.34512	.22137	28
33	.33081	.21420	.33443	.21599	.33803	.21779	.34161	.21959	.34518	.22140	27
34	.33087	.21423	.33449	.21602	.33809	.21782	.34167	.21962	.34524	.22143	26
35	.33093	.21426	.33455	.21605	.33815	.21785	.34173	.21965	.34529	.22146	25
+ 9′	9.33099	.21429	9.33461	.21608	9.33821	.21788	9 34179	.21968	9.34535	.22149	24
37	.33105	.21431	.33467	.21611	.33827	.21791	.34185	.21971	.34541	.22152	23
38	.33111	.21434	.33473	.21614	.33833	.21794	.34191	.21974	.34547	.22155	22
39	.33117	.21437	.33479	.21617	.33839	.21797	.34197	.21977	.34553	.22158	21
+ 10′	9.33123	.21440	9.33485	.21620	9.33845	.21800	9.34203	.21980	9.34559	.22161	20
41	.33129	.21443	.33491	.21623	.33851	.21803	.34209	.21983	.34565	.22164	19
42	.33135	.21446	.33497	.21626	.33857	.21806	.34215	.21986	.34571	.22167	18
43	.33142	.21449	.33503	.21629	.33863	.21809	.34221	.21989	.34577	.22170	17
+ 11′	9.33148	.21452	9.33509	.21632	9.33869	.21812	9.34227	.21992	9.34583	.22173	16
45	.33154	.21455	.33515	.21635	.33875	.21815	.34233	.21995	.34589	.22176	15
46	.33160	.21458	.33521	.21638	.33881	.21818	.34239	.21998	.34595	.22179	14
47	.33166	.21461	.33527	.21641	.33887	.21821	.34245	.22001	.34600	.22182	13
+ 12′	9.33172	.21464	9.33533	.21644	9.33893	.21824	9.34251	.22004	9.34606	.22185	12
49	.33178	.21467	.33539	.21647	.33899	.21827	.34256	.22007	.34612	.22188	11
50	.33184	.21470	.33545	.21650	.33905	.21830	.34262	.22010	.34618	.22191	10
51	.33190	.21473	.33551	.21653	.33911	.21833	.34268	.22013	.34624	.22194	9
+ 13′	9.33196	.21476	9.33557	.21656	9.33917	.21836	9.34274	.22016	9.34630	.22197	8
53	.33202	.21479	.33563	.21659	.33923	.21839	.34280	.22019	.34636	.22200	7
54	.33208	.21482	.33569	.21662	.33929	.21842	.34286	.22022	.34642	.22203	6
55	.33214	.21485	.33575	.21665	.33935	.21845	.34292	.22025	.34648	.22206	5
+ 14′	9.33220	.21488	9.33581	.21668	9.33941	.21848	9.34298	.22028	9.34654	.22209	4
57	.33226	.21491	.33587	.21671	.33947	.21851	.34304	.22031	.34660	.22212	3
58	.33232	.21494	.33593	.21674	.33953	.21854	34310	.22034	.34666	.22215	2
59	.33238	.21497	.33599	.21677	.33959	.21857	.34316	.22037	.34671	.22218	1
+ 15′	9.33244	.21500	9.33605	.21680	9.33965	.21860	9.34322	.22040	9.34677	.22221	0
	20h 19m		20h 18m		20h 17m		20h 16m		20h 15m		

TABLE 34.

Haversines.

s	3h 45m 56° 15′ Log. Hav.	Nat. Hav.	3h 46m 56° 30′ Log. Hav.	Nat. Hav.	3h 47m 56° 45′ Log. Hav.	Nat. Hav.	3h 48m 57° 0′ Log. Hav.	Nat. Hav.	3h 49m 57° 15′ Log. Hav.	Nat. Hav.	s
0	9.34677	.22221	9.35031	.22403	9.35383	.22585	9.35733	.22768	9.36081	.22951	60
1	.34683	.22225	.35037	.22406	.35389	.22588	.35738	.22771	.36086	.22954	59
2	.34689	.22228	.35043	.22409	.35394	.22591	.35744	.22774	.36092	.22957	58
3	.34695	.22231	.35049	.22412	.35400	.22594	.35750	.22777	.36098	.22960	57
+ 1′	9.34701	.22234	9.35054	.22415	9.35406	.22598	9.35756	.22780	9.36104	.22964	56
5	.34707	.22237	.35060	.22418	.35412	.22601	.35762	.22783	.36110	.22967	55
6	.34713	.22240	.35066	.22421	.35418	.22604	.35767	.22786	.36115	.22970	54
7	.34719	.22243	.35072	.22424	.35424	.22607	.35773	.22789	.36121	.22973	53
+ 2′	9.34725	.22246	9.35078	.22427	9.35429	.22610	9.35779	.22792	9.36127	.22976	52
9	.34730	.22249	.35084	.22430	.35435	.22613	.35785	.22795	.36133	.22979	51
10	.34736	.22252	.35090	.22433	.35441	.22616	.35791	.22799	.36139	.22982	50
11	.34742	.22255	.35096	.22437	.35447	.22619	.35797	.22802	.36144	.22985	49
+ 3′	9.34748	.22258	9.35101	.22440	9.35453	.22622	9.35802	.22805	9.36150	.22988	48
13	.34754	.22261	.35107	.22443	.35459	.22625	.35808	.22808	.36156	.22991	47
14	.34760	.22264	.35113	.22446	.35464	.22628	.35814	.22811	.36162	.22994	46
15	.34766	.22267	.35119	.22449	.35470	.22631	.35820	.22814	.36167	.22997	45
+ 4′	9.34772	.22270	9.35125	.22452	9.35476	.22634	9.35826	.22817	9.36173	.23000	44
17	.34778	.22273	.35131	.22455	.35482	.22637	.35831	.22820	.36179	.23003	43
18	.34784	.22276	.35137	.22458	.35488	.22640	.35837	.22823	.36185	.23006	42
19	.34789	.22279	.35143	.22461	.35494	.22643	.35843	.22826	.36191	.23009	41
+ 5′	9.34795	.22282	9.35148	.22464	9.35500	.22646	9.35849	.22829	9.36196	.23012	40
21	.34801	.22285	.35154	.22467	.35505	.22649	.35855	.22832	.36202	.23016	39
22	.34807	.22288	.35160	.22470	.35511	.22652	.35860	.22835	.36208	.23019	38
23	.34813	.22291	.35166	.22473	.35517	.22655	.35866	.22838	.36214	.23022	37
+ 6′	9.34819	.22294	9.35172	.22476	9.35523	.22658	9.35872	.22841	9.36219	.23025	36
25	.34825	.22297	.35178	.22479	.35529	.22661	.35878	.22844	.36225	.23028	35
26	.34831	.22300	.35184	.22482	.35535	.22664	.35884	.22847	.36231	.23031	34
27	.34837	.22303	.35189	.22485	.35540	.22667	.35889	.22850	.36237	.23034	33
+ 7′	9.34843	.22306	9.35195	.22488	9.35546	.22671	9.35895	.22853	9.36243	.23037	32
29	.34848	.22309	.35201	.22491	.35552	.22674	.35901	.22857	.36248	.23040	31
30	.34854	.22312	.35207	.22494	.35558	.22677	.35907	.22860	.36254	.23043	30
31	.34860	.22315	.35213	.22497	.35564	.22680	.35913	.22863	.36260	.23046	29
+ 8′	9.34866	.22318	9.35219	.22500	9.35570	.22683	9.35918	.22866	9.36266	.23049	28
33	.34872	.22321	.35225	.22503	.35575	.22686	.35924	.22869	.36271	.23052	27
34	.34878	.22324	.35230	.22506	.35581	.22689	.35930	.22872	.36277	.23055	26
35	.34884	.22327	.35236	.22509	.35587	.22692	.35936	.22875	.36283	.23058	25
+ 9′	9.34890	.22330	9.35242	.22512	9.35593	.22695	9.35942	.22878	9.36289	.23061	24
37	.34896	.22333	.35248	.22515	.35599	.22698	.35947	.22881	.36294	.23065	23
38	.34901	.22336	.35254	.22518	.35604	.22701	.35953	.22884	.36300	.23068	22
39	.34907	.22340	.35260	.22522	.35610	.22704	.35959	.22887	.36306	.23071	21
+ 10′	9.34913	.22343	9.35266	.22525	9.35616	.22707	9.35965	.22890	9.36312	.23074	20
41	.34919	.22346	.35271	.22528	.35622	.22710	.35971	.22893	.36318	.23077	19
42	.34925	.22349	.35277	.22531	.35628	.22713	.35976	.22896	.36323	.23080	18
43	.34931	.22352	.35283	.22534	.35634	.22716	.35982	.22899	.36329	.23083	17
+ 11′	9.34937	.22355	9.35289	.22537	9.35639	.22719	9.35988	.22902	9.36335	.23086	16
45	.34943	.22358	.35295	.22540	.35645	.22722	.35994	.22905	.36341	.23089	15
46	.34949	.22361	.35301	.22543	.35651	.22725	.36000	.22908	.36346	.23092	14
47	.34954	.22364	.35307	.22546	.35657	.22728	.36005	.22912	.36352	.23095	13
+ 12′	9.34960	.22367	9.35312	.22549	9.35663	.22731	9.36011	.22915	9.36358	.23098	12
49	.34966	.22370	.35318	.22552	.35669	.22735	.36017	.22918	.36364	.23101	11
50	.34972	.22373	.35324	.22555	.35674	.22738	.36023	.22921	.36369	.23104	10
51	.34978	.22376	.35330	.22558	.35680	.22741	.36029	.22924	.36375	.23107	9
+ 13′	9.34984	.22379	9.35336	.22561	9.35686	.22744	9.36034	.22927	9.36381	.23110	8
53	.34990	.22382	.35342	.22564	.35692	.22747	.36040	.22930	.36387	.23114	7
54	.34996	.22385	.35348	.22567	.35698	.22750	.36046	.22933	.36392	.23117	6
55	.35002	.22388	.35353	.22570	.35703	.22753	.36052	.22936	.36398	.23120	5
+ 14′	9.35007	.22391	9.35359	.22573	9.35709	.22756	9.36058	.22939	9.36404	.23123	4
57	.35013	.22394	.35365	.22576	.35715	.22759	.36063	.22942	.36410	.23126	3
58	.35019	.22397	.35371	.22579	.35721	.22762	.36069	.22945	.36415	.23129	2
59	.35025	.22400	.35377	.22582	.35727	.22765	.36075	.22948	.36421	.23132	1
+ 15′	9.35031	.22403	9.35383	.22585	9.35733	.22768	9.36081	.22951	9.36427	.23135	0
	20h 14m		20h 13m		20h 12m		20h 11m		20h 10m		

TABLE 34.

Haversines.

s	3h 50m 57° 30′		3h 51m 57° 45′		3h 52m 58° 0′		3h 53m 58° 15′		3h 54m 58° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Nav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.36427	.23135	9.36772	.23319	9.37114	.23504	9.37455	.23689	9.37794	.23875	60
1	.36433	.23138	.36777	.23322	.37120	.23507	.37461	.23692	.37800	.23878	59
2	.36439	.23141	.36783	.23325	.37126	.23510	.37467	.23695	.37806	.23881	58
3	.36444	.23144	.36789	.23329	.37131	.23513	.37472	.23699	.37811	.23884	57
+ 1′	9.36450	.23147	9.36794	.23332	9.37137	.23516	9.37478	.23702	9.37817	.23887	56
5	.36456	.23150	.36800	.23335	.37143	.23519	.37484	.23705	.37823	.23891	55
6	.36462	.23153	.36806	.23338	.37148	.23523	.37489	.23708	.37828	.23894	54
7	.36467	.23156	.36812	.23341	.37154	.23526	.37495	.23711	.37834	.23897	53
+ 2′	9.36473	.23160	9.36817	.23344	9.37160	.23529	9.37501	.23714	9.37840	.23960	52
9	.36479	.23163	.36823	.23347	.37166	.23532	.37506	.23717	.37845	.23903	51
10	.36485	.23166	.36829	.23350	.37171	.23535	.37512	.23720	.37851	.23906	50
11	.36490	.23169	.36834	.23353	.37177	.23538	.37518	.23723	.37856	.23909	49
+ 3′	9.36496	.23172	9.36840	.23356	9.37183	.23541	9.37523	.23726	9.37862	.23912	48
13	.36502	.23175	.36846	.23359	.37188	.23544	.37529	.23729	.37868	.23915	47
14	.36508	.23178	.36852	.23362	.37194	.23547	.37535	.23733	.37873	.23918	46
15	.36513	.23181	.36857	.23365	.37200	.23550	.37540	.23736	.37879	.23922	45
+ 4′	9.36519	.23184	9.36863	.23368	9.37205	.23553	9.37546	.23739	9.37885	.23925	44
17	.36525	.23187	.36869	.23372	.37211	.23556	.37552	.23742	.37890	.23928	43
18	.36531	.23190	.36875	.23375	.37217	.23560	.37557	.23745	.37896	.23931	42
19	.36536	.23193	.36880	.23378	.37222	.23563	.37563	.23748	.37902	.23934	41
+ 5′	9.36542	.23196	9.36886	.23381	9.37228	.23566	9.37569	.23751	9.37907	.23937	40
21	.36548	.23199	.36892	.23384	.37234	.23569	.37574	.23754	.37913	.23940	39
22	.36554	.23203	.36897	.23387	.37239	.23572	.37580	.23757	.37918	.23943	38
23	.36559	.23206	.36903	.23390	.37245	.23575	.37585	.23760	.37924	.23946	37
+ 6′	9.36565	.23209	9.36909	.23393	9.37251	.23578	9.37591	.23764	9.37930	.23950	36
25	.36571	.23212	.36915	.23396	.37257	.23581	.37597	.23767	.37935	.23953	35
26	.36577	.23215	.36920	.23399	.37262	.23584	.37602	.23770	.37941	.23956	34
27	.36582	.23218	.36926	.23402	.37268	.23587	.37608	.23773	.37947	.23959	33
+ 7′	9.36588	.23221	9.36932	.23405	9.37274	.23590	9.37614	.23776	9.37952	.23962	32
29	.36594	.23224	.36937	.23409	.37279	.23594	.37619	.23779	.37958	.23965	31
30	.36599	.23227	.36943	.23412	.37285	.23597	.37625	.23782	.37963	.23968	30
31	.36605	.23230	.36949	.23415	.37291	.23600	.37631	.23785	.37969	.23971	29
+ 8′	9.36611	.23233	9.36955	.23418	9.37296	.23603	9.37636	.23788	9.37975	.23974	28
33	.36617	.23236	.36960	.23421	.37302	.23606	.37642	.23791	.37980	.23977	27
34	.36622	.23239	.36966	.23424	.37308	.23609	.37648	.23795	.37986	.23981	26
35	.36628	.23242	.36972	.23427	.37313	.23612	.37653	.23798	.37992	.23984	25
+ 9′	9.36634	.23246	9.36977	.23430	9.37319	.23615	9.37659	.23801	9.37997	.23987	24
37	.36640	.23249	.36983	.23433	.37325	.23618	.37665	.23804	.38003	.23990	23
38	.36645	.23252	.36989	.23436	.37330	.23621	.37670	.23807	.38008	.23993	22
39	.36651	.23255	.36995	.23439	.37336	.23624	.37676	.23810	.38014	.23996	21
+ 10′	9.36657	.23258	9.37000	.23442	9.37342	.23627	9.37682	.23813	9.38020	.23999	20
41	.36663	.23261	.37006	.23445	.37347	.23631	.37687	.23816	.38025	.24002	19
42	.36668	.23264	.37012	.23449	.37353	.23634	.37693	.23819	.38031	.24005	18
43	.36674	.23267	.37017	.23452	.37359	.23637	.37699	.23822	.38037	.24009	17
+ 11′	9.36680	.23270	9.37023	.23455	9.37364	.23640	9.37704	.23825	9.38042	.24012	16
45	.36686	.23273	.37029	.23458	.37370	.23643	.37710	.23829	.38048	.24015	15
46	.36691	.23276	.37034	.23461	.37376	.23646	.37715	.23832	.38053	.24018	14
47	.36697	.23279	.37040	.23464	.37382	.23649	.37721	.23835	.38059	.24021	13
+ 12′	9.36703	.23282	9.37046	.23467	9.37387	.23652	9.37727	.23838	9.38065	.24024	12
49	.36708	.23285	.37052	.23470	.37393	.23655	.37732	.23841	.38070	.24027	11
50	.36714	.23289	.37057	.23473	.37399	.23658	.37738	.23844	.38076	.24030	10
51	.36720	.23292	.37063	.23476	.37404	.23661	.37744	.23847	.38081	.24033	9
+ 13′	9.36726	.23295	9.37069	.23479	9.37410	.23665	9.37749	.23850	9.38087	.24036	8
53	.36731	.23298	.37074	.23482	.37416	.23668	.37755	.23853	.38093	.24040	7
54	.36737	.23301	.37080	.23486	.37421	.23671	.37761	.23856	.38098	.24043	6
55	.36743	.23304	.37086	.23489	.37427	.23674	.37766	.23860	.38104	.24046	5
+ 14′	9.36749	.23307	9.37091	.23492	9.37433	.23677	9.37772	.23863	9.38110	.24049	4
57	.36754	.23310	.37097	.23495	.37438	.23680	.37778	.23866	.38115	.24052	3
58	.36760	.23313	.37103	.23498	.37444	.23683	.37783	.23869	.38121	.24055	2
59	.36766	.23316	.37109	.23501	.37450	.23686	.37789	.23872	.38126	.24058	1
+ 15′	9.36772	.23319	9.37114	.23504	9.37455	.23689	9.37794	.23875	9.38132	.24061	0
	20h 9m		20h 8m		20h 7m		20h 6m		20h 5m		

TABLE 34.

Haversines.

s	3h 55m 58° 45′ Log. Hav.	Nat. Hav.	3h 56m 59° 0′ Log. Hav.	Nat. Hav.	3h 57m 59° 15′ Log. Hav.	Nat. Hav.	3h 58m 59° 30′ Log. Hav.	Nat. Hav.	3h 59m 59° 45′ Log. Hav.	Nat. Hav.	s
0	9.38132	.24061	9.38468	.24248	9.38802	.24435	9.39134	.24623	9.39465	.24811	60
1	.38138	.24064	.38473	.24251	.38807	.24438	.39140	.24626	.39470	.24814	59
2	.38143	.24068	.38479	.24254	.38813	.24442	.39145	.24629	.39476	.24818	58
3	.38149	.24071	.38485	.24257	.38819	.24445	.39151	.24632	.39481	.24821	57
+ 1′	9.38154	.24074	9.38490	.24261	9.38824	.24448	9.39156	.24636	9.39487	.24824	56
5	.38160	.24077	.38496	.24264	.38830	.24451	.39162	.24639	.39492	.24827	55
6	.38166	.24080	.38501	.24267	.38835	.24454	.39167	.24642	.39498	.24830	54
7	.38171	.24083	.38507	.24270	.38841	.24457	.39173	.24645	.39503	.24833	53
+ 2′	9.38177	.24086	9.38512	.24273	9.38846	.24460	9.39178	.24648	9.39509	.24836	52
9	.38182	.24089	.38518	.24276	.38852	.24463	.39184	.24651	.39514	.24840	51
10	.38188	.24092	.38524	.24279	.38857	.24467	.39189	.24654	.39520	.24843	50
11	.38194	.24096	.38529	.24282	.38863	.24470	.39195	.24658	.39525	.24846	49
+ 3′	9.38199	.24099	9.38535	.24286	9.38868	.24473	9.39201	.24661	9.39531	.24849	48
13	.38205	.24102	.38540	.24289	.38874	.24476	.39206	.24664	.39536	.24852	47
14	.38210	.24105	.38546	.24292	.38880	.24479	.39212	.24667	.39542	.24855	46
15	.38216	.24108	.38551	.24295	.38885	.24482	.39217	.24670	.39547	.24858	45
+ 4′	9.38222	.24111	9.38557	.24298	9.38891	.24485	9.39223	.24673	9.39553	.24862	44
17	.38227	.24114	.38563	.24301	.38896	.24488	.39228	.24676	.39558	.24865	43
18	.38233	.24117	.38568	.24304	.38902	.24492	.39234	.24680	.39564	.24868	42
19	.38239	.24120	.38574	.24307	.38907	.24495	.39239	.24683	.39569	.24871	41
+ 5′	9.38244	.24124	9.38579	.24310	9.38913	.24498	9.39245	.24686	9.39575	.24874	40
21	.38250	.24127	.38585	.24314	.38918	.24501	.39250	.24689	.39580	.24877	39
22	.38255	.24130	.38590	.24317	.38924	.24504	.39256	.24692	.39586	.24880	38
23	.38261	.24133	.38596	.24320	.38929	.24507	.39261	.24695	.39591	.24884	37
+ 6′	9.38267	.24136	9.38602	.24323	9.38935	.24510	9.39267	.24698	9.39597	.24887	36
25	.38272	.24139	.38607	.24326	.38941	.24514	.39272	.24701	.39602	.24890	35
26	.38278	.24142	.38613	.24329	.38946	.24517	.39278	.24705	.39608	.24893	34
27	.38283	.24145	.38618	.24332	.38952	.24520	.39283	.24708	.39613	.24896	33
+ 7′	9.38289	.24148	9.38624	.24335	9.38957	.24523	9.39289	.24711	9.39619	.24899	32
29	.38295	.24152	.38629	.24339	.38963	.24526	.39294	.24714	.39624	.24902	31
30	.38300	.24155	.38635	.24342	.38968	.24529	.39300	.24717	.39630	.24906	30
31	.38306	.24158	.38641	.24345	.38974	.24532	.39305	.24720	.39635	.24909	29
+ 8′	9.38311	.24161	9.38646	.24348	9.38979	.24535	9.39311	.24723	9.39641	.24912	28
33	.38317	.24164	.38652	.24351	.38985	.24539	.39316	.24727	.39646	.24915	27
34	.38322	.24167	.38657	.24354	.38990	.24542	.39322	.24730	.39652	.24918	26
35	.38328	.24170	.38663	.24357	.38996	.24545	.39327	.24733	.39657	.24921	25
+ 9′	9.38334	.24173	9.38668	.24360	9.39002	.24548	9.39333	.24736	9.39663	.24924	24
37	.38339	.24176	.38674	.24364	.39007	.24551	.39338	.24739	.39668	.24928	23
38	.38345	.24180	.38680	.24367	.39013	.24554	.39344	.24742	.39674	.24931	22
39	.38350	.24183	.38685	.24370	.39018	.24557	.39349	.24745	.39679	.24934	21
+ 10′	9.38356	.24186	9.38691	.24373	9.39024	.24560	9.39355	.24749	9.39685	.24937	20
41	.38362	.24189	.38696	.24376	.39029	.24564	.39360	.24752	.39690	.24940	19
42	.38367	.24192	.38702	.24379	.39035	.24567	.39366	.24755	.39695	.24943	18
43	.38373	.24195	.38707	.24382	.39040	.24570	.39371	.24758	.39701	.24946	17
+ 11′	9.38378	.24198	9.38713	.24385	9.39046	.24573	9.39377	.24761	9.39706	.24950	16
45	.38384	.24201	.38719	.24388	.39051	.24576	.39382	.24764	.39712	.24953	15
46	.38390	.24204	.38724	.24392	.39057	.24579	.39388	.24767	.39717	.24956	14
47	.38395	.24208	.38730	.24395	.39062	.24582	.39393	.24770	.39723	.24959	13
+ 12′	9.38401	.24211	9.38735	.24398	9.39068	.24586	9.39399	.24774	9.39728	.24962	12
49	.38406	.24214	.38741	.24401	.39073	.24589	.39404	.24777	.39734	.24965	11
50	.38412	.24217	.38746	.24404	.39079	.24592	.39410	.24780	.39739	.24969	10
51	.38418	.24220	.38752	.24407	.39085	.24595	.39415	.24783	.39745	.24972	9
+ 13′	9.38423	.24223	9.38757	.24410	9.39090	.24598	9.39421	.24786	9.39750	.24975	8
53	.38429	.24226	.38763	.24413	.39096	.24601	.39426	.24789	.39756	.24978	7
54	.38434	.24229	.38769	.24417	.39101	.24604	.39432	.24792	.39761	.24981	6
55	.38440	.24233	.38774	.24420	.39107	.24607	.39437	.24796	.39767	.24984	5
+ 14′	9.38445	.24236	9.38780	.24423	9.39112	.24611	9.39443	.24799	9.39772	.24987	4
57	.38451	.24239	.38785	.24426	.39118	.24614	.39448	.24802	.39778	.24991	3
58	.38457	.24242	.38791	.24429	.39123	.24617	.39454	.24805	.39783	.24994	2
59	.38462	.24245	.38796	.24432	.39129	.24620	.39459	.24808	.39789	.24997	1
+ 15′	9.38468	.24248	9.38802	.24435	9.39134	.24623	9.39465	.24811	9.39794	.25000	0
	20h 4m		20h 3m		20h 2m		20h 1m		20h 0m		

TABLE 34.

Haversines.

s	4h 0m 60° 0′		4h 1m 60° 15′		4h 2m 60° 30′		4h 3m 60° 45′		4h 4m 61° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.39794	.25000	9.40121	.25189	9.40447	.25379	9.40771	.25569	9.41094	.25760	60
1	.39799	.25003	.40127	.25192	.40453	.25382	.40777	.25572	.41099	.25763	59
2	.39805	.25006	.40132	.25195	.40458	.25385	.40782	.25575	.41105	.25766	58
3	.39810	.25009	.40138	.25199	.40463	.25388	.40787	.25578	.41110	.25769	57
+ 1′	9.39816	.25013	9.40143	.25202	9.40469	.25391	9.40793	.25582	9.41115	.25772	56
5	.39821	.25016	.40149	.25205	.40474	.25395	.40798	.25585	.41121	.25775	55
6	.39827	.25019	.40154	.25208	.40480	.25398	.40804	.25588	.41126	.25779	54
7	.39832	.25022	.40159	.25211	.40485	.25401	.40809	.25591	.41131	.25782	53
+ 2′	9.39838	.25025	9.40165	.25214	9.40490	.25404	9.40814	.25594	9.41137	.25785	52
9	.39843	.25028	.40170	.25218	.40496	.25407	.40820	.25597	.41142	.25788	51
10	.39849	.25032	.40176	.25221	.40501	.25410	.40825	.25601	.41147	.25791	50
11	.39854	.25035	.40181	.25224	.40507	.25414	.40831	.25604	.41153	.25795	49
+ 3′	9.39860	.25038	9.40187	.25227	9.40512	.25417	9.40836	.25607	9.41158	.25798	48
13	.39865	.25041	.40192	.25230	.40518	.25420	.40841	.25610	.41163	.25801	47
14	.39871	.25044	.40198	.25233	.40523	.25423	.40847	.25613	.41169	.25804	46
15	.39876	.25047	.40203	.25237	.40528	.25426	.40852	.25617	.41174	.25807	45
+ 4′	9.39881	.25050	9.40208	.25240	9.40534	.25429	9.40858	.25620	9.41180	.25810	44
17	.39887	.25054	.40214	.25243	.40539	.25433	.40863	.25623	.41185	.25814	43
18	.39892	.25057	.40219	.25246	.40545	.25436	.40868	.25626	.41190	.25817	42
19	.39898	.25060	.40225	.25249	.40550	.25439	.40874	.25629	.41196	.25820	41
+ 5′	9.39903	.25063	9.40230	.25252	9.40555	.25442	9.40879	.25632	9.41201	.25823	40
21	.39909	.25066	.40236	.25255	.40561	.25445	.40884	.25636	.41206	.25826	39
22	.39914	.25069	.40241	.25259	.40566	.25448	.40890	.25639	.41212	.25830	38
23	.39920	.25072	.40246	.25262	.40572	.25452	.40895	.25642	.41217	.25833	37
+ 6′	9.39925	.25076	9.40252	.25265	9.40577	.25455	9.40900	.25645	9.41222	.25836	36
25	.39931	.25079	.40257	.25268	.40582	.25458	.40906	.25648	.41228	.25839	35
26	.39936	.25082	.40263	.25271	.40588	.25461	.40911	.25651	.41233	.25842	34
27	.39942	.25085	.40268	.25274	.40593	.25464	40917	.25655	.41238	.25845	33
+ 7′	9.39947	.25088	9.40274	.25278	9.40599	.25467	9.40922	.25658	9.41244	.25849	32
29	.39952	.25091	.40279	.25281	.40604	.25471	.40927	.25661	.41249	.25852	31
30	.39958	.25095	.40284	.25284	.40609	.25474	.40933	.25664	.41254	.25855	30
31	.39963	.25098	.40290	.25287	.40615	.25477	.40938	.25667	.41260	.25858	29
+ 8′	9.39969	.25101	9.40295	.25290	9.40620	.25480	9.40943	.25671	9.41265	.25861	28
33	.39974	.25104	.40301	.25293	.40626	.25483	.40949	.25674	.41270	.25865	27
34	.39980	.25107	.40306	.25297	.40631	.25487	.40954	.25677	.41276	.25868	26
35	.39985	.25110	.40312	.25300	.40636	.25490	.40960	.25680	.41281	.25871	25
+ 9′	9.39991	.25113	9.40317	.25303	9.40642	.25493	9.40965	.25683	9.41287	.25874	24
37	.39996	.25117	.40322	.25306	.40647	.25496	.40970	.25686	.41292	.25877	23
38	.40002	.25120	.40328	.25309	.40653	.25499	.40976	.25690	.41297	.25880	22
39	.40007	.25123	.40333	.25312	.40658	.25502	.40981	.25693	.41303	.25884	21
+ 10′	9.40012	.25126	9.40339	.25316	9.40663	.25506	9.40986	.25696	9.41308	.25887	20
41	.40018	.25129	.40344	.25319	.40669	.25509	.40992	.25699	.41313	.25890	19
42	.40023	.25132	.40350	.25322	.40674	.25512	.40997	.25702	.41319	.25893	18
43	.40029	.25136	.40355	.25325	.40680	.25515	.41003	.25705	.41324	.25896	17
+ 11′	9.40034	.25139	9.40360	.25328	9.40685	.25518	9.41008	.25709	9.41329	.25900	16
45	.40040	.25142	.40366	.25331	.40690	.25521	.41013	.25712	.41335	.25903	15
46	.40045	.25145	.40371	.25335	.40696	.25525	.41019	.25715	.41340	.25906	14
47	.40051	.25148	.40377	.25338	.40701	.25528	.41024	.25718	.41345	.25909	13
+ 12′	9.40056	.25151	9.40382	.25341	9.40707	.25531	9.41029	.25721	9.41351	.25912	12
49	.40062	.25154	.40388	.25344	.40712	.25534	.41035	.25724	.41356	.25915	11
50	.40067	.25158	.40393	.25347	.40717	.25537	.41040	.25728	.41361	.25919	10
51	.40072	.25161	.40398	.25350	.40723	.25540	.41046	.25731	.41367	.25922	9
+ 13′	9.40078	.25164	9.40404	.25354	9.40728	.25544	9.41051	.25734	9.41372	.25925	8
53	.40083	.25167	.40409	.25357	.40734	.25547	.41056	.25737	.41377	.25928	7
54	.40089	.25170	.40415	.25360	.40739	.25550	.41062	.25740	.41383	.25931	6
55	.40094	.25173	.40420	.25363	.40744	.25553	.41067	.25744	.41388	.25935	5
+ 14′	9.40100	.25177	9.40425	.25366	9.40750	.25556	9.41072	.25747	9.41393	.25938	4
57	.40105	.25180	.40431	.25369	.40755	.25559	.41078	.25750	.41399	.25941	3
58	.40111	.25183	.40436	.25372	.40761	.25563	.41083	.25753	.41404	.25944	2
59	.40116	.25186	.40442	.25376	.40766	.25566	.41088	.25756	.41409	.25947	1
+ 15′	9.40121	.25189	9.40447	.25379	9.40771	.25569	9.41094	.25760	9.41415	.25951	0
	19h 59m		19h 58m		19h 57m		19h 56m		19h 55m		

Haversines.

s	4h 5m 61° 15′		4h 6m 61° 30′		4h 7m 61° 45′		4h 8m 62° 0′		4h 9m 62° 15′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.41415	.25951	9.41734	.26142	9.42052	.26334	9.42368	.26526	9.42682	.26719	60
1	.41420	.25954	.41739	.26145	.42057	.26337	.42373	.26530	.42688	.26722	59
2	.41425	.25957	.41745	.26148	.42062	.26340	.42378	.26533	.42693	.26726	58
3	.41431	.25960	.41750	.26152	.42068	.26344	.42384	.26536	.42698	.26729	57
+ 1′	9.41436	.25963	9.41755	.26155	9.42073	.26347	9.42389	.26539	9.42703	.26732	56
5	.41441	.25966	.41761	.26158	.42078	.26350	.42394	.26543	.42709	.26735	55
6	.41447	.25970	.41766	.26161	.42083	.26353	.42399	.26546	.42714	.26739	54
7	.41452	.25973	.41771	.26164	.42089	.26356	.42405	.26549	.42719	.26742	53
+ 2′	9.41457	.25976	9.41776	.26168	9.42094	.26360	9.42410	.26552	9.42724	.26745	52
9	.41463	.25979	.41782	.26171	.42099	.26363	.42415	.26555	.42730	.26748	51
10	.41468	.25982	.41787	.26174	.42105	.26366	.42420	.26559	.42735	.26751	50
11	.41473	.25986	.41792	.26177	.42110	.26369	.42426	.26562	.42740	.26755	49
+ 3′	9.41479	.25989	9.41798	.26180	9.42115	.26372	9.42431	.26565	9.42745	.26758	48
13	.41484	.25992	.41803	.26184	.42120	.26376	.42436	.26568	.42750	.26761	47
14	.41489	.25995	.41808	.26187	.42126	.26379	.42441	.26571	.42756	.26764	46
15	.41495	.25998	.41814	.26190	.42131	.26382	.42447	.26575	.42761	.26768	45
+ 4′	9.41500	.26002	9.41819	.26193	9.42136	.26385	9.42452	.26578	9.42766	.26771	44
17	.41505	.26005	.41824	.26196	.42141	.26389	.42457	.26581	.42771	.26774	43
18	.41511	.26008	.41829	.26200	.42147	.26392	.42462	.26584	.42777	.26777	42
19	.41516	.26011	.41835	.26203	.42152	.26395	.42468	.26587	.42782	.26780	41
+ 5′	9.41521	.26014	9.41840	.26206	9.42157	.26398	9.42473	.26591	9.42787	.26784	40
21	.41527	.26017	.41845	.26209	.42163	.26402	.42478	.26594	.42792	.26787	39
22	.41532	.26021	.41851	.26212	.42168	.26405	.42483	.26597	.42797	.26790	38
23	.41537	.26024	.41856	.26216	.42173	.26408	.42489	.26600	.42803	.26793	37
+ 6′	9.41543	.26027	9.41861	.26219	9.42178	.26411	9.42494	.26604	9.42808	.26797	36
25	.41548	.26030	.41867	.26222	.42184	.26414	.42499	.26607	.42813	.26800	35
26	.41553	.26033	.41872	.26225	.42189	.26417	.42504	.26610	.42818	.26803	34
27	.41559	.26037	.41877	.26228	.42194	.26421	.42510	.26613	.42824	.26806	33
+ 7′	9.41564	.26040	9.41882	.26232	9.42199	.26424	9.42515	.26616	9.42829	.26809	32
29	.41569	.26043	.41888	.26235	.42205	.26427	.42520	.26620	.42834	.26813	31
30	.41575	.26046	.41893	.26238	.42210	.26430	.42525	.26623	.42839	.26816	30
31	.41580	.26049	.41898	.26241	.42215	.26433	.42531	.26626	.42844	.26819	29
+ 8′	9.41585	.26053	9.41904	.26244	9.42221	.26437	9.42536	.26629	9.42850	.26822	28
33	.41590	.26056	.41909	.26248	.42226	.26440	.42541	.26632	.42855	.26826	27
34	.41596	.26059	.41914	.26251	.42231	.26443	.42546	.26636	.42860	.26829	26
35	.41601	.26062	.41920	.26254	.42236	.26446	.42552	.26639	.42865	.26832	25
+ 9′	9.41606	.26065	9.41925	.26257	9.42242	.26449	9.42557	.26642	9.42870	.26835	24
37	.41612	.26069	.41930	.26260	.42247	26453	.42562	.26645	.42876	.26838	23
38	.41617	.26072	.41935	.26264	.42252	.26456	.42567	.26649	.42881	.26842	22
39	.41622	.26075	.41941	.26267	.42257	.26459	.42573	.26652	.42886	.26845	21
+ 10′	9.41628	.26078	9.41946	.26270	9.42263	.26462	9.42578	.26655	9.42891	.26848	20
41	.41633	.26081	.41951	.26273	.42268	.26465	.42583	.26658	.42897	.26851	19
42	41638	.26085	.41957	.26276	.42273	.26469	.42588	.26661	.42902	.26855	18
43	.41644	.26088	.41962	.26280	.42278	.26472	.42593	.26665	.42907	.26858	17
+ 11′	9.41649	.26091	9.41967	.26283	9.42284	.26475	9.42599	.26668	9.42912	.26861	16
45	.41654	.26094	.41972	.26286	.42289	.26478	.42604	.26671	.42917	.26864	15
46	.41660	.26097	.41978	.26289	.42294	.26481	.42609	.26674	.42923	.26867	14
47	.41665	.26101	.41983	.26292	.42300	.26485	.42614	.26677	.42928	.26871	13
+ 12′	9.41670	.26104	9.41988	.26296	9.42305	.26488	9.42620	.26681	9.42933	.26874	12
49	.41676	.26107	.41994	.26299	.42310	.26491	.42625	.26684	.42938	.26877	11
50	.41681	.26110	.41999	.26302	.42315	.26494	.42630	.26687	.42943	.26880	10
51	.41686	.26113	.42004	.26305	.42321	.26498	.42635	.26690	.42949	.26883	9
+ 13′	9.41692	.26117	9.42009	.26308	9.42326	.26501	9.42641	.26694	9.42954	.26887	8
53	.41697	.26120	.42015	.26312	.42331	.26504	.42646	.26697	.42959	.26890	7
54	.41702	.26123	.42020	.26315	.42336	.26507	.42651	.26700	.42964	.26893	6
55	.41707	.26126	.42025	.26318	.42342	.26510	.42656	.26703	.42969	.26896	5
+ 14′	9.41713	.26129	9.42031	.26321	9.42347	.26514	9.42662	.26706	9.42975	.26900	4
57	.41718	.26132	.42036	.26324	.42352	.26517	.42667	.26710	.42980	.26903	3
58	.41723	.26136	.42041	.26328	.42357	.26520	.42672	.26713	.42985	.26906	2
59	.41729	.26139	.42046	.26331	.42363	.26523	.42677	.26716	.42990	.26909	1
+ 15′	9.41734	.26142	9.42052	.26334	9.42368	.26526	9.42682	.26719	9.42996	.26913	0
	19h 54m		19h 53m		19h 52m		19h 51m		19h 50m		

TABLE 34.

Haversines.

s	4h 10m 62° 30′		4h 11m 62° 45′		4h 12m 63° 0′		4h 13m 63° 15′		4h 14m 63° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.42996	.26913	9.43307	.27106	9.43617	.27300	9.43926	.27495	9.44232	.27690	60
1	.43001	.26916	.43312	.27110	.43622	.27304	.43931	.27498	.44238	.27693	59
2	.43006	.26919	.43317	.27113	.43627	.27307	.43936	.27502	.44243	.27697	58
3	.43011	.26922	.43323	.27116	.43632	.27310	.43941	.27505	.44248	.27700	57
+ 1′	9.43016	.26925	9.43328	.27119	9.43638	.27313	9.43946	.27508	9.44253	.27703	56
5	.43022	.26929	.43333	.27122	.43643	.27317	.43951	.27511	.44258	.27706	55
6	.43027	.26932	.43338	.27126	.43648	.27320	.43956	.27515	.44263	.27710	54
7	.43032	.26935	.43343	.27129	.43653	.27323	.43961	.27518	.44268	.27713	53
+ 2′	9.43037	.26938	9.43348	.27132	9.43658	.27326	9.43967	.27521	9.44273	.27716	52
9	.43042	.26942	.43354	.27135	.43663	.27330	.43972	.27524	.44278	.27719	51
10	.43048	.26945	.43359	.27139	.43669	.27333	.43977	.27528	.44283	.27723	50
11	.43053	.26948	.43364	.27142	.43674	.27336	.43982	.27531	.44289	.27726	49
+ 3′	9.43058	.26951	9.43369	.27145	9.43679	.27339	9.43987	.27534	9.44294	.27729	48
13	.43063	.26955	.43374	.27148	.43684	.27343	.43992	.27537	.44299	.27732	47
14	.43068	.26958	.43380	.27152	.43689	.27346	.43997	.27541	.44304	.27736	46
15	.43074	.26961	.43385	.27155	.43694	.27349	.44002	.27544	.44309	.27739	45
+ 4′	9.43079	.26964	9.43390	.27158	9.43699	.27352	9.44008	.27547	9.44314	.27742	44
17	.43084	.26967	.43395	.27161	.43705	.27356	.44013	.27550	.44319	.27745	43
18	.43089	.26971	.43400	.27165	.43710	.27359	.44018	.27554	.44324	.27749	42
19	.43094	.26974	.43405	.27168	.43715	.27362	.44023	.27557	.44329	.27752	41
+ 5′	9.43100	.26977	9.43411	.27171	9.43720	.27365	9.44028	.27560	9.44334	.27755	40
21	.43105	.26980	.43416	.27174	.43725	.27369	.44033	.27563	.44340	.27758	39
22	.43110	.26984	.43421	.27177	.43730	.27372	.44038	.27567	.44345	.27762	38
23	.43115	.26987	.43426	.27181	.43735	.27375	.44043	.27570	.44350	.27765	37
+ 6′	9.43120	.26990	9.43431	.27184	9.43741	.27378	9.44048	.27573	9.44355	.27768	36
25	.43126	.26993	.43436	.27187	.43746	.27382	.44054	.27576	.44360	.27772	35
26	.43131	.26996	.43442	.27190	.43751	.27385	.44059	.27580	.44365	.27775	34
27	.43136	.27000	.43447	.27194	.43756	.27388	.44064	.27583	.44370	.27778	33
+ 7′	9.43141	.27003	9.43452	.27197	9.43761	.27391	9.44069	.27586	9.44375	.27781	32
29	.43146	.27006	.43457	.27200	.43766	.27394	.44074	.27589	.44380	.27785	31
30	.43151	.27009	.43462	.27203	.43771	.27398	.44079	.27593	.44385	.27788	30
31	43157	.27013	.43467	.27207	.43777	.27401	.44084	.27596	.44390	.27791	29
+ 8′	9.43162	.27016	9.43473	.27210	9.43782	.27404	9.44089	.27599	9.44396	.27794	28
33	.43167	.27019	.43478	.27213	.43787	.27407	.44095	.27602	.44401	.27798	27
34	.43172	.27022	.43483	.27216	.43792	.27411	.44100	.27606	.44406	.27801	26
35	.43177	.27025	.43488	.27220	.43797	.27414	.44105	.27609	.44411	.27804	25
+ 9′	9.43183	.27029	9.43493	.27223	9.43802	.27417	9.44110	.27612	9.44416	.27807	24
37	.43188	.27032	.43498	.27226	.43807	.27420	.44115	.27615	.44421	.27811	23
38	.43193	.27035	.43504	.27229	.43813	.27424	.44120	.27619	.44426	.27814	22
39	.43198	.27038	.43509	.27232	.43818	.27427	.44125	.27622	.44431	.27817	21
+ 10′	9.43203	.27042	9.43514	.27236	9.43823	.27430	9.44130	.27625	9.44436	.27820	20
41	.43209	.27045	.43519	.27239	.43828	.27433	.44135	.27628	.44441	.27824	19
42	.43214	.27048	.43524	.27242	.43833	.27437	.44141	.27632	.44446	.27827	18
43	.43219	.27051	.43529	.27245	.43838	.27440	.44146	.27635	.44452	.27830	17
+ 11′	9.43224	.27055	9.43535	.27249	9.43843	.27443	9.44151	.27638	9.44457	.27833	16
45	.43229	.27058	.43540	.27252	.43849	.27446	.44156	.27641	.44462	.27837	15
46	.43234	.27061	.43545	.27255	.43854	.27450	.44161	.27645	.44467	.27840	14
47	.43240	.27064	.43550	.27258	.43859	.27453	.44166	.27648	.44472	.27843	13
+ 12′	9.43245	.27068	9.43555	.27262	9.43864	.27456	9.44171	.27651	9.44477	.27846	12
49	.43250	.27071	.43560	.27265	.43869	.27459	44176	.27654	.44482	.27850	11
50	.43255	.27074	.43565	.27268	.43874	.27463	.44181	.27658	.44487	.27853	10
51	.43260	.27077	.43571	.27271	.43879	.27466	.44187	.27661	.44492	.27856	9
+ 13′	9.43266	.27080	9.43576	.27275	9.43884	.27469	9.44192	.27664	9.44497	.27859	8
53	.43271	.27084	.43581	.27278	.43890	.27472	.44197	.27667	.44502	.27863	7
54	.43276	.27087	.43586	.27281	.43895	.27476	.44202	.27671	.44507	.27866	6
55	.43281	.27090	.43591	.27284	.43900	.27479	.44207	.27674	.44513	.27869	5
+ 14′	9.43286	.27093	9.43596	.27288	9.43905	.27482	9.44212	.27677	9.44518	.27873	4
57	.43291	.27097	.43602	.27291	.43910	.27485	.44217	.27680	.44523	.27876	3
58	.43297	.27100	.43607	.27294	.43915	.27489	.44222	.27684	.44528	.27879	2
59	.43302	.27103	.43612	.27297	.43920	.27492	.44227	.27687	.44533	.27882	1
+ 15′	9.43307	.27106	9.43617	.27300	9.43926	.27495	9.44232	.27690	9.44538	.27886	0
	19h 49m		19h 48m		19h 47m		19h 46m		19h 45m		

TABLE 34.

Haversines.

s	4h 15m 63° 45′		4h 16m 64° 0′		4h 17m 64° 15′		4h 18m 64° 30′		4h 19m 64° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.44538	.27886	9.44842	.28081	9.45144	.28278	9.45446	.28474	9.45745	.28672	60
1	.44543	.27889	.44847	.28085	.45149	.28281	.45451	.28478	.45750	.28675	59
2	.44548	.27892	.44852	.28088	.45155	.28284	.45456	.28481	.45755	.28678	58
3	.44553	.27895	.44857	.28091	.45160	.28288	.45461	.28484	.45760	.28681	57
+ 1′	9.44558	.27899	9.44862	.28095	9.45165	.28291	9.45466	.28488	9.45765	.28685	56
5	.44563	.27902	.44867	.28098	.45170	.28294	.45471	.28491	.45770	.28688	55
6	.44568	.27905	.44872	.28101	.45175	.28297	.45476	.28494	.45775	.28691	54
7	.44573	.27908	.44877	.28104	.45180	.28301	.45481	.28497	.45780	.28695	53
+ 2′	9.44579	.27912	9.44882	.28108	9.45185	.28304	9.45486	.28501	9.45785	.28698	52
9	.44584	.27915	.44887	.28111	.45190	.28307	.45491	.28504	.45790	.28701	51
10	.44589	.27918	.44892	.28114	.45195	.28310	.45496	.28507	.45795	.28704	50
11	.44594	.27921	.44898	.28117	.45200	.28314	.45501	.28511	.45800	.28708	49
+ 3′	9.44599	.27925	9.44903	.28121	9.45205	.28317	9.45506	.28514	9.45805	.28711	48
13	.44604	.27928	.44908	.28124	.45210	.28320	.45511	.28517	.45810	.28714	47
14	.44609	.27931	.44913	.28127	.45215	.28324	.45516	.28520	.45815	.28718	46
15	.44614	.27935	.44918	.28130	.45220	.28327	.45521	.28524	.45820	.28721	45
+ 4′	9.44619	.27938	9.44923	.28134	9.45225	.28330	9.45526	.28527	9.45825	.28724	44
17	.44624	.27941	.44928	.28137	.45230	.28333	.45531	.28530	.45830	.28727	43
18	.44629	.27944	.44933	.28140	.45235	.28337	.45536	.28534	.45835	.28731	42
19	.44634	.27948	.44938	.28144	.45240	.28340	.45541	.28537	.45840	.28734	41
+ 5′	9.44639	.27951	9.44943	.28147	9.45245	.28343	9.45546	.28540	9.45845	.28737	40
21	.44645	.27954	.44948	.28150	.45250	.28347	.45551	.28543	.45850	.28741	39
22	.44650	.27957	.44953	.28153	.45255	.28350	.45556	.28547	.45855	.28744	38
23	.44655	.27961	.44958	.28157	.45260	.28353	.45561	.28550	.45860	.28747	37
+ 6′	9.44660	.27964	9.44963	.28160	9.45265	.28356	9.45566	.28553	9.45865	.28751	36
25	.44665	.27967	.44968	.28163	.45270	.28360	.45571	.28557	.45870	.28754	35
26	.44670	.27970	.44973	.28166	.45275	.28363	.45576	.28560	.45875	.28757	34
27	.44675	.27974	.44978	.28170	.45280	.28366	.45581	.28563	.45879	.28760	33
+ 7′	9.44680	.27977	9.44983	.28173	9.45285	.28369	9.45586	.28566	9.45884	.28764	32
29	.44685	.27980	.44988	.28176	.45290	.28373	.45591	.28570	.45889	.28767	31
30	.44690	.27983	.44993	.28180	.45295	.28376	.45596	.28573	.45894	.28770	30
31	.44695	.27987	.44998	.28183	.45300	.28379	.45601	.28576	.45899	.28774	29
+ 8′	9.44700	.27990	9.45003	.28186	9.45305	.28383	9.45606	.28580	9.45904	.28777	28
33	.44705	.27993	.45009	.28189	.45310	.28386	.45610	.28583	.45909	.28780	27
34	.44710	.27997	.45014	.28193	.45315	.28389	.45615	.28586	.45914	.28783	26
35	.44715	.28000	.45019	.28196	.45320	.28392	.45620	.28589	.45919	.28787	25
+ 9′	9.44721	.28003	9.45024	.28199	9.45325	.28396	9.45625	.28593	9.45924	.28790	24
37	.44726	.28006	.45029	.28202	.45330	.28399	.45630	.28596	.45929	.28793	23
38	.44731	.28010	.45034	.28206	.45335	.28402	.45635	.28599	.45934	.28797	22
39	.44736	.28013	.45039	.28209	.45340	.28406	.45640	.28603	.45939	.28800	21
+ 10′	9.44741	.28016	9.45044	.28212	9.45345	.28409	9.45645	.28606	9.45944	.28803	20
41	.44746	.28019	.45049	.28216	.45350	.28412	.45650	.28609	.45949	.28807	19
42	.44751	.28023	.45054	.28219	.45355	.28415	.45655	.28612	.45954	.28810	18
43	.44756	.28026	.45059	.28222	.45360	.28419	.45660	.28616	.45959	.28813	17
+ 11′	9.44761	.28029	9.45064	.28225	9.45365	.28422	9.45665	.28619	9.45964	.28816	16
45	.44766	.28032	.45069	.28229	.45370	.28425	.45670	.28622	.45969	.28820	15
46	.44771	.28036	.45074	.28232	.45375	.28429	.45675	.28626	.45974	.28823	14
47	.44776	.28039	.45079	.28235	.45380	.28432	.45680	.28629	.45979	.28826	13
+ 12′	9.44781	.28042	9.45084	.28238	9.45385	.28435	9.45685	.28632	9.45984	.28830	12
49	.44786	.28046	.45089	.28242	.45390	.28438	.45690	.28635	.45989	.28833	11
50	.44791	.28049	.45094	.28245	.45395	.28442	.45695	.28639	.45994	.28836	10
51	.44796	.28052	.45099	.28248	.45400	.28445	.45700	.28642	.45999	.28839	9
+ 13′	9.44801	.28055	9.45104	.28252	9.45405	.28448	9.45705	.28645	9.46004	.28843	8
53	.44807	.28059	.45109	.28255	.45410	.28451	.45710	.28649	.46009	.28846	7
54	.44812	.28062	.45114	.28258	.45415	.28455	.45715	.28652	.46014	.28849	6
55	.44817	.28065	.45119	.28261	.45420	.28458	.45720	.28655	.46019	.28853	5
+ 14′	9.44822	.28068	9.45124	.28265	9.45426	.28461	9.45725	.28658	9.46023	.28856	4
57	.44827	.28072	.45129	.28268	.45431	.28465	.45730	.28662	.46028	.28859	3
58	.44832	.28075	.45134	.28271	.45436	.28468	.45735	.28665	.46033	.28863	2
59	.44837	.28078	.45139	.28274	.45441	.28471	.45740	.28668	.46038	.28866	1
+ 15′	9.44842	.28081	9.45144	.28278	9.45446	.28474	9.45745	.28672	9.46043	.28869	0
	19h 44m		19h 43m		19h 42m		19h 41m		19h 40m		

TABLE 34.

Haversines.

s	4h 20m 65° 0′		4h 21m 65° 15′		4h 22m 65° 30′		4h 23m 65° 45′		4h 24m 66° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.46043	.28869	9.46340	.29067	9.46635	.29265	9.46929	.29464	9.47222	.29663	60
1	.46048	.28872	.46345	.29070	.46640	.29269	.46934	.29467	.47227	.29666	59
2	.46053	.28876	.46350	.29074	.46645	.29272	.46939	.29471	.47231	.29670	58
3	.46058	.28879	.46355	.29077	.46650	.29275	.46944	.29474	.47236	.29673	57
+ 1′	9.46063	.28882	9.46360	.29080	9.46655	.29279	9.46949	.29477	9.47241	.29676	56
5	.46068	.28886	.46365	.29084	.46660	.29282	.46954	.29481	.47246	.29680	55
6	.46073	.28889	.46370	.29087	.46665	.29285	.46959	.29484	.47251	.29683	54
7	.46078	.28892	.46375	.29090	.46670	.29289	.46963	.29487	.47256	.29686	53
+ 2′	9.46083	.28895	9.46380	.29093	9.46675	.29292	9.46968	.29491	9.47261	.29690	52
9	.46088	.28899	.46384	.29097	.46680	.29295	.46973	.29494	.47266	.29693	51
10	.46093	.28902	.46389	.29100	.46684	.29298	.46978	.29497	.47270	.29696	50
11	.46098	.28905	.46394	.29103	.46689	.29302	.46983	.29501	.47275	.29700	49
+ 3′	9.46103	.28909	9.46399	.29107	9.46694	.29305	9.46988	.29504	9.47280	.29703	48
13	.46108	.28912	.46404	.29110	.46699	.29308	.46993	.29507	.47285	.29706	47
14	.46113	.28915	.46409	.29113	.46704	.29312	.46998	.29510	.47290	.29710	46
15	.46118	.28918	.46414	.29117	.46709	.29315	.47003	.29514	.47295	.29713	45
+ 4′	9.46123	.28922	9.46419	.29120	9.46714	.29318	9.47007	.29517	9.47300	.29716	44
17	.46128	.28925	.46424	.29123	.46719	.29322	.47012	.29520	.47304	.29720	43
18	.46132	.28928	.46429	.29126	.46724	.29325	.47017	.29524	.47309	.29723	42
19	.46137	.28932	.46434	.29130	.46729	.29328	.47022	.29527	.47314	.29726	41
+ 5′	9.46142	.28935	9.46439	.29133	9.46733	.29332	9.47027	.29530	9.47319	.29730	40
21	.46147	.28938	.46444	.29136	.46738	.29335	.47032	.29534	.47324	.29733	39
22	.46152	.28942	.46448	.29140	.46743	.29338	.47037	.29537	.47329	.29736	38
23	.46157	.28945	.46453	.29143	.46748	.29341	.47042	.29540	.47334	.29740	37
+ 6′	9.46162	.28948	9.46458	.29146	9.46753	.29345	9.47046	.29544	9.47338	.29743	36
25	.46167	.28952	.46463	.29150	.46758	.29348	.47051	.29547	.47343	.29746	35
26	.46172	.28955	.46468	.29153	.46763	.29351	.47056	.29550	.47348	.29750	34
27	.46177	.28958	.46473	.29156	.46768	.29355	.47061	.29554	.47353	.29753	33
+ 7′	9.46182	.28961	9.46478	.29160	9.46773	.29358	9.47066	.29557	9.47358	.29756	32
29	.46187	.28965	.46483	.29163	.46778	.29361	.47071	.29560	.47363	.29760	31
30	.46192	.28968	.46488	.29166	.46782	.29365	.47076	.29564	.47367	.29763	30
31	.46197	.28971	.46493	.29169	.46787	.29368	.47081	.29567	.47372	.29766	29
+ 8′	9.46202	.28975	9.46498	.29173	9.46792	.29371	9.47085	.29570	9.47377	.29770	28
33	.46207	.28978	.46503	.29176	.46797	.29375	.47090	.29573	.47382	.29773	27
34	.46212	.28981	.46508	.29179	.46802	.29378	.47095	.29577	.47387	.29776	26
35	.46217	.28985	.46512	.29183	.46807	.29381	.47100	.29580	.47392	.29779	25
+ 9′	9.46222	.28988	9.46517	.29186	9.46812	.29385	9.47105	.29583	9.47397	.29783	24
37	.46226	.28991	.46522	.29189	.46817	.29388	.47110	.29587	.47401	.29786	23
38	.46231	.28994	.46527	.29193	.46822	.29391	.47115	.29590	.47406	.29789	22
39	.46236	.28998	.46532	.29196	.46827	.29394	.47120	.29593	.47411	.29793	21
+ 10′	9.46241	.29001	9.46537	.29199	9.46831	.29398	9.47124	.29597	9.47416	.29796	20
41	.46246	.29004	.46542	.29202	.46836	.29401	.47129	.29600	.47421	.29799	19
42	.46251	.29008	.46547	.29206	.46841	.29404	.47134	.29603	.47426	.29803	18
43	.46256	.29011	.46552	.29209	.46846	.29408	.47139	.29607	.47431	.29806	17
+ 11′	9.46261	.29014	9.46557	.29212	9.46851	.29411	9.47144	.29610	9.47435	.29809	16
45	.46266	.29017	.46562	.29216	.46856	.29414	.47149	.29613	.47440	.29813	15
46	.46271	.29021	.46567	.29219	.46861	.29418	.47154	.29617	.47445	.29816	14
47	.46276	.29024	.46571	.29222	.46866	.29421	.47159	.29620	.47450	.29819	13
+ 12′	9.46281	.29027	9.46576	.29226	9.46871	.29424	9.47163	.29623	9.47455	.29823	12
49	.46286	.29031	.46581	.29229	.46875	.29428	.47168	.29627	.47460	.29826	11
50	.46291	.29034	.46586	.29232	.46880	.29431	.47173	.29630	.47464	.29829	10
51	.46296	.29037	.46591	.29236	.46885	.29434	.47178	.29633	.47469	.29833	9
+ 13′	9.46301	.29041	9.46596	.29239	9.46890	.29438	9.47183	.29637	9.47474	.29836	8
53	46305	.29044	.46601	.29242	.46895	.29441	.47188	.29640	.47479	.29839	7
54	.46310	.29047	.46606	.29245	.46900	.29444	.47193	.29643	.47484	.29843	6
55	.46315	.29051	.46611	.29249	.46905	.29447	.47197	.29647	.47489	.29846	5
+ 14′	9.46320	.29054	9.46616	.29252	9.46910	.29451	9.47202	.29650	9.47493	.29849	4
57	.46325	.29057	.46621	.29255	.46915	.29454	.47207	.29653	.47498	.29853	3
58	.46330	.29060	.46626	.29259	.46919	.29457	.47212	.29657	.47503	.29856	2
59	.46335	.29064	.46630	.29262	.46924	.29461	.47217	.29660	.47508	.29859	1
+ 15′	9.46340	.29067	9.46635	.29265	9.46929	.29464	9.47222	.29663	9.47513	.29863	0
	19h 39m		19h 38m		19h 37m		19h 36m		19h 35m		

Haversines.

s	4h 25m 66° 15′		4h 26m 66° 30′		4h 27m 66° 45′		4h 28m 67° 0′		4h 29m 67° 15′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.47513	.29863	9.47803	.30063	9.48091	.30263	9.48378	.30463	9.48664	.30664	60
1	.47518	.29866	.47807	.30066	.48096	.30266	.48383	.30467	.48668	.30668	59
2	.47523	.29869	.47812	.30069	.48101	.30269	.48387	.30470	.48673	.30671	58
3	.47527	.29873	.47817	.30073	.48105	.30273	.48392	.30473	.48678	.30675	57
+ 1′	9.47532	.29876	9.47822	.30076	9.48110	.30276	9.48397	.30477	9.48683	.30678	56
5	.47537	.29879	.47827	.30079	.48115	.30280	.48402	.30480	.48687	.30681	55
6	.47542	.29883	.47831	.30083	.48120	.30283	.48407	.30484	.48692	.30685	54
7	.47547	.29886	.47836	.30086	.48124	.30286	.48411	.30487	.48697	.30688	53
+ 2′	9.47552	.29889	9.47841	.30089	9.48129	.30290	9.48416	.30490	9.48702	.30691	52
9	.47556	.29893	.47846	.30093	.48134	.30293	.48421	.30494	.48706	.30695	51
10	.47561	.29896	.47851	.30096	.48139	.30296	.48426	.30497	.48711	.30698	50
11	.47566	.29899	.47856	.30099	.48144	.30300	.48430	.30500	.48716	.30701	49
+ 3′	9.47571	.29903	9.47860	.30103	9.48148	.30303	9.48435	.30504	9.48720	.30705	48
13	.47576	.29906	.47865	.30106	.48153	.30306	.48440	.30507	.48725	.30708	47
14	.47581	.29909	.47870	.30109	.48158	.30310	.48445	.30510	.48730	.30711	46
15	.47585	.29913	.47875	.30113	.48163	.30313	.48449	.30514	.48735	.30715	45
+ 4′	9.47590	.29916	9.47880	.30116	9.48168	.30316	9.48454	.30517	9.48739	.30718	44
17	.47595	.29919	.47884	.30119	.48172	.30320	.48459	.30520	.48744	.30721	43
18	.47600	.29923	.47889	.30123	.48177	.30323	.48464	.30524	.48749	.30725	42
19	.47605	.29926	.47894	.30126	.48182	.30326	.48468	.30527	.48754	.30728	41
+ 5′	9.47610	.29929	9.47899	.30129	9.48187	.30330	9.48473	.30530	9.48758	.30732	40
21	.47614	.29933	.47904	.30133	.48192	.30333	.48478	.30534	.48763	.30735	39
22	.47619	.29936	.47908	.30136	.48196	.30336	.48483	.30537	.48768	.30738	38
23	.47624	.29939	.47913	.30139	.48201	.30340	.48488	.30540	.48773	.30742	37
+ 6′	9.47629	.29943	9.47918	.30143	9.48206	.30343	9.48492	.30544	9.48777	.30745	36
25	.47634	.29946	.47923	.30146	.48211	.30346	.48497	.30547	.48782	.30748	35
26	.47639	.29949	.47928	.30149	.48215	.30350	.48502	.30551	.48787	.30752	34
27	.47643	.29953	.47933	.30153	.48220	.30353	.48507	.30554	.48792	.30755	33
+ 7′	9.47648	.29956	9.47937	.30156	9.48225	.30356	9.48511	.30557	9.48796	.30758	32
29	.47653	.29959	.47942	.30159	.48230	.30360	.48516	.30561	.48801	.30762	31
30	.47658	.29963	.47947	.30163	.48235	.30363	.48521	.30564	.48806	.30765	30
31	.47663	.29966	.47952	.30166	.48239	.30366	.48526	.30567	.48811	.30768	29
+ 8′	9.47668	.29969	9.47957	.30169	9.48244	.30370	9.48530	.30571	9.48815	.30772	28
33	.47672	.29973	.47961	.30173	.48249	.30373	.48535	.30574	.48820	.30775	27
34	.47677	.29976	.47966	.30176	.48254	.30376	.48540	.30577	.48825	.30779	26
35	.47682	.29979	.47971	.30179	.48258	.30380	.48545	.30581	.48830	.30782	25
+ 9′	9.47687	.29983	9.47976	.30183	9.48263	.30383	9.48549	.30584	9.48834	.30785	24
37	.47692	.29986	.47981	.30186	.48268	.30386	.48554	.30587	.48839	.30789	23
38	.47697	.29989	.47985	.30189	.48273	.30390	.48559	.30591	.48844	.30792	22
39	.47701	.29993	.47990	.30193	.48278	.30393	.48564	.30594	.48848	.30795	21
+ 10′	9.47706	.29996	9.47995	.30196	9.48282	.30397	9.48568	.30597	9.48853	.30799	20
41	.47711	.29999	.48000	.30199	.48287	.30400	.48573	.30601	.48858	.30802	19
42	.47716	.30003	.48005	.30203	.48292	.30403	.48578	.30604	.48863	.30805	18
43	.47721	.30006	.48009	.30206	.48297	.30407	.48583	.30607	.48867	.30809	17
+ 11′	9.47725	.30009	9.48014	.30209	9.48302	.30410	9.48587	.30611	9.48872	.30812	16
45	.47730	.30013	.48019	.30213	.48306	.30413	.48592	.30614	.48877	.30815	15
46	.47735	.30016	.48024	.30216	.48311	.30417	.48597	.30618	.48882	.30819	14
47	.47740	.30019	.48029	.30219	.48316	.30420	.48602	.30621	.48886	.30822	13
+ 12′	9.47745	.30023	9.48033	.30223	9.48321	.30423	9.48607	.30624	9.48891	.30826	12
49	.47750	.30026	.48038	.30226	.48325	.30427	.48611	.30628	.48896	.30829	11
50	.47754	.30029	.48043	.30229	.48330	.30430	.48616	.30631	.48901	.30832	10
51	.47759	.30033	.48048	.30233	.48335	.30433	.48621	.30634	.48905	.30836	9
+ 13′	9.47764	.30036	9.48053	.30236	9.48340	.30437	9.48626	.30638	9.48910	.30839	8
53	.47769	.30039	.48057	.30239	.48344	.30440	.48630	.30641	.48915	.30842	7
54	.47774	.30043	.48062	.30243	.48349	.30443	.48635	.30644	.48919	.30846	6
55	.47778	.30046	.48067	.30246	.48354	.30447	.48640	.30648	.48924	.30849	5
+ 14′	9.47783	.30049	9.48072	.30249	9.48359	.30450	9.48645	.30651	9.48929	.30852	4
57	.47788	.30053	.48077	.30253	.48364	.30453	.48649	.30655	.48934	.30856	3
58	.47793	.30056	.48081	.30256	.48368	.30457	.48654	.30658	.48938	.30859	2
59	.47798	.30059	.48086	.30259	.48373	.30460	.48659	.30661	.48943	.30862	1
+ 15′	9.47803	.30063	9.48091	.30263	9.48378	.30463	9.48664	.30664	9.48948	.30866	0
	19h 34m		19h 33m		19h 32m		19h 31m		19h 30m		

TABLE 34.

Haversines.

s	4h 30m 67° 30′		4h 31m 67° 45′		4h 32m 68° 0′		4h 33m 68° 15′		4h 34m 68° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.48948	.30866	9.49231	.31068	9.49512	.31270	9.49793	.31472	9.50072	.31675	60
1	.48953	.30869	.49235	.31071	.49517	.31273	.49797	.31475	.50076	.31678	59
2	.48957	.30873	.49240	.31074	.49522	.31276	.49802	.31479	.50081	.31682	58
3	.48962	.30876	.49245	.31078	.49526	.31280	.49807	.31482	.50085	.31685	57
+ 1′	9.48967	.30879	9.49250	.31081	9.49531	.31283	9.49811	.31486	9.50090	.31688	56
5	.48971	.30883	.49254	.31084	.49536	.31287	.49816	.31489	.50095	.31692	55
6	.48976	.30886	.49259	.31088	.49540	.31290	.49821	.31492	.50099	.31695	54
7	.48981	.30889	.49264	.31091	.49545	.31293	.49825	.31496	.50104	.31699	53
+ 2′	9.48986	.30893	9.49268	.31095	9.49550	.31297	9.49830	.31499	9.50109	.31702	52
9	.48990	.30896	.49273	.31098	.49554	.31300	.49835	.31503	.50113	.31705	51
10	.48995	.30899	.49278	.31101	.49559	.31303	.49839	.31506	.50118	.31709	50
11	.49000	.30903	.49282	.31105	.49564	.31307	.49844	.31509	.50123	.31712	49
+ 3′	9.49004	.30906	9.49287	.31108	9.49568	.31310	9.49849	.31513	9.50127	.31716	48
13	.49009	.30910	.49292	.31111	.49573	.31314	.49853	.31516	.50132	.31719	47
14	.49014	.30913	.49297	.31115	.49578	.31317	.49858	.31519	.50136	.31722	46
15	.49019	.30916	.49301	.31118	.49583	.31320	.49862	.31523	.50141	.31726	45
+ 4′	9.49023	.30920	9.49306	.31121	9.49587	.31324	9.49867	.31526	9.50146	.31729	44
17	.49028	.30923	.49311	.31125	.49592	.31327	.49872	.31530	.50150	.31732	43
18	.49033	.30926	.49315	.31128	.49597	.31330	.49876	.31533	.50155	.31736	42
19	.49038	.30930	.49320	.31132	.49601	.31334	.49881	.31536	.50160	.31739	41
+ 5′	9.49042	.30933	9.49325	.31135	9.49606	.31337	9.49886	.31540	9.50164	.31742	40
21	.49047	.30936	.49329	.31138	.49611	.31341	.49890	.31543	.50169	.31746	39
22	.49052	.30940	.49334	.31142	.49615	.31344	.49895	.31546	.50174	.31749	38
23	.49056	.30943	.49339	.31145	.49620	.31347	.49900	.31550	.50178	.31753	37
+ 6′	9.49061	.30946	9.49344	.31148	9.49625	.31351	9.49904	.31553	9.50183	.31756	36
25	.49066	.30950	.49348	.31152	.49629	.31354	.49909	.31557	.50187	.31760	35
26	.49071	.30953	.49353	.31155	.49634	.31357	.49914	.31560	.50192	.31763	34
27	.49075	.30957	.49358	.31158	.49639	.31361	.49918	.31563	.50197	.31766	33
+ 7′	9.49080	.30960	9.49362	.31162	9.49643	.31364	9.49923	.31567	9.50201	.31770	32
29	.49085	.30963	.49367	.31165	.49648	.31367	.49928	.31570	.50206	.31773	31
30	.49089	.30967	.49372	.31169	.49653	.31371	.49932	.31573	.50211	.31776	30
31	.49094	.30970	.49376	.31172	.49657	.31374	.49937	.31577	.50215	.31780	29
+ 8′	9.49099	.30973	9.49381	.31175	9.49662	.31378	9.49942	.31580	9.50220	.31783	28
33	.49104	.30977	.49386	.31179	.49667	.31381	.49946	.31584	.50224	.31787	27
34	.49108	.30980	.49390	.31182	.49671	.31384	.49951	.31587	.50229	.31790	26
35	.49113	.30983	.49395	.31185	.49676	.31388	.49956	.31590	.50234	.31793	25
+ 9′	9.49118	.30987	9.49400	.31189	9.49681	.31391	9.49960	.31594	9.50238	.31797	24
37	.49122	.30990	.49405	.31192	.49685	.31394	.49965	.31597	.50243	.31800	23
38	.49127	.30994	.49409	.31196	.49690	.31398	.49969	.31601	.50248	.31804	22
39	.49132	.30997	.49414	.31199	.49695	.31401	.49974	.31604	.50252	.31807	21
+ 10′	9.49137	.31000	9.49419	.31202	9.49699	.31405	9.49979	.31607	9.50257	.31810	20
41	.49141	.31004	.49423	.31206	.49704	.31408	.49983	.31611	.50261	.31814	19
42	.49146	.31007	.49428	.31209	.49709	.31411	.49988	.31614	.50266	.31817	18
43	.49151	.31010	.49433	.31212	.49713	.31415	.49993	.31617	.50271	.31820	17
+ 11′	9.49155	.31014	9.49437	.31216	9.49718	.31418	9.49997	.31621	9.50275	.31824	16
45	.49160	.31017	.49442	.31219	.49723	.31421	.50002	.31624	.50280	.31827	15
46	.49165	.31020	.49447	.31222	.49727	.31425	.50007	.31628	.50284	.31831	14
47	.49170	.31024	.49451	.31226	.49732	.31428	.50011	.31631	.50289	.31834	13
+ 12′	9.49174	.31027	9.49456	.31229	9.49737	.31432	9.50016	.31634	9.50294	.31837	12
49	.49179	.31031	.49461	.31233	.49741	.31435	.50021	.31638	.50298	.31841	11
50	.49184	.31034	.49465	.31236	.49746	.31438	.50025	.31641	.50303	.31844	10
51	.49188	.31037	.49470	.31239	.49751	.31442	.50030	.31644	.50308	.31848	9
+ 13′	9.49193	.31041	9.49475	.31243	9.49755	.31445	9.50034	.31648	9.50312	.31851	8
53	.49198	.31044	.49480	.31246	.49760	.31448	.50039	.31651	.50317	.31854	7
54	.49202	.31047	.49484	.31249	.49765	.31452	.50044	.31655	.50322	.31858	6
55	.49207	.31051	.49489	.31253	.49769	.31455	.50048	.31658	.50326	.31861	5
+ 14′	9.49212	.31054	9.49494	.31256	9.49774	.31459	9.50053	.31661	9.50331	.31865	4
57	.49217	.31057	.49498	.31260	.49779	.31462	.50058	.31665	.50335	.31868	3
58	.49221	.31061	.49503	.31263	.49783	.31465	.50062	.31668	.50340	.31871	2
59	.49226	.31064	.49508	.31266	.49788	.31469	.50067	.31672	.50345	.31875	1
+ 15′	9.49231	.31068	9.49512	.31270	9.49793	.31472	9.50072	.31675	9.50349	.31878	0
	19h 29m		19h 28m		19h 27m		19h 26m		19h 25m		

Haversines.

s	4h 35m 68° 45′		4h 36m 69° 0′		4h 37m 69° 15′		4h 38m 69° 30′		4h 39m 69° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.50349	.31878	9.50626	.32082	9.50901	.32285	9.51174	.32490	9.51447	.32694	60
1	.50354	.31881	.50630	.32085	.50905	.32289	.51179	.32493	.51452	.32698	59
2	.50358	.31885	.50635	.32088	.50910	.32292	.51184	.32496	.51456	.32701	58
3	.50363	.31888	.50639	.32092	.50914	.32296	.51188	.32500	.51461	.32704	57
+ 1′	9.50368	.31892	9.50644	.32095	9.50919	.32299	9.51193	.32503	9.51465	.32708	56
5	.50372	.31895	.50649	.32099	.50924	.32302	.51197	.32507	.51470	.32711	55
6	.50377	.31898	.50653	.32102	.50928	.32306	.51202	.32510	.51474	.32715	54
7	.50382	.31902	.50658	.32105	.50933	.32309	.51206	.32513	.51479	.32718	53
+ 2′	9.50386	.31905	9.50662	.32109	9.50937	.32313	9.51211	.32517	9.51483	.32721	52
9	.50391	.31909	.50667	.32112	.50942	.32316	.51215	.32520	.51488	.32725	51
10	.50395	.31912	.50672	.32116	.50946	.32319	.51220	.32524	.51492	.32728	50
11	.50400	.31915	.50676	.32119	.50951	.32323	.51225	.32527	.51497	.32732	49
+ 3′	9.50405	.31919	9.50681	.32122	9.50956	.32326	9.51229	.32531	9.51501	.32735	48
13	.50409	.31922	.50685	.32126	.50960	.32330	.51234	.32534	.51506	.32738	47
14	.50414	.31926	.50690	.32129	.50965	.32333	.51238	.32537	.51510	.32742	46
15	.50418	.31929	.50694	.32133	.50969	.32336	.51243	.32541	.51515	.32745	45
+ 4′	9.50423	.31932	9.50699	.32136	9.50974	.32340	9.51247	.32544	9.51519	.32749	44
17	.50428	.31936	.50704	.32139	.50978	.32343	.51252	.32547	.51524	.32752	43
18	.50432	.31939	.50708	.32143	.50983	.32347	.51256	.32551	.51529	.32756	42
19	.50437	.31942	.50713	.32146	.50988	.32350	.51261	.32554	.51533	.32759	41
+ 5′	9.50442	.31946	9.50717	.32150	9.50992	.32353	9.51265	.32558	9.51538	.32762	40
21	.50446	.31949	.50722	.32153	.50997	.32357	.51270	.32561	.51542	.32766	39
22	.50451	.31953	.50727	.32156	.51001	.32360	.51275	.32565	.51547	.32769	38
23	.50455	.31956	.50731	.32160	.51006	.32364	.51279	.32568	.51551	.32773	37
+ 6′	9.50460	.31959	9.50736	.32163	9.51010	.32367	9.51284	.32571	9.51556	.32776	36
25	.50465	.31963	.50740	.32166	.51015	.32370	.51288	.32575	.51560	.32779	35
26	.50469	.31966	.50745	.32170	.51019	.32374	.51293	.32578	.51565	.32783	34
27	.50474	.31970	.50750	.32173	.51024	.32377	.51297	.32582	.51569	.32786	33
+ 7′	9.50478	.31973	9.50754	.32177	9.51029	.32381	9.51302	.32585	9.51574	.32790	32
29	.50483	.31976	.50759	.32180	.51033	.32384	.51306	.32588	.51578	.32793	31
30	.50488	.31980	.50763	.32183	.51038	.32388	.51311	.32592	.51583	.32797	30
31	.50492	.31983	.50768	.32187	.51042	.32391	.51315	.32595	.51587	.32800	29
+ 8′	9.50497	.31987	9.50772	.32190	9.51047	.32394	9.51320	.32599	9.51592	.32803	28
33	.50501	.31990	.50777	.32194	.51051	.32398	.51325	.32602	.51596	.32807	27
34	.50506	.31993	.50782	.32197	.51056	.32401	.51329	.32605	.51601	.32810	26
35	.50511	.31997	.50786	.32200	.51061	.32405	.51334	.32609	.51605	.32814	25
+ 9′	9.50515	.32000	9.50791	.32204	9.51065	.32408	9.51338	.32612	9.51610	.32817	24
37	.50520	.32004	.50795	.32207	.51070	.32411	.51343	.32616	.51614	.32820	23
38	.50524	.32007	.50800	.32211	.51074	.32415	.51347	.32619	.51619	.32824	22
39	.50529	.32010	.50805	.32214	.51079	.32418	.51352	.32623	.51623	.32827	21
+ 10′	9.50534	.32014	9.50809	.32217	9.51083	.32422	9.51356	.32626	9.51628	.32831	20
41	.50538	.32017	.50814	.32221	.51088	.32425	.51361	.32629	.51633	.32834	19
42	.50543	.32021	.50818	.32224	.51092	.32428	.51365	.32633	.51637	.32838	18
43	.50547	.32024	.50823	.32228	.51097	.32432	.51370	.32636	.51642	.32841	17
+ 11′	9.50552	.32027	9.50827	.32231	9.51102	.32435	9.51374	.32640	9.51646	.32844	16
45	.50557	.32031	.50832	.32235	.51106	.32438	.51379	.32643	.51651	.32848	15
46	.50561	.32034	.50837	.32238	.51111	.32442	.51384	.32646	.51655	.32851	14
47	.50566	.32037	.50841	.32241	.51115	.32445	.51388	.32650	.51660	.32855	13
+ 12′	9.50570	.32041	9.50846	.32245	9.51120	.32449	9.51393	.32653	9.51664	.32858	12
49	.50575	.32044	.50850	.32248	.51124	.32452	.51397	.32657	.51669	.32861	11
50	.50580	.32048	.50855	.32251	.51129	.32456	.51402	.32660	.51673	.32865	10
51	.50584	.32051	.50860	.32255	.51133	.32459	.51406	.32663	.51678	.32868	9
+ 13′	9.50589	.32054	9.50864	.32258	9.51138	.32462	9.51411	.32667	9.51682	.32872	8
53	.50593	.32058	.50869	.32262	.51143	.32466	.51415	.32670	.51687	.32875	7
54	.50598	.32061	.50873	.32265	.51147	.32469	.51420	.32674	.51691	.32878	6
55	.50603	.32065	.50878	.32268	.51152	.32473	.51424	.32677	.51696	.32882	5
+ 14′	9.50607	.32068	9.50882	.32272	9.51156	.32476	9.51429	.32681	9.51700	.32885	4
57	.50612	.32071	.50887	.32275	.51161	.32479	.51433	.32684	.51705	.32889	3
58	.50616	.32075	.50892	.32279	.51165	.32483	.51438	.32687	.51709	.32892	2
59	.50621	.32078	.50896	.32282	.51170	.32486	.51442	.32691	.51714	.32896	1
+ 15′	9.50626	.32082	9.50901	.32285	9.51174	.32490	9.51447	.32694	9.51718	.32899	0
	19h 24m		19h 23m		19h 22m		19h 21m		19h 20m		

TABLE 34.

Haversines.

s	4h 40m 70° 0′		4h 41m 70° 15′		4h 42m 70° 30′		4h 43m 70° 45′		4h 44m 71° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.51718	.32899	9.51988	.33104	9.52257	.33310	9.52525	.33515	9.52791	.33722	60
1	.51723	.32902	.51993	.33108	.52261	.33313	.52529	.33519	.52795	.33725	59
2	.51727	.32906	.51997	.33111	.52266	.33317	.52533	.33522	.52800	.33728	58
3	.51732	.32909	.52002	.33114	.52270	.33320	.52538	.33526	.52804	.33732	57
+ 1′	9.51736	.32913	9.52006	.33118	9.52275	.33323	9.52542	.33529	9.52809	.33735	56
5	.51741	.32916	.52011	.33121	.52279	.33327	.52547	.33533	.52813	.33739	55
6	.51745	.32920	.52015	.33125	.52284	.33330	.52551	.33536	.52817	.33742	54
7	.51750	.32923	.52020	.33128	.52288	.33334	.52556	.33540	.52822	.33746	53
+ 2′	9.51754	.32926	9.52024	.33132	9.52293	.33337	9.52560	.33543	9.52826	.33749	52
9	.51759	.32930	.52029	.33135	.52297	.33341	.52565	.33546	.52831	.33753	51
10	.51763	.32933	.52033	.33138	.52302	.33344	.52569	.33550	.52835	.33756	50
11	.51768	.32937	.52038	.33142	.52306	.33347	.52573	.33553	.52839	.33759	49
+ 3′	9.51772	.32940	9.52042	.33145	9.52311	.33351	9.52578	.33557	9.52844	.33763	48
13	.51777	.32943	.52047	.33149	.52315	.33354	.52582	.33560	.52848	.33766	47
14	.51781	.32947	.52051	.33152	.52320	.33358	.52587	.33564	.52853	.33770	46
15	.51786	.32950	.52056	.33156	.52324	.33361	.52591	.33567	.52857	.33773	45
+ 4′	9.51790	.32954	9.52060	.33159	9.52328	.33365	9.52596	.33570	9.52862	.33777	44
17	.51795	.32957	.52065	.33162	.52333	.33368	.52600	.33574	.52866	.33780	43
18	.51799	.32961	.52069	.33166	.52337	.33371	.52605	.33577	.52870	.33783	42
19	.51804	.32964	.52074	.33169	.52342	.33375	.52609	.33581	.52875	.33787	41
+ 5′	9.51808	.32967	9.52078	.33173	9.52346	.33378	9.52613	.33584	9.52879	.33790	40
21	.51813	.32971	.52082	.33176	.52351	.33382	.52618	.33588	.52884	.33794	39
22	.51817	.32974	.52087	.33179	.52355	.33385	.52622	.33591	.52888	.33797	38
23	.51822	.32978	.52091	.33183	.52360	.33389	.52627	.33594	.52893	.33801	37
+ 6′	9.51826	.32981	9.52096	.33186	9.52364	.33392	9.52631	.33598	9.52897	.33804	36
25	.51831	.32984	.52100	.33190	.52369	.33395	.52636	.33601	.52901	.33808	35
26	.51835	.32988	.52105	.33193	.52373	.33399	.52640	.33605	.52906	.33811	34
27	.51840	.32991	.52109	.33197	.52378	.33402	.52645	.33608	.52910	.33814	33
+ 7′	9.51844	.32995	9.52114	.33200	9.52382	.33406	9.52649	.33612	9.52915	.33818	32
29	.51849	.32998	.52118	.33203	.52386	.33409	.52653	.33615	.52919	.33821	31
30	.51853	.33002	.52123	.33207	.52391	.33413	.52658	.33618	.52923	.33825	30
31	.51858	.33005	.52127	.33210	.52395	.33416	.52662	.33622	.52928	.33828	29
+ 8′	9.51862	.33008	9.52132	.33214	9.52400	.33419	9.52667	.33625	9.52932	.33832	28
33	.51867	.33012	.52136	.33217	.52404	.33423	.52671	.33629	.52937	.33835	27
34	.51871	.33015	.52141	.33221	.52409	.33426	.52676	.33632	.52941	.33839	26
35	.51876	.33019	.52145	.33224	.52413	.33430	.52680	.33636	.52946	.33842	25
+ 9′	9.51880	.33022	9.52150	.33227	9.52418	.33433	9.52684	.33639	9.52950	.33845	24
37	.51885	.33025	.52154	.33231	.52422	.33436	.52689	.33642	.52954	.33849	23
38	.51889	.33029	.52159	.33234	.52427	.33440	.52693	.33646	.52959	.33852	22
39	.51894	.33032	.52163	.33238	.52431	.33444	.52698	.33649	.52963	.33856	21
+ 10′	9.51898	.33036	9.52168	.33241	9.52436	.33447	9.52702	.33653	9.52968	.33859	20
41	.51903	.33039	.52172	.33245	.52440	.33450	.52707	.33656	.52972	.33863	19
42	.51907	.33043	.52177	.33248	.52444	.33454	.52711	.33660	.52976	.33866	18
43	.51912	.33046	.52181	.33251	.52449	.33457	.52715	.33663	.52981	.33869	17
+ 11′	9.51916	.33049	9.52185	.33255	9.52453	.33461	9.52720	.33667	9.52985	.33873	16
45	.51921	.33053	.52190	.33258	.52458	.33464	.52724	.33670	.52990	.33876	15
46	.51925	.33056	.52194	.33262	.52462	.33467	.52729	.33673	.52994	.33880	14
47	.51930	.33060	.52199	.33265	.52467	.33471	.52733	.33677	.52999	.33883	13
+ 12′	9.51934	.33063	9.52203	.33269	9.52471	.33474	9.52738	.33680	9.53003	.33887	12
49	.51939	.33067	.52208	.33272	.52476	.33478	.52742	.33684	.53007	.33890	11
50	.51943	.33070	.52212	.33275	.52480	.33481	.52747	.33687	.53012	.33894	10
51	.51948	.33073	.52217	.33279	.52484	.33485	.52751	.33691	.53016	.33897	9
+ 13′	9.51952	.33077	9.52221	.33282	9.52489	.33488	9.52755	.33694	9.53021	.33900	8
53	.51957	.33080	.52226	.33286	.52493	.33491	.52760	.33698	.53025	.33904	7
54	.51961	.33084	.52230	.33289	.52498	.33495	.52764	.33701	.53029	.33907	6
55	.51966	.33087	.52235	.33293	.52502	.33498	.52769	.33704	.53034	.33911	5
+ 14′	9.51970	.33090	9.52239	.33296	9.52507	.33502	9.52773	.33708	9.53038	.33914	4
57	.51975	.33094	.52244	.33299	.52511	.33505	.52778	.33711	.53043	.33918	3
58	.51979	.33097	.52248	.33303	.52516	.33509	.52782	.33715	.53047	.33921	2
59	.51984	.33101	.52253	.33306	.52520	.33512	.52786	.33718	.53051	.33925	1
+ 15′	9.51988	.33104	9.52257	.33310	9.52525	.33515	9.52791	.33722	9.53056	.33928	0
	19h 19m		19h 18m		19h 17m		19h 16m		19h 15m		

Haversines.

	4h 45m 71° 15′		4h 46m 71° 30′		4h 47m 71° 45′		4h 48m 72° 0′		4h 49m 72° 15′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.53056	.33928	9.53320	.34135	9.53582	.34342	9.53844	.34549	9.54104	.34757	60
1	.53060	.33931	.53324	.34138	.53587	.34345	.53848	.34553	.54108	.34760	59
2	.53065	.33935	.53328	.34142	.53591	.34349	.53852	.34556	.54113	.34764	58
3	.53069	.33938	.53333	.34145	.53595	.34352	.53857	.34560	.54117	.34767	57
+ 1′	9.53073	.33942	9.53337	.34149	9.53600	.34356	9.53861	.34563	9.54121	.34771	56
5	.53078	.33945	.53342	.34152	.53604	.34359	.53865	.34566	.54126	.34774	55
6	.53082	.33949	.53346	.34155	.53609	.34363	.53870	.34570	.54130	.34778	54
7	.53087	.33952	.53350	.34159	.53613	.34366	.53874	.34573	.54134	.34781	53
+ 2′	9.53091	.33956	9.53355	.34162	9.53617	.34369	9.53879	.34577	9.54139	.34784	52
9	.53096	.33959	.53359	.34166	.53622	.34373	.53883	.34580	.54143	.34788	51
10	.53100	.33962	.53364	.34169	.53626	.34376	.53887	.34584	.54147	.34791	50
11	.53104	.33966	.53368	.34173	.53630	.34380	.53892	.34587	.54152	.34795	49
+ 3′	9.53109	.33969	9.53372	.34176	9.53635	.34383	9.53896	.34591	9.54156	.34798	48
13	.53113	.33973	.53377	.34180	.53639	.34387	.53900	.34594	.54160	.34802	47
14	.53118	.33976	.53381	.34183	.53643	.34390	.53905	.34598	.54165	.34805	46
15	.53122	.33980	.53385	.34186	.53648	.34394	.53909	.34601	.54169	.34809	45
+ 4′	9.53126	.33983	9.53390	.34190	9.53652	.34397	9.53913	.34604	9.54173	.34812	44
17	.53131	.33986	.53394	.34193	.53657	.34400	.53918	.34608	.54177	.34816	43
18	.53135	.33990	.53399	.34197	.53661	.34404	.53922	.34611	.54182	.34819	42
19	.53140	.33993	.53403	.34200	.53665	.34407	.53926	.34615	.54186	.34823	41
+ 5′	9.53144	.33997	9.53407	.34204	9.53670	.34411	9.53931	.34618	9.54190	.34826	40
21	.53148	.34000	.53412	.34207	.53674	.34414	.53935	.34622	.54195	.34830	39
22	.53153	.34004	.53416	.34211	.53678	.34418	.53939	.34625	.54199	.34833	38
23	.53157	.34007	.53421	.34214	.53683	.34421	.53944	.34629	.54203	.34836	37
+ 6′	9.53162	.34011	9.53425	.34218	9.53687	.34425	9.53948	.34632	9.54208	.34840	36
25	.53166	.34014	.53429	.34221	.53691	.34428	.53952	.34636	.54212	.34843	35
26	.53170	.34018	.53434	.34224	.53696	.34432	.53957	.34639	.54216	.34847	34
27	.53175	.34021	.53438	.34228	.53700	.34435	.53961	.34643	.54221	.34850	33
+ 7′	9.53179	.34024	9.53442	.34231	9.53704	.34439	9.53966	.34646	9.54225	.34854	32
29	.53184	.34028	.53447	.34235	.53709	.34442	.53970	.34649	.54229	.34857	31
30	.53188	.34031	.53451	.34238	.53713	.34445	.53974	.34653	.54234	.34861	30
31	.53192	.34035	.53456	.34242	.53718	.34449	.53978	.34656	.54238	.34864	29
+ 8′	9.53197	.34038	9.53460	.34245	9.53722	.34452	9.53983	.34660	9.54242	.34868	28
33	.53201	.34042	.53464	.34249	.53726	.34456	.53987	.34663	.54247	.34871	27
34	.53206	.34045	.53469	.34252	.53731	.34459	.53991	.34667	.54251	.34875	26
35	.53210	.34049	.53473	.34256	.53735	.34463	.53996	.34670	.54255	.34878	25
+ 9′	9.53214	.34052	9.53477	.34259	9.53739	.34466	9.54000	.34674	9.54260	.34882	24
37	.53219	.34055	.53482	.34262	.53744	.34470	.54004	.34677	.54264	.34885	23
38	.53223	.34059	.53486	.34266	.53748	.34473	.54009	.34681	.54268	.34888	22
39	.53228	.34062	.53491	.34269	.53752	.34477	.54013	.34684	.54272	.34892	21
+ 10′	9.53232	.34066	9.53495	.34273	9.53757	.34480	9.54017	.34688	9.54277	.34895	20
41	.53236	.34069	.53499	.34276	.53761	.34483	.54022	.34691	.54281	.34899	19
42	.53241	.34073	.53504	.34280	.53765	.34487	.54026	.34694	.54285	.34902	18
43	.53245	.34076	.53508	.34283	.53770	.34490	.54030	.34698	.54290	.34906	17
+ 11′	9.53249	.34080	9.53512	.34287	9.53774	.34494	9.54035	.34701	9.54294	.34909	16
45	.53254	.34083	.53517	.34290	.53778	.34497	.54039	.34705	.54298	.34913	15
46	.53258	.34087	.53521	.34293	.53783	.34501	.54043	.34708	.54303	.34916	14
47	.53263	.34090	.53526	.34297	.53787	.34504	.54048	.34712	.54307	.34920	13
+ 12′	9.53267	.34093	9.53530	.34300	9.53792	.34508	9.54052	.34715	9.54311	.34923	12
49	.53271	.34097	.53534	.34304	.53796	.34511	.54056	.34719	.54316	.34927	11
50	.53276	.34100	.53539	.34307	.53800	.34515	.54061	.34722	.54320	.34930	10
51	.53280	.34104	.53543	.34311	.53805	.34518	.54065	.34726	.54324	.34933	9
+ 13′	9.53285	.34107	9.53547	.34314	9.53809	.34521	9.54069	.34729	9.54329	.34937	8
53	.53289	.34111	.53552	.34318	.53813	.34525	.54074	.34733	.54333	.34940	7
54	.53293	.34114	.53556	.34321	.53818	.34528	.54078	.34736	.54337	.34944	6
55	.53298	.34118	.53560	.34325	.53822	.34532	.54082	.34739	.54341	.34947	5
+ 14′	9.53302	.34121	9.53565	.34328	9.53826	.34535	9.54087	.34743	9.54346	.34951	4
57	.53307	.34124	.53569	.34331	.53831	.34539	.54091	.34746	.54350	.34954	3
58	.53311	.34128	.53574	.34335	.53835	.34542	.54095	.34750	.54354	.34958	2
59	.53315	.34131	.53578	.34338	.53839	.34546	.54100	.34753	.54359	.34961	1
+ 15′	9.53320	.34135	9.53582	.34342	9.53844	.34549	9.54104	.34757	9.54363	.34965	0
	19h 14m		19h 13m		19h 12m		19h 11m		19h 10m		

TABLE 34.

Haversines.

	4h 50m 72° 30′		4h 51m 72° 45′		4h 52m 73° 0′		4h 53m 73° 15′		4h 54m 73° 30′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.54363	.34965	9.54621	.35173	9.54878	.35381	9.55133	.35590	9.55387	.35799	60
1	.54367	.34968	.54625	.35176	.54882	.35385	.55137	.35594	.55392	.35803	59
2	.54372	.34972	.54629	.35180	.54886	.35388	.55142	.35597	.55396	.35806	58
3	.54376	.34975	.54634	.35183	.54890	.35392	.55146	.35601	.55400	.35810	57
+ 1′	9.54380	.34979	9.54638	.35187	9.54895	.35395	9.55150	.35604	9.55404	.35813	56
5	.54385	.34982	.54642	.35190	.54899	.35399	.55154	.35608	.55409	.35817	55
6	.54389	.34986	.54647	.35194	.54903	.35402	.55159	.35611	.55413	.35820	54
7	.54393	.34989	.54651	.35197	.54907	.35406	.55163	.35615	.55417	.35824	53
+ 2′	9.54397	.34992	9.54655	.35201	9.54912	.35409	9.55167	.35618	9.55421	.35827	52
9	.54402	.34996	.54659	.35204	.54916	.35413	.55171	.35622	.55425	.35831	51
10	.54406	.34999	.54664	.35208	.54920	.35416	.55176	.35625	.55430	.35834	50
11	.54410	.35003	.54668	.35211	.54924	.35420	.55180	.35628	.55434	.35838	49
+ 3′	9.54415	.35006	9.54672	.35215	9.54929	.35423	9.55184	.35632	9.55438	.35841	48
13	.54419	.35010	.54677	.35218	.54933	.35427	.55188	.35635	.55442	.35845	47
14	.54423	.35013	.54681	.35222	.54937	.35430	.55192	.35639	.55447	.35848	46
15	.54428	.35017	.54685	.35225	.54942	.35434	.55197	.35642	.55451	.35852	45
+ 4′	9.54432	.35020	9.54689	.35228	9.54946	.35437	9.55201	.35646	9.55455	.35855	44
17	.54436	.35024	.54694	.35232	.54950	.35441	.55205	.35649	.55459	.35859	43
18	.54440	.35027	.54698	.35235	.54954	.35444	.55209	.35653	.55463	.35862	42
19	.54445	.35031	.54702	.35239	.54959	.35448	.55214	.35656	.55468	.35865	41
+ 5′	9.54449	.35034	9.54707	.35242	9.54963	.35451	9.55218	.35660	9.55472	.35869	40
21	.54453	.35038	.54711	.35246	.54967	.35454	.55222	.35663	.55476	.35872	39
22	.54458	.35041	.54715	.35249	.54971	.35458	.55226	.35667	.55480	.35876	38
23	.54462	.35044	.54719	.35253	.54976	.35461	.55231	.35670	.55485	.35879	37
+ 6′	9.54466	.35048	9.54724	.35256	9.54980	.35465	9.55235	.35674	9.55489	.35883	36
25	.54471	.35051	.54728	.35260	.54984	.35468	.55239	.35677	.55493	.35886	35
26	.54475	.35055	.54732	.35263	.54988	.35472	.55243	.35681	.55497	.35890	34
27	.54479	.35058	.54736	.35267	.54993	.35475	.55248	.35684	.55501	.35893	33
+ 7′	9.54483	.35062	9.54741	.35270	9.54997	.35479	9.55252	.35688	9.55506	.35897	32
29	.54488	.35065	.54745	.35274	.55001	.35482	.55256	.35691	.55510	.35900	31
30	.54492	.35069	.54749	.35277	.55005	.35486	.55260	.35695	.55514	.35904	30
31	.54496	.35072	.54754	.35281	.55010	.35489	.55265	.35698	.55518	.35907	29
+ 8′	9.54501	.35076	9.54758	.35284	9.55014	.35493	9.55269	.35702	9.55523	.35911	28
33	.54505	.35079	.54762	.35288	.55018	.35496	.55273	.35705	.55527	.35914	27
34	.54509	.35083	.54766	.35291	.55022	.35500	.55277	.35709	.55531	.35918	26
35	.54514	.35086	.54771	.35294	.55027	.35503	.55282	.35712	.55535	.35921	25
+ 9′	9.54518	.35090	9.54775	.35298	9.55031	.35507	9.55286	.35716	9.55539	.35925	24
37	.54522	.35093	.54779	.35301	.55035	.35510	.55290	.35719	.55544	.35928	23
38	.54526	.35097	.54784	.35305	.55039	.35514	.55294	.35723	.55548	.35932	22
39	.54531	.35100	.54788	.35308	.55044	.35517	.55298	.35726	.55552	.35935	21
+ 10′	9.54535	.35103	9.54792	.35312	9.55048	.35521	9.55303	.35730	9.55556	.35939	20
41	.54539	.35107	.54796	.35315	.55052	.35524	.55307	.35733	.55561	.35942	19
42	.54544	.35110	.54801	.35319	.55057	.35528	.55311	.35737	.55565	.35946	18
43	.54548	.35114	.54805	.35322	.55061	.35531	.55315	.35740	.55569	.35949	17
+ 11′	9.54552	.35117	9.54809	.35326	9.55065	.35534	9.55320	.35743	9.55573	.35953	16
45	.54556	.35121	.54813	.35329	.55069	.35538	.55324	.35747	.55577	.35956	15
46	.54561	.35124	.54818	.35333	.55074	.35541	.55328	.35750	.55582	.35960	14
47	.54565	.35128	.54822	.35336	.55078	.35545	.55332	.35754	.55586	.35963	13
+ 12′	9.54569	.35131	9.54826	.35340	9.55082	.35548	9.55337	.35757	9.55590	.35967	12
49	.54574	.35135	.54831	.35343	.55086	.35552	.55341	.35761	.55594	.35970	11
50	.54578	.35138	.54835	.35347	.55091	.35555	.55345	.35764	.55598	.35974	10
51	.54582	.35142	.54839	.35350	.55095	.35559	.55349	.35768	.55603	.35977	9
+ 13′	9.54587	.35145	9.54843	.35354	9.55099	.35562	9.55354	.35771	9.55607	.35981	8
53	.54591	.35149	.54848	.35357	.55103	.35566	.55358	.35775	.55611	.35984	7
54	.54595	.35152	.54852	.35361	.55108	.35569	.55362	.35778	.55615	.35988	6
55	.54599	.35156	.54856	.35364	.55112	.35573	.55366	.35782	.55620	.35991	5
+ 14′	9.54604	.35159	9.54860	.35368	9.55116	.35576	9.55370	.35785	9.55624	.35995	4
57	.54608	.35162	.54865	.35371	.55120	.35580	.55375	.35789	.55628	.35998	3
58	.54612	.35166	.54869	.35374	.55125	.35583	.55379	.35792	.55632	.36002	2
59	.54617	.35169	.54873	.35378	.55129	.35587	.55383	.35796	.55636	.36005	1
+ 15′	9.54621	.35173	9.54878	.35381	9.55133	.35590	9.55387	.35799	9.55641	.36009	0
	19h 9m		19h 8m		19h 7m		19h 6m		19h 5m		

Haversines.

s	4h 55m 73° 45′		4h 56m 74° 0′		4h 57m 74° 15′		4h 58m 74° 30′		4h 59m 74° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.55641	.36009	9.55893	.36218	9.56144	.36428	9.56393	.36638	9.56642	.36848	60
1	.55645	.36012	.55897	.36222	.56148	.36431	.56397	.36642	.56646	.36852	59
2	.55649	.36016	.55901	.36225	.56152	.36435	.56402	.36645	.56650	.36855	58
3	.55653	.36019	.55905	.36229	.56156	.36438	.56406	.36649	.56654	.36859	57
+ 1′	9.55657	.36023	9.55909	.36232	9.56160	.36442	9.56410	.36652	9.56658	.36862	56
5	.55662	.36026	.55914	.36236	.56164	.36445	.56414	.36656	.56663	.36866	55
6	.55666	.36030	.55918	.36239	.56169	.36449	.56418	.36659	.56667	.36869	54
7	.55670	.36033	.55922	.36243	.56173	.36452	.56422	.36663	.56671	.36873	53
+ 2′	9.55674	.36036	9.55926	.36246	9.56177	.36456	9.56426	.36666	9.56675	.36877	52
9	.55678	.36040	.55930	.36250	.56181	.36459	.56431	.36670	.56679	.36880	51
10	.55683	.36043	.55935	.36253	.56185	.36463	.56435	.36673	.56683	.36884	50
11	.55687	.36047	.55939	.36257	.56189	.36466	.56439	.36677	.56687	.36887	49
+ 3′	9.55691	.36050	9.55943	.36260	9.56194	.36470	9.56443	.36680	9.56692	.36891	48
13	.55695	.36054	.55947	.36264	.56198	.36473	.56447	.36684	.56696	.36894	47
14	.55699	.36057	.55951	.36267	.56202	.36477	.56451	.36687	.56700	.36898	46
15	.55704	.36061	.55955	.36271	.56206	.36480	.56456	.36691	.56704	.36901	45
+ 4′	9.55708	.36064	9.55960	.36274	9.56210	.36484	9.56460	.36694	9.56708	.36905	44
17	.55712	.36068	.55964	.36278	.56214	.36487	.56464	.36698	.56712	.36908	43
18	.55716	.36071	.55968	.36281	.56219	.36491	.56468	.36701	.56716	.36912	42
19	.55721	.36075	.55972	.36285	.56223	.36494	.56472	.36705	.56720	.36915	41
+ 5′	9.55725	.36078	9.55976	.36288	9.56227	.36498	9.56476	.36708	9.56725	.36919	40
21	.55729	.36082	.55981	.36292	.56231	.36501	.56480	.36712	.56729	.36922	39
22	.55733	.36085	.55985	.36295	.56235	.36505	.56485	.36715	.56733	.36926	38
23	.55737	.36089	.55989	.36299	.56239	.36508	.56489	.36719	.56737	.36929	37
+ 6′	9.55742	.36092	9.55993	.36302	9.56244	.36512	9.56493	.36722	9.56741	.36933	36
25	.55746	.36096	.55997	.36306	.56248	.36515	.56497	.36726	.56745	.36936	35
26	.55750	.36099	.56001	.36309	.56252	.36519	.56501	.36729	.56749	.36940	34
27	.55754	.36103	.56006	.36313	.56256	.36522	.56505	.36733	.56753	.36943	33
+ 7′	9.55758	.36106	9.56010	.36316	9.56260	.36526	9.56509	.36736	9.56758	.36947	32
29	.55763	.36110	.56014	.36320	.56264	.36529	.56514	.36740	.56762	.36950	31
30	.55767	.36113	.56018	.36323	.56269	.36533	.56518	.36743	.56766	.36954	30
31	.55771	.36117	.56022	.36327	.56273	.36536	.56522	.36747	.56770	.36957	29
+ 8′	9.55775	.36120	9.56027	.36330	9.56277	.36540	9.56526	.36750	9.56774	.36961	28
33	.55779	.36124	.56031	.36334	.56281	.36543	.56530	.36754	.56778	.36964	27
34	.55784	.36127	.56035	.36337	.56285	.36547	.56534	.36757	.56782	.36968	26
35	.55788	.36131	.56039	.36341	.56289	.36551	.56538	.36761	.56786	.36971	25
+ 9′	9.55792	.36134	9.56043	.36344	9.56294	.36554	9.56543	.36764	9.56791	.36975	24
37	.55796	.36138	.56047	.36348	.56298	.36558	.56547	.36768	.56795	.36978	23
38	.55800	.36141	.56052	.36351	.56302	.36561	.56551	.36771	.56799	.36982	22
39	.55805	.36145	.56056	.36355	.56306	.36565	.56555	.36775	.56803	.36985	21
+ 10′	9.55809	.36148	9.56060	.36358	9.56310	.36568	9.56559	.36778	9.56807	.36989	20
41	.55813	.36152	.56064	.36362	.56314	.36572	.56563	.36782	.56811	.36992	19
42	.55817	.36155	.56068	.36365	.56318	.36575	.56567	.36785	.56815	.36996	18
43	.55821	.36159	.56073	.36368	.56323	.36579	.56572	.36789	.56819	.36999	17
+ 11′	9.55826	.36162	9.56077	.36372	9.56327	.36582	9.56576	.36792	9.56824	.37003	16
45	.55830	.36166	.56081	.36376	.56331	.36586	.56580	.36796	.56828	.37006	15
46	.55834	.36169	.56085	.36379	.56335	.36589	.56584	.36799	.56832	.37010	14
47	.55838	.36173	.56089	.36382	.56339	.36593	.56588	.36803	.56836	.37013	13
+ 12′	9.55842	.36176	9.56093	.36386	9.56343	.36596	9.56592	.36806	9.56840	.37017	12
49	.55846	.36180	.56098	.36389	.56348	.36600	.56596	.36810	.56844	.37020	11
50	.55851	.36183	.56102	.36393	.56352	.36603	.56601	.36813	.56848	.37024	10
51	.55855	.36187	.56106	.36396	.56356	.36607	.56605	.36817	.56852	.37027	9
+ 13′	9.55859	.36190	9.56110	.36400	9.56360	.36610	9.56609	.36820	9.56856	.37031	8
53	.55863	.36194	.56114	.36403	.56364	.36614	.56613	.36824	.56861	.37034	7
54	.55867	.36197	.56118	.36407	.56368	.36617	.56617	.36827	.56865	.37038	6
55	.55872	.36201	.56123	.36410	.56373	.36621	.56621	.36831	.56869	.37041	5
+ 14′	9.55876	.36204	9.56127	.36414	9.56377	.36624	9.56625	.36834	9.56873	.37045	4
57	.55880	.36208	.56131	.36417	.56381	.36628	.56630	.36838	.56877	.37049	3
58	.55884	.36211	.56135	.36421	.56385	.36631	.56634	.36841	.56881	.37052	2
59	.55888	.36215	.56139	.36424	.56389	.36635	.56638	.36845	.56885	.37055	1
+ 15′	9.55893	.36218	9.56144	.36428	9.56393	.36638	9.56642	.36848	9.56889	.37059	0
	19h 4m		19h 3m		19h 2m		19h 1m		19h 0m		

TABLE 34.

Haversines.

s	5h 0m 75° 0′		5h 1m 75° 15′		5h 2m 75° 30′		5h 3m 75° 45′		5h 4m 76° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.56889	.37059	9.57136	.37270	9.57381	.37481	9.57625	.37692	9.57868	.37904	60
1	.56893	.37063	.57140	.37273	.57385	.37485	.57629	.37696	.57872	.37907	59
2	.56898	.37066	.57144	.37277	.57389	.37488	.57633	.37699	.57876	.37911	58
3	.56902	.37070	.57148	.37280	.57393	.37492	.57637	.37703	.57881	.37914	57
+ 1′	9.56906	.37073	9.57152	.37284	9.57397	.37495	9.57642	.37706	9.57885	.37918	56
5	.56910	.37077	.57156	.37287	.57402	.37499	.57646	.37710	.57889	.37922	55
6	.56914	.37080	.57160	.37291	.57406	.37502	.57650	.37713	.57893	.37925	54
7	.56918	.37084	.57165	.37295	.57410	.37506	.57654	.37717	.57897	.37929	53
+ 2′	9.56922	.37087	9.57169	.37298	9.57414	.37509	9.57658	.37721	9.57901	.37932	52
9	.56926	.37091	.57173	.37302	.57418	.37513	.57662	.37724	.57905	.37936	51
10	.56931	.37094	.57177	.37305	.57422	.37516	.57666	.37728	.57909	.37939	50
11	.56935	.37098	.57181	.37309	.57426	.37520	.57670	.37731	.57913	.37943	49
+ 3′	9.56939	.37101	9.57185	.37312	9.57430	.37523	9.57674	.37735	9.57917	.37946	48
13	.56943	.37105	.57189	.37316	.57434	.37527	.57678	.37738	.57921	.37950	47
14	.56947	.37108	.57193	.37319	.57438	.37530	.57682	.37742	.57925	.37953	46
15	.56951	.37112	.57197	.37323	.57442	.37534	.57686	.37745	.57929	.37957	45
+ 4′	9.56955	.37115	9.57201	.37326	9.57446	.37537	9.57690	.37749	9.57933	.37960	44
17	.56959	.37119	.57205	.37330	.57450	.37541	.57694	.37752	.57937	.37964	43
18	.56963	.37122	.57210	.37333	.57454	.37544	.57698	.37756	.57941	.37967	42
19	.56968	.37126	.57214	.37337	.57459	.37548	.57702	.37759	.57945	.37971	41
+ 5′	9.56972	.37129	9.57218	.37340	9.57463	.37551	9.57706	.37763	9.57949	.37974	40
21	.56976	.37133	.57222	.37344	.57467	.37555	.57711	.37766	.57953	.37978	39
22	.56980	.37136	.57226	.37347	.57471	.37558	.57715	.37770	.57957	.37982	38
23	.56984	.37140	.57230	.37351	.57475	.37562	.57719	.37773	.57961	.37985	37
+ 6′	9.56988	.37143	9.57234	.37354	9.57479	.37566	9.57723	.37777	9.57965	.37989	36
25	.56992	.37147	.57238	.37358	.57483	.37569	.57727	.37780	.57969	.37992	35
26	.56996	.37150	.57242	.37361	.57487	.37573	.57731	.37784	.57973	.37996	34
27	.57000	.37154	.57246	.37365	.57491	.37576	.57735	.37788	.57977	.37999	33
+ 7′	9.57005	.37157	9.57250	.37368	9.57495	.37580	9.57739	.37791	9.57981	.38003	32
29	.57009	.37161	.57255	.37372	.57499	.37583	.57743	.37794	.57986	.38006	31
30	.57013	.37164	.57259	.37375	.57503	.37587	.57747	.37798	.57990	.38010	30
31	.57017	.37168	.57263	.37379	.57507	.37590	.57751	.37802	.57994	.38013	29
+ 8′	9.57021	.37171	9.57267	.37382	9.57511	.37594	9.57755	.37805	9.57998	.38017	28
33	.57025	.37175	.57271	.37386	.57516	.37597	.57759	.37809	.58002	.38020	27
34	.57029	.37179	.57275	.37389	.57520	.37601	.57763	.37812	.58006	.38024	26
35	.57033	.37182	.57279	.37393	.57524	.37604	.57767	.37816	.58010	.38027	25
+ 9′	9.57037	.37186	9.57283	.37397	9.57528	.37608	9.57771	.37819	9.58014	.38031	24
37	.57042	.37189	.57287	.37400	.57532	.37611	.57775	.37823	.58018	.38034	23
38	.57046	.37193	.57291	.37404	.57536	.37615	.57779	.37826	.58022	.38038	22
39	.57050	.37196	.57295	.37407	.57540	.37618	.57783	.37830	.58026	.38042	21
+ 10′	9.57054	.37200	9.57299	.37411	9.57544	.37622	9.57787	.37833	9.58030	.38045	20
41	.57058	.37203	.57304	.37414	.57548	.37625	.57792	.37837	.58034	.38049	19
42	.57062	.37207	.57308	.37418	.57552	.37629	.57796	.37840	.58038	.38052	18
43	.57066	.37210	.57312	.37421	.57556	.37632	.57800	.37844	.58042	.38056	17
+ 11′	9.57070	.37214	9.57316	.37425	9.57560	.37636	9.57804	.37847	9.58046	.38059	16
45	.57074	.37217	.57320	.37428	.57564	.37639	.57808	.37851	.58050	.38063	15
46	.57078	.37221	.57324	.37432	.57568	.37643	.57812	.37855	.58054	.38066	14
47	.57083	.37224	.57328	.37435	.57572	.37647	.57816	.37858	.58058	.38070	13
+ 12′	9.57087	.37228	9.57332	.37439	9.57577	.37650	9.57820	.37862	9.58062	.38073	12
49	.57091	.37231	.57336	.37442	.57581	.37654	.57824	.37865	.58066	.38077	11
50	.57095	.37235	.57340	.37446	.57585	.37657	.57828	.37869	.58070	.38080	10
51	.57099	.37238	.57344	.37449	.57589	.37661	.57832	.37872	.58074	.38084	9
+ 13′	9.57103	.37242	9.57348	.37453	9.57593	.37664	9.57836	.37876	9.58078	.38087	8
53	.57107	.37245	.57353	.37456	.57597	.37668	.57840	.37879	.58082	.38091	7
54	.57111	.37249	.57357	.37460	.57601	.37671	.57844	.37883	.58086	.38095	6
55	.57115	.37252	.57361	.37463	.57605	.37675	.57848	.37886	.58090	.38098	5
+ 14′	9.57119	.37256	9.57365	.37467	9.57609	.37678	9.57852	.37890	9.58094	.38102	4
57	.57124	.37259	.57369	.37470	.57613	.37682	.57856	.37893	.58098	.38105	3
58	.57128	.37263	.57373	.37474	.57617	.37685	.57860	.37897	.58102	.38109	2
59	.57132	.37266	.57377	.37477	.57621	.37689	.57864	.37900	.58106	.38112	1
+ 15′	9.57136	.37270	9.57381	.37481	9.57625	.37692	9.57868	.37904	9.58110	.38116	0
	18h 59m		18h 58m		18h 57m		18h 56m		18h 55m		

Haversines.

s	5h 5m 76° 15′		5h 6m 76° 30′		5h 7m 76° 45′		5h 8m 77° 0′		5h 9m 77° 15′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.58110	.38116	9.58351	.38328	9.58591	.38540	9.58830	.38752	9.59068	.38965	60
1	.58114	.38119	.58355	.38331	.58595	.38544	.58834	.38756	.59072	.38969	59
2	.58118	.38123	.58359	.38335	.58599	.38547	.58838	.38760	.59076	.38972	58
3	.58122	.38126	.58363	.38338	.58603	.38551	.58842	.38763	.59079	.38976	57
+ 1′	9.58126	.38130	9.58367	.38342	9.58607	.38554	9.58846	.38767	9.59083	.38979	56
5	.58131	.38133	.58371	.38345	.58611	.38558	.58850	.38770	.59087	.38983	55
6	.58135	.38137	.58375	.38349	.58615	.38561	.58854	.38774	.59091	.38986	54
7	.58139	.38140	.58379	.38352	.58619	.38565	.58858	.38777	.59095	.38990	53
+ 2′	9.58143	.38144	9.58383	.38356	9.58623	.38568	9.58862	.38781	9.59099	.38994	52
9	.58147	.38148	.58387	.38360	.58627	.38572	.58866	.38784	.59103	.38997	51
10	.58151	.38151	.58391	.38363	.58631	.38575	.58870	.38788	.59107	.39001	50
11	.58155	.38155	.58395	.38367	.58635	.38579	.58874	.38791	.59111	.39004	49
+ 3′	9.58159	.38158	9.58399	.38370	9.58639	.38582	9.58878	.38795	9.59115	.39008	48
13	.58163	.38162	.58403	.38374	.58643	.38586	.58882	.38799	.59119	.39011	47
14	.58167	.38165	.58407	.38377	.58647	.38590	.58885	.38802	.59123	.39015	46
15	.58171	.38169	.58411	.38381	.58651	.38593	.58889	.38806	.59127	.39018	45
+ 4′	9.58175	.38172	9.58415	.38384	9.58655	.38597	9.58893	.38809	9.59131	.39022	44
17	.58179	.38176	.58419	.38388	.58659	.38600	.58897	.38813	.59135	.39025	43
18	.58183	.38179	.58423	.38391	.58663	.38604	.58901	.38816	.59139	.39029	42
19	.58187	.38183	.58427	.38395	.58667	.38607	.58905	.38820	.59143	.39033	41
+ 5′	9.58191	.38186	9.58431	.38398	9.58671	.38611	9.58909	.38823	9.59147	.39036	40
21	.58195	.38190	.58435	.38402	.58675	.38614	.58913	.38827	.59151	.39040	39
22	.58199	.38193	.58439	.38406	.58679	.38618	.58917	.38830	.59155	.39043	38
23	.58203	.38197	.58443	.38409	.58683	.38621	.58921	.38834	.59158	.39047	37
+ 6′	9.58207	.38200	9.58447	.38413	9.58687	.38625	9.58925	.38837	9.59162	.39050	36
25	.58211	.38204	.58451	.38416	.58691	.38628	.58929	.38841	.59166	.39054	35
26	.58215	.38208	.58455	.38420	.58695	.38632	.58933	.38845	.59170	.39057	34
27	.58219	.38211	.58459	.38423	.58699	.38636	.58937	.38848	.59174	.39061	33
+ 7′	9.58223	.38215	9.58463	.38427	9.58703	.38639	9.58941	.38852	9.59178	.39064	32
29	.58227	.38218	.58467	.38430	.58707	.38643	.58945	.38855	.59182	.39068	31
30	.58231	.38222	.58471	.38434	.58711	.38646	.58949	.38859	.59186	.39072	30
31	.58235	.38225	.58475	.38437	.58715	.38650	.58953	.38862	.59190	.39075	29
+ 8′	9.58239	.38229	9.58479	.38441	9.58719	.38653	9.58957	.38866	9.59194	.39079	28
33	.58243	.38232	.58483	.38444	.58723	.38657	.58961	.38869	.59198	.39082	27
34	.58247	.38236	.58487	.38448	.58727	.38660	.58965	.38873	.59202	.39086	26
35	.58251	.38239	.58491	.38451	.58731	.38664	.58969	.38876	.59206	.39089	25
+ 9′	9.58255	.38243	9.58495	.38455	9.58735	.38667	9.58973	.38880	9.59210	.39093	24
37	.58259	.38246	.58499	.38459	.58739	.38671	.58977	.38884	.59214	.39096	23
38	.58263	.38250	.58503	.38462	.58742	.38675	.58981	.38887	.59218	.39100	22
39	.58267	.38254	.58507	.38466	.58746	.38678	.58985	.38891	.59222	.39103	21
+ 10′	9.58271	.38257	9.58511	.38469	9.58750	.38682	9.58989	.38894	9.59225	.39107	20
41	.58275	.38261	.58515	.38473	.58754	.38685	.58992	.38898	.59229	.39111	19
42	.58279	.38264	.58519	.38476	.58758	.38689	.58996	.38901	.59233	.39114	18
43	.58283	.38268	.58523	.38480	.58762	.38692	.59000	.38905	.59237	.39118	17
+ 11′	9.58287	.38271	9.58527	.38483	9.58766	.38696	9.59004	.38908	9.59241	.39121	16
45	.58291	.38275	.58531	.38487	.58770	.38699	.59008	.38912	.59245	.39125	15
46	.58295	.38278	.58535	.38490	.58774	.38703	.59012	.38915	.59249	.39128	14
47	.58299	.38282	.58539	.38494	.58778	.38706	.59016	.38919	.59253	.39132	13
+ 12′	9.58303	.38285	9.58543	.38498	9.58782	.38710	9.59020	.38923	9.59257	.39135	12
49	.58307	.38289	.58547	.38501	.58786	.38713	.59024	.38926	.59261	.39139	11
50	.58311	.38292	.58551	.38505	.58790	.38717	.59028	.38930	.59265	.39143	10
51	.58315	.38296	.58555	.38508	.58794	.38721	.59032	.38933	.59269	.39146	9
+ 13′	9.58319	.38299	9.58559	.38512	9.58798	.38724	9.59036	.38937	9.59273	.39150	8
53	.58323	.38303	.58563	.38515	.58802	.38728	.59040	.38940	.59277	.39153	7
54	.58327	.38307	.58567	.38519	.58806	.38731	.59044	.38944	.59281	.39157	6
55	.58331	.38310	.58571	.38522	.58810	.38735	.59048	.38947	.59285	.39160	5
+ 14′	9.58335	.38314	9.58575	.38526	9.58814	.38738	9.59052	.38951	9.59289	.39164	4
57	.58339	.38317	.58579	.38529	.58818	.38742	.59056	.38954	.59292	.39167	3
58	.58343	.38321	.58583	.38533	.58822	.38745	.59060	.38958	.59296	.39171	2
59	.58347	.38324	.58587	.38536	.58826	.38749	.59064	.38962	.59300	.39174	1
+ 15′	9.58351	.38328	9.58591	.38540	9.58830	.38752	9.59068	.38965	9.59304	.39178	0
	18h 54m		18h 53m		18h 52m		18h 51m		18h 50m		

TABLE 34.

Haversines.

s	5h 10m 77° 30′		5h 11m 77° 45′		5h 12m 78° 0′		5h 13m 78° 15′		5h 14m 78° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.59304	.39178	9.59540	.39391	9.59774	.39604	9.60008	.39818	9.60240	.40032	60
1	.59308	.39182	.59544	.39395	.59778	.39608	.60012	.39821	.60244	.40035	59
2	.59312	.39185	.59548	.39398	.59782	.39612	.60016	.39825	.60248	.40039	58
3	.59316	.39189	.59552	.39402	.59786	.39615	.60020	.39829	.60252	.40042	57
+ 1′	9.59320	.39192	9.59556	.39405	9.59790	.39619	9.60023	.39832	9.60256	.40046	56
5	.59324	.39196	.59559	.39409	.59794	.39622	.60027	.39836	.60260	.40049	55
6	.59328	.39199	.59563	.39412	.59798	.39626	.60031	.39839	.60263	.40053	54
7	.59332	.39203	.59567	.39416	.59802	.39629	.60035	.39843	.60267	.40057	53
+ 2′	9.59336	.39206	9.59571	.39420	9.59806	.39633	9.60039	.39846	9.60271	.40060	52
9	.59340	.39210	.59575	.39423	.59809	.39636	.60043	.39850	.60275	.40064	51
10	.59344	.39214	.59579	.39427	.59813	.39640	.60047	.39854	.60279	.40067	50
11	.59348	.39217	.59583	.39430	.59817	.39644	.60051	.39857	.60283	.40071	49
+ 3′	9.59351	.39221	9.59587	.39434	9.59821	.39647	9.60054	.39861	9.60287	.40074	48
13	.59355	.39224	.59591	.39437	.59825	.39651	.60058	.39864	.60291	.40078	47
14	.59359	.39228	.59595	.39441	.59829	.39654	.60062	.39868	.60294	.40081	46
15	.59363	.39231	.59599	.39444	.59833	.39658	.60066	.39871	.60298	.40085	45
+ 4′	9.59367	.39235	9.59602	.39448	9.59837	.39661	9.60070	.39875	9.60302	.40089	44
17	.59371	.39238	.59606	.39451	.59841	.39665	.60074	.39878	.60306	.40092	43
18	.59375	.39242	.59610	.39455	.59845	.39668	.60078	.39882	.60310	.40096	42
19	.59379	.39245	.59614	.39459	.59848	.39672	.60082	.39886	.60314	.40099	41
+ 5′	9.59383	.39249	9.59618	.39462	9.59852	.39676	9.60085	.39889	9.60318	.40103	40
21	.59387	.39253	.59622	.39466	.59856	.39679	.60089	.39893	.60321	.40106	39
22	.59391	.39256	.59626	.39469	.59860	.39683	.60093	.39896	.60325	.40110	38
23	.59395	.39260	.59630	.39473	.59864	.39686	.60097	.39900	.60329	.40114	37
+ 6′	9.59399	.39263	9.59634	.39476	9.59868	.39690	9.60101	.39903	9.60333	.40117	36
25	.59403	.39267	.59638	.39480	.59872	.39693	.60105	.39907	.60337	.40121	35
26	.59406	.39270	.59642	.39484	.59876	.39697	.60109	.39910	.60341	.40124	34
27	.59410	.39274	.59646	.39487	.59880	.39700	.60113	.39914	.60345	.40128	33
+ 7′	9.59414	.39277	9.59649	.39491	9.59883	.39704	9.60116	.39918	9.60348	.40131	32
29	.59418	.39281	.59653	.39494	.59887	.39708	.60120	.39921	.60352	.40135	31
30	.59422	.39285	.59657	.39498	.59891	.39711	.60124	.39925	.60356	.40139	30
31	.59426	.39288	.59661	.39501	.59895	.39715	.60128	.39928	.60360	.40142	29
+ 8′	9.59430	.39292	9.59665	.39505	9.59899	.39718	9.60132	.39932	9.60364	.40146	28
33	.59434	.39295	.59669	.39508	.59903	.39722	.60136	.39935	.60368	.40149	27
34	.59438	.39299	.59673	.39512	.59907	.39725	.60140	.39939	.60372	.40153	26
35	.59442	.39302	.59677	.39516	.59911	.39729	.60144	.39943	.60375	.40156	25
+ 9′	9.59446	.39306	9.59681	.39519	9.59915	.39732	9.60147	.39946	9.60379	.40160	24
37	.59450	.39309	.59685	.39523	.59918	.39736	.60151	.39950	.60383	.40163	23
38	.59454	.39313	.59688	.39526	.59922	.39739	.60155	.39953	.60387	.40167	22
39	.59458	.39317	.59692	.39530	.59926	.39743	.60159	.39957	.60391	.40171	21
+ 10′	9.59461	.39320	9.59696	.39533	9.59930	.39746	9.60163	.39960	9.60395	.40174	20
41	.59465	.39324	.59700	.39537	.59934	.39750	.60167	.39964	.60399	.40178	19
42	.59469	.39327	.59704	.39540	.59938	.39754	.60171	.39967	.60402	.40181	18
43	.59473	.39331	.59708	.39544	.59942	.39757	.60175	.39971	.60406	.40185	17
+ 11′	9.59477	.39334	9.59712	.39548	9.59946	.39761	9.60178	.39975	9.60410	.40188	16
45	.59481	.39338	.59716	.39551	.59950	.39765	.60182	.39978	.60414	.40192	15
46	.59485	.39341	.59720	.39555	.59953	'39768	.60186	.39982	.60418	.40196	14
47	.59489	.39345	.59724	.39558	.59957	.39772	.60190	.39985	.60422	.40199	13
+ 12′	9.59493	.39348	9.59728	.39562	9.59961	.39775	9.60194	.39989	9.60426	.40203	12
49	.59497	.39352	.59731	.39565	.59965	.39779	.60198	.39992	.60429	.40206	11
50	.59501	.39356	.59735	.39569	.59969	.39782	.60202	.39996	.60433	.40210	10
51	.59505	.39359	.59739	.39572	.59973	.39786	.60206	.40000	.60437	.40213	9
+ 13′	9.59508	.39363	9.59743	.39576	9.59977	.39789	9.60209	.40003	9.60441	.40217	8
53	.59512	.39366	.59747	.39580	.59981	.39793	.60213	.40007	.60445	.40220	7
54	.59516	.39370	.59751	.39583	.59985	.39796	.60217	.40010	.60449	.40224	6
55	.59520	.39373	.59755	.39587	.59988	.39800	.60221	.40014	.60452	.40228	5
+ 14′	9.59524	.39377	9.59759	.39590	9.59992	.39803	9.60225	.40017	9.60456	.40231	4
57	.59528	.39380	.59763	.39594	.59996	.39807	.60229	.40021	.60460	.40235	3
58	.59532	.39384	.59767	.39597	60000	.39811	.60233	.40024	.60464	.40238	2
59	.59536	.39388	.59770	.39601	.60004	.39814	.60236	.40028	.60468	.40242	1
+ 15′	9.59540	.39391	9.59774	.39604	9.60008	.39818	9.60240	.40032	9.60472	.40245	0
	18h 49m		18h 48m		18h 47m		18h 46m		18h 45m		

Haversines.

s	5h 15m 78° 45′ Log. Hav.	Nat. Hav.	5h 16m 79° 0′ Log. Hav.	Nat. Hav.	5h 17m 79° 15′ Log. Hav.	Nat. Hav.	5h 18m 79° 30′ Log. Hav.	Nat. Hav.	5h 19m 79° 45′ Log. Hav.	Nat. Hav.	s
0	9.60472	.40245	9.60702	.40460	9.60931	.40674	9.61160	.40888	9.61387	.41103	60
1	.60476	.40249	.60706	.40463	.60935	.40677	.61164	.40892	.61391	.41106	59
2	.60479	.40253	.60710	.40467	.60939	.40681	.61167	.40895	.61395	.41110	58
3	.60483	.40256	.60714	.40470	.60943	.40685	.61171	.40899	.61399	.41114	57
+ 1′	9.60487	.40260	9.60717	.40474	9.60947	.40688	9.61175	.40903	9.61402	.41117	56
5	.60491	.40263	.60721	.40477	.60951	.40692	.61179	.40906	.61406	.41121	55
6	.60495	.40267	.60725	.40481	.60954	.40695	.61183	.40910	.61410	.41124	54
7	.60499	.40270	.60729	.40485	.60958	.40699	.61186	.40913	.61414	.41128	53
+ 2′	9.60502	.40274	9.60733	.40488	9.60962	.40702	9.61190	.40917	9.61417	.41131	52
9	.60506	.40277	.60737	.40492	.60966	.40706	.61194	.40920	.61421	.41135	51
10	.60510	.40281	.60740	.40495	.60970	.40710	.61198	.40924	.61425	.41139	50
11	.60514	.40285	.60744	.40499	.60973	.40713	.61202	.40928	.61429	.41142	49
+ 3′	9.60518	.40288	9.60748	.40502	9.60977	.40717	9.61205	.40931	9.61433	.41146	48
13	.60522	.40292	.60752	.40506	.60981	.40720	.61209	.40935	.61436	.41149	47
14	.60526	.40295	.60756	.40510	.60985	.40724	.61213	.40938	.61440	.41153	46
15	.60529	.40299	.60760	.40513	.60989	.40727	.61217	.40942	.61444	.41156	45
+ 4′	9.60533	.40303	9.60763	.40517	9.60992	.40731	9.61221	.40945	9.61448	.41160	44
17	.60537	.40306	.60767	.40520	.60996	.40735	.61224	.40949	.61451	.41164	43
18	.60541	.40310	.60771	.40524	.61000	.40738	.61228	.40953	.61455	.41167	42
19	.60545	.40313	.60775	.40527	.61004	.40742	.61232	.40956	.61459	.41171	41
+ 5′	9.60549	.40317	9.60779	.40531	9.61008	.40745	9.61236	.40960	9.61463	.41174	40
21	.60552	.40320	.60783	.40535	.61012	.40749	.61240	.40963	.61467	.41178	39
22	.60556	.40324	.60786	.40538	.61015	.40752	.61243	.40967	.61470	.41182	38
23	.60560	.40328	.60790	.40542	.61019	.40756	.61247	.40970	.61474	.41185	37
+ 6′	9.60564	.40331	9.60794	.40545	9.61023	.40760	9.61251	.40974	9.61478	.41189	36
25	.60568	.40335	.60798	.40549	.61027	.40763	.61255	.40978	.61482	.41192	35
26	.60572	.40338	.60802	.40552	.61031	.40767	.61258	.40981	.61485	.41196	34
27	.60576	.40342	.60805	.40556	.61034	.40770	.61262	.40985	.61489	.41199	33
+ 7′	9.60579	.40345	9.60809	.40560	9.61038	.40774	9.61266	.40988	9.61493	.41203	32
29	.60583	.40349	.60813	.40563	.61042	.40777	.61270	.40992	.61497	.41207	31
30	.60587	.40352	.60817	.40567	.61046	.40781	.61274	.40996	.61500	.41210	30
31	.60591	.40356	.60821	.40570	.61050	.40785	.61277	.40999	.61504	.41214	29
+ 8′	9.60595	.40360	9.60825	.40574	9.61053	.40788	9.61281	.41003	9.61508	.41217	28
33	.60599	.40363	.60828	.40577	.61057	.40792	.61285	.41006	.61512	.41221	27
34	.60602	.40367	.60832	.40581	.61061	.40795	.61289	.41010	.61516	.41225	26
35	.60606	.40370	.60836	.40585	.61065	.40799	.61293	.41013	.61519	.41228	25
+ 9′	9.60610	.40374	9.60840	.40588	9.61069	.40802	9.61296	.41017	9.61523	.41232	24
37	.60614	.40377	.60844	.40592	.61072	.40806	.61300	.41021	.61527	.41235	23
38	.60618	.40381	.60847	.40595	.61076	.40810	.61304	.41024	.61531	.41239	22
39	.60622	.40385	.60851	.40599	.61080	.40813	.61308	.41028	.61534	.41242	21
+ 10′	9.60625	.40388	9.60855	.40602	9.61084	.40817	9.61312	.41031	9.61538	.41246	20
41	.60629	.40392	.60859	.40606	.61088	.40820	.61315	.41035	.61542	.41250	19
42	.60633	.40395	.60863	.40610	.61091	.40824	.61319	.41039	.61546	.41253	18
43	.60637	.40399	.60867	.40613	.61095	.40827	.61323	.41042	.61549	.41257	17
+ 11′	9.60641	.40402	9.60870	.40617	9.61099	.40831	9.61327	.41046	9.61553	.41260	16
45	.60645	.40406	.60874	.40620	.61103	.40835	.61330	.41049	.61557	.41264	15
46	.60648	.40410	.60878	.40624	.61107	.40838	.61334	.41053	.61561	.41267	14
47	.60652	.40413	.60882	.40627	.61110	.40842	.61338	.41056	.61565	.41271	13
+ 12′	9.60656	.40417	9.60886	.40631	9.61114	.40845	9.61342	.41060	9.61568	.41275	12
49	.60660	.40420	.60890	.40635	.61118	.40849	.61346	.41063	.61572	.41278	11
50	.60664	.40424	.60893	.40638	.61122	.40852	.61349	.41067	.61576	.41282	10
51	.60668	.40427	.60897	.40642	.61126	.40856	.61353	.41071	.61580	.41285	9
+ 13′	9.60671	.40431	9.60901	.40645	9.61129	.40860	9.61357	.41074	9.61583	.41289	8
53	.60675	.40434	.60905	.40649	.61133	.40863	.61361	.41078	.61587	.41293	7
54	.60679	.40438	.60909	.40652	.61137	.40867	.61364	.41082	.61591	.41296	6
55	.60683	.40442	.60912	.40656	.61141	.40870	.61368	.41085	.61595	.41300	5
+ 14′	9.60687	.40445	9.60916	.40660	9.61145	.40874	9.61372	.41089	9.61598	.41303	4
57	.60691	.40449	.60920	.40663	.61148	.40878	.61376	.41092	.61602	.41307	3
58	.60694	.40452	.60924	.40667	.61152	.40881	.61380	.41096	.61606	.41310	2
59	.60698	.40456	.60928	.40670	.61156	.40885	.61383	.41099	.61610	.41314	1
+ 15′	9.60702	.40460	9.60931	.40674	9.61160	.40888	9.61387	.41103	9.61614	.41318	0
	18h 44m		18h 43m		18h 42m		18h 41m		18h 40m		

TABLE 34.

Haversines.

s	$5^h\ 20^m$ 80° 0′		$5^h\ 21^m$ 80° 15′		$5^h\ 22^m$ 80° 30′		$5^h\ 23^m$ 80° 45′		$5^h\ 24^m$ 81° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.61614	.41318	9.61839	.41533	9.62063	.41748	9.62287	.41963	9.62509	.42178	60
1	.61617	.41321	.61843	.41536	.62067	.41751	.62290	.41966	.62513	.42182	59
2	.61621	.41325	.61846	.41540	.62071	.41755	.62294	.41970	.62516	.42185	58
3	.61625	.41328	.61850	.41543	.62074	.41758	.62298	.41974	.62520	.42189	57
+ 1′	9.61629	.41332	9.61854	.41547	9.62078	.41762	9.62301	.41977	9.62524	.42193	56
5	.61632	.41335	.61858	.41550	.62082	.41766	.62305	.41981	.62527	.42196	55
6	.61636	.41339	.61861	.41554	.62086	.41769	.62309	.41984	.62531	.42200	54
7	.61640	.41343	.61865	.41558	.62089	.41773	.62313	.41988	.62535	.42203	53
+ 2′	9.61644	.41346	9.61869	.41561	9.62093	.41776	9.62316	.41992	9.62538	.42207	52
9	.61647	.41350	.61873	.41565	.62097	.41780	.62320	.41995	.62542	.42211	51
10	.61651	.41353	.61876	.41568	.62100	.41783	.62324	.41999	.62546	.42214	50
11	.61655	.41357	.61880	.41572	.62104	.41787	.62327	.42002	.62550	.42218	49
+ 3′	9.61659	.41361	9.61884	.41576	9.62108	.41791	9.62331	.42006	9.62553	.42221	48
13	.61662	.41364	.61888	.41579	.62112	.41794	.62335	.42010	.62557	.42225	47
14	.61666	.41368	.61891	.41583	.62115	.41798	.62338	.42013	.62561	.42229	46
15	.61670	.41371	.61895	.41586	.62119	.41801	.62342	.42017	.62564	.42232	45
+ 4′	9.61674	.41375	9.61899	.41590	9.62123	.41805	9.62346	.42020	9.62568	.42236	44
17	.61677	.41378	.61903	.41593	.62127	.41809	.62350	.42024	.62572	.42239	43
18	.61681	.41382	.61906	.41597	.62130	.41812	.62353	.42027	.62575	.42243	42
19	.61685	.41386	.61910	.41601	.62134	.41816	.62357	.42031	.62579	.42247	41
+ 5′	9.61689	.41389	9.61914	.41604	9.62138	.41819	9.62361	.42035	9.62583	.42250	40
21	.61692	.41393	.61917	.41608	.62141	.41823	.62364	.42038	.62586	.42254	39
22	.61696	.41396	.61921	.41611	.62145	.41827	.62368	.42042	.62590	.42257	38
23	.61700	.41400	.61925	.41615	.62149	.41830	.62372	.42045	.62594	.42261	37
+ 6′	9.61704	.41404	9.61929	.41619	9.62153	.41834	9.62376	.42049	9.62598	.42264	36
25	.61708	.41407	.61932	.41622	.62156	.41837	.62379	.42053	.62601	.42268	35
26	.61711	.41411	.61936	.41626	.62160	.41811	.62383	.42056	.62605	.42272	34
27	.61715	.41414	.61940	.41629	.62164	.41844	.62387	.42060	.62609	.42275	33
+ 7′	9.61719	.41418	9.61944	.41633	9.62168	.41848	9.62390	.42063	9.62612	.42279	32
29	.61723	.41421	.61947	.41636	.62171	.41852	.62394	.42067	.62616	.42282	31
30	.61726	.41425	.61951	.41640	.62175	.41855	.62398	.42071	.62620	.42286	30
31	.61730	.41429	.61955	.41644	.62179	.41859	.62402	.42074	.62623	.42290	29
+ 8′	9.61734	.41432	9.61959	.41647	9.62182	.41862	9.62405	.42078	9.62627	.42293	28
33	.61738	.41436	.61962	.41651	.62186	.41866	.62409	.42081	.62631	.42297	27
34	.61741	.41439	.61966	.41654	.62190	.41870	.62413	.42085	.62634	.42300	26
35	.61745	.41443	.61970	.41658	.62194	.41873	.62416	.42089	.62638	.42304	25
+ 9′	9.61749	.41447	9.61974	.41662	9.62197	.41877	9.62420	.42092	9.62642	.42308	24
37	.61753	.41450	.61977	.41665	.62201	.41880	.62424	.42096	.62646	.42311	23
38	.61756	.41454	.61981	.41669	.62205	.41884	.62427	.42099	.62649	.42315	22
39	.61760	.41457	.61985	.41672	.62208	.41888	.62431	.42103	.62653	.42318	21
+ 10′	9.61764	.41461	9.61989	.41676	9.62212	.41891	9.62435	.42106	9.62657	.42322	20
41	.61768	.41464	.61992	.41679	.62216	.41895	.62439	.42110	.62660	.42326	19
42	.61771	.41468	.61996	.41683	.62220	.41898	.62442	.42114	.62664	.42329	18
43	.61775	.41472	.62000	.41687	.62223	.41902	.62446	.42117	.62668	.42333	17
+ 11′	9.61779	.41475	9.62003	.41690	9.62227	.41905	9.62450	.42121	9.62671	.42336	16
45	.61783	.41479	.62007	.41694	.62231	.41909	.62453	.42124	.62675	.42340	15
46	.61786	.41482	.62011	.41697	.62234	.41913	.62457	.42128	.62679	.42344	14
47	.61790	.41486	.62015	.41701	.62238	.41916	.62461	.42132	.62682	.42347	13
+ 12′	9.61794	.41490	9.62018	.41705	9.62242	.41920	9.62464	.42135	9.62686	.42351	12
49	.61798	.41493	.62022	.41708	.62246	.41923	.62468	.42139	.62690	.42354	11
50	.61801	.41497	.62026	.41712	.62249	.41927	.62472	.42142	.62693	.42358	10
51	.61805	.41500	.62030	.41715	.62253	.41931	.62476	.42146	.62697	.42361	9
+ 13′	9.61809	.41504	9.62033	.41719	9.62257	.41934	9.62479	.42150	9.62701	.42365	8
53	.61813	.41507	.62037	.41722	.62261	.41938	.62483	.42153	.62704	.42369	7
54	.61816	.41511	.62041	.41726	.62264	.41941	.62487	.42157	.62708	.42372	6
55	.61820	.41515	.62045	.41730	.62268	.41945	.62490	.42160	.62712	.42376	5
+ 14′	9.61824	.41518	9.62048	.41733	9.62272	.41949	9.62494	.42164	9.62716	.42379	4
57	.61828	.41522	.62052	.41737	.62275	.41952	.62498	.42168	.62719	.42383	3
58	.61831	.41525	.62056	.41740	.62279	.41956	.62501	.42171	.62723	.42387	2
59	.61835	.41529	.62059	.41744	.62283	.41959	.62505	.42175	.62727	.42390	1
+ 15′	9.61839	.41533	9.62063	.41748	9.62287	.41963	9.62509	.42178	9.62730	.42394	0
	$18^h\ 39^m$		$18^h\ 38^m$		$18^h\ 37^m$		$18^h\ 36^m$		$18^h\ 35^m$		

Haversines.

s	5h 25m 81° 15′ Log. Hav.	Nat. Hav.	5h 26m 81° 30′ Log. Hav.	Nat. Hav.	5h 27m 81° 45′ Log. Hav.	Nat. Hav.	5h 28m 82° 0′ Log. Hav.	Nat. Hav.	5h 29m 82° 15′ Log. Hav	Nat. Hav.	s
0	9.62730	.42394	9.62951	.42610	9.63170	.42825	9.63389	.43041	9.63606	.43257	60
1	.62734	.42397	.62954	.42613	.63174	.42829	.63392	.43045	.63610	.43261	59
2	.62738	.42401	.62958	.42617	.63177	.42833	.63396	.43049	.63613	.43265	58
3	.62741	.42405	.62962	.42620	.63181	.42836	.63399	.43052	.63617	.43268	57
+ 1′	9.62745	.42408	9.62965	.42624	9.63185	.42840	9.63403	.43056	9.63621	.43272	56
5	.62749	.42412	.62969	.42628	.63188	.42843	.63407	.43059	.63624	.43275	55
6	.62752	.42415	.62973	.42631	.63192	.42847	.63410	.43063	.63628	.43279	54
7	.62756	.42419	.62976	.42635	.63196	.42851	.63414	.43067	.63631	.43283	53
+ 2′	9.62760	.42423	9.62980	.42638	9.63199	.42854	9.63418	.43070	9.63635	.43286	52
9	.62763	.42426	.62984	.42642	.63203	.42858	.63421	.43074	.63639	.43290	51
10	.62767	.42430	.62987	.42645	.63207	.42861	.63425	.43077	.63642	.43293	50
11	.62771	.42433	.62991	.42649	.63210	.42865	.63429	.43081	.63646	.43297	49
+ 3′	9.62774	.42437	9.62995	.42653	9.63214	.42869	9.63432	.43085	9.63649	.43301	48
13	.62778	.42441	.62998	.42656	.63218	.42872	.63436	.43088	.63653	.43304	47
14	.62782	.42444	.63002	.42660	.63221	.42876	.63439	.43092	.63657	.43308	46
15	.62785	.42448	.63006	.42663	.63225	.42879	.63443	.43095	.63660	.43312	45
+ 4′	9.62789	.42451	9.63009	.42667	9.63228	.42883	9.63447	.43099	9.63664	.43315	44
17	.62793	.42455	.63013	.42671	.63232	.42887	.63450	.43103	.63668	.43319	43
18	.62796	.42459	.63017	.42674	.63236	.42890	.63454	.43106	.63671	.43322	42
19	.62800	.42462	.63020	.42678	.63239	.42894	.63458	.43110	.63675	.43326	41
+ 5′	9.62804	.42466	9.63024	.42681	9.63243	.42897	9.63461	.43113	9.63678	.43330	40
21	.62808	.42469	.63028	.42685	.63247	.42901	.63465	.43117	.63682	.43333	39
22	.62811	.42473	.63031	.42689	.63250	.42905	.63468	.43121	.63686	.43337	38
23	.62815	.42477	.63035	.42692	.63254	.42908	.63472	.43124	.63689	.43340	37
+ 6′	9.62819	.42480	9.63039	.42696	9.63258	.42912	9.63476	.43128	9.63693	.43344	36
25	.62822	.42484	.63042	.42699	.63261	.42915	.63479	.43131	.63696	.43348	35
26	.62826	.42487	.63046	.42703	.63265	.42919	.63483	.43135	.63700	.43351	34
27	.62830	.42491	.63050	.42707	.63269	.42923	.63487	.43139	.63704	.43355	33
+ 7′	9.62833	.42494	9.63053	.42710	9.63272	.42926	9.63490	.43142	9.63707	.43358	32
29	.62837	.42498	.63057	.42714	.63276	.42930	.63494	.43146	.63711	.43362	31
30	.62841	.42502	.63061	.42717	.63279	.42933	.63497	.43149	.63714	.43366	30
31	.62844	.42505	.63064	.42721	.63283	.42937	.63501	.43153	.63718	.43369	29
+ 8′	9.62848	.42509	9.63068	.42725	9.63287	.42941	9.63505	.43157	9.63722	.43373	28
33	.62852	.42512	.63071	.42728	.63290	.42944	.63508	.43160	.63725	.43376	27
34	.62855	.42516	.63075	.42732	.63294	.42948	.63512	.43164	.63729	.43380	26
35	.62859	.42520	.63079	.42735	.63298	.42951	.63516	.43167	.63733	.43384	25
+ 9′	9.62863	.42523	9.63082	.42739	9.63301	.42955	9.63519	.43171	9.63736	.43387	24
37	.62866	.42527	.63086	.42743	.63305	.42959	.63523	.43175	.63740	.43391	23
38	.62870	.42530	.63090	.42746	.63309	.42962	.63526	.43178	.63743	.43394	22
39	.62874	.42534	.63093	.42750	.63312	.42966	.63530	.43182	.63747	.43398	21
+ 10′	9.62877	.42538	9.63097	.42753	9.63316	.42969	9.63534	.43185	9.63751	.43402	20
41	.62881	.42541	.63101	.42757	.63320	.42973	.63537	.43189	.63754	.43405	19
42	.62885	.42545	.63104	.42761	.63323	.42977	.63541	.43193	.63758	.43409	18
43	.62888	.42548	.63108	.42764	.63327	.42980	.63545	.43196	.63761	.43412	17
+ 11′	9.62892	.42552	9.63112	.42768	9.63330	.42984	9.63548	.43200	9.63765	.43416	16
45	.62896	.42556	.63115	.42771	.63334	.42987	.63552	.43203	.63769	.43420	15
46	.62899	.42559	.63119	.42775	.63338	.42991	.63555	.43207	.63772	.43423	14
47	.62903	.42563	.63123	.42779	.63341	.42995	.63559	.43211	.63776	.43427	13
+ 12′	9.62907	.42566	9.63126	.42782	9.63345	.42998	9.63563	.43214	9.63779	.43430	12
49	.62910	.42570	.63130	.42786	.63349	.43002	.63566	.43218	.63783	.43434	11
50	.62914	.42574	.63134	.42789	.63352	.43005	.63570	.43221	.63787	.43438	10
51	.62918	.42577	.63137	.42793	.63356	.43009	.63574	.43225	.63790	.43441	9
+ 13′	9.62921	.42581	9.63141	.42797	9.63360	.43013	9.63577	.43229	9.63794	.43445	8
53	.62925	.42584	.63145	.42800	.63363	.43016	.63581	.43232	.63797	.43448	7
54	.62929	.42588	.63148	.42804	.63367	.43020	.63584	.43236	.63801	.43452	6
55	.62932	.42592	.63152	.42807	.63370	.43023	.63588	.43239	.63805	.43456	5
+ 14′	9.62936	.42595	9.63156	.42811	9.63374	.43027	9.63592	.43243	9.63808	.43459	4
57	.62940	.42599	.63159	.42815	.63378	.43031	.63595	.43247	.63812	.43463	3
58	.62943	.42602	.63163	.42818	.63381	.43034	.63599	.43250	.63815	.43466	2
59	.62947	.42606	.63166	.42822	.63385	.43038	.63602	.43254	.63819	.43470	1
+ 15′	9.62951	.42610	9.63170	.42825	9.63389	.43041	9.63606	.43257	9.63823	.43474	0
	18h 34m		18h 33m		18h 32m		18h 31m		18h 30m		

TABLE 34.

Haversines.

s	5h 30m 82° 30′		5h 31m 82° 45′		5h 32m 83° 0′		5h 33m 83° 15′		5h 34m 83° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.63823	.43474	9.64038	.43690	9.64253	.43907	9.64467	.44123	9.64679	.44340	60
1	.63826	.43477	.64042	.43694	.64256	.43910	.64470	.44127	.64683	.44343	59
2	.63830	.43481	.64046	.43697	.64260	.43914	.64474	.44130	.64686	.44347	58
3	.63833	.43485	.64049	.43701	.64264	.43917	.64477	.44134	.64690	.44351	57
+ 1′	9.63837	.43488	9.64053	.43704	9.64267	.43921	9.64481	.44138	9.64694	.44354	56
5	.63841	.43492	.64056	.43708	.64271	.43925	.64484	.44141	.64697	.44358	55
6	.63844	.43495	.64060	.43712	.64274	.43928	.64488	.44145	.64701	.44362	54
7	.63848	.43499	.64063	.43715	.64278	.43932	.64492	.44148	.64704	.44365	53
+ 2′	9.63851	.43503	9.64067	.43719	9.64281	.43935	9.64495	.44152	9.64708	.44369	52
9	.63855	.43506	.64071	.43723	.64285	.43939	.64499	.44156	.64711	.44372	51
10	.63859	.43510	.64074	.43726	.64289	.43943	.64502	.44159	.64715	.44376	50
11	.63862	.43513	.64078	.43730	.64292	.43946	.64506	.44163	.64718	.44380	49
+ 3′	9.63866	.43517	9.64081	.43733	9.64296	.43950	9.64509	.44166	9.64722	.44383	48
13	.63869	.43521	.64085	.43737	.64299	.43953	.64513	.44170	.64725	.44387	47
14	.63873	.43524	.64088	.43741	.64303	.43957	.64516	.44174	.64729	.44390	46
15	.63877	.43528	.64092	.43744	.64306	.43961	.64520	.44177	.64732	.44394	45
+ 4′	9.63880	.43531	9.64096	.43748	9.64310	.43964	9.64523	.44181	9.64736	.44398	44
17	.63884	.43535	.64099	.43751	.64314	.43968	.64527	.44185	.64740	.44401	43
18	.63887	.43539	.64102	.43755	.64317	.43972	.64531	.44188	.64743	.44405	42
19	.63891	.43542	.64106	.43759	.64321	.43975	.64534	.44192	.64747	.44408	41
+ 5′	9.63895	.43546	9.64110	.43762	9.64324	.43979	9.64538	.44195	9.64750	.44412	40
21	.63898	.43549	.64113	.43766	.64328	.43982	.64541	.44199	.64754	.44416	39
22	.63902	.43553	.64117	.43769	.64331	.43986	.64545	.44203	.64757	.44419	38
23	.63905	.43557	.64121	.43773	.64335	.43990	.64548	.44206	.64761	.44423	37
+ 6′	9.63909	.43560	9.64124	.43777	9.64339	.43993	9.64552	.44210	9.64764	.44427	36
25	.63913	.43564	.64128	.43780	.64342	.43997	.64555	.44213	.64768	.44430	35
26	.63916	.43567	.64131	.43784	.64346	.44000	.64559	.44217	.64771	.44434	34
27	.63920	.43571	.64135	.43787	.64349	.44004	.64563	.44221	.64775	.44437	33
+ 7′	9.63923	.43575	9.64139	.43791	9.64353	.44008	9.64566	.44224	9.64778	.44441	32
29	.63927	.43578	.64142	.43795	.64356	.44011	.64570	.44228	.64782	.44445	31
30	.63931	.43582	.64146	.43798	.64360	.44015	.64573	.44231	.64785	.44448	30
31	.63934	.43585	.64149	.43802	.64363	.44018	.64577	.44235	.64789	.44452	29
+ 8′	9.63938	.43589	9.64153	.43805	9.64367	.44022	9.64580	.44239	9.64793	.44455	28
33	.63941	.43593	.64156	.43809	.64371	.44026	.64584	.44242	.64796	.44459	27
34	.63945	.43596	.64160	.43813	.64374	.44029	.64587	.44246	.64800	.44463	26
35	.63949	.43600	.64164	.43816	.64378	.44033	.64591	.44250	.64803	.44466	25
+ 9′	9.63952	.43603	9.64167	.43820	9.64381	.44036	9.64594	.44253	9.64807	.44470	24
37	.63956	.43607	.64171	.43824	.64385	.44040	.64598	.44257	.64810	.44474	23
38	.63959	.43611	.64174	.43827	.64388	.44044	.64602	.44260	.64814	.44477	22
39	.63963	.43614	.64178	.43831	.64392	.44047	.64605	.44264	.64817	.44481	21
+ 10′	9.63966	.43618	9.64181	.43834	9.64396	.44051	9.64609	.44268	9.64821	.44484	20
41	.63970	.43622	.64185	.43838	.64399	.44055	.64612	.44271	.64824	.44488	19
42	.63974	.43625	.64189	.43842	.64403	.44058	.64616	.44275	.64828	.44492	18
43	.63977	.43629	.64192	.43845	.64406	.44062	.64619	.44278	.64831	.44495	17
+ 11′	9.63981	.43632	9.64196	.43849	9.64410	.44065	9.64623	.44282	9.64835	.44499	16
45	.63984	.43636	.64199	.43852	.64413	.44069	.64626	.44286	.64838	.44502	15
46	.63988	.43640	.64203	.43856	.64417	.44073	.64630	.44289	.64842	.44506	14
47	.63992	.43643	.64206	.43860	.64420	.44076	.64633	.44293	.64845	.44510	13
+ 12′	9.63995	.43647	9.64210	.43863	9.64424	.44080	9.64637	.44296	9.64849	.44513	12
49	.63999	.43650	.64214	.43867	.64428	.44083	.64640	.44300	.64852	.44517	11
50	.64002	.43654	.64217	.43870	.64431	.44087	.64644	.44304	.64856	.44521	10
51	.64006	.43658	.64221	.43874	.64435	.44091	.64648	.44307	.64860	.44524	9
+ 13′	9.64010	.43661	9.64224	.43878	9.64438	.44094	9.64651	.44311	9.64863	.44528	8
53	.64013	.43665	.64228	.43881	.64442	.44098	.64655	.44315	.64867	.44531	7
54	.64017	.43668	.64231	.43885	.64445	.44101	.64658	.44318	.64870	.44535	6
55	.64020	.43672	.64235	.43888	.64449	.44105	.64662	.44322	.64874	.44539	5
+ 14′	9.64024	.43676	9.64239	.43892	9.64452	.44109	9.64665	.44325	9.64877	.44542	4
57	.64028	.43679	.64242	.43896	.64456	.44112	.64669	.44329	.64881	.44546	3
58	.64031	.43683	.64246	.43899	.64460	.44116	.64672	.44333	.64884	.44549	2
59	.64035	.43686	.64249	.43903	.64463	.44120	.64676	.44336	.64888	.44553	1
+ 15′	9.64038	.43690	9.64253	.43907	9.64467	.44123	9.64679	.44340	9.64891	.44557	0
	18h 29m		18h 28m		18h 27m		18h 26m		18h 25m		

Haversines.

s	5h 35m 83° 45′		5h 36m 84° 0′		5h 37m 84° 15′		5h 38m 84° 30′		5h 39m 84° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.64891	.44557	9.65102	.44774	9.65312	.44991	9.65521	.45208	9.65729	.45425	60
1	.64895	.44560	.65106	.44777	.65316	.44994	.65525	.45211	.65733	.45429	59
2	.64898	.44564	.65109	.44781	.65319	.44998	.65528	.45215	.65736	.45432	58
3	.64902	.44568	.65113	.44784	.65323	.45001	.65532	.45219	.65740	.45436	57
+ 1′	9.64905	.44571	9.65116	.44788	9.65326	.45005	9.65535	.45222	9.65743	.45439	56
5	.64909	.44575	.65120	.44792	.65330	.45009	.65539	.45226	.65747	.45443	55
6	.64912	.44578	.65123	.44795	.65333	.45012	.65542	.45229	.65750	.45447	54
7	.64916	.44582	.65127	.44799	.65337	.45016	.65546	.45233	.65754	.45450	53
+ 2′	9.64919	.44586	9.65130	.44803	9.65340	.45020	9.65549	.45237	9.65757	.45454	52
9	.64923	.44589	.65134	.44806	.65344	.45023	.65553	.45240	.65761	.45458	51
10	.64926	.44593	.65137	.44810	.65347	.45027	.65556	.45244	.65764	.45461	50
11	.64930	.44596	.65141	.44813	.65351	.45030	.65559	.45248	.65767	.45465	49
+ 3′	9.64934	.44600	9.65144	.44817	9.65354	.45034	9.65563	.45251	9.65771	.45468	48
13	.64937	.44604	.65148	.44821	.65358	.45038	.65566	.45235	.65774	.45472	47
14	.64941	.44607	.65151	.44824	.65361	.45041	.65570	.45258	.65778	.45476	46
15	.64944	.44611	.65155	.44828	.65365	.45045	.65573	.45262	.65781	.45479	45
+ 4′	9.64948	.44614	9.65158	.44831	9.65368	.45048	9.65577	.45266	9.65785	.45483	44
17	.64951	.44618	.65162	.44835	.65372	.45052	.65580	.45269	.65788	.45486	43
18	.64955	.44622	.65165	.44839	.65375	.45056	.65584	.45273	.65792	.45490	42
19	.64958	.44625	.65169	.44842	.65378	.45059	.65587	.45276	.65795	.45494	41
+ 5′	9.64962	.44629	9.65172	.44846	9.65382	.45063	9.65591	.45280	9.65799	.45497	40
21	.64965	.44633	.65176	.44850	.65385	.45067	.65594	.45284	.65802	.45501	39
22	.64969	.44636	.65179	.44853	.65389	.45070	.65598	.45287	.65806	.45505	38
23	.64972	.44640	.65183	.44857	.65392	.45074	.65601	.45291	.65809	.45508	37
+ 6′	9.64976	.44643	9.65186	.44860	9.65396	.45077	9.65605	.45295	9.65812	.45512	36
25	.64979	.44647	.65190	.44864	.65399	.45081	.65608	.45298	.65816	.45515	35
26	.64983	.44651	.65193	.44868	.65403	.45085	.65612	.45302	.65819	.45519	34
27	.64986	.44654	.65197	.44871	.65406	.45088	.65615	.45305	.65823	.45523	33
+ 7′	9.64990	.44658	9.65200	.44875	9.65410	.45092	9.65619	.45309	9.65826	.45526	32
29	.64993	.44661	.65204	.44878	.65413	.45096	.65622	.45313	.65830	.45530	31
30	.64997	.44665	.65207	.44882	.65417	.45099	.65625	.45316	.65833	.45534	30
31	.65000	.44669	.65211	.44886	.65421	.45103	.65629	.45320	.65837	.45537	29
+ 8′	9.65004	.44672	9.65214	.44889	9.65424	.45106	9.65632	.45324	9.65840	.45541	28
33	.65007	.44676	.65218	.44893	.65427	.45110	.65636	.45327	.65844	.45544	27
34	.65011	.44680	.65221	.44897	.65431	.45114	.65639	.45331	.65847	.45548	26
35	.65014	.44683	.65225	.44900	.65434	.45117	.65643	.45334	.65850	.45552	25
+ 9′	9.65018	.44687	9.65228	.44904	9.65438	.45121	9.65646	.45338	9.65854	.45555	24
37	.65021	.44690	.65232	.44907	.65441	.45124	.65650	.45342	.65857	.45559	23
38	.65025	.44694	.65235	.44911	.65445	.45128	.65653	.45345	.65861	.45563	22
39	.65028	.44698	.65239	.44915	.65448	.45132	.65657	.45349	.65864	.45566	21
+ 10′	9.65032	.44701	9.65242	.44918	9.65452	.45135	9.65660	.45353	9.65868	.45570	20
41	.65035	.44705	.65246	.44922	.65455	.45139	.65664	.45356	.65871	.45573	19
42	.65039	.44708	.65249	.44925	.65459	.45143	.65667	.45360	.65875	.45577	18
43	.65043	.44712	.65253	.44929	.65462	.45146	.65671	.45363	.65878	.45581	17
+ 11′	9.65046	.44716	9.65256	.44933	9.65466	.45150	9.65674	.45367	9.65881	.45584	16
45	.65050	.44719	.65260	.44936	.65469	.45153	.65677	.45371	.65885	.45588	15
46	.65053	.44723	.65263	.44940	.65473	.45157	.65681	.45374	.65888	.45592	14
47	.65057	.44727	.65267	.44944	.65476	.45161	.65684	.45378	.65892	.45595	13
+ 12′	9.65060	.44730	9.65270	.44947	9.65480	.45164	9.65688	.45381	9.65895	.45599	12
49	.65064	.44734	.65274	.44951	.65483	.45168	.65691	.45385	.65899	.45602	11
50	.65067	.44737	.65277	.44954	.65486	.45172	.65695	.45389	.65902	.45606	10
51	.65071	.44741	.65281	.44958	.65490	.45175	.65698	.45392	.65906	.45610	9
+ 13′	9.65074	.44745	9.65284	.44962	9.65493	.45179	9.65702	.45396	9.65909	.45613	8
53	.65078	.44748	.65288	.44965	.65497	.45182	.65705	.45400	.65913	.45617	7
54	.65081	.44752	.65291	.44969	.65500	.45186	.65709	.45403	.65916	.45620	6
55	.65085	.44755	.65295	.44973	.65504	.45190	.65712	.45407	.65919	.45624	5
+ 14′	9.65088	.44759	9.65298	.44976	9.65507	.45193	9.65716	.45410	9.65923	.45628	4
57	.65092	.44763	.65302	.44980	.65511	.45197	.65719	.45414	.65926	.45631	3
58	.65095	.44766	.65305	.44983	.65514	.45200	.65722	.45418	.65930	.45635	2
59	.65099	.44770	.65309	.44987	.65518	.45204	.65726	.45421	.65933	.45639	1
+ 15′	9.65102	.44774	9.65312	.44991	9.65521	.45208	9.65729	.45425	9.65937	.45642	0
	18h 24m		18h 23m		18h 22m		18h 21m		18h 20m		

TABLE 34.

Haversines.

s	$5^h\ 40^m$ 85° 0′		$5^h\ 41^m$ 85° 15′		$5^h\ 42^m$ 85° 30′		$5^h\ 43^m$ 85° 45′		$5^h\ 44^m$ 86° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.65937	.45642	9.66143	.45860	9.66348	.46077	9.66553	.46295	9.66757	.46512	60
1	.65940	.45646	.66146	.45863	.66352	.46081	.66556	.46298	.66760	.46516	59
2	.65944	.45649	.66150	.45867	.66355	.46084	.66560	.46302	.66763	.46519	58
3	.65947	.45653	.66153	.45870	.66359	.46088	.66563	.46305	.66767	.46523	57
+ 1′	9.65950	.45657	9.66157	.45874	9.66362	.46092	9.66567	.46309	9.66770	.46527	56
5	.65954	.45660	.66160	.45878	.66366	.46095	.66570	.46313	.66774	.46530	55
6	.65957	.45664	.66164	.45881	.66369	.46099	.66573	.46316	.66777	.46534	54
7	.65961	.45668	.66167	.45885	.66372	.46102	.66577	.46320	.66780	.46538	53
+ 2′	9.65964	.45671	9.66170	.45889	9.66376	.46106	9.66580	.46324	9.66784	.46541	52
9	.65968	.45675	.66174	.45892	.66379	.46110	.66584	.46327	.66787	.46545	51
10	.65971	.45678	.66177	.45896	.66383	.46113	.66587	.46331	.66791	.46548	50
11	.65975	.45682	.66181	.45899	.66386	.46117	.66590	.46334	.66794	.46552	49
+ 3′	9.65978	.45686	9.66184	.45903	9.66389	.46121	9.66594	.46338	9.66797	.46556	48
13	.65981	.45689	.66188	.45907	.66393	.46124	.66597	.46342	.66801	.46559	47
14	.65985	.45693	.66191	.45910	.66396	.46128	.66601	.46345	.66804	.46563	46
15	.65988	.45697	.66194	.45914	.66400	.46131	.66604	.46349	.66807	.46567	45
+ 4′	9.65992	.45700	9.66198	.45918	9.66403	.46135	9.66607	.46353	9.66811	.46570	44
17	.65995	.45704	.66201	.45921	.66407	.46139	.66611	.46356	.66814	.46574	43
18	.65999	.45707	.66205	.45925	.66410	.46142	.66614	.46360	.66818	.46577	42
19	.66002	.45711	.66208	.45928	.66413	.46146	.66618	.46363	.66821	.46581	41
+ 5′	9.66006	.45715	9.66212	.45932	9.66417	.46150	9.66621	.46367	9.66824	.46585	40
21	.66009	.45718	.66215	.45936	.66420	.46153	.66624	.46371	.66828	.46588	39
22	.66012	.45722	.66218	.45939	.66424	.46157	.66628	.46374	.66831	.46592	38
23	.66016	.45726	.66222	.45943	.66427	.46161	.66631	.46378	.66835	.46596	37
+ 6′	9.66019	.45729	9.66225	.45947	9.66430	.46164	9.66635	.46382	9.66838	.46599	36
25	.66023	.45733	.66229	.45950	.66434	.46168	.66638	.46385	.66841	.46603	35
26	.66026	.45736	.66232	.45954	.66437	.46171	.66641	.46389	.66845	.46606	34
27	.66030	.45740	.66236	.45957	.66441	.46175	.66645	.46392	.66848	.46610	33
+ 7′	9.66033	.45744	9.66239	.45961	9.66444	.46179	9.66648	.46396	9.66851	.46614	32
29	.66037	.45747	.66242	.45965	.66447	.46182	.66652	.46400	.66855	.46617	31
30	.66040	.45751	.66246	.45968	.66451	.46186	.66655	.46403	.66858	.46621	30
31	.66043	.45755	.66249	.45972	.66454	.46189	.66658	.46407	.66862	.46625	29
+ 8′	9.66047	.45758	9.66253	.45976	9.66458	.46193	9.66662	.46411	9.66865	.46628	28
33	.66050	.45762	.66256	.45979	.66461	.46197	.66665	.46414	.66868	.46632	27
34	.66054	.45765	.66260	.45983	.66464	.46200	.66669	.46418	.66872	.46636	26
35	.66057	.45769	.66263	.45986	.66468	.46204	.66672	.46421	.66875	.46639	25
+ 9′	9.66061	.45773	9.66266	.45990	9.66471	.46208	9.66675	.46425	9.66878	.46643	24
37	.66064	.45776	.66270	.45994	.66475	.46211	.66679	.46429	.66882	.46646	23
38	.66067	.45780	.66273	.45997	.66478	.46215	.66682	.46432	.66885	.46650	22
39	.66071	.45783	.66277	.46001	.66482	.46218	.66685	.46436	.66889	.46654	21
+ 10′	9.66074	.45787	9.66280	.46005	9.66485	.46222	9.66689	.46440	9.66892	.46657	20
41	.66078	.45791	.66284	.46008	.66488	.46226	.66692	.46443	.66895	.46661	19
42	.66081	.45794	.66287	.46012	.66492	.46229	.66696	.46447	.66899	.46665	18
43	.66085	.45798	.66290	.46015	.66495	.46233	.66699	.46451	.66902	.46668	17
+ 11′	9.66088	.45802	9.66294	.46019	9.66499	.46237	9.66702	.46454	9.66905	.46672	16
45	.66092	.45805	.66297	.46023	.66502	.46240	.66706	.46458	.66909	.46675	15
46	.66095	.45809	.66301	.46026	.66505	.46244	.66709	.46461	.66912	.46679	14
47	.66098	.45812	.66304	.46030	.66509	.46247	.66713	.46465	.66916	.46683	13
+ 12′	9.66102	.45816	9.66307	.46034	9.66512	.46251	9.66716	.46469	9.66919	.46686	12
49	.66105	.45820	.66311	.46037	.66516	.46255	.66719	.46472	.66922	.46690	11
50	.66109	.45823	.66314	.46041	.66519	.46258	.66723	.46476	.66926	.46694	10
51	.66112	.45827	.66318	.46044	.66522	.46262	.66726	.46480	.66929	.46697	9
+ 13′	9.66116	.45831	9.66321	.46048	9.66526	.46266	9.66730	.46483	9.66932	.46701	8
53	.66119	.45834	.66325	.46052	.66529	.46269	.66733	.46487	.66936	.46704	7
54	.66122	.45838	.66328	.46055	.66533	.46273	.66736	.46490	.66939	.46708	6
55	.66126	.45841	.66331	.46059	.66536	.46276	.66740	.46494	.66943	.46712	5
+ 14′	9.66129	.45845	9.66335	.46063	9.66539	.46280	9.66743	.46498	9.66946	.46715	4
57	.66133	.45849	.66338	.46066	.66543	.46284	.66747	.46501	.66949	.46719	3
58	.66136	.45852	.66342	.46070	.66546	.46287	.66750	.46505	.66953	.46723	2
59	.66140	.45856	.66345	.46073	.66550	.46291	.66753	.46509	.66956	.46726	1
+ 15′	9.66143	.45860	9.66348	.46077	9.66553	.46295	9.66757	.46512	9.66959	.46730	0
	$18^h\ 19^m$		$18^h\ 18^m$		$18^h\ 17^m$		$18^h\ 16^m$		$18^h\ 15^m$		

Haversines.

s	5h 45m 86° 15′		5h 46m 86° 30′		5h 47m 86° 45′		5h 48m 87° 0′		5h 49m 87° 15′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.66959	.46730	9.67161	.46948	9.67362	.47165	9.67562	.47383	9.67762	.47601	60
1	.66963	.46733	.67165	.46951	.67366	.47169	.67566	.47387	.67765	.47605	59
2	.66966	.46737	.67168	.46955	.67369	.47173	.67569	.47390	.67768	.47608	58
3	.66970	.46741	.67171	.46958	.67372	.47176	.67572	.47394	.67772	.47612	57
+ 1′	9.66973	.46744	9.67175	.46962	9.67376	.47180	9.67576	.47398	9.67775	.47616	56
5	.66976	.46748	.67178	.46966	.67379	.47184	.67579	.47401	.67778	.47619	55
6	.66980	.46752	.67181	.46969	.67382	.47187	.67582	.47405	.67782	.47623	54
7	.66983	.46755	.67185	.46973	.67386	.47191	.67586	.47409	.67785	.47627	53
+ 2′	9.66986	.46759	9.67188	.46977	9.67389	.47194	9.67589	.47412	9.67788	.47630	52
9	.66990	.46762	.67192	.46980	.67392	.47198	.67592	.47416	.67792	.47634	51
10	.66993	.46766	.67195	.46984	.67396	.47202	.67596	.47420	.67795	.47637	50
11	.66997	.46770	.67198	.46987	.67399	.47205	.67599	.47423	.67798	.47641	49
+ 3′	9.67000	.46773	9.67202	.46991	9.67402	.47209	9.67602	.47427	9.67801	.47645	48
13	.67003	.46777	.67205	.46995	.67406	.47213	.67606	.47430	.67805	.47648	47
14	.67007	.46781	.67208	.46998	.67409	.47216	.67609	.47434	.67808	.47652	46
15	.67010	.46784	.67212	.47002	.67412	.47220	.67612	.47438	.67811	.47656	45
+ 4′	9.67013	.46788	9.67215	.47006	9.67416	.47223	9.67616	.47441	9.67815	.47659	44
17	.67017	.46792	.67218	.47009	.67419	.47227	.67619	.47445	.67818	.47663	43
18	.67020	.46795	.67222	.47013	.67422	.47231	.67622	.47449	.67821	.47666	42
19	.67023	.46799	.67225	.47017	.67426	.47234	.67626	.47452	.67825	.47670	41
+ 5′	9.67027	.46802	9.67228	.47020	9.67429	.47238	9.67629	.47456	9.67828	.47674	40
21	.67030	.46806	.67232	.47024	.67432	.47242	.67632	.47459	.67831	.47677	39
22	.67034	.46810	.67235	.47027	.67436	.47245	.67636	.47463	.67835	.47681	38
23	.67037	.46813	.67238	.47031	.67439	.47249	.67639	.47467	.67838	.47685	37
+ 6′	9.67040	.46817	9.67242	.47035	9.67443	.47252	9.67642	.47470	9.67841	.47688	36
25	.67044	.46821	.67245	.47038	.67446	.47256	.67646	.47474	.67844	.47692	35
26	.67047	.46824	.67249	.47042	.67449	.47260	.67649	.47478	.67848	.47696	34
27	.67050	.46828	.67252	.47046	.67452	.47263	.67652	.47481	.67851	.47699	33
+ 7′	9.67054	.46831	9.67255	.47049	9.67456	.47267	9.67656	.47485	9.67854	.47703	32
29	.67057	.46835	.67259	.47053	.67459	.47271	.67659	.47489	.67858	.47706	31
30	.67060	.46839	.67262	.47056	.67462	.47274	.67662	.47492	.67861	.47710	30
31	.67064	.46842	.67265	.47060	.67466	.47278	.67666	.47496	.67864	.47714	29
+ 8′	9.67067	.46846	9.67269	.47064	9.67469	.47282	9.67669	.47499	9.67868	.47717	28
33	.67071	.46850	.67272	.47067	.67472	.47285	.67672	.47503	.67871	.47721	27
34	.67074	.46853	.67275	.47071	.67476	.47289	.67675	.47507	.67874	.47725	26
35	.67077	.46857	.67279	.47075	.67479	.47292	.67679	.47510	.67878	.47728	25
+ 9′	9.67081	.46860	9.67282	.47078	9.67483	.47296	9.67682	.47514	9.67881	.47732	24
37	.67084	.46864	.67285	.47082	.67486	.47300	.67685	.47518	.67884	.47735	23
38	.67087	.46868	.67289	.47086	.67489	.47303	.67689	.47521	.67887	.47739	22
39	.67091	.46871	.67292	.47089	.67493	.47307	.67692	.47525	.67891	.47743	21
+ 10′	9.67094	.46875	9.67295	.47093	9.67496	.47311	9.67695	.47528	9.67894	.47746	20
41	.67097	.46879	.67299	.47096	.67499	.47314	.67699	.47532	.67897	.47750	19
42	.67101	.46882	.67302	.47100	.67503	.47318	.67702	.47536	.67901	.47754	18
43	.67104	.46886	.67305	.47104	.67506	.47321	.67705	.47539	.67904	.47757	17
+ 11′	9.67108	.46890	9.67309	.47107	9.67509	.47325	9.67709	.47543	9.67907	.47761	16
45	.67111	.46893	.67312	.47111	.67512	.47329	.67712	.47547	.67911	.47765	15
46	.67114	.46897	.67315	.47115	.67516	.47332	.67715	.47550	.67914	.47768	14
47	.67118	.46900	.67319	.47118	.67519	.47336	.67719	.47554	.67917	.47772	13
+ 12′	9.67121	.46904	9.67322	.47122	9.67522	.47340	9.67722	.47558	9.67920	.47775	12
49	.67124	.46908	.67326	.47125	.67526	.47343	.67725	.47561	.67924	.47779	11
50	.67128	.46911	.67329	.47129	.67529	.47347	.67729	.47565	.67927	.47783	10
51	.67131	.46915	.67332	.47133	.67532	.47351	.67732	.47568	.67930	.47786	9
+ 13′	9.67134	.46919	9.67336	.47136	9.67536	.47354	9.67735	.47572	9.67934	.47790	8
53	.67138	.46922	.67339	.47140	.67539	.47358	.67738	.47576	.67937	.47794	7
54	.67141	.46926	.67342	.47144	.67542	.47361	.67742	.47579	.67940	.47797	6
55	.67145	.46929	.67346	.47147	.67546	.47365	.67745	.47583	.67944	.47801	5
+ 14′	9.67148	.46933	9.67349	.47151	9.67549	.47369	9.67748	.47587	9.67947	.47805	4
57	.67151	.46937	.67352	.47155	.67552	.47372	.67752	.47590	.67950	.47808	3
58	.67155	.46940	.67356	.47158	.67556	.47376	.67755	.47594	.67953	.47812	2
59	.67158	.46944	.67359	.47162	.67559	.47380	.67758	.47597	.67957	.47815	1
+ 15′	9.67161	.46948	9.67362	.47165	9.67562	.47383	9.67762	.47601	9.67960	.47819	0
	18h 14m		18h 13m		18h 12m		18h 11m		18h 10m		

TABLE 34.

Haversines.

s	5h 50m 87° 30′		5h 51m 87° 45′		5h 52m 88° 0′		5h 53m 88° 15′		5h 54m 88° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.67960	.47819	9.68158	.48037	9.68354	.48255	9.68550	.48473	9.68745	.48691	60
1	.67963	.47823	.68161	.48041	.68358	.48259	.68553	.48477	.68748	.48695	59
2	.67967	.47826	.68164	.48044	.68361	.48262	.68557	.48480	.68751	.48698	58
3	.67970	.47830	.68167	.48048	.68364	.48266	.68560	.48484	.68755	.48702	57
+ 1′	9.67973	.47834	9.68171	.48052	9.68367	.48269	9.68563	.48488	9.68758	.48706	56
5	.67977	.47837	.68174	.48055	.68371	.48273	.68566	.48491	.68761	.48709	55
6	.67980	.47841	.68177	.48059	.68374	.48277	.68570	.48495	.68764	.48713	54
7	.67983	.47844	.68181	.48062	.68377	.48280	.68573	.48499	.68768	.48717	53
+ 2′	9.67986	.47848	9.68184	.48066	9.68380	.48284	9.68576	.48502	9.68771	.48720	52
9	.67990	.47852	.68187	.48070	.68384	.48288	.68579	.48506	.68774	.48724	51
10	.67993	.47855	.68190	.48073	.68387	.48291	.68583	.48509	.68777	.48728	50
11	.67996	.47859	.68194	.48077	.68390	.48295	.68586	.48513	.68781	.48731	49
+ 3′	9.68000	.47863	9.68197	.48081	9.68393	.48299	9.68589	.48517	9.68784	.48735	48
13	.68003	.47866	.68200	.48084	.68397	.48302	.68592	.48520	.68787	.48738	47
14	.68006	.47870	.68204	.48088	.68400	.48306	.68596	.48524	.68790	.48742	46
15	.68010	.47874	.68207	.48092	.68403	.48310	.68599	.48528	.68794	.48746	45
+ 4′	9.68013	.47877	9.68210	.48095	9.68407	.48313	9.68602	.48531	9.68797	.48749	44
17	.68016	.47881	.68213	.48099	.68410	.48317	.68605	.48535	.68800	.48753	43
18	.68019	.47884	.68217	.48102	.68413	.48320	.68609	.48538	.68803	.48757	42
19	.68023	.47888	.68220	.48106	.68416	.48324	.68612	.48542	.68806	.48760	41
+ 5′	9.68026	.47892	9.68223	.48110	9.68420	.48328	9.68615	.48546	9.68810	.48764	40
21	.68029	.47895	.68227	.48113	.68423	.48331	.68618	.48549	.68813	.48767	39
22	.68033	.47899	.68230	.48117	.68426	.48335	.68622	.48553	.68816	.48771	38
23	.68036	.47903	.68233	.48121	.68429	.48339	.68625	.48557	.68820	.48775	37
+ 6′	9.68039	.47906	9.68236	.48124	9.68433	.48342	9.68628	.48560	9.68823	.48778	36
25	.68042	.47910	.68240	.48128	.68436	.48346	.68631	.48564	.68826	.48782	35
26	.68046	.47913	.68243	.48131	.68439	.48350	.68635	.48568	.68829	.48786	34
27	.68049	.47917	.68246	.48135	.68442	.48353	.68638	.48571	.68832	.48789	33
+ 7′	9.68052	.47921	9.68249	.48139	9.68446	.48357	9.68641	.48575	9.68836	.48793	32
29	.68056	.47924	.68253	.48142	.68449	.48360	.68644	.48578	.68839	.48797	31
30	.68059	.47928	.68256	.48146	.68452	.48364	.68648	.48582	.68842	.48800	30
31	.68062	.47932	.68259	.48150	.68456	.48368	.68651	.48586	.68845	.48804	29
+ 8′	9.68066	.47935	9.68263	.48153	9.68459	.48371	9.68654	.48589	9.68849	.48807	28
33	.68069	.47939	.68266	.48157	.68462	.48375	.68657	.48593	.68852	.48811	27
34	.68072	.47943	.68269	.48161	.68465	.48379	.68661	.48597	.68855	.48815	26
35	.68075	.47946	.68272	.48164	.68469	.48382	.68664	.48600	.68858	.48818	25
+ 9′	9.68079	.47950	9.68276	.48168	9.68472	.48386	9.68667	.48604	9.68862	.48822	24
37	.68082	.47953	.68279	.48171	.68475	.48389	.68670	.48608	.68865	.48826	23
38	.68085	.47957	.68282	.48175	.68478	.48393	.68674	.48611	.68868	.48829	22
39	.68089	.47961	.68286	.48179	.68482	.48397	.68677	.48615	.68871	.48833	21
+ 10′	9.68092	.47964	9.68289	.48182	9.68485	.48400	9.68680	.48618	9.68875	.48837	20
41	.68095	.47968	.68292	.48186	.68488	.48404	.68683	.48622	.68878	.48840	19
42	.68098	.47972	.68295	.48190	.68491	.48408	.68687	.48626	.68881	.48844	18
43	.68102	.47975	.68299	.48193	.68495	.48411	.68690	.48629	.68884	.48847	17
+ 11′	9.68105	.47979	9.68302	.48197	9.68498	.48415	9.68693	.48633	9.68887	.48851	16
45	.68108	.47983	.68305	.48201	.68501	.48419	.68696	.48637	.68891	.48855	15
46	.68112	.47986	.68308	.48204	.68504	.48422	.68700	.48640	.68894	.48858	14
47	.68115	.47990	.68312	.48208	.68508	.48426	.68703	.48644	.68897	.48862	13
+ 12′	9.68118	.47993	9.68315	.48211	9.68511	.48429	9.68706	.48648	9.68900	.48866	12
49	.68121	.47997	.68318	.48215	.68514	.48433	.68709	.48651	.68904	.48869	11
50	.68125	.48001	.68322	.48219	.68517	.48437	.68713	.48655	.68907	.48873	10
51	.68128	.48004	.68325	.48222	.68521	.48440	.68716	.48658	.68910	.48877	9
+ 13′	9.68131	.48008	9.68328	.48226	9.68524	.48444	9.68719	.48662	9.68913	.48880	8
53	.68135	.48012	.68331	.48230	.68527	.48448	.68722	.48666	.68917	.48884	7
54	.68138	.48015	.68335	.48233	.68531	.48451	.68726	.48669	.68920	.48887	6
55	.68141	.48019	.68338	.48237	.68534	.48455	.68729	.48673	.68923	.48891	5
+ 14′	9.68144	.48022	9.68341	.48241	9.68537	.48459	9.68732	.48677	9.68926	.48895	4
57	.68148	.48026	.68344	.48244	.68540	.48462	.68735	.48680	.68929	.48898	3
58	.68151	.48030	.68348	.48248	.68544	.48466	.68739	.48684	.68933	.48902	2
59	.68154	.48033	.68351	.48251	.68547	.48469	.68742	.48688	.68936	.48906	1
+ 15′	9.68158	.48037	9.68354	.48255	9.68550	.48473	9.68745	.48691	9.68939	.48909	0
	18h 9m		18h 8m		18h 7m		18h 6m		18h 5m		

Haversines.

s	5h 55m 88° 45′		5h 56m 89° 0′		5h 57m 89° 15′		5h 58m 89° 30′		5h 59m 89° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.68939	.48909	9.69132	.49127	9.69325	.49346	9.69516	.49564	9.69707	.49782	60
1	.68942	.48913	.69136	.49131	.69328	.49349	.69520	.49567	.69710	.49785	59
2	.68946	.48917	.69139	.49135	.69331	.49353	.69523	.49571	.69713	.49789	58
3	.68949	.48920	.69142	.49138	.69334	.49356	.69526	.49575	.69717	.49793	57
+ 1′	9.68952	.48924	9.69145	.49142	9.69338	.49360	9.69529	.49578	9.69720	.49796	56
5	.68955	.48927	.69148	.49146	.69341	.49364	.69532	.49582	.69723	.49800	55
6	.68958	.48931	.69152	.49149	.69344	.49367	.69535	.49585	.69726	.49804	54
7	.68962	.48935	.69155	.49153	.69347	.49371	.69539	.49589	.69729	.49807	53
+ 2′	9.68965	.48938	9.69158	.49156	9.69350	.49375	9.69542	.49593	9.69732	.49811	52
9	.68968	.48942	.69161	.49160	.69354	.49378	.69545	.49596	.69736	.49815	51
10	.68971	.48946	.69164	.49164	.69357	.49382	.69548	.49600	.69739	.49818	50
11	.68975	.48949	.69168	.49167	.69360	.49386	.69551	.49604	.69742	.49822	49
+ 3′	9.68978	.48953	9.69171	.49171	9.69363	.49389	9.69555	.49607	9.69745	.49825	48
13	.68981	.48957	.69174	.49175	.69366	.49393	.69558	.49611	.69748	.49829	47
14	.68984	.48960	.69177	.49178	.69370	.49396	.69561	.49615	.69751	.49833	46
15	.68988	.48964	.69181	.49182	.69373	.49400	.69564	.49618	.69755	.49836	45
+ 4′	9.68991	.48967	9.69184	.49186	9.69376	.49404	9.69567	.49622	9.69758	.49840	44
17	.68994	.48971	.69187	.49189	.69379	.49407	.69570	.49625	.69761	.49844	43
18	.68997	.48975	.69190	.49193	.69382	.49411	.69574	.49629	.69764	.49847	42
19	.69000	.48978	.69193	.49196	.69386	.49415	.69577	.49633	.69767	.49851	41
+ 5′	9.69004	.48982	9.69197	.49200	9.69389	.49418	9.69580	.49636	9.69770	.49855	40
21	.69007	.48986	.69200	.49204	.69392	.49422	.69583	.49640	.69774	.49858	39
22	.69010	.48989	.69203	.49207	.69395	.49426	.69586	.49644	.69777	.49862	38
23	.69013	.48993	.69206	.49211	.69398	.49429	.69590	.49647	.69780	.49865	37
+ 6′	9.69017	.48997	9.69209	.49215	9.69402	.49433	9.69593	.49651	9.69783	.49869	36
25	.69020	.49000	.69213	.49218	.69405	.49436	.69596	.49655	.69786	.49873	35
26	.69023	.49004	.69216	.49222	.69408	.49440	.69599	.49658	.69789	.49876	34
27	.69026	.49007	.69219	.49226	.69411	.49444	.69602	.49662	.69793	.49880	33
+ 7′	9.69029	.49011	9.69222	.49229	9.69414	.49447	9.69605	.49665	9.69796	.49884	32
29	.69033	.49015	.69225	.49233	.69417	.49451	.69609	.49669	.69799	.49887	31
30	.69036	.49018	.69229	.49236	.69421	.49455	.69612	.49673	.69802	.49891	30
31	.69039	.49022	.69232	.49240	.69424	.49458	.69615	.49676	.69805	.49895	29
+ 8′	9.69042	.49026	9.69235	.49244	9.69427	.49462	9.69618	.49680	9.69808	.49898	28
33	.69046	.49029	.69238	.49247	.69430	.49465	.69621	.49684	.69812	.49902	27
34	.69049	.49033	.69242	.49251	.69433	.49469	.69625	.49687	.69815	.49905	26
35	.69052	.49036	.69245	.49255	.69437	.49473	.69628	.49691	.69818	.49909	25
+ 9′	9.69055	.49040	9.69248	.49258	9.69440	.49476	9.69631	.49695	9.69821	.49913	24
37	.69058	.49044	.69251	.49262	.69443	.49480	.69634	.49698	.69824	.49916	23
38	.69062	.49047	.69254	.49266	.69446	.49484	.69637	.49702	.69827	.49920	22
39	.69065	.49051	.69258	.49269	.69449	.49487	.69640	.49705	.69831	.49924	21
+ 10′	9.69068	.49055	9.69261	.49273	9.69453	.49491	9.69644	.49709	9.69834	.49927	20
41	.69071	.49058	.69264	.49276	.69456	.49495	.69647	.49713	.69837	.49931	19
42	.69074	.49062	.69267	.49280	.69459	.49498	.69650	.49716	.69840	.49935	18
43	.69078	.49066	.69270	.49284	.69462	.49502	.69653	.49720	.69843	.49938	17
+ 11′	9.69081	.49069	9.69274	.49287	9.69465	.49506	9.69656	.49724	9.69846	.49942	16
45	.69084	.49073	.69277	.49291	.69469	.49509	.69659	.49727	.69850	.49945	15
46	.69087	.49076	.69280	.49295	.69472	.49513	.69663	.49731	.69853	.49949	14
47	.69091	.49080	.69283	.49298	.69475	.49516	.69666	.49735	.69856	.49953	13
+ 12′	9.69094	.49084	9.69286	.49302	9.69478	.49520	9.69669	.49738	9.69859	.49956	12
49	.69097	.49087	.69290	.49306	.69481	.49524	.69672	.49742	.69862	.49960	11
50	.69100	.49091	.69293	.49309	.69484	.49527	.69675	.49745	.69865	.49964	10
51	.69103	.49095	.69296	.49313	.69488	.49531	.69678	.49749	.69869	.49967	9
+ 13′	9.69107	.49098	9.69299	.49316	9.69491	.49535	9.69682	.49753	9.69872	.49971	8
53	.69110	.49102	.69302	.49320	.69494	.49538	.69685	.49756	.69875	.49975	7
54	.69113	.49106	.69306	.49324	.69497	.49542	.69688	.49760	.69878	.49978	6
55	.69116	.49109	.69309	.49327	.69500	.49545	.69691	.49764	.69881	.49982	5
+ 14′	9.69120	.49113	9.69312	.49331	9.69504	.49549	9.69694	.49767	9.69884	.49985	4
57	.69123	.49116	.69315	.49335	.69507	.49553	.69698	.49771	.69888	.49989	3
58	.69126	.49120	.69318	.49338	.69510	.49556	.69701	.49775	.69891	.49993	2
59	.69129	.49124	.69322	.49342	.69513	.49560	.69704	.49778	.69894	.49997	1
+ 15′	9.69132	.49127	9.69325	.49346	9.69516	.49564	9.69707	.49782	9.69897	.50000	0
	18h 4m		18h 3m		18h 2m		18h 1m		18h 0m		

TABLE 34.

Haversines.

s	6h 0m 90° 0′		6h 1m 90° 15′		6h 2m 90° 30′		6h 3m 90° 45′		6h 4m 91° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.69897	.50000	9.70086	.50218	9.70274	.50436	9.70462	.50654	9.70648	.50873	60
1	.69900	.50004	.70089	.50222	.70277	.50440	.70465	.50658	.70652	.50876	59
2	.69903	.50007	.70092	.50225	.70281	.50444	.70468	.50662	.70655	.50880	58
3	.69906	.50011	.70096	.50229	.70284	.50447	.70471	.50665	.70658	.50884	57
+ 1′	9.69910	.50015	9.70099	.50233	9.70287	.50451	9.70474	.50669	9.70661	.50887	56
5	.69913	.50018	.70102	.50236	.70290	.50455	.70477	.50673	.70664	.50891	55
6	.69916	.50022	.70105	.50240	.70293	.50458	.70480	.50676	.70667	.50894	54
7	.69919	.50025	.70108	.50244	.70296	.50462	.70484	.50680	.70670	.50898	53
+ 2′	9.69922	.50029	9.70111	.50247	9.70299	.50465	9.70487	.50684	9.70673	.50902	52
9	.69925	.50033	.70114	.50251	.70303	.50469	.70490	.50687	.70676	.50905	51
10	.69929	.50036	.70118	.50255	.70306	.50473	.70493	.50691	.70679	.50909	50
11	.69932	.50040	.70121	.50258	.70309	.50476	.70496	.50694	.70683	.50913	49
+ 3′	9.69935	.50044	9.70124	.50262	9.70312	.50480	9.70499	.50698	9.70686	.50916	48
13	.69938	.50047	.70127	.50265	.70315	.50484	.70502	.50702	.70689	.50920	47
14	.69941	.50051	.70130	.50269	.70318	.50487	.70505	.50705	.70692	.50924	46
15	.69944	.50055	.70133	.50273	.70321	.50491	.70509	.50709	.70695	.50927	45
+ 4′	9.69948	.50058	9.70136	.50276	9.70324	.50495	9.70512	.50713	9.70698	.50931	44
17	.69951	.50062	.70140	.50280	.70328	.50498	.70515	.50716	.70701	.50934	43
18	.69954	.50065	.70143	.50284	.70331	.50502	.70518	.50720	.70704	.50938	42
19	.69957	.50069	.70146	.50287	.70334	.50505	.70521	.50724	.70707	.50942	41
+ 5′	9.69960	.50073	9.70149	.50291	9.70337	.50509	9.70524	.50727	9.70710	.50945	40
21	.69963	.50076	.70152	.50295	.70340	.50513	.70527	.50731	.70714	.50949	39
22	.69966	.50080	.70155	.50298	.70343	.50516	.70530	.50734	.70717	.50953	38
23	.69970	.50084	.70158	.50302	.70346	.50520	.70533	.50738	.70720	.50956	37
+ 6′	9.69973	.50087	9.70161	.50305	9.70349	.50524	9.70537	.50742	9.70723	.50960	36
25	.69976	.50091	.70165	.50309	.70353	.50527	.70540	.50745	.70726	.50964	35
26	.69979	.50095	.70168	.50313	.70356	.50531	.70543	.50749	.70729	.50967	34
27	.69982	.50098	.70171	.50316	.70359	.50534	.70546	.50753	.70732	.50971	33
+ 7′	9.69985	.50102	9.70174	.50320	9.70362	.50538	9.70549	.50756	9.70735	.50974	32
29	.69988	.50105	.70177	.50324	.70365	.50542	.70552	.50760	.70738	.50978	31
30	.69992	.50109	.70180	.50327	.70368	.50545	.70555	.50764	.70741	.50982	30
31	.69995	.50113	.70183	.50331	.70371	.50549	.70558	.50767	.70745	.50985	29
+ 8′	9.69998	.50116	9.70187	.50335	9.70374	.50553	9.70561	.50771	9.70748	.50989	28
33	.70001	.50120	.70190	.50338	.70378	.50556	.70565	.50774	.70751	.50993	27
34	.70004	.50124	.70193	.50342	.70381	.50560	.70568	.50778	.70754	.50996	26
35	.70007	.50127	.70196	.50345	.70384	.50564	.70571	.50782	.70757	.51000	25
+ 9′	9.70011	.50131	9.70199	.50349	9.70387	.50567	9.70574	.50785	9.70760	.51004	24
37	.70014	.50135	.70202	.50353	.70390	.50571	.70577	.50789	.70763	.51007	23
38	.70017	.50138	.70205	.50356	.70393	.50574	.70580	.50793	.70766	.51011	22
39	.70020	.50142	.70209	.50360	.70396	.50578	.70583	.50796	.70769	.51014	21
+ 10′	9.70023	.50145	9.70212	.50364	9.70399	.50582	9.70586	.50800	9.70772	.51018	20
41	.70026	.50149	.70215	.50367	.70402	.50585	.70589	.50804	.70775	.51022	19
42	.70029	.50153	.70218	.50371	.70406	.50589	.70593	.50807	.70779	.51025	18
43	.70033	.50156	.70221	.50375	.70409	.50593	.70596	.50811	.70782	.51029	17
+ 11′	9.70036	.50160	9.70224	.50378	9.70412	.50596	9.70599	.50814	9.70785	.51033	16
45	.70039	.50164	.70227	.50382	.70415	.50600	.70602	.50818	.70788	.51036	15
46	.70042	.50167	.70230	.50385	.70418	.50604	.70605	.50822	.70791	.51040	14
47	.70045	.50171	.70234	.50389	.70421	.50607	.70608	.50825	.70794	.51043	13
+ 12′	9.70048	.50175	9.70237	.50393	9.70424	.50611	9.70611	.50829	9.70797	.51047	12
49	.70051	.50178	.70240	.50396	.70427	.50614	.70614	.50833	.70800	.51051	11
50	.70055	.50182	.70243	.50400	.70431	.50618	.70617	.50836	.70803	.51054	10
51	.70058	.50185	.70246	.50404	.70434	.50622	.70620	.50840	.70806	.51058	9
+ 13′	9.70061	.50189	9.70249	.50407	9.70437	.50625	9.70624	.50844	9.70809	.51062	8
53	.70064	.50193	.70252	.50411	.70440	.50629	.70627	.50847	.70813	.51065	7
54	.70067	.50196	.70256	.50415	.70443	.50633	.70630	.50851	.70816	.51069	6
55	.70070	.50200	.70259	.50418	.70446	.50636	.70633	.50854	.70819	.51073	5
+ 14′	9.70074	.50204	9.70262	.50422	9.70449	.50640	9.70636	.50858	9.70822	.51076	4
57	.70077	.50207	.70265	.50425	.70452	.50644	.70639	.50862	.70825	.51080	3
58	.70080	.50211	.70268	.50429	.70456	.50647	.70642	.50865	.70828	.51083	2
59	.70083	.50215	.70271	.50433	.70459	.50651	.70645	.50869	.70831	.51087	1
+ 15′	9.70086	.50218	9.70274	.50436	9.70462	.50654	9.70648	.50873	9.70834	.51091	0
	17h 59m		17h 58m		17h 57m		17h 56m		17h 55m		

Haversines.

s	6h 5m 91° 15′		6h 6m 91° 30′		6h 7m 91° 45′		6h 8m 92° 0′		6h 9m 92° 15′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.70834	.51091	9.71019	.51309	9.71203	.51527	9.71387	.51745	9.71569	.51963	60
1	.70837	.51094	.71022	.51312	.71206	.51531	.71390	.51749	.71572	.51967	59
2	.70840	.51098	.71025	.51316	.71210	.51534	.71393	.51752	.71575	.51970	58
3	.70843	.51102	.71028	.51320	.71213	.51538	.71396	.51756	.71579	.51974	57
+ 1′	9.70847	.51105	9.71032	.51323	9.71216	.51541	9.71399	.51760	9.71582	.51978	56
5	.70850	.51109	.71035	.51327	.71219	.51545	.71402	.51763	.71585	.51981	55
6	.70853	.51113	.71038	.51331	.71222	.51549	.71405	.51767	.71588	.51985	54
7	.70856	.51116	.71041	.51334	.71225	.51552	.71408	.51770	.71591	.51988	53
+ 2′	9.70859	.51120	9.71044	.51338	9.71228	.51556	9.71411	.51774	9.71594	.51992	52
9	.70862	.51123	.71047	.51342	.71231	.51560	.71414	.51778	.71597	.51996	51
10	.70865	.51127	.71050	.51345	.71234	.51563	.71417	.51781	.71600	.51999	50
11	.70868	.51131	.71053	.51349	.71237	.51567	.71420	.51785	.71603	.52003	49
+ 3′	9.70871	.51134	9.71056	.51352	9.71240	.51571	9.71423	.51789	9.71606	.52007	48
13	.70874	.51138	.71059	.51356	.71243	.51574	.71426	.51792	.71609	.52010	47
14	.70877	.51142	.71062	.51360	.71246	.51578	.71430	.51796	.71612	.52014	46
15	.70881	.51145	.71065	.51363	.71249	.51581	.71433	.51799	.71615	.52018	45
+ 4′	9.70884	.51149	9.71068	.51367	9.71252	.52585	9.71436	.51803	9.71618	.52021	44
17	.70887	.51153	.71072	.51371	.71255	.51589	.71439	.51807	.71621	.52025	43
18	.70890	.51156	.71075	.51374	.71259	.51592	.71442	.51810	.71624	.52028	42
19	.70893	.51160	.71078	.51378	.71262	.51596	.71445	.51814	.71627	.52032	41
+ 5′	9.70896	.51163	9.71081	.51382	9.71265	.51600	9.71448	.51818	9.71630	.52036	40
21	.70899	.51167	.71084	.51385	.71268	.51603	.71451	.51821	.71633	.52039	39
22	.70902	.51171	.71087	.51389	.71271	.51607	.71454	.51825	.71636	.52043	38
23	.70905	.51174	.71090	.51392	.71274	.51611	.71457	.51829	.71639	.52047	37
+ 6′	9.70908	.51178	9.71093	.51396	9.71277	.51614	9.71460	.51832	9.71642	.52050	36
25	.70911	.51182	.71096	.51400	.71280	.51618	.71463	.51836	.71645	.52054	35
26	.70914	.51185	.71099	.51403	.71283	.51621	.71466	.51839	.71648	.52057	34
27	.70918	.51189	.71102	.51407	.71286	.51625	.71469	.51843	.71651	.52061	33
+ 7′	9.70921	.51193	9.71105	.51411	9.71289	.51629	9.71472	.51847	9.71654	.52065	32
29	.70924	.51196	.71108	.51414	.71292	.51632	.71475	.51850	.71657	.52068	31
30	.70927	.51200	.71111	.51418	.71295	.51636	.71478	.51854	.71660	.52072	30
31	.70930	.51203	.71114	.51422	.71298	.51640	.71481	.51858	.71663	.52076	29
+ 8′	9.70933	.51207	9.71118	.51425	9.71301	.51643	9.71484	.51861	9.71666	.52079	28
33	.70936	.51211	.71121	.51429	.71304	.51647	.71487	.51865	.71670	.52083	27
34	.70939	.51214	.71124	.51432	.71307	.51650	.71490	.51869	.71673	.52087	26
35	.70942	.51218	.71127	.51436	.71311	.51654	.71493	.51872	.71676	.52090	25
+ 9′	9.70945	.51222	9.71130	.51440	9.71314	.51658	9.71496	.51876	9.71679	.52094	24
37	.70948	.51225	.71133	.51443	.71317	.51661	.71500	.51879	.71682	.52097	23
38	.70951	.51229	.71136	.51447	.71320	.51665	.71503	.51883	.71685	.52101	22
39	.70955	.51233	.71139	.51451	.71323	.51669	.71506	.51887	.71688	.52105	21
+ 10′	9.70958	.51236	9.71142	.51454	9.71326	.51672	9.71509	.51890	9.71691	.52108	20
41	.70961	.51240	.71145	.51458	.71329	.51676	.71512	.51894	.71694	.52112	19
42	.70964	.51243	.71148	.51462	.71332	.51680	.71515	.51898	.71697	.52116	18
43	.70967	.51247	.71151	.51465	.71335	.51683	.71518	.51901	.71700	.52119	17
+ 11′	9.70970	.51251	9.71154	.51469	9.71338	.51687	9.71521	.51905	9.71703	.52123	16
45	.70973	.51254	.71157	.51472	.71341	.51690	.71524	.51908	.71706	.52126	15
46	.70976	.51258	.71161	.51476	.71344	.51694	.71527	.51912	.71709	.52130	14
47	.70979	.51262	.71164	.51480	.71347	.51698	.71530	.51916	.71712	.52134	13
+ 12′	9.70982	.51265	9.71167	.51483	9.71350	.51701	9.71533	.51919	9.71715	.52137	12
49	.70985	.51269	.71170	.51487	.71353	.51705	.71536	.51923	.71718	.52141	11
50	.70988	.51273	.71173	.51491	.71356	.51709	.71539	.51927	.71721	.52145	10
51	.70992	.51276	.71176	.51494	.71359	.51712	.71542	.51930	.71724	.52148	9
+ 13′	9.70995	.51280	9.71179	.51498	9.71362	.51716	9.71545	.51934	9.71727	.52152	8
53	.70998	.51283	.71182	.51501	.71365	.51720	.71548	.51938	.71730	.52156	7
54	.71001	.51287	.71185	.51505	.71369	.51723	.71551	.51941	.71733	.52159	6
55	.71004	.51291	.71188	.51508	.71372	.51727	.71554	.51945	.71736	.52163	5
+ 14′	9.71007	.51294	9.71191	.51512	9.71375	.51730	9.71557	.51948	9.71739	.52166	4
57	.71010	.51298	.71194	.51516	.71378	.51734	.71560	.51952	.71742	.52170	3
58	.71013	.51302	.71197	.51520	.71381	.51738	.71563	.51956	.71745	.52174	2
59	.71016	.51305	.71200	.51523	.71384	.51741	.71566	.51959	.71748	.52177	1
+ 15′	9.71019	.51309	9.71203	.51527	9.71387	.51745	9.71569	.51963	9.71751	.52181	0
	17h 54m		17h 53m		17h 52m		17h 51m		17h 50m		

TABLE 34.

Haversines.

s	6h 10m 92° 30′		6h 11m 92° 45′		6h 12m 93° 0′		6h 13m 93° 15′		6h 14m 93° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.71751	.52181	9.71932	.52399	9.72112	.52617	9.72292	.52835	9.72471	.53052	60
1	.71754	.52185	.71935	.52403	.72115	.52620	.72295	.52838	.72474	.53056	59
2	.71757	.52188	.71938	.52406	.72118	.52624	.72298	.52842	.72476	.53060	58
3	.71760	.52192	.71941	.52410	.72121	.52628	.72301	.52846	.72479	.53063	57
+ 1′	9.71763	.52196	9.71944	.52413	9.72124	.52631	9.72304	.52849	9.72482	.53067	56
5	.71766	.52199	.71947	.52417	.72127	.52635	.72307	.52853	.72485	.53071	55
6	.71769	.52203	.71950	.52421	.72130	.52639	.72310	.52856	.72488	.53074	54
7	.71772	.52206	.71953	.52424	.72133	.52642	.72313	.52860	.72491	.53078	53
+ 2′	9.71775	.52210	9.71956	.52428	9.72136	.52646	9.72316	.52864	9.72494	.53081	52
9	.71778	.52214	.71959	.52432	.72139	.52649	.72319	.52867	.72497	.53085	51
10	.71781	.52217	.71962	.52435	.72142	.52653	.72322	.52871	.72500	.53089	50
11	.71784	.52221	.71965	.52439	.72145	.52657	.72325	.52875	.72503	.53092	49
+ 3′	9.71787	.52225	9.71968	.52442	9.72148	.52660	9.72328	.52878	9.72506	.53096	48
13	.71791	.52228	.71971	.52446	.72151	.52664	.72331	.52882	.72509	.53100	47
14	.71794	.52232	.71974	.52450	.72154	.52668	.72334	.52885	.72512	.53103	46
15	.71797	.52235	.71977	.52453	.72157	.52671	.72337	.52889	.72515	.53107	45
+ 4′	9.71800	.52239	9.71980	.52457	9.72160	.52675	9.72340	.52893	9.72518	.53110	44
17	.71803	.52243	.71983	.52461	.72163	.52679	.72343	.52896	.72521	.53114	43
18	.71806	.52246	.71986	.52464	.72166	.52682	.72346	.52900	.72524	.53118	42
19	.71809	.52250	.71989	.52468	.72169	.52686	.72349	.52904	.72527	.53121	41
+ 5′	9.71812	.52254	9 71992	.52472	9.72172	.52689	9.72352	.52907	9.72530	.53125	40
21	.71815	.52257	.71995	.52475	.72175	.52693	.72354	.52911	.72533	.53129	39
22	.71818	.52261	.71998	.52479	.72178	.52697	.72357	.52915	.72536	.53132	38
23	.71821	.52264	.72001	.52482	.72181	.52700	.72360	.52918	.72539	.53136	37
+ 6′	9.71824	.52268	9.72004	.52486	9.72184	.52704	9.72363	.52922	9.72542	.53140	36
25	.71827	.52272	.72007	.52490	.72187	.52708	.72366	.52925	.72545	.53143	35
26	.71830	.52275	.72010	.52493	.72190	.52711	.72369	.52929	.72548	.53147	34
27	.71833	.52279	.72013	.52497	.72193	.52715	.72372	.52933	.72551	.53150	33
+ 7′	9.71836	.52283	9.72016	.52501	9.72196	.52718	9.72375	.52936	9.72554	.53154	32
29	.71839	.52286	.72019	.52504	.72199	.52722	.72378	.52940	.72557	.53158	31
30	.71842	.52290	.72022	.52508	.72202	.52726	.72381	.52944	.72560	.53161	30
31	.71845	.52294	.72025	.52511	.72205	.52729	.72384	.52947	.72563	.53165	29
+ 8′	9.71848	.52297	9.72028	.52515	9.72208	.52733	9.72387	.52951	9.72565	.53169	28
33	.71851	.52301	.72031	.52519	.72211	.52737	.72390	.52954	.72568	.53172	27
34	.71854	.52304	.72034	.52522	.72214	.52740	.72393	.52958	.72571	.53176	26
35	.71857	.52308	.72037	.52526	.72217	.52744	.72396	.52962	.72574	.53179	25
+ 9′	9.71860	.52312	9.72040	.52530	9.72220	.52748	9.72399	.52965	9.72577	.53183	24
37	.71863	.52315	.72043	.52533	.72223	.52751	.72402	.52969	.72580	.53187	23
38	.71866	.52319	.72046	.52537	.72226	.52755	.72405	.52973	.72583	.53190	22
39	.71869	.52323	.72049	.52541	.72229	.52758	.72408	.52976	.72586	.53194	21
+ 10′	9.71872	.52326	9.72052	.52544	9.72232	.52762	9.72411	.52980	9.72589	.53198	20
41	.71875	.52330	.72055	.52548	.72235	.52766	.72414	.52983	.72592	.53201	19
42	.71878	.52334	.72058	.52551	.72238	.52769	.72417	.52987	.72595	.53205	18
43	.71881	.52337	.72061	.52555	.72241	.52773	.72420	.52991	.72598	.53208	17
+ 11′	9.71884	.52341	9.72064	.52559	9.72244	.52776	9.72423	.52994	9.72601	.53212	16
45	.71887	.52344	.72067	.52562	.72247	.52780	.72426	.52998	.72604	.53216	15
46	.71890	.52348	.72070	.52566	.72250	.52784	.72429	.53002	.72607	.53219	14
47	.71893	.52352	.72073	.52570	.72253	.52787	.72432	.53005	.72610	.53223	13
+ 12′	9.71896	.52355	9.72076	.52573	9.72256	.52791	9.72435	.53009	9.72613	.53227	12
49	.71899	.52359	.72079	.52577	.72259	.52795	.72438	.53013	.72616	.53230	11
50	.71902	.52363	.72082	.52580	.72262	.52798	.72441	.53016	.72619	.53234	10
51	.71905	.52366	.72085	.52584	.72265	.52802	.72444	.53020	.72622	.53238	9
+ 13′	9.71908	.52370	9.72088	.52588	9.72268	.52806	9.72447	.53023	9.72625	.53241	8
53	.71911	.52373	.72091	.52591	.72271	.52809	.72450	.53027	.72628	.53245	7
54	.71914	.52377	.72094	.52595	.72274	.52813	.72453	.53031	.72631	.53248	6
55	.71917	.52381	.72097	.52599	.72277	.52816	.72456	.53034	.72634	.53252	5
+ 14′	9.71920	.52384	9.72100	.52602	9.72280	.52820	9.72459	.53038	9.72637	.53256	4
57	.71923	.52388	.72103	.52606	.72283	.52824	.72462	.53042	.72640	.53259	3
58	.71926	.52392	.72106	.52610	.72286	.52827	.72465	.53045	.72642	.53263	2
59	.71929	.52395	.72109	.52613	.72289	.52831	.72468	.53049	.72645	.53267	1
+ 15′	9.71932	.52399	9.72112	.52617	9.72292	.52835	9.72471	.53052	9.72648	.53270	0
	17h 49m		17h 48m		17h 47m		17h 46m		17h 45m		

Haversines.

s	6h 15m 93° 45′ Log. Hav.	Nat. Hav.	6h 16m 94° 0′ Log. Hav.	Nat. Hav.	6h 17m 94° 15′ Log. Hav.	Nat. Hav.	6h 18m 94° 30′ Log. Hav.	Nat. Hav.	6h 19m 94° 45 Log. Hav.	Nat. Hav.	s
0	9.72648	.53270	9.72825	.53488	9.73002	.53705	9.73177	.53923	9.73352	.54140	60
1	.72651	.53274	.72828	.53491	.73005	.53709	.73180	.53927	.73355	.54144	59
2	.72654	.53277	.72831	.53495	.73008	.53713	.73183	.53930	.73358	.54148	58
3	.72657	.53281	.72834	.53499	.73011	.53716	.73186	.53934	.73361	.54151	57
+ 1′	9.72660	.53285	9.72837	.53502	9.73014	.53720	9.73189	.53937	9.73364	.54155	56
5	.72663	.53288	.72840	.53506	.73016	.53724	.73192	.53941	.73367	.54159	55
6	.72666	.53292	.72843	.53510	.73019	.53727	.73195	.53945	.73370	.54162	54
7	.72669	.53296	.72846	.53513	.73022	.53731	.73198	.53948	.73373	.54166	53
+ 2′	9.72672	.53299	9.72849	.53517	9.73025	.53734	9.73201	.53952	9.73375	.54169	52
9	.72675	.53303	.72852	.53520	.73028	.53738	.73204	.53956	.73378	.54173	51
10	.72678	.53306	.72855	.53524	.73031	.53742	.73207	.53959	.73381	.54177	50
11	.72681	.53310	.72858	.53528	.73034	.53745	.73209	.53963	.73384	.54180	49
+ 3′	9.72684	.53314	9.72861	.53531	9.73037	.53749	9.73212	.53966	9.73387	.54184	48
13	.72687	.53317	.72864	.53535	.73040	.53753	.73215	.53970	.73390	.54188	47
14	.72690	.53321	.72867	.53539	.73043	.53756	.73218	.53974	.73393	.54191	46
15	.72693	.53325	.72870	.53542	.73046	.53760	.73221	.53977	.73396	.54195	45
+ 4′	9.72696	.53328	9.72873	.53546	9.73049	.53763	9.73224	.53981	9.73399	.54198	44
17	.72699	.53332	.72876	.53549	.73052	.53767	.73227	.53985	.73402	.54202	43
18	.72702	.53335	.72878	.53553	.73055	.53771	.73230	.53988	.73404	.54206	42
19	.72705	.53339	.72881	.53557	.73057	.53774	.73233	.53992	.73407	.54209	41
+ 5′	9.72708	.53343	9.72884	.53560	9.73060	.53778	9.73236	.53995	9.73410	.54213	40
21	.72710	.53346	.72887	.53564	.73063	.53782	.73239	.53999	.73413	.54217	39
22	.72713	.53350	.72890	.53568	.73066	.53785	.73242	.54003	.73416	.54220	38
23	.72716	.53354	.72893	.53571	.73069	.53789	.73244	.54006	.73419	.54224	37
+ 6′	9.72719	.53357	9.72896	.53575	9.73072	.53792	9.73247	.54010	9.73422	.54227	36
25	.72722	.53361	.72899	.53579	.73075	.53796	.73250	.54014	.73425	.54231	35
26	.72725	.53364	.72902	.53582	.75078	.53800	.73253	.54017	.73428	.54235	34
27	.72728	.53368	.72905	.53586	.73081	.53803	.73256	.54021	.73431	.54238	33
+ 7′	9.72731	.53372	9.72908	.53589	9.73084	.53807	9.73259	.54024	9.73433	.54242	32
29	.72734	.53375	.72911	.53593	.73087	.53811	.73262	.54028	.73436	.54245	31
30	.72737	.53379	.72914	.53597	.73090	.53814	.73265	.54032	.73439	.54249	30
31	.72740	.53383	.72917	.53600	.73093	.53818	.73268	.54035	.73442	.54253	29
+ 8′	9.72743	.53386	9.72920	.53604	9.73096	.53821	9.73271	.54039	9.73445	.54256	28
33	.72746	.53390	.72923	.53608	.73098	.53825	.73274	.54043	.73448	.54260	27
34	.72749	.53394	.72926	.53611	.73101	.53829	.73277	.54046	.73451	.54264	26
35	.72752	.53397	.72928	.53615	.73104	.53832	.73280	.54050	.73454	.54267	25
+ 9′	9.72755	.53401	9.72931	.53618	9.73107	.53836	9.73282	.54053	9.73457	.54271	24
37	.72758	.53404	.72934	.53622	.73110	.53840	.73285	.54057	.73460	.54274	23
38	.72761	.53408	.72937	.53626	.73113	.53843	.73288	.54061	.73462	.54278	22
39	.72764	.53412	.72940	.53629	.73116	.53847	.73291	.54064	.73465	.54282	21
+ 10′	9.72767	.53415	9.72943	.53633	9.73119	.53850	9.73294	.54068	9.73468	.54285	20
41	.72770	.53419	.72946	.53637	.73122	.53854	.73297	.54072	.73471	.54289	19
42	.72772	.53423	.72949	.53640	.73125	.53858	.73300	.54075	.73474	.54293	18
43	.72775	.53426	.72952	.53644	.73128	.53861	.73303	.54079	.73477	.54296	17
+ 11′	9.72778	.53430	9.72955	.53647	9.73131	.53865	9.73306	.54082	9.73480	.54300	16
45	.72781	.53433	.72958	.53651	.73134	.53869	.73309	.54086	.73483	.54303	15
46	.72784	.53437	.72961	.53655	.73136	.53872	.73311	.54090	.73486	.54307	14
47	.72787	.53441	.72964	.53658	.73139	.53876	.73314	.54093	.73489	.54311	13
+ 12′	9.72790	.53444	9.72967	.53662	9.73142	.53879	9.73317	.54097	9.73491	.54314	12
49	.72793	.53448	.72970	.53666	.73145	.53883	.73320	.54101	.73494	.54318	11
50	.72796	.53452	.72972	.53669	.73148	.53887	.73323	.54104	.73497	.54322	10
51	.72799	.53455	.72975	.53673	.73151	.53890	.73326	.54108	.73500	.54325	9
+ 13′	9.72802	.53459	9.72978	.53676	9.73154	.53894	9.73329	.54111	9.73503	.54329	8
53	.72805	.53462	.72981	.53680	.73157	.53898	.73332	.54115	.73506	.54332	7
54	.72808	.53466	.72984	.53684	.73160	.53901	.73335	.54119	.73509	.54336	6
55	.72811	.53470	.72987	.53687	.73163	.53905	.73338	.54122	.73512	.54340	5
+ 14′	9.72814	.53473	9.72990	.53691	9.73166	.53908	9.73341	.54126	9.73515	.54343	4
57	.72817	.53477	.72993	.53695	.73169	.53912	.73343	.54130	.73517	.54347	3
58	.72820	.53481	.72996	.53698	.73172	.53916	.73346	.54133	.73520	.54351	2
59	.72823	.53484	.72999	.53702	.73174	.53919	.73349	.54137	.73523	.54354	1
+ 15′	9.72825	.53488	9.73002	.53705	9.73177	.53923	9.73352	.54140	9.73526	.54358	0
	17h 44m		17h 43m		17h 42m		17h 41m		17h 40m		

TABLE 34.

Haversines.

s	6h 20m 95° 0′		6h 21m 95° 15′		6h 22m 95° 30′		6h 23m 95° 45′		6h 24m 96° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.73526	.54358	9.73699	.54575	9.73872	.54792	9.74044	.55009	9.74215	.55226	60
1	.73529	.54361	.73702	.54579	.73875	.54796	.74047	.55013	.74218	.55230	59
2	.73532	.54365	.73705	.54582	.73878	.54800	.74049	.55017	.74220	.55234	58
3	.73535	.54369	.73708	.54586	.73881	.54803	.74052	.55020	.74223	.55237	57
+ 1′	9.73538	.54372	9.73711	.54590	9.73883	.54807	9.74055	.55024	9.74226	.55241	56
5	.73541	.54376	.73714	.54593	.73886	.54810	.74058	.55028	.74229	.55245	55
6	.73544	.54380	.73717	.54597	.73889	.54814	.74061	.55031	.74232	.55248	54
7	.73546	.54383	.73720	.54600	.73892	.54818	.74064	.55035	.74235	.55252	53
+ 2′	9.73549	.54387	9.73722	.54604	9.73895	.54821	9.74067	.55038	9.74237	.55255	52
9	.73552	.54390	.73725	.54608	.73898	.54825	.74069	.55042	.74240	.55259	51
10	.73555	.54394	.73728	.54611	.73901	.54828	.74072	.55046	.74243	.55263	50
11	.73558	.54398	.73731	.54615	.73903	.54832	.74075	.55049	.74246	.55266	49
+ 3′	9.73561	.54401	9.73734	.54619	9.73906	.54836	9.74078	.55053	9.74249	.55270	48
13	.73564	.54405	.73737	.54622	.73909	.54839	.74081	.55056	.74252	.55273	47
14	.73567	.54409	.73740	.54626	.73912	.54843	.74084	.55060	.74254	.55277	46
15	.73570	.54412	.73743	.54629	.73915	.54847	.74087	.55064	.74257	.55281	45
+ 4′	9.73572	.54416	9.73746	.54633	9.73918	.54850	9.74089	.55067	9.74260	.55284	44
17	.73575	.54419	.73748	.54637	.73921	.54854	.74092	.55071	.74263	.55288	43
18	.73578	.54423	.73751	.54640	.73924	.54857	.74095	.55075	.74266	.55292	42
19	.73581	.54427	.73754	.54644	.73926	.54861	.74098	.55078	.74269	.55295	41
+ 5′	9.73584	.54430	9.73757	.54647	9.73929	.54865	9.74101	.55082	9.74272	.55299	40
21	.73587	.54434	.73760	.54651	.73932	.54868	.74104	.55085	.74274	.55302	39
22	.73590	.54437	.73763	.54655	.73935	.54872	.74106	.55089	.74277	.55306	38
23	.73593	.54441	.73766	.54658	.73938	.54876	.74109	.55093	.74280	.55310	37
+ 6′	9.73596	.54445	9.73769	.54662	9.73941	.54879	9.74112	.55096	9.74283	.55313	36
25	.73598	.54448	.73771	.54666	.73944	.54883	.74115	.55100	.74286	.55317	35
26	.73601	.54452	.73774	.54669	.73946	.54886	.74118	.55103	.74289	.55320	34
27	.73604	.54456	.73777	.54673	.73949	.54890	.74121	.55107	.74291	.55324	33
+ 7′	9.73607	.54459	9.73780	.54676	9.73952	.54894	9.74124	.55111	9.74294	.55328	32
29	.73610	.54463	.73783	.54680	.73955	.54897	.74126	.55114	.74297	.55331	31
30	.73613	.54466	.73786	.54684	.73958	.54901	.74129	.55118	.74300	.55335	30
31	.73616	.54470	.73789	.54687	.73961	.54904	.74132	.55122	.74303	.55339	29
+ 8′	9.73619	.54474	9.73792	.54691	9.73964	.54908	9.74135	.55125	9.74306	.55342	28
33	.73622	.54477	.73794	.54695	.73967	.54912	.74138	.55129	.74308	.55346	27
34	.73624	.54481	.73797	.54698	.73969	.54915	.74141	.55132	.74311	.55349	26
35	.73627	.54485	.73800	.54702	.73972	.54919	.74144	.55136	.74314	.55353	25
+ 9′	9.73630	.54488	9.73803	.54705	9.73975	.54923	9.74146	.55140	9.74317	.55357	24
37	.73633	.54492	.73806	.54709	.73978	.54926	.74149	.55143	.74320	.55360	23
38	.73636	.54495	.73809	.54713	.73981	.54930	.74152	.55147	.74323	.55364	22
39	.73639	.54499	.73812	.54716	.73984	.54933	.74155	.55150	.74325	.55367	21
+ 10′	9.73642	.54503	9.73815	.54720	9.73987	.54937	9.74158	.55154	9.74328	.55371	20
41	.73645	.54506	.73817	.54724	.73989	.54941	.74161	.55158	.74331	.55375	19
42	.73648	.54510	.73820	.54727	.73992	.54944	.74163	.55161	.74334	.55378	18
43	.73650	.54514	.73823	.54731	.73995	.54948	.74166	.55165	.74337	.55382	17
+ 11′	9.73653	.54517	9.73826	.54734	9.73998	.54952	9.74169	.55169	9.74340	.55386	16
45	.73656	.54521	.73829	.54738	.74001	.54955	.74172	.55172	.74342	.55389	15
46	.73659	.54524	.73832	.54742	.74004	.54959	.74175	.55176	.74345	.55393	14
47	.73662	.54528	.73835	.54745	.74007	.54963	.74178	.55179	.74348	.55396	13
+ 12′	9.73665	.54532	9.73838	.54749	9.74009	.54966	9.74181	.55183	9.74351	.55400	12
49	.73668	.54535	.73840	.54752	.74012	.54970	.74183	.55187	.74354	.55404	11
50	.73671	.54539	.73843	.54756	.74015	.54973	.74186	.55190	.74357	.55407	10
51	.73674	.54542	.73846	.54760	.74018	.54977	.74189	.55194	.74359	.55411	9
+ 13′	9.73676	.54546	9.73849	.54763	9.74021	.54980	9.74192	.55197	9.74362	.55414	8
53	.73679	.54550	.73852	.54767	.74024	.54984	.74195	.55201	.74365	.55418	7
54	.73682	.54553	.73855	.54771	.74027	.54988	.74198	.55205	.74368	.55422	6
55	.73685	.54557	.73858	.54774	.74029	.54991	.74200	.55208	.74371	.55425	5
+ 14′	9.73688	.54561	9.73860	.54778	9.74032	.54995	9.74203	.55212	9.74374	.55429	4
57	.73691	.54564	.73863	.54781	.74035	.54999	.74206	.55216	.74376	.55433	3
58	.73694	.54568	.73866	.54785	.74038	.55002	.74209	.55219	.74379	.55436	2
59	.73697	.54571	.73869	.54789	.74041	.55006	.74212	.55223	.74382	.55440	1
+ 15′	9.73699	.54575	9.73872	.54792	9.74044	.55009	9.74215	.55226	9.74385	.55443	0
	17h 39m		17h 38m		17h 37m		17h 36m		17h 35m		

Haversines.

	6h 25m 96° 15′		6h 26m 96° 30′		6h 27m 96° 45′		6h 28m 97° 0′		6h 29m 97° 15′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.74385	.55443	9.74554	.55660	9.74723	.55877	9.74891	.56093	9.75059	.56310	60
1	.74388	.55447	.74557	.55664	.74726	.55880	.74894	.56097	.75061	.56314	59
2	.74391	.55451	.74560	.55667	.74729	.55884	.74897	.56101	.75064	.56317	58
3	.74393	.55454	.74563	.55671	.74732	.55888	.74900	.56104	.75067	.56321	57
+ 1′	9.74396	.55458	9.74566	.55675	9.74734	.55891	9.74902	.56108	9.75070	.56324	56
5	.74399	.55461	.74569	.55678	.74737	.55895	.74905	.56112	.75072	.56328	55
6	.74402	.55465	.74571	.55682	.74740	.55899	.74908	.56115	.75075	.56332	54
7	.74405	.55469	.74574	.55685	.74743	.55902	.74911	.56119	.75078	.56335	53
+ 2′	9.74408	.55472	9.74577	.55689	9.74746	.55906	9.74914	.56122	9.75081	.56339	52
9	.74410	.55476	.74580	.55693	.74748	.55909	.74916	.56126	.75084	.56342	51
10	.74413	.55479	.74583	.55696	.74751	.55913	.74919	.56130	.75086	.56346	50
11	74416	.55483	.74585	.55700	.74754	.55917	.74922	.56133	.75089	.56350	49
+ 3′	9 74419	.55487	9.74588	.55704	9.74757	.55920	9.74925	.56137	9.75092	.56353	48
13	.74422	.55490	.74591	.55707	.74760	.55924	.74928	.56140	.75095	.56357	47
14	.74425	.55494	.74594	.55711	.74762	.55927	.74930	.56144	.75097	.56369	46
15	.74427	.55498	.74597	.55714	.74765	.55931	.74933	.56147	.75100	.56364	45
+ 4′	9.74430	.55501	9.74600	.55718	9.74768	.55935	9.74936	.56151	9.75103	.56368	44
17	.74433	.55505	.74602	.55722	.74771	.55938	.74939	.56155	.75106	.56371	43
18	.74436	.55508	.74605	.55725	.74774	.55942	.74941	.56158	.75109	.56375	42
19	.74439	.55512	.74608	.55729	.74776	.55945	.74944	.56162	.75111	.56378	41
+ 5′	9.74442	.55516	9.74611	.55732	9.74779	.55949	9.74947	.56166	9.75114	.56382	40
21	.74444	.55519	.74614	.55736	.74782	.55953	.74950	.56169	.75117	.56386	39
22	.74447	.55523	.74616	.55740	.74785	.55956	.74953	.56173	.75120	.56389	38
23	.74450	.55526	.74619	.55743	.74788	.55960	.74955	.56176	.75122	.56393	37
+ 6′	9.74453	.55530	9.74622	.55747	9.74791	.55964	9.74958	.56180	9.75125	.56397	36
25	.74456	.55534	.74625	.55750	.74793	.55967	.74961	.56184	.75128	.56400	35
26	.74458	.55537	.74628	.55754	.74796	.55971	.74964	.56187	.75131	.56404	34
27	.74461	.55541	.74630	.55758	.74799	.55974	.74967	.56191	.75134	.56407	33
+ 7′	9.74464	.55545	9.74633	.55761	9.74802	.55978	9.74969	.56195	9.75136	.56411	32
29	.74467	.55548	.74636	.55765	.74805	.55982	.74972	.56198	.75139	.56415	31
30	.74470	.55552	.74639	.55769	.74807	.55985	.74975	.56202	.75142	.56418	30
31	.74473	.55555	.74642	.55772	.74810	.55989	.74978	.56205	.75145	.56422	29
+ 8′	9.74475	.55559	9.74645	.55776	9.74813	.55992	9.74981	.56209	9.75147	.56425	28
33	.74478	.55563	.74647	.55779	.74816	.55996	.74983	.56213	.75150	.56429	27
34	.74481	.55566	.74650	.55783	.74819	.56000	.74986	.56216	.75153	.56433	26
35	.74484	.55570	.74653	.55787	.74821	.56003	.74989	.56220	.75156	.56436	25
+ 9′	9.74487	.55573	9.74656	.55790	9.74824	.56007	9.74992	.56223	9.75159	.56440	24
37	.74490	.55577	.74659	.55794	.74827	.56010	.74994	.56227	.75161	.56443	23
38	.74492	.55581	.74661	.55797	.74830	.56014	.74997	.56231	.75164	.56447	22
39	.74495	.55584	.74664	.55801	.74833	.56018	.75000	.56234	.75167	.56451	21
+ 10′	9.74498	.55588	9.74667	.55805	9.74835	.56021	9.75003	.56238	9.75170	.56454	20
41	.74501	.55592	.74670	.55808	.74838	.56025	.75006	.56241	.75172	.56458	19
42	.74504	.55595	.74673	.55812	.74841	.56029	.75008	.56245	.75175	.56461	18
43	.74506	.55599	.74675	.55815	.74844	.56032	.75011	.56249	.75178	.56465	17
+ 11′	9.74509	.55602	9.74678	.55819	9.74846	.56036	9.75014	.56252	9.75181	.56469	16
45	.74512	.55606	.74681	.55823	.74849	.56039	.75017	.56256	.75183	.56472	15
46	.74515	.55610	.74684	.55826	.74852	.56043	.75020	.56259	.75186	.56476	14
47	.74518	.55613	.74687	.55830	.74855	.56047	.75022	.56263	.75189	.56479	13
+ 12′	9.74521	.55617	9.74690	.55834	9.74858	.56050	9.75025	.56267	9.75192	.56483	12
49	.74523	.55620	.74692	.55837	.74860	.56054	.75028	.56270	.75195	.56487	11
50	.74526	.55624	.74695	.55841	.74863	.56057	.75031	.56274	.75197	.56490	10
51	.74529	.55628	.74698	.55844	.74866	.56061	.75033	.56277	.75200	.56494	9
+ 13′	9.74532	.55631	9.74701	.55848	9.74869	.56065	9.75036	.56281	9.75203	.56497	8
53	.74535	.55635	.74704	.55852	.74872	.56068	.75039	.56285	.75206	.56501	7
54	.74538	.55638	.74706	.55855	.74874	.56072	.75042	.56288	.75208	.56505	6
55	.74540	.55642	.74709	.55859	.74877	.56075	.75045	.56292	.75211	.56508	5
+ 14′	9.74543	.55646	9.74712	.55862	9.74880	.56079	9.75047	.56296	9.75214	.56512	4
57	.74546	.55649	.74715	.55866	.74883	.56083	.75050	.56299	.75217	.56516	3
58	.74549	.55653	.74718	.55870	.74886	.56086	.75053	.56303	.75220	.56519	2
59	.74552	.55657	.74720	.55873	.74888	.56090	.75056	.56306	.75222	.56523	1
+ 15′	9.74554	.55660	9.74723	.55877	9.74891	.56093	9.75059	.56310	9.75225	.56526	0
	17h 34m		17h 33m		17h 32m		17h 31m		17h 30m		

TABLE 34.

Haversines.

s	6h 30m 97° 30′		6h 31m 97° 45′		6h 32m 98° 0′		6h 33m 98° 15′		6h 34m 98° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.75225	.56526	9.75391	.56743	9.75556	.56959	9.75720	.57175	9.75884	.57390	60
1	.75228	.56530	.75394	.56746	.75559	.56962	.75723	.57178	.75887	.57394	59
2	.75231	.56534	.75396	.56750	.75561	.56966	.75726	.57182	.75889	.57398	58
3	.75233	.56537	.75399	.56753	.75564	.56969	.75729	.57185	.75892	.57401	57
+ 1′	9.75236	.56541	9.75402	.56757	9.75567	.56973	9.75731	.57189	9.75895	.57405	56
5	.75239	.56544	.75405	.56761	.75570	.56977	.75734	.57193	.75898	.57408	55
6	.75242	.56548	.75407	.56764	.75572	.56980	.75737	.57196	.75900	.57412	54
7	.75244	.56552	.75410	.56768	.75575	.56984	.75739	.57200	.75903	.57416	53
+ 2′	9.75247	.56555	9.75413	.56771	9.75578	.56987	9.75742	.57203	9.75906	.57419	52
9	.75250	.56559	.75416	.56775	.75581	.56991	.75745	.57207	.75908	.57423	51
10	.75253	.56562	.75418	.56779	.75583	.56994	.75748	.57211	.75911	.57426	50
11	.75256	.56566	.75421	.56782	.75586	.56998	.75750	.57214	.75914	.57430	49
+ 3′	9.75258	.56570	9.75424	.56786	9.75589	.57002	9.75753	.57218	9.75917	.57434	48
13	.75261	.56573	.75427	.56789	.75592	.57005	.75756	.57221	.75919	.57437	47
14	.75264	.56577	.75429	.56793	.75594	.57009	.75759	.57225	.75922	.57441	46
15	.75267	.56580	.75432	.56797	.75597	.57012	.75761	.57229	.75925	.57444	45
+ 4′	9.75269	.56584	9.75435	.56800	9.75600	.57016	9.75764	.57232	9.75927	.57448	44
17	.75272	.56588	.75438	.56804	.75603	.57020	.75767	.57236	.75930	.57452	43
18	.75275	.56591	.75440	.56807	.75605	.57023	.75770	.57239	.75933	.57455	42
19	.75278	.56595	.75443	.56811	.75608	.57027	.75772	.57243	.75936	.57459	41
+ 5′	9.75280	.56598	9.75446	.56815	9.75611	.57031	9.75775	.57247	9.75938	.57462	40
21	.75283	.56602	.75449	.56818	.75614	.57034	.75778	.57250	.75941	.57466	39
22	.75286	.56606	.75452	.56822	.75616	.57038	.75780	.57254	.75944	.57470	38
23	.75289	.56609	.75454	.56825	.75619	.57041	.75783	.57257	.75947	.57473	37
+ 6′	9.75291	.56613	9.75457	.56829	9.75622	.57045	9.75786	.57261	9.75949	.57477	36
25	.75294	.56616	.75460	.56833	.75625	.57049	.75789	.57265	.75952	.57480	36
26	.75297	.56620	.75463	.56836	.75627	.57052	.75791	.57268	.75955	.57484	34
27	.75300	.56624	.75465	.56840	.75630	.57056	.75794	.57272	.75957	.57488	33
+ 7′	9.75303	.56627	9.75468	.56843	9.75633	.57059	9.75797	.57275	9.75960	.57491	32
29	.75305	.56631	.75471	.56847	.75636	.57063	.75800	.57279	.75963	.57495	31
30	.75308	.56634	.75474	.56851	.75638	.57067	.75802	.57283	.75966	.57498	30
31	.75311	.56638	.75476	.56854	.75641	.57070	.75805	.57286	.75968	.57502	29
+ 8′	9.75314	.56642	9.75479	.56858	9.75644	.57074	9.75808	.57290	9.75971	.57506	28
33	.75316	.56645	.75482	.56861	.75646	.57077	.75810	.57293	.75974	.57509	27
34	.75319	.56649	.75485	.56865	.75649	.57081	.75813	.57297	.75976	.57513	26
35	.75322	.56652	.75487	.56869	.75652	.57085	.75816	.57301	.75979	.57516	25
+ 9′	9.75325	.56656	9.75490	.56872	9.75655	.57088	9.75819	.57304	9.75982	.57520	24
37	.75327	.56660	.75493	.56876	.75657	.57092	.75821	.57308	.75985	.57524	23
38	.75330	.56663	.75496	.56879	.75660	.57095	.75824	.57311	.75987	.57527	22
39	.75333	.56667	.75498	.56883	.75663	.57099	.75827	.57315	.75990	.57531	21
+ 10′	9.75336	.56670	9.75501	.56887	9.75666	.57103	9.75830	.57318	9.75993	.57534	20
41	.75338	.56674	.75504	.56890	.75668	.57106	.75832	.57322	.75995	.57538	19
42	.75341	.56678	.75507	.56894	.75671	.57110	.75835	.57326	.75998	.57541	18
43	.75344	.56681	.75509	.56897	.75674	.57114	.75838	.57329	.76001	.57545	17
+ 11′	9.75347	.56685	9.75512	.56901	9.75677	.57117	9.75840	.57333	9.76004	.57549	16
45	.75350	.56689	.75515	.56905	.75679	.57121	.75843	.57337	.76006	.57552	15
46	.75352	.56692	.75518	.56908	.75682	.57124	.75846	.57340	.76009	.57556	14
47	.75355	.56696	.75520	.56912	.75685	.57128	.75849	.57344	.76012	.57559	13
+ 12′	9.75358	.56699	9.75523	.56915	9.75688	.57131	9.75851	.57347	9.76014	.57563	12
49	.75361	.56703	.75526	.56919	.75690	.57135	.75854	.57351	.76017	.57567	11
50	.75363	.56707	.75529	.56923	.75693	.57139	.75857	.57355	.76020	.57570	10
51	.75366	.56710	.75531	.56926	.75696	.57142	.75859	.57358	.76023	.57574	9
+ 13′	9.75369	.56714	9.75534	.56930	9.75698	.57146	9.75862	.57362	9.76025	.57577	8
53	.75372	.56717	.75537	.56933	.75701	.57149	.75865	.57365	.76028	.57581	7
54	.75374	.56721	.75540	.56937	.75704	.57153	.75868	.57369	.76031	.57585	6
55	.75377	.56725	.75542	.56941	.75707	.57157	.75870	.57373	.76033	.57588	5
+ 14′	9.75380	.56728	9.75545	.56944	9.75709	.57160	9.75873	.57376	9.76036	.57592	4
57	.75383	.56732	.75548	.56948	.75712	.57164	.75876	.57380	.76039	.57595	3
58	.75385	.56735	.75550	.56951	.75715	.57167	.75879	.57383	.76041	.57599	2
59	.75388	.56739	.75553	.56955	.75718	.57171	.75881	.57387	.76044	.57603	1
+ 15′	9.75391	.56743	9.75556	.56959	9.75720	.57175	9.75884	.57390	9.76047	.57606	0
	17h 29m		17h 28m		17h 27m		17h 26m		17h 25m		

Haversines.

s	6h 35m 98° 45′ Log. Hav.	Nat. Hav.	6h 36m 99° 0′ Log. Hav.	Nat. Hav.	6h 37m 99° 15′ Log. Hav.	Nat. Hav.	6h 38m 99° 30′ Log. Hav.	Nat. Hav.	6h 39m 99° 45′ Log. Hav.	Nat. Hav.	s
0	9.76047	.57606	9.76209	.57822	9.76371	.58037	9.76531	.58252	9.76691	.58467	60
1	.76050	.57610	.76212	.57825	.76373	.58041	.76534	.58256	.76694	.58471	59
2	.76052	.57613	.76215	.57829	.76376	.58044	.76537	.58260	.76697	.58475	58
3	.76055	.57617	.76217	.57833	.76379	.58048	.76539	.58263	.76699	.58478	57
+ 1′	9.76058	.57621	9.76220	.57836	9.76381	.58051	9.76542	.58267	9.76702	.58482	56
5	.76060	.57624	.76223	.57840	.76384	.58055	.76545	.58270	.76705	.58485	55
6	.76063	.57628	.76225	.57843	.76387	.58059	.76547	.58274	.76707	.58489	54
7	.76066	.57631	.76228	.57847	.76389	.58062	.76550	.58277	.76710	.58493	53
+ 2′	9.76069	.57635	9.76231	.57850	9.76392	.58066	9.76553	.58281	9.76713	.58496	52
9	.76071	.57639	.76233	.57854	.76395	.58069	.76555	.58285	.76715	.58500	51
10	.76074	.57642	.76236	.57858	.76397	.58073	.76558	.58288	.76718	.58503	50
11	.76077	.57646	.76239	.57861	.76400	.58077	.76561	.58292	.76721	.58507	49
+ 3′	9.76079	.57649	9.76241	.57865	9.76403	.58080	9.76563	.58295	9.76723	.58510	48
13	.76082	.57653	.76244	.57868	.76405	.58084	.76566	.58299	.76726	.58514	47
14	.76085	.57656	.76247	.57872	.76408	.58087	.76569	.58303	.76729	.58518	46
15	.76088	.57660	.76250	.57876	.76411	.58091	.76571	.58306	.76731	.58521	45
+ 4′	9.76090	.57664	9.76252	.57879	9.76414	.58095	9.76574	.58310	9.76734	.58525	44
17	.76093	.57667	.76255	.57883	.76416	.58098	.76577	.58313	.76737	.58528	43
18	.76096	.57671	.76258	.57886	.76419	.58102	.76579	.58317	.76739	.58532	42
19	.76098	.57675	.76260	.57890	.76422	.58105	.76582	.58321	.76742	.58536	41
+ 5′	9.76101	.57678	9.76263	.57894	9.76424	.58109	9.76585	.58324	9.76745	.58539	40
21	.76104	.57682	.76266	.57897	.76427	.58112	.76587	.58328	.76747	.58543	39
22	.76106	.57685	.76268	.57901	.76430	.58116	.76590	.58331	.76750	.58546	38
23	.76109	.57689	.76271	.57904	.76432	.58120	.76593	.58335	.76753	.58550	37
+ 6′	9.76112	.57692	9.76274	.57908	9.76435	.58123	9.76595	.58338	9.76755	.58553	36
25	.76115	.57696	.76276	.57911	.76438	.58127	.76598	.58342	.76758	.58557	35
26	.76117	.57700	.76279	.57915	.76440	.58130	.76601	.58346	.76761	.58561	34
27	.76120	.57703	.76282	.57919	.76443	.58134	.76603	.58349	.76763	.58564	33
+ 7′	9.76123	.57707	9.76285	.57922	9.76446	.58138	9.76606	.58353	9.76766	.58568	32
29	.76125	.57710	.76287	.57926	.76448	.58141	.76609	.58356	.76769	.58571	31
30	.76128	.57714	.76290	.57929	.76451	.58145	.76611	.58360	.76771	.58575	30
31	.76131	.57718	.76293	.57933	.76454	.58148	.76614	.58364	.76774	.58579	29
+ 8′	9.76134	.57721	9.76296	.57937	9.76456	.58152	9.76617	.58367	9.76777	.58582	28
33	.76136	.57725	.76298	.57940	.76459	.58156	.76619	.58371	.76779	.58586	27
34	.76139	.57728	.76301	.57944	.76462	.58159	.76622	.58374	.76782	.58589	26
35	.76142	.57732	.76303	.57947	.76464	.58163	.76625	.58378	.76784	.58593	25
+ 9′	9.76144	.57736	9.76306	.57951	9.76467	.58166	9.76627	.58381	9.76787	.58596	24
37	.76147	.57739	.76309	.57955	.76470	.58170	.76630	.58385	.76790	.58600	23
38	.76150	.57743	.76311	.57958	.76473	.58173	.76633	.58389	.76792	.58604	22
39	.76152	.57746	.76314	.57962	.76475	.58177	.76635	.58392	.76795	.58607	21
+ 10′	9.76155	.57750	9.76317	.57965	9.76478	.58181	9.76638	.58396	9.76798	.58611	20
41	.76158	.57753	.76320	.57969	.76481	.58184	.76641	.58399	.76800	.58614	19
42	.76161	.57757	.76322	.57973	.76483	.58188	.76643	.58403	.76803	.58618	18
43	.76163	.57761	.76325	.57976	.76486	.58191	.76646	.58407	.76806	.58622	17
+ 11′	9.76166	.57764	9.76328	.57980	9.76489	.58195	9.76649	.58410	9.76808	.58625	16
45	.76169	.57768	.76330	.57983	.76491	.58199	.76651	.58414	.76811	.58629	15
46	.76171	.57771	.76333	.57987	.76494	.58202	.76654	.58417	.76814	.58632	14
47	.76174	.57775	.76336	.57990	.76497	.58206	.76657	.58421	.76816	.58636	13
+ 12′	9.76177	.57779	9.76338	.57994	9.76499	.58209	9.76659	.58424	9.76819	.58639	12
49	.76179	.57782	.76341	.57998	.76502	.58213	.76662	.58428	.76822	.58643	11
50	.76182	.57786	.76344	.58001	.76505	.58217	.76665	.58432	.76824	.58647	10
51	.76185	.57789	.76346	.58005	.76507	.58220	.76667	.58435	.76827	.58650	9
+ 13′	9.76188	.57793	9.76349	.58008	9.76510	.58224	9.76670	.58439	9.76830	.58654	8
53	.76190	.57797	.76352	.58012	.76513	.58227	.76673	.58442	.76832	.58657	7
54	.76193	.57800	.76354	.58016	.76515	.58231	.76675	.58446	.76835	.58661	6
55	.76196	.57804	.76357	.58019	.76518	.58234	.76678	.58450	.76838	.58665	5
+ 14′	9.76198	.57807	9.76360	.58023	9.76521	.58238	9.76681	.58453	9.76840	.58668	4
57	.76201	.57811	.76363	.58026	.76523	.58242	.76683	.58457	.76843	.58671	3
58	.76204	.57815	.76365	.58030	.76526	.58245	.76686	.58460	.76845	.58675	2
59	.76206	.57818	.76368	.58034	.76529	.58249	.76689	.58464	.76848	.58679	1
+ 15′	9.76209	.57822	9.76371	.58037	9.76531	.58252	9.76691	.58467	9.76851	.58682	0
	17h 24m		17h 23m		17h 22m		17h 21m		17h 20m		

TABLE 34.

Haversines.

	6h 40m 100° 0′		6h 41m 100° 15′		6h 42m 100° 30′		6h 43m 100° 45′		6h 44m 101° 0′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.76851	.58682	9.77009	.58897	9.77167	.59112	9.77325	.59326	9.77481	.59540	60
1	.76853	.58686	.77012	.58901	.77170	.59115	.77327	.59330	.77484	.59544	59
2	.76856	.58690	.77015	.58904	.77173	.59119	.77330	.59333	.77486	.59548	58
3	.76859	.58693	.77017	.58908	.77175	.59122	.77333	.59337	.77489	.59551	57
+ 1′	9.76861	.58697	9.77020	.58911	9.77178	.59126	9.77335	.59340	9.77492	.59555	56
5	.76864	.58700	.77023	.58915	.77181	.59130	.77338	.59344	.77494	.59558	55
6	.76867	.58704	.77025	.58919	.77183	.59133	.77340	.59348	.77497	.59562	54
7	.76869	.58707	.77028	.58922	.77186	.59137	.77343	.59351	.77499	.59565	53
+ 2′	9.76872	.58711	9.77031	.58926	9.77188	.59140	9.77346	.59355	9.77502	.59569	52
9	.76875	.58714	.77033	.58929	.77191	.59144	.77348	.59358	.77505	.59573	51
10	.76877	.58718	.77036	.58933	.77194	.59148	.77351	.59362	.77507	.59576	50
11	.76880	.58722	.77038	.58937	.77196	.59151	.77353	.59365	.77510	.59580	49
+ 3′	9.76883	.58725	9.77041	.58940	9.77199	.59155	9.77356	.59369	9.77512	.59583	48
13	.76885	.58729	.77044	.58944	.77202	.59158	.77359	.59373	.77515	.59587	47
14	.76888	.58733	.77046	.58947	.77204	.59162	.77361	.59376	.77518	.59590	46
15	.76891	.58736	.77049	.58951	.77207	.59165	.77364	.59380	.77520	.59594	45
+ 4′	9.76893	.58740	9.77052	.58954	9.77209	.59169	9.77366	.59383	9.77523	.59598	44
17	.76896	.58743	.77054	.58958	.77212	.59173	.77369	.59387	.77525	.59601	43
18	.76898	.58747	.77057	.58962	.77215	.59176	.77372	.59391	.77528	.59605	42
19	.76901	.58750	.77060	.58965	.77217	.59180	.77374	.59394	.77531	.59608	41
+ 5′	9.76904	.58754	9.77062	.58969	9.77220	.59183	9.77377	.59398	9.77533	.59612	40
21	.76906	.58758	.77065	.58972	.77223	.59187	.77380	.59401	.77536	.59615	39
22	.76909	.58761	.77067	.58976	.77225	.59190	.77382	.59405	.77538	.59619	38
23	.76912	.58765	.77070	.58979	.77228	.59194	.77385	.59408	.77541	.59623	37
+ 6′	9.76914	.58768	9.77073	.58983	9.77230	.59198	9.77387	.59412	9.77544	.59626	36
25	.76917	.58772	.77075	.58987	.77233	.59201	.77390	.59416	.77546	.59630	35
26	.76920	.58776	.77078	.58990	.77236	.59205	.77393	.59419	.77549	.59633	34
27	.76922	.58779	.77081	.58994	.77238	.59208	.77395	.59423	.77551	.59637	33
+ 7′	9.76925	.58783	9.77083	.58997	9.77241	.59212	9.77398	.59426	9.77554	.59640	32
29	.76928	.58786	.77086	.59001	.77243	.59215	.77400	.59430	.77557	.59644	31
30	.76930	.58790	.77089	.59005	.77246	.59219	.77403	.59433	.77559	.59648	30
31	.76933	.58793	.77091	.59008	.77249	.59223	.77406	.59437	.77562	.59651	29
+ 8′	9.76936	.58797	9.77094	.59012	9.77251	.59226	9.77408	.59440	9.77564	.59655	28
33	.76938	.58801	.77096	.59015	.77254	.59230	.77411	.59444	.77567	.59658	27
34	.76941	.58804	.77099	.59019	.77257	.59233	.77413	.59448	.77570	.59662	26
35	.76943	.58808	.77102	.59022	.77259	.59237	.77416	.59451	.77572	.59665	25
+ 9′	9.76946	.58811	9.77104	.59026	9.77262	.59240	9.77419	.59455	9.77575	.59669	24
37	.76949	.58815	.77107	.59030	.77264	.59244	.77421	.59458	.77577	.59672	23
38	.76951	.58818	.77110	.59033	.77267	.59248	.77424	.59462	.77580	.59676	22
39	.76954	.58822	.77112	.59037	.77270	.59251	.77427	.59465	.77583	.59680	21
+ 10′	9.76957	.58826	9.77115	.59040	9.77272	.59255	9.77429	.59469	9.77585	.59683	20
41	.76959	.58829	.77117	.59044	.77275	.59258	.77432	.59473	.77588	.59687	19
42	.76962	.58833	.77120	.59047	.77278	.59262	.77434	.59476	.77590	.59690	18
43	.76965	.58836	.77123	.59051	.77280	.59265	.77437	.59480	.77593	.59694	17
+ 11′	9.76967	.58840	9.77125	.59055	9.77283	.59269	9.77440	.59483	9.77596	.59697	16
45	.76970	.58843	.77128	.59058	.77285	.59273	.77442	.59487	.77598	.59701	15
46	.76972	.58847	.77131	.59062	.77288	.59276	.77445	.59490	.77601	.59705	14
47	.76975	.58851	.77133	.59065	.77291	.59280	.77447	.59494	.77603	.59708	13
+ 12′	9.76978	.58854	9.77136	.59069	9.77293	.59283	9.77450	.59498	9.77606	.59712	12
49	.76980	.58858	.77139	.59072	.77296	.59287	.77453	.59501	.77609	.59715	11
50	.76983	.58861	.77141	.59076	.77298	.59290	.77455	.59505	.77611	.59719	10
51	.76986	.58865	.77144	.59080	.77301	.59294	.77458	.59508	.77614	.59722	9
+ 13′	9.76988	.58869	9.77146	.59083	9.77304	.59298	9.77460	.59512	9.77616	.59726	8
53	.76991	.58872	.77149	.59087	.77306	.59301	.77463	.59515	.77619	.59730	7
54	.76994	.58876	.77152	.59090	.77309	.59305	.77466	.59519	.77622	.59733	6
55	.76996	.58879	.77154	.59094	.77312	.59308	.77468	.59523	.77624	.59737	5
+ 14′	9.76999	.58883	9.77157	.59097	9.77314	.59312	9.77471	.59526	9.77627	.59740	4
57	.77002	.58886	.77160	.59101	.77317	.59315	.77473	.59530	.77629	.59744	3
58	.77004	.58890	.77162	.59105	.77319	.59319	.77476	.59533	.77632	.59747	2
59	.77007	.58894	.77165	.59108	.77322	.59323	.77479	.59537	.77634	.59751	1
+ 15′	9.77009	.58897	9.77167	.59112	9.77325	.59326	9.77481	.59540	9.77637	.59755	0
	17h 19m		17h 18m		17h 17m		17h 16m		17h 15m		

Haversines.

s	$6^h\ 45^m$ 101° 15′		$6^h\ 46^m$ 101° 30′		$6^h\ 47^m$ 101° 45′		$6^h\ 48^m$ 102° 0′		$6^h\ 49^m$ 102° 15′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.77637	.59755	9.77792	.59968	9.77947	.60182	9.78101	.60396	9.78254	.60609	60
1	.77640	.59758	.77795	.59972	.77949	.60185	.78103	.60399	.78256	.60612	59
2	.77642	.59762	.77797	.59976	.77952	.60189	.78106	.60403	.78259	.60616	58
3	.77645	.59765	.77800	.59979	.77954	.60193	.78108	.60406	.78261	.60620	57
+ 1′	9.77647	.59769	9.77803	.59983	9.77957	.60196	9.78111	.60410	9.78264	.60623	56
5	.77650	.59772	.77805	.59986	.77960	.60200	.78113	.60414	.78266	.60627	55
6	.77653	.59776	.77808	.59990	.77962	.60203	.78116	.60417	.78269	.60630	54
7	.77655	.59779	.77810	.59993	.77965	.60207	.78118	.60420	.78271	.60634	53
+ 2′	9.77658	.59783	9.77813	.59997	9.77967	.60211	9.78121	.60424	9.78274	.60637	52
9	.77660	.59787	.77815	.60000	.77970	.60214	.78124	.60428	.78277	.60641	51
10	.77663	.59790	.77818	.60004	.77972	.60218	.78126	.60431	.78279	.60644	50
11	.77666	.59794	.77821	.60008	.77975	.60221	.78129	.60435	.78282	.60648	49
+ 3′	9.77668	.59797	9.77823	.60011	9.77978	.60225	9.78131	.60438	9.78284	.60652	48
13	.77671	.59801	.77826	.60015	.77980	.60228	.78134	.60442	.78287	.60655	47
14	.77673	.59804	.77828	.60018	.77983	.60232	.78136	.60445	.78289	.60659	46
15	.77676	.59808	.77831	.60022	.77985	.60235	.78139	.60449	.78292	.60662	45
+ 4′	9.77679	.59812	9.77834	.60025	9.77988	.60239	9.78141	.60452	9.78294	.60666	44
17	.77681	.59815	.77836	.60029	.77990	.60243	.78144	.60456	.78297	.60669	43
18	.77684	.59819	.77839	.60033	.77993	.60246	.78147	.60460	.78299	.60673	42
19	.77686	.59822	.77841	.60036	.77996	.60250	.78149	.60463	.78302	.60676	41
+ 5′	9.77689	.59826	9.77844	.60040	9.77998	.60253	9.78152	.60467	9.78305	.60680	40
21	.77691	.59829	.77846	.60043	.78001	.60257	.78154	.60470	.78307	.60684	39
22	.77694	.59833	.77849	.60047	.78003	.60260	.78157	.60474	.78310	.60687	38
23	.77697	.59837	.77852	.60050	.78006	.60264	.78159	.60477	.78312	.60691	37
+ 6′	9.77699	.59840	9.77854	.60054	9.78008	.60268	9.78162	.60481	9.78315	.60694	36
25	.77702	.59844	.77857	.60057	.78011	.60271	.78164	.60484	.78317	.60698	35
26	.77704	.59847	.77859	.60061	.78013	.60275	.78167	.60488	.78320	.60701	34
27	.77707	.59851	.77862	.60065	.78016	.60278	.78170	.60492	.78322	.60705	33
+ 7′	9.77710	.59854	9.77864	.60068	9.78019	.60282	9.78172	.60495	9.78325	.60708	32
29	.77712	.59858	.77867	.60072	.78021	.60285	.78175	.60499	.78327	.60712	31
30	.77715	.59861	.77870	.60075	.78024	.60289	.78177	.60502	.78330	.60715	30
31	.77717	.59865	.77872	.60079	.78026	.60292	.78180	.60506	.78332	.60719	29
+ 8′	9.77720	.59869	9.77875	.60082	9.78029	.60296	9.78182	.60509	9.78335	.60723	28
33	.77723	.59872	.77877	.60086	.78031	.60300	.78185	.60513	.78338	.60726	27
34	.77725	.59876	.77880	.60090	.78034	.60303	.78187	.60516	.78340	.60730	26
35	.77728	.59879	.77882	.60093	.78037	.60307	.78190	.60520	.78343	.60733	25
+ 9′	9.77730	.59883	9.77885	.60097	9.78039	.60310	9.78192	.60524	9.78345	.60737	24
37	.77733	.59886	.77888	.60100	.78042	.60314	.78195	.60527	.78348	.60740	23
38	.77735	.59890	.77890	.60104	.78044	.60317	.78198	.60531	.78350	.60744	22
39	.77738	.59894	.77893	.60107	.78047	.60321	.78200	.60534	.78353	.60747	21
+ 10′	9.77741	.59897	9.77895	.60111	9.78049	.60324	9.78203	.60538	9.78355	.60751	20
41	.77743	.59901	.77898	.60114	.78052	.60328	.78205	.60541	.78358	.60755	19
42	.77746	.59904	.77900	.60118	.78054	.60332	.78208	.60545	.78360	.60758	18
43	.77748	.59908	.77903	.60122	.78057	.60335	.78210	.60548	.78363	.60762	17
+ 11′	9.77751	.59911	9.77906	.60125	9.78060	.60339	9.78213	.60552	9.78365	.60765	16
45	.77754	.59915	.77908	.60129	.78062	.60342	.78215	.60556	.78368	.60769	15
46	.77756	.59919	.77911	.60132	.78065	.60346	.78218	.60559	.78371	.60772	14
47	.77759	.59922	.77913	.60136	.78067	.60349	.78221	.60563	.78373	.60776	13
+ 12′	9.77761	.59926	9.77916	.60139	9.78070	.60353	9.78223	.60566	9.78376	.60779	12
49	.77764	.59929	.77918	.60143	.78072	.60356	.78226	.60570	.78378	.60783	11
50	.77766	.59933	.77921	.60146	.78075	.60360	.78228	.60573	.78381	.60786	10
51	.77769	.59936	.77924	.60150	.78077	.60364	.78231	.60577	.78383	.60790	9
+ 13′	9.77772	.59940	9.77926	.60154	9.78080	.60367	9.78233	.60580	9.78386	.60794	8
53	.77774	.59943	.77929	.60157	.78083	.60371	.78236	.60584	.78388	.60797	7
54	.77777	.59947	.77931	.60161	.78085	.60374	.78238	.60588	.78391	.60801	6
55	.77779	.59951	.77934	.60164	.78088	.60378	.78241	.60591	.78393	.60804	5
+ 14′	9.77782	.59954	9.77936	.60168	9.78090	.60381	9.78243	.60595	9.78396	.60808	4
57	.77785	.59958	.77939	.60171	.78093	.60385	.78246	.60598	.78398	.60811	3
58	.77787	.59961	.77942	.60175	.78095	.60388	.78249	.60602	.78401	.60815	2
59	.77790	.59965	.77944	.60179	.78098	.60392	.78251	.60605	.78404	.60818	1
+ 15′	9.77792	.59968	9.77947	.60182	9.78101	.60396	9.78254	.60609	9.78406	.60822	0
	$17^h\ 14^m$		$17^h\ 13^m$		$17^h\ 12^m$		$17^h\ 11^m$		$17^h\ 10^m$		

TABLE 34.

Haversines.

s	6h 50m 102° 30′ Log. Hav.	Nat. Hav.	6h 51m 102° 45′ Hav.Log.	Nat. Hav.	6h 52m 103° 0′ Log. Hav.	Nat. Hav.	6h 53m 103° 15′ Log. Hav.	Nat. Hav.	6h 54m 103° 30′ Log. Hav.	Nat. Hav.	s
0	9.78406	.60822	9.78558	.61035	9.78709	.61248	9.78859	.61460	9.79009	.61672	60
1	.78409	.60825	.78560	.61038	.78711	.61251	.78862	.61464	.79011	.61676	59
2	.78411	.60829	.78563	.61042	.78714	.61255	.78864	.61467	.79014	.61679	58
3	.78414	.60833	.78565	.61046	.78716	.61258	.78867	.61471	.79016	.61683	57
+ 1′	9.78416	.60836	9.78568	.61049	9.78719	.61262	9.78869	.61474	9.79019	.61686	56
5	.78419	.60840	.78570	.61053	.78721	.61265	.78872	.61478	.79021	.61690	55
6	.78421	.60843	.78573	.61056	.78724	.61269	.78874	.61481	.79024	.61693	54
7	.78424	.60847	.78575	.61060	.78726	.61272	.78877	.61485	.79026	.61697	53
+ 2′	9.78426	.60850	9.78578	.61063	9.78729	.61276	9.78879	.61488	9.79029	.61701	52
9	.78429	.60854	.78581	.61067	.78731	.61279	.78882	.61492	.79031	.61704	51
10	.78431	.60857	.78583	.61070	.78734	.61283	.78884	.61495	.79034	.61708	50
11	.78434	.60861	.78586	.61074	.78737	.61287	.78887	.61499	.79036	.61711	49
+ 3′	9.78436	.60865	9.78588	.61077	9.78739	.61290	9.78889	.61502	9.79039	.61715	48
13	.78439	.60868	.78591	.61081	.78742	.61294	.78892	.61506	.79041	.61718	47
14	.78442	.60872	.78593	.61085	.78744	.61297	.78894	.61510	.79044	.61722	46
15	.78444	.60875	.78596	.61088	.78747	.61301	.78897	.61513	.79046	.61725	45
+ 4′	9.78447	.60879	9.78598	.61092	9.78749	.61304	9.78899	.61517	9.79049	.61729	44
17	.78449	.60882	.78601	.61095	.78752	.61308	.78902	.61520	.79051	.61732	43
18	.78452	.60886	.78603	.61099	.78754	.61311	.78904	.61524	.79054	.61736	42
19	.78454	.60889	.78606	.61102	.78757	.61315	.78907	.61527	.79056	.61739	41
+ 5′	9.78457	.60893	9.78608	.61106	9.78759	.61318	9.78909	.61531	9.79059	.61743	40
21	.78459	.60897	.78611	.61109	.78762	.61322	.78912	.61534	.79061	.61747	39
22	.78462	.60900	.78613	.61113	.78764	.61325	.78914	.61538	.79064	.61750	38
23	.78464	.60904	.78616	.61116	.78767	.61329	.78917	.61541	.79066	.61754	37
+ 6′	9.78467	.60907	9.78618	.61120	9.78769	.61333	9.78919	.61545	9.79069	.61757	36
25	.78469	.60911	.78621	.61124	.78772	.61336	.78922	.61548	.79071	.61761	35
26	.78472	.60914	.78623	.61127	.78774	.61340	.78924	.61552	.79074	.61764	34
27	.78474	.60918	.78626	.61131	.78777	.61343	.78927	.61556	.79076	.61768	33
+ 7′	9.78477	.60921	9.78628	.61134	9.78779	.61347	9.78929	.61559	9.79079	.61771	32
29	.78479	.60925	.78631	.61138	.78782	.61350	.78932	.61563	.79081	.61775	31
30	.78482	.60928	.78633	.61141	.78784	.61354	.78934	.61566	.79084	.61778	30
31	.78485	.60932	.78636	.61145	.78787	.61357	.78937	.61570	.79086	.61782	29
+ 8′	9.78487	.60936	9.78638	.61148	9.78789	.61361	9.78939	.61573	9.79089	.61785	28
33	.78490	.60939	.78641	.61152	.78792	.61364	.78942	.61577	.79091	.61789	27
34	.78492	.60943	.78643	.61155	.78794	.61368	.78944	.61580	.79094	.61792	26
35	.78495	.60946	.78646	.61159	.78797	.61372	.78947	.61584	.79096	.61796	25
+ 9′	9.78497	.60950	9.78649	.61163	9.78799	.61375	9.78949	.61587	9.79099	.61800	24
37	.78500	.60953	.78651	.61166	.78802	.61379	.78952	.61591	.79101	.61803	23
38	.78502	.60957	.78654	.61170	.78804	.61382	.78954	.61594	.79103	.61807	22
39	.78505	.60960	.78656	.61173	.78807	.61386	.78957	.61598	.79106	.61810	21
+ 10′	9.78507	.60964	9.78659	.61177	9.78809	.61389	9.78959	.61602	9.79108	.61814	20
41	.78510	.60967	.78661	.61180	.78812	.61393	.78962	.61605	.79111	.61817	19
42	.78512	.60971	.78664	.61184	.78814	.61396	.78964	.61609	.79113	.61821	18
43	.78515	.60975	.78666	.61187	.78817	.61400	.78967	.61612	.79116	.61824	17
+ 11′	9.78517	.60978	9.78669	.61191	9.78819	.61403	9.78969	.61616	9.79118	.61828	16
45	.78520	.60982	.78671	.61194	.78822	.61407	.78972	.61619	.79121	.61831	15
46	.78522	.60985	.78674	.61198	.78824	.61410	.78974	.61623	.79123	.61835	14
47	.78525	.60989	.78676	.61201	.78827	.61414	.78977	.61626	.79126	.61838	13
+ 12′	9.78528	.60992	9.78679	.61205	9.78829	.61418	9.78979	.61630	9.79128	.61842	12
49	.78530	.60996	.78681	.61209	.78832	.61421	.78982	.61633	.79131	.61845	11
50	.78533	.60999	.78684	.61212	.78834	.61425	.78984	.61637	.79133	.61849	10
51	.78535	.61003	.78686	.61216	.78837	.61428	.78987	.61640	.79136	.61853	9
+ 13′	9.78538	.61007	9.78689	.61219	9.78839	.61432	9.78989	.61644	9.79138	.61856	8
53	.78540	.61010	.78691	.61223	.78842	.61435	.78992	.61648	.79141	.61860	7
54	.78543	.61014	.78694	.61226	.78844	.61439	.78994	.61651	.79143	.61863	6
55	.78545	.61017	.78696	.61230	.78847	.61442	.78997	.61655	.79146	.61867	5
+ 14′	9.78548	.61021	9.78699	.61233	9.78849	.61446	9.78999	.61658	9.79148	.61870	4
57	.78550	.61024	.78701	.61237	.78852	.61449	.79002	.61662	.79151	.61874	3
58	.78553	.61028	.78704	.61240	.78854	.61453	.79004	.61665	.79153	.61877	2
59	.78555	.61032	.78706	.61244	.78857	.61456	.79007	.61669	.79156	.61881	1
+ 15′	9.78558	.61035	9.78709	.61248	9.78859	.61460	9.79009	.61672	9.79158	.61884	0
	17h 9m		17h 8m		17h 7m		17h 6m		17h 5m		

TABLE 34.

Haversines.

s	6h 55m 103° 45′		6h 56m 104° 0′		6h 57m 104° 15′		6h 58m 104° 30′		6h 59m 104° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.79158	.61884	9.79306	.62096	9.79454	.62308	9.79601	.62519	9.79748	.62730	60
1	.79161	.61888	.79309	.62100	.79457	.62311	.79604	.62522	.79750	.62734	59
2	.79163	.61891	.79311	.62103	.79459	.62315	.79606	.62526	.79752	.62737	58
3	.79165	.61895	.79314	.62107	.79462	.62318	.79609	.62530	.79755	.62741	57
+ 1′	9.79168	.61898	9.79316	.62110	9.79464	.62322	9.79611	.62533	9.79757	.62744	56
5	.79170	.61902	.79319	.62114	.79466	.62325	.79613	.62537	.79760	.62748	55
6	.79173	.61905	.79321	.62117	.79469	.62329	.79616	.62540	.79762	.62751	54
7	.79175	.61909	.79324	.62121	.79471	.62332	.79618	.62544	.79765	.62755	53
+ 2′	9.79178	.61913	9.79326	.62124	9.79474	.62336	9.79621	.62547	9.79767	.62758	52
9	.79180	.61916	.79329	.62128	.79476	.62339	.79623	.62551	.79770	.62762	51
10	.79183	.61920	.79331	.62131	.79479	.62343	.79626	.62554	.79772	.62765	50
11	.79185	.61923	.79334	.62135	.79481	.62346	.79628	.62558	.79774	.62769	49
+ 3′	9.79188	.61927	9.79336	.62138	9.79484	.62350	9.79631	.62561	9.79777	.62772	48
13	.79190	.61930	.79339	.62142	.79486	.62353	.79633	.62565	.79779	.62776	47
14	.79193	.61934	.79341	.62145	.79489	.62357	.79635	.62568	.79782	.62779	46
15	.79195	.61937	.79343	.62149	.79491	.62361	.79638	.62572	.79784	.62783	45
+ 4′	9.79198	.61941	9.79346	.62153	9.79493	.62364	9.79640	.62575	9.79787	.62786	44
17	.79200	.61944	.79348	.62156	.79496	.62368	.79643	.62579	.79789	.62790	43
18	.79203	.61948	.79351	.62160	.79498	.62371	.79645	.62582	.79791	.62793	42
19	.79205	.61951	.79353	.62163	.79501	.62375	.79648	.62586	.79794	.62797	41
+ 5′	9.79208	.61955	9.79356	.62167	9.79503	.62378	9.79650	.62589	9.79796	.62800	40
21	.79210	.61958	.79358	.62170	.79506	.62382	.79653	.62593	.79799	.62804	39
22	.79213	.61962	.79361	.62174	.79508	.62385	.79655	.62596	.79801	.62807	38
23	.79215	.61966	.79363	.62177	.79511	.62389	.79657	.62600	.79804	.62811	37
+ 6′	9.79217	.61969	9.79366	.62181	9.79513	.62392	9.79660	.62603	9.79806	.62814	36
25	.79220	.61973	.79368	.62184	.79516	.62396	.79662	.62607	.79808	.62818	35
26	.79222	.61976	.79371	.62188	.79518	.62399	.79665	.62611	.79811	.62822	34
27	.79225	.61980	.79373	.62191	.79520	.62403	.79667	.62614	.79813	.62825	33
+ 7′	9.79227	.61983	9.79376	.62195	9.79523	.62406	9.79670	.62618	9.79816	.62829	32
29	.79230	.61987	.79378	.62198	.79525	.62410	.79672	.62621	.79818	.62832	31
30	.79232	.61990	.79380	.62202	.79528	.62413	.79674	.62625	.79821	.62836	30
31	.79235	.61994	.79383	.62205	.79530	.62417	.79677	.62628	.79823	.62839	29
+ 8′	9.79237	.61997	9.79385	.62209	9.79533	.62420	9.79679	.62632	9.79825	.62843	28
33	.79240	.62001	.79388	.62213	.79535	.62424	.79682	.62635	.79828	.62846	27
34	.79242	.62004	.79390	.62216	.79538	.62427	.79684	.62639	.79830	.62850	26
35	.79245	.62008	.79393	.62220	.79540	.62431	.79687	.62642	.79833	.62853	25
+ 9′	9.79247	.62011	9.79395	.62223	9.79542	.62434	9.79689	.62646	9.79835	.62857	24
37	.79250	.62015	.79398	.62227	.79545	.62438	.79692	.62649	.79838	.62860	23
38	.79252	.62018	.79400	.62230	.79547	.62442	.79694	.62653	.79840	.62864	22
39	.79255	.62022	.79403	.62234	.79550	.62445	.79696	.62656	.79842	.62867	21
+ 10′	9.79257	.62026	9.79405	.62237	9.79552	.62449	9.79699	.62660	9.79845	.62871	20
41	.79260	.62029	.79407	.62241	.79555	.62452	.79701	.62663	.79847	.62874	19
42	.79262	.62033	.79410	.62244	.79557	.62456	.79704	.62667	.79850	.62878	18
43	.79264	.62036	.79412	.62248	.79560	.62459	.79706	.62670	.79852	.62881	17
+ 11′	9.79267	.62040	9.79415	.62251	9.79562	.62463	9.79709	.62674	9.79855	.62885	16
45	.79269	.62043	.79417	.62255	.79565	.62466	.79711	.62677	.79857	.62888	15
46	.79272	.62047	.79420	.62258	.79567	.62470	.79714	.62681	.79859	.62892	14
47	.79274	.62050	.79422	.62262	.79569	.62473	.79716	.62684	.79862	.62895	13
+ 12′	9.79277	.62054	9.79425	.62265	9.79572	.62477	9.79718	.62688	9.79864	.62899	12
49	.79279	.62057	.79427	.62269	.79574	.62480	.79721	.62691	.79867	.62902	11
50	.79282	.62061	.79430	.62272	.79577	.62484	.79723	.62695	.79869	.62906	10
51	.79284	.62064	.79432	.62276	.79579	.62487	.79726	.62698	.79872	.62909	9
+ 13′	9.79287	.62068	9.79434	.62279	9.79582	.62491	9.79728	.62702	9.79874	.62913	8
53	.79289	.62071	.79437	.62283	.79584	.62494	.79731	.62706	.79876	.62916	7
54	.79292	.62075	.79439	.62287	.79587	.62498	.79733	.62709	.79879	.62920	6
55	.79294	.62078	.79442	.62290	.79589	.62501	.79735	.62713	.79881	.62923	5
+ 14′	9.79297	.62082	9.79444	.62294	9.79591	.62505	9.79738	.62716	9.79884	.62927	4
57	.79299	.62086	.79447	.62297	.79594	.62508	.79740	.62720	.79886	.62930	3
58	.79301	.62089	.79449	.62301	.79596	.62512	.79743	.62723	.79888	.62934	2
59	.79304	.62093	.79452	.62304	.79599	.62515	.79745	.62727	.79891	.62937	1
+ 15′	9.79306	.62096	9.79454	.62308	9.79601	.62519	9.79748	.62730	9.79893	.62941	0
	17h 4m		17h 3m		17h 2m		17h 1m		17h 0m		

TABLE 34.

Haversines.

s	7h 0m 105° 0′		7h 1m 105° 15′		7h 2m 105° 30′		7h 3m 105° 45′		7h 4m 106° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.79893	.62941	9.80038	.63152	9.80183	.63362	9.80327	.63572	9.80470	.63782	60
1	.79896	.62944	.80041	.63155	.80185	.63365	.80329	.63576	.80472	.63785	59
2	.79898	.62948	.80043	.63159	.80188	.63369	.80331	.63579	.80474	.63789	58
3	.79901	.62951	.80046	.63162	.80190	.63372	.80334	.63583	.80477	.63792	57
+ 1′	9.79903	.62955	9.80048	.63166	9.80192	.63376	9.80336	.63586	9.80479	.63796	56
5	.79905	.62958	.80050	.63169	.80195	.63379	.80339	.63590	.80482	.63799	55
6	.79908	.62962	.80053	.63173	.80197	.63383	.80341	.63593	.80484	.63803	54
7	.79910	.62965	.80055	.63176	.80200	.63386	.80343	.63597	.80486	.63806	53
+ 2′	9.79913	.62969	9.80058	.63180	9.80202	.63390	9.80346	.63600	9.80489	.63810	52
9	.79915	.62973	.80060	.63183	.80204	.63393	.80348	.63604	.80491	.63813	51
10	.79918	.62976	.80063	.63187	.80207	.63397	.80351	.63607	.80494	.63817	50
11	.79920	.62980	.80065	.63190	.80209	.63400	.80353	.63611	.80496	.63820	49
+ 3′	9.79922	.62983	9.80067	.63194	9.80212	.63404	9.80355	.63614	9.80498	.63824	48
13	.79925	.62987	.80070	.63197	.80214	.63407	.80358	.63618	.80501	.63827	47
14	.79927	.62990	.80072	.63201	.80216	.63411	.80360	.63621	.80503	.63831	46
15	.79930	.62994	.80075	.63204	.80219	.63414	.80362	.63625	.80505	.63834	45
+ 4′	9.79932	.62997	9.80077	.63208	9.80221	.63418	9.80365	.63628	9.80508	.63838	44
17	.79935	.63001	.80079	.63211	.80224	.63421	.80367	.63632	.80510	.63841	43
18	.79937	.63004	.80082	.63215	.80226	.63425	.80370	.63635	.80513	.63845	42
19	.79939	.63008	.80084	.63218	.80228	.63428	.80372	.63639	.80515	.63848	41
+ 5′	9.79942	.63011	9.80087	.63222	9.80231	.63432	9.80374	.63642	9.80517	.63852	40
21	.79944	.63015	.80089	.63225	.80233	.63435	.80377	.63646	.80520	.63855	39
22	.79947	.63018	.80091	.63229	.80236	.63439	.80379	.63649	.80522	.63859	38
23	.79949	.63022	.80094	.63232	.80238	.63442	.80382	.63653	.80524	.63862	37
+ 6′	9.79951	.63025	9.80096	.63236	9.80240	.63446	9.80384	.63656	9.80527	.63866	36
25	.79954	.63029	.80099	.63239	.80243	.63450	.80386	.63660	.80529	.63869	35
26	.79956	.63032	.80101	.63243	.80245	.63453	.80389	.63663	.80532	.63873	34
27	.79959	.63036	.80103	.63246	.80248	.63457	.80391	.63666	.80534	.63876	33
+ 7′	9.79961	.63039	9.80106	.63250	9.80250	.63460	9.80393	.63670	9.80536	.63880	32
29	.79964	.63043	.80108	.63253	.80252	.63464	.80396	.63673	.80539	.63883	31
30	.79966	.63046	.80111	.63257	.80255	.63467	.80398	.63677	.80541	.63887	30
31	.79968	.63050	.80113	.63260	.80257	.63471	.80401	.63680	.80543	.63890	29
+ 8′	9.79971	.63053	9.80116	.63264	9.80260	.63474	9.80403	.63684	9.80546	.63894	28
33	.79973	.63057	.80118	.63267	.80262	.63478	.80405	.63687	.80548	.63897	27
34	.79976	.63060	.80120	.63271	.80264	.63481	.80408	.63691	.80551	.63901	26
35	.79978	.63064	.80123	.63274	.80267	.63485	.80410	.63694	.80553	.63904	25
+ 9′	9.79980	.63067	9.80125	.63278	9.80269	.63488	9.80413	.63698	9.80555	.63908	24
37	.79983	.63071	.80128	.63281	.80272	.63492	.80415	.63701	.80558	.63911	23
38	.79985	.63074	.80130	.63285	.80274	.63495	.80417	.63705	.80560	.63915	22
39	.79988	.63078	.80132	.63288	.80276	.63499	.80420	.63708	.80562	.63918	21
+ 10′	9.79990	.63081	9.80135	.63292	9.80279	.63502	9.80422	.63712	9.80565	.63922	20
41	.79993	.63085	.80137	.63295	.80281	.63506	.80424	.63715	.80567	.63925	19
42	.79995	.63088	.80140	.63299	.80284	.63509	.80427	.63719	.80570	.63929	18
43	.79997	.63092	.80142	.63302	.80286	.63513	.80429	.63722	.80572	.63932	17
+ 11′	9.80000	.63095	9.80144	.63306	9.80288	.63516	9.80432	.63726	9.80574	.63936	16
45	.80002	.63099	.80147	.63309	.80291	.63520	.80434	.63729	.80577	.63939	15
46	.80005	.63102	.80149	.63313	.80293	.63523	.80436	.63733	.80579	.63943	14
47	.80007	.63106	.80152	.63316	.80296	.63527	.80439	.63736	.80581	.63946	13
+ 12′	9.80009	.63109	9.80154	.63320	9.80298	.63530	9.80441	.63740	9.80584	.63950	12
49	.80012	.63113	.80156	.63323	.80300	.63534	.80444	.63743	.80586	.63953	11
50	.80014	.63116	.80159	.63327	.80303	.63537	.80446	.63747	.80589	.63957	10
51	.80017	.63120	.80161	.63330	.80305	.63541	.80448	.63750	.80591	.63960	9
+ 13′	9.80019	.63123	9.80164	.63334	9.80307	.63544	9.80451	.63754	9.80593	.63964	8
53	.80022	.63127	.80166	.63337	.80310	.63548	.80453	.63757	.80596	.63967	7
54	.80024	.63131	.80168	.63341	.80312	.63551	.80455	.63761	.80598	.63971	6
55	.80026	.63134	.80171	.63344	.80315	.63555	.80458	.63764	.80600	.63974	5
+ 14′	9.80029	.63138	9.80173	.63348	9.80317	.63558	9.80460	.63768	9.80603	.63977	4
57	.80031	.63142	.80176	.63351	.80319	.63562	.80463	.63771	.80605	.63981	3
58	.80034	.63145	.80178	.63355	.80322	.63565	.80465	.63775	.80607	.63984	2
59	.80036	.63148	.80180	.63358	.80324	.63569	.80467	.63778	.80610	.63988	1
+ 15′	9.80038	.63152	9.80183	.63362	9.80327	.63572	9.80470	.63782	9.80612	.63991	0
	16h 59m		16h 58m		16h 57m		16h 56m		16h 55m		

Haversines.

	7h 5m 106° 15′		7h 6m 106° 30′		7h 7m 106° 45′		7h 8m 107° 0′		7h 9m 107° 15′		
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.80612	.63991	9.80754	.64201	9.80895	.64410	9.81036	.64619	9.81176	.64827	60
1	.80615	.63995	.80756	.64204	.80898	.64413	.81038	.64622	.81178	.64831	59
2	.80617	.63998	.80759	.64208	.80900	.64417	.81040	.64626	.81180	.64834	58
3	.80619	.64002	.80761	.64211	.80902	.64420	.81043	.64629	.81183	.64838	57
+ 1′	9.80622	.64005	9.80763	.64215	9.80905	.64424	9.81045	.64632	9.81185	.64841	56
5	.80624	.64009	.80766	.64218	.80907	.64427	.81047	.64636	.81187	.64844	55
6	.80626	.64012	.80768	.64222	.80909	.64431	.81050	.64639	.81190	.64848	54
7	.80629	.64016	.80771	.64225	.80912	.64434	.81052	.64643	.81192	.64851	53
+ 2′	9.80631	.64019	9.80773	.64229	9.80914	.64438	9.81054	.64646	9.81194	.64855	52
9	.80634	.64023	.80775	.64232	.80916	.64441	.81057	.64650	.81197	.64858	51
10	.80636	.64026	.80778	.64236	.80919	.64445	.81059	.64653	.81199	.64862	50
11	.80638	.64030	.80780	.64239	.80921	.64448	.81061	.64657	.81201	.64865	49
+ 3′	9.80641	.64033	9.80782	.64243	9.80923	.64452	9.81064	.64660	9.81204	.64869	48
13	.80643	.64037	.80785	.64246	.80926	.64455	.81066	.64664	.81206	.64872	47
14	.80645	.64040	.80787	.64250	.80928	.64459	.81068	.64667	.81208	.64876	46
15	.80648	.64044	.80789	.64253	.80930	.64462	.81071	.64671	.81211	.64879	45
+ 4′	9.80650	.64047	9.80792	.64257	9.80933	.64466	.81073	.64674	9.81213	.64883	44
17	.80652	.64051	.80794	.64260	.80935	.64469	.81075	.64678	.81215	.64886	43
18	.80655	.64054	.80796	.64264	.80937	.64472	.81078	.64681	.81217	.64890	42
19	.80657	.64058	.80799	.64267	.80940	.64476	.81080	.64685	.81220	.64893	41
+ 5′	9.80660	.64061	9.80801	.64270	9.80942	.64479	9.81082	.64688	9.81222	.64897	40
21	.80662	.64065	.80804	.64274	.80944	.64483	.81085	.64692	.81224	.64900	39
22	.80664	.64068	.80806	.64277	.80947	.64486	.81087	.64695	.81227	.64903	38
23	.80667	.64072	.80808	.64281	.80949	.64490	.81089	.64699	.81229	.64907	37
+ 6′	9.80669	.64075	9.80811	.64284	9.80952	.64493	9.81092	.64702	9.81231	.64910	36
25	.80671	.64079	.80813	.64288	.80954	.64497	.81094	.64705	.81234	.64914	35
26	.80674	.64082	.80815	.64291	.80956	.64500	.81096	.64709	.81236	.64917	34
27	.80676	.64086	.80818	.64295	.80959	.64504	.81099	.64712	.81238	.64921	33
+ 7′	9.80678	.64089	9.80820	.64298	9.80961	.64507	9.81101	.64716	9.81241	.64924	32
29	.80681	.64093	.80822	.64302	.80963	.64511	.81103	.64719	.81243	.64928	31
30	.80683	.64096	.80825	.64305	.80966	.64514	.81106	.64723	.81245	.64931	30
31	.80686	.64100	.80827	.64309	.80968	.64518	.81108	.64726	.81248	.64935	29
+ 8′	9.80688	.64103	9.80829	.64312	9.80970	.64521	9.81110	.64730	9.81250	.64938	28
33	.80690	.64107	.80832	.64316	.80973	.64525	.81113	.64733	.81252	.64942	27
34	.80693	.64110	.80834	.64319	.80975	.64528	.81115	.64737	.81255	.64945	26
35	.80695	.64114	.80836	.64323	.80977	.64532	.81117	.64740	.81257	.64949	25
+ 9′	9.80697	.64117	9.80839	.64326	9.80980	.64535	9.81120	.64744	9.81259	.64952	24
37	.80700	.64121	.80841	.64330	.80982	.64539	.81122	.64747	.81262	.64956	23
38	.80702	.64124	.80844	.64333	.80984	.64542	.81124	.64751	.81264	.64959	22
39	.80704	.64128	.80846	.64337	.80987	.64546	.81127	.64754	.81266	.64962	21
+ 10′	9.80707	.64131	9.80848	.64340	9.80989	.64549	9.81129	.64758	9.81269	.64966	20
41	.80709	.64135	.80851	.64344	.80991	.64552	.81131	.64761	.81271	.64969	19
42	.80712	.64138	.80853	.64347	.80994	.64556	.81134	.64765	.81273	.64973	18
43	.80714	.64142	.80855	.64351	.80996	.64559	.81136	.64768	.81276	.64976	17
+ 11′	9.80716	.64145	9.80858	.64354	9.80998	.64563	9.81138	.64772	9.81278	.64980	16
45	.80719	.64148	.80860	.64358	.81001	.64566	.81141	.64775	.81280	.64983	15
46	.80721	.64152	.80862	.64361	.81003	.64570	.81143	.64778	.81282	.64987	14
47	.80723	.64155	.80865	.64365	.81005	.64573	.81145	.64782	.81285	.64990	13
+ 12′	9.80726	.64159	9.80867	.64368	9.81008	.64577	9.81148	.64785	9.81287	.64994	12
49	.80728	.64162	.80869	.64372	.81010	.64580	.81150	.64789	.81289	.64997	11
50	.80730	.64166	.80872	.64375	.81012	.64584	.81152	.64792	.81292	.65001	10
51	.80733	.64169	.80874	.64378	.81015	.64587	.81155	.64796	.81294	.65004	9
+ 13′	9.80735	.64173	9.80876	.64382	9.81017	.64591	9.81157	.64799	9.81296	.65008	8
53	.80738	.64176	.80879	.64385	.81019	.64594	.81159	.64803	.81299	.65011	7
54	.80740	.64180	.80881	.64389	.81022	.64598	.81162	.64806	.81301	.65014	6
55	.80742	.64183	.80883	.64392	.81024	.64601	.81164	.64810	.81303	.65018	5
+ 14′	9.80745	.64187	9.80886	.64396	9.81026	.64605	9.81166	.64813	9.81306	.65021	4
57	.80747	.64190	.80888	.64399	.81029	.64608	.81169	.64817	.81308	.65025	3
58	.80749	.64194	.80891	.64403	.81031	.64612	.81171	.64820	.81310	.65028	2
59	.80752	.64197	.80893	.64406	.81033	.64615	.81173	.64824	.81313	.65032	1
+ 15′	9.80754	.64201	9.80895	.64410	9.81036	.64619	9.81176	.64827	9.81315	.65035	0
	16h 54m		16h 53m		16h 52m		16h 51m		16h 50m		

TABLE 34.

Haversines.

s	7h 10m 107° 30′		7h 11m 107° 45′		7h 12m 108° 0′		7h 13m 108° 15′		7h 14m 108° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.81315	.65035	9.81454	.65243	9.81592	.65451	9.81729	.65658	9.81866	.65865	60
1	.81317	.65039	.81456	.65247	.81594	.65454	.81731	.65662	.81868	.65869	59
2	.81320	.65042	.81458	.65250	.81596	.65458	.81733	.65665	.81870	.65872	58
3	.81322	.65046	.81460	.65254	.81598	.65461	.81736	.65668	.81872	.65876	57
+ 1′	9.81324	.65049	9.81463	.65257	9.81601	.65465	9.81738	.65672	9.81875	.65879	56
5	.81326	.65053	.81465	.65261	.81603	.65468	.81740	.65675	.81877	.65882	55
6	.81329	.65056	.81467	.65264	.81605	.65472	.81743	.65679	.81879	.65886	54
7	.81331	.65060	.81470	.65267	.81608	.65475	.81745	.65682	.81882	.65889	53
+ 2′	9.81333	.65063	9.81472	.65271	9.81610	.65479	9.81747	.65686	9.81884	.65893	52
9	.81336	.65066	.81474	.65274	.81612	.65482	.81749	.65689	.81886	.65896	51
10	.81338	.65070	.81477	.65278	.81614	.65485	.81752	.65693	.81888	.65900	50
11	.81340	.65073	.81479	.65281	.81617	.65489	.81754	.65696	.81891	.65903	49
+ 3′	9.81343	.65077	9.81481	.65285	9.81619	.65492	9.81756	.65700	9.81893	.65907	48
13	.81345	.65080	.81483	.65288	.81621	.65496	.81759	.65703	.81895	.65910	47
14	.81347	.65084	.81486	.65292	.81624	.65499	.81761	.65707	.81897	.65914	46
15	.81350	.65087	.81488	.65295	.81626	.65503	.81763	.65710	.81900	.65917	45
+ 4′	9.81352	.65091	9.81490	.65299	9.81628	.65506	9.81765	.65713	9.81902	.65920	44
17	.81354	.65094	.81493	.65302	.81631	.65510	.81768	.65717	.81904	.65924	43
18	.81357	.65098	.81495	.65306	.81633	.65513	.81770	.65720	.81907	.65927	42
19	.81359	.65101	.81497	.65309	.81635	.65516	.81772	.65724	.81909	.65931	41
+ 5′	9.81361	.65105	9.81500	.65312	9.81637	.65520	9.81775	.65727	9.81911	.65934	40
21	.81364	.65108	.81502	.65316	.81640	.65523	.81777	.65731	.81913	.65938	39
22	.81366	.65112	.81505	.65319	.81642	.65527	.81779	.65734	.81916	.65941	38
23	.81368	.65115	.81507	.65323	.81644	.65530	.81781	.65738	.81918	.65944	37
+ 6′	9.81370	.65118	9.81509	.65326	9.81647	.65534	9.81784	.65741	9.81920	.65948	36
25	.81373	.65122	.81511	.65330	.81649	.65537	.81786	.65744	.81922	.65951	35
26	.81375	.65125	.81513	.65333	.81651	.65541	.81788	.65748	.81925	.65955	34
27	.81377	.65129	.81516	.65337	.81653	.65544	.81791	.65751	.81927	.65958	33
+ 7′	9.81380	.65132	9.81518	.65340	9.81656	.65548	9.81793	.65755	9.81929	.65962	32
29	.81382	.65136	.81520	.65344	.81658	.65551	.81795	.65758	.81931	.65965	31
30	.81384	.65139	.81523	.65347	.81660	.65555	.81797	.65762	.81934	.65969	30
31	.81387	.65143	.81525	.65351	.81663	.65558	.81800	.65765	.81936	.65972	29
+ 8′	9.81389	.65146	9.81527	.65354	9.81665	.65561	9.81802	.65769	9.81938	.65976	28
33	.81391	.65150	.81530	.65357	.81667	.65565	.81804	.65772	.81941	.65979	27
34	.81394	.65153	.81532	.65361	.81669	.65568	.81806	.65776	.81943	.65982	26
35	.81396	.65157	.81534	.65364	.81672	.65572	.81809	.65779	.81945	.65986	25
+ 9′	9.81398	.65160	9.81536	.65368	9.81674	.65575	9.81811	.65782	9.81947	.65989	24
37	.81400	.65164	.81539	.65372	.81676	.65579	.81813	.65786	.81950	.65993	23
38	.81403	.65167	.81541	.65375	.81679	.65582	.81816	.65789	.81952	.65996	22
39	.81405	.65171	.81543	.65378	.81681	.65586	.81818	.65793	.81954	.66000	21
+ 10′	9.81407	.65174	9.81546	.65382	9.81683	.65589	9.81820	.65796	9.81956	.66003	20
41	.81410	.65177	.81548	.65385	.81685	.65593	.81822	.65800	.81959	.66006	19
42	.81412	.65181	.81550	.65389	.81688	.65596	.81825	.65803	.81961	.66010	18
43	.81414	.65184	.81552	.65392	.81690	.65599	.81827	.65807	.81963	.66013	17
+ 11′	9.81417	.65188	9.81555	.65396	9.81692	.65603	.81829	.65810	9.81965	.66017	16
45	.81419	.65191	.81557	.65399	.81695	.65606	.81832	.65813	.81968	.66020	15
46	.81421	.65195	.81559	.65402	.81697	.65610	.81834	.65817	.81970	.66024	14
47	.81424	.65198	.81562	.65406	.81699	.65613	.81836	.65820	.81972	.66027	13
+ 12′	9.81426	.65202	9.81564	.65409	9.81701	.65617	9.81838	.65824	9.81975	.66031	12
49	.81428	.65205	.81566	.65413	.81704	.65620	.81841	.65827	.81977	.66034	11
50	.81430	.65209	.81569	.65416	.81706	.65624	.81843	.65831	.81979	.66038	10
51	.81433	.65212	.81571	.65420	.81708	.65627	.81845	.65834	.81981	.66041	9
+ 13′	9.81435	.65216	9.81573	.65423	9.81711	.65630	9.81847	.65838	9.81984	.66044	8
53	.81437	.65219	.81575	.65427	.81713	.65634	.81850	.65841	.81986	.66048	7
54	.81440	.65222	.81578	.65430	.81715	.65637	.81852	.65845	.81988	.66051	6
55	.81442	.65226	.81580	.65434	.81717	.65641	.81854	.65848	.81990	.66055	5
+ 14′	9.81444	.65229	9.81582	.65437	9.81720	.65644	9.81857	.65851	9.81993	.66058	4
57	.81447	.65233	.81585	.65440	.81722	.65648	.81859	.65855	.81995	.66062	3
58	.81449	.65236	.81587	.65444	.81724	.65651	.81861	.65858	.81997	.66065	2
59	.81451	.65240	.81589	.65447	.81727	.65655	.81863	.65862	.81999	.66068	1
+ 15′	9.81454	.65243	9.81592	.65451	9.81729	.65658	9.81866	.65865	9.82002	.66072	0
	16h 49m		16h 48m		16h 47m		16h 46m		16h 45m		

TABLE 34.

Haversines.

s	7h 15m 108° 45′		7h 16m 109° 0′		7h 17m 109° 15′		7h 18m 109° 30′		7h 19m 109° 45′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.82002	.66072	9.82137	.66278	9.82272	.66485	9.82406	.66690	9.82540	.66896	60
1	.82004	.66075	.82139	.66282	.82274	.66488	.82409	.66694	.82542	.66899	59
2	.82006	.66079	.82142	.66285	.82277	.66491	.82411	.66697	.82544	.66903	58
3	.82009	.66082	.82144	.66289	.82279	.66495	.82413	.66701	.82547	.66906	57
+ 1′	9.82011	.66086	9.82146	.66292	9.82281	.66498	9.82415	.66704	9.82549	.66910	56
5	.82013	.66089	.82148	.66296	.82283	.66502	.82417	.66707	.82551	.66913	55
6	.82015	.66093	.82151	.66299	.82286	.66505	.82420	.66711	.82553	.66916	54
7	.82018	.66096	.82153	.66302	.82288	.66508	.82422	.66714	.82555	.66920	53
+ 2′	9.82020	.66100	9.82155	.66306	9.82290	.66512	9.82424	.66718	9.82558	.66923	52
9	.82022	.66103	.82157	.66309	.82292	.66515	.82426	.66721	.82560	.66927	51
10	.82024	.66106	.82160	.66313	.82294	.66519	.82429	.66725	.82562	.66930	50
11	.82027	.66110	.82162	.66316	.82297	.66522	.82431	.66728	.82564	.66933	49
+ 3′	9.82029	.66113	9.82164	.66320	9.82299	.66526	9.82433	.66731	9.82567	.66937	48
13	.82031	.66117	.82166	.66323	.82301	.66529	.82435	.66735	.82569	.66940	47
14	.82033	.66120	.82169	.66327	.82303	.66533	.82438	.66738	.82571	.66944	46
15	.82036	.66124	.82171	.66330	.82306	.66536	.82440	.66742	.82573	.66947	45
+ 4′	9.82038	.66127	9.82173	.66333	9.82308	.66539	9.82442	.66745	9.82575	.66951	44
17	.82040	.66130	.82175	.66337	.82310	.66543	.82444	.66749	.82578	.66954	43
18	.82042	.66134	.82178	.66340	.82312	.66546	.82446	.66752	.82580	.66957	42
19	.82045	.66137	.82180	.66344	.82315	.66550	.82449	.66755	.82582	.66961	41
+ 5′	9.82047	.66141	9.82182	.66347	9.82317	.66553	9.82451	.66759	9.82584	.66964	40
21	.82049	.66144	.82184	.66351	.82319	.66557	.82453	.66762	.82587	.66968	39
22	.82051	.66148	.82187	.66354	.82321	.66560	.82455	.66766	.82589	.66971	38
23	.82054	.66151	.82189	.66357	.82324	.66563	.82458	.66769	.82591	.66975	37
+ 6′	9.82056	.66155	9.82191	.66361	9.82326	.66567	9.82460	.66773	9.82593	.66978	36
25	.82058	.66158	.82193	.66364	.82328	.66570	.82462	.66776	.82595	.66981	35
26	.82061	.66161	.82196	.66368	.82330	.66574	.82464	.66779	.82598	.66985	34
27	.82063	.66165	.82198	.66371	.82333	.66577	.82467	.66783	.82600	.66988	33
+ 7′	9.82065	.66168	9.82200	.66375	9.82335	.66581	9.82469	.66786	9.82602	.66992	32
29	.82067	.66172	.82202	.66378	.82337	.66584	.82471	.66790	.82604	.66995	31
30	.82070	.66175	.82205	.66382	.82339	.66587	.82473	.66793	.82606	.66998	30
31	.82072	.66179	.82207	.66385	.82341	.66591	.82475	.66797	.82609	.67002	29
+ 8′	9.82074	.66182	9.82209	.66388	9.82344	.66594	9.82478	.66800	9.82611	.67005	28
33	.82076	.66186	.82211	.66392	.82346	.66598	.82480	.66803	.82613	.67009	27
34	.82079	.66189	.82214	.66395	.82348	.66601	.82482	.66807	.82615	.67012	26
35	.82081	.66192	.82216	.66399	.82350	.66605	.82484	.66810	.82618	.67016	25
+ 9′	9.82083	.66196	9.82218	.66402	9.82353	.66608	9.82487	.66814	9.82620	.67019	24
37	.82085	.66199	.82220	.66406	.82355	.66611	.82489	.66817	.82622	.67022	23
38	.82088	.66203	.82223	.66409	.82357	.66615	.82491	.66821	.82624	.67026	22
39	.82090	.66206	.82225	.66412	.82359	.66618	.82493	.66824	.82627	.67029	21
+ 10′	9.82092	.66210	9.82227	.66416	9.82362	.66622	9.82495	.66827	9.82629	.67033	20
41	.82094	.66213	.82229	.66419	.82364	.66625	.82498	.66831	.82631	.67036	19
42	.82097	.66217	.82232	.66423	.82366	.66629	.82500	.66834	.82633	.67039	18
43	.82099	.66220	.82234	.66426	.82368	.66632	.82502	.66838	.82635	.67043	17
+ 11′	9.82101	.66223	9.82236	.66430	9.82371	.66635	9.82504	.66841	9.82638	.67046	16
45	.82103	.66227	.82238	.66433	.82373	.66639	.82507	.66844	.82640	.67050	15
46	.82106	.66230	.82241	.66436	.82375	.66642	.82509	.66848	.82642	.67053	14
47	.82108	.66234	.82243	.66440	.82377	.66646	.82511	.66851	.82644	.67057	13
+ 12′	9.82110	.66237	9.82245	.66443	9.82380	.66649	9.82513	.66855	9.82646	.67060	12
49	.82112	.66241	.82247	.66447	.82382	.66653	.82515	.66858	.82649	.67063	11
50	.82115	.66244	.82250	.66450	.82384	.66656	.82518	.66862	.82651	.67067	10
51	.82117	.66247	.82252	.66454	.82386	.66659	.82520	.66865	.82653	.67070	9
+ 13′	9.82119	.66251	9.82254	.66457	9.82388	.66663	9.82522	.66868	9.82655	.67074	8
53	.82121	.66254	.82256	.66460	.82391	.66666	.82524	.66872	.82657	.67077	7
54	.82124	.66258	.82259	.66464	.82393	.66670	.82527	.66875	.82660	.67081	6
55	.82126	.66261	.82261	.66467	.82395	.66673	.82529	.66879	.82662	.67084	5
+ 14′	9.82128	.66265	9.82263	.66471	9.82397	.66677	9.82531	.66882	9.82664	.67087	4
57	.82130	.66268	.82265	.66474	.82400	.66680	.82533	.66886	.82666	.67091	3
58	.82133	.66272	.82268	.66478	.82402	.66683	.82535	.66889	.82668	.67094	2
59	.82135	.66275	.82270	.66481	.82404	.66687	.82538	.66892	.82671	.67098	1
+ 15′	9.82137	.66278	9.82272	.66485	9.82406	.66690	9.82540	.66896	9.82673	.67101	0
	16h 44m		16h 43m		16h 42m		16h 41m		16h 40m		

TABLE 34.

Haversines.

s	7h 20m 110° 0′		7h 21m 110° 15′		7h 22m 110° 30′		7h 23m 110° 45′		7h 24m 111° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.82673	.67101	9.82805	.67306	9.82937	.67510	9.83068	.67715	9.83199	.67918	60
1	.82675	.67104	.82807	.67309	.82939	.67514	.83070	.67718	.83201	.67922	59
2	.82677	.67108	.82810	.67313	.82941	.67517	.83073	.67721	.83203	.67925	58
3	.82680	.67111	.82812	.67316	.82944	.67521	.83075	.67725	.83205	.67929	57
+ 1′	9.82682	.67115	9.82814	.67320	9.82946	.67524	9.83077	.67728	9.83207	.67932	56
5	.82684	.67118	.82816	.67323	.82948	.67527	.83079	.67732	.83210	.67935	55
6	.82686	.67122	.82818	.67326	.82950	.67531	.83081	.67735	.83212	.67939	54
7	.82688	.67125	.82821	.67330	.82952	.67534	.83083	.67738	.83214	.67942	53
+ 2′	9.82691	.67128	9.82823	.67333	9.82955	.67538	9.83086	.67742	9.83216	.67946	52
9	.82693	.67132	.82825	.67337	.82957	.67541	.83088	.67745	.83218	.67949	51
10	.82695	.67135	.82827	.67340	.82959	.67544	.83090	.67749	.83220	.67952	50
11	.82697	.67139	.82829	.67343	.82961	.67548	.83092	.67752	.83223	.67956	49
+ 3′	9.82699	.67142	9.82832	.67347	9.82963	.67551	9.83094	.67755	9.83225	.67959	48
13	.82702	.67145	.82834	.67350	.82966	.67555	.83097	.67759	.83227	.67963	47
14	.82704	.67149	.82836	.67354	.82968	.67558	.83099	.67762	.83229	.67966	46
15	.82706	.67152	.82838	.67357	.82970	.67561	.83101	.67766	.83231	.67969	45
+ 4′	9.82708	.67156	9.82840	.67360	9.82972	.67565	9.83103	.67769	9.83233	.67973	44
17	.82710	.67159	.82843	.67364	.82974	.67568	.83105	.67772	.83236	.67976	43
18	.82713	.67163	.82845	.67367	.82976	.67572	.83107	.67776	.83238	.67979	42
19	.82715	.67166	.82847	.67371	.82979	.67575	.83110	.67779	.83240	.67983	41
+ 5′	9.82717	.67169	9.82849	.67374	9.82981	.67578	9.83112	.67783	9.83242	.67986	40
21	.82719	.67173	.82851	.67377	.82983	.67582	.83114	.67786	.83244	.67990	39
22	.82722	.67176	.82854	.67381	.82985	.67585	.83116	.67789	.83246	.67993	38
23	.82724	.67180	.82856	.67384	.82987	.67589	.83118	.67793	.83249	.67996	37
+ 6′	9.82726	.67183	9.82858	.67388	9.82990	.67592	9.83120	.67796	9.83251	.68000	36
25	.82728	.67186	.82860	.67391	.82992	.67595	.83123	.67800	.83253	.68003	35
26	.82730	.67190	.82862	.67395	.82994	.67599	.83125	.67803	.83255	.68007	34
27	.82733	.67193	.82865	.67398	.82996	.67602	.83127	.67806	.83257	.68010	33
+ 7′	9.82735	.67197	9.82867	.67401	9.82998	.67606	9.83129	.67810	9.83259	.68013	32
29	.82737	.67200	.82869	.67405	.83001	.67609	.83131	.67813	.83262	.68017	31
30	.82739	.67203	.82871	.67408	.83003	.67613	.83134	.67817	.83264	.68020	30
31	.82741	.67207	.82873	.67412	.83005	.67616	.83136	.67820	.83266	.68024	29
+ 8′	9.82744	.67210	9.82876	.67415	9.83007	.67619	9.83138	.67823	9.83268	.68027	28
33	.82746	.67214	.82878	.67418	.83009	.67623	.83140	.67827	.83270	.68030	27
34	.82748	.67217	.82880	.67422	.83011	.67626	.83142	.67830	.83272	.68034	26
35	.82750	.67221	.82882	.67425	.83014	.67630	.83144	.67834	.83275	.68037	25
+ 9′	9.82752	.67224	9.82884	.67429	9.83016	.67633	9.83147	.67837	9.83277	.68041	24
37	.82755	.67227	.82887	.67432	.83018	.67636	.83149	.67840	.83279	.68044	23
38	.82757	.67231	.82889	.67435	.83020	.67640	.83151	.67844	.83281	.68047	22
39	.82759	.67234	.82891	.67439	.83022	.67643	.83153	.67847	.83283	.68051	21
+ 10′	9.82761	.67238	9.82893	.67442	9.83025	.67647	9.83155	.67850	9.83285	.68054	20
41	.82763	.67241	.82895	.67446	.83027	.67650	.83157	.67854	.83288	.68058	19
42	.82766	.67244	.82898	.67449	.83029	.67653	.83160	.67857	.83290	.68061	18
43	.82768	.67248	.82900	.67452	.83031	.67657	.83162	.67861	.83292	.68064	17
+ 11′	9.82770	.67251	9.82902	.67456	9.83033	.67660	9.83164	.67864	9.83294	.68068	16
45	.82772	.67255	.82904	.67459	.83035	.67664	.83166	.67868	.83296	.68071	15
46	.82774	.67258	.82906	.67463	.83038	.67667	.83168	.67871	.83298	.68074	14
47	.82777	.67261	.82909	.67466	.83040	.67670	.83170	.67874	.83301	.68078	13
+ 12′	9.82779	.67265	9.82911	.67469	9.83042	.67674	9.83173	.67878	9.83303	.68081	12
49	.82781	.67268	.82913	.67473	.83044	.67677	.83175	.67881	.83305	.68085	11
50	.82783	.67272	.82915	.67476	.83046	.67681	.83177	.67884	.83307	.68088	10
51	.82785	.67275	.82917	.67480	.83049	.67684	.83179	.67888	.83309	.68091	9
+ 13′	9.82788	.67279	9.82920	.67483	9.83051	.67687	9.83181	.67891	9.83311	.68095	8
53	.82790	.67282	.82922	.67487	.83053	.67691	.83184	.67895	.83314	.68098	7
54	.82792	.67285	.82924	.67490	.83055	.67694	.83186	.67898	.83316	.68102	6
55	.82794	.67289	.82926	.67493	.83057	.67698	.83188	.67901	.83318	.68105	5
+ 14′	9.82796	.67292	9.82928	.67497	9.83059	.67701	9.83190	.67905	9.83320	.68108	4
57	.82799	.67296	.82930	.67500	.83062	.67704	.83192	.67908	.83322	.68112	3
58	.82801	.67299	.82933	.67504	.83064	.67708	.83194	.67912	.83324	.68115	2
59	.82803	.67302	.82935	.67507	.83066	.67711	.83197	.67915	.83327	.68119	1
+ 15′	9.82805	.67306	9.82937	.67510	9.83068	.67715	9.83199	.67918	9.83329	.68122	0
	16h 39m		16h 38m		16h 37m		16h 36m		16h 35m		

Haversines.

s	7h 25m 111° 15′		7h 26m 111° 30′		7h 27m 111° 45′		7h 28m 112° 0′		7h 29m 112° 15′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.83329	.68122	9.83458	.68325	9.83587	.68528	9.83715	.68730	9.83842	.68932	60
1	.83331	.68125	.83460	.68328	.83589	.68531	.83717	.68734	.83844	.68936	59
2	.83333	.68129	.83462	.68332	.83591	.68535	.83719	.68737	.83847	.68939	58
3	.83335	.68132	.83464	.68335	.83593	.68538	.83721	.68740	.83849	.68943	57
+ 1′	9.83337	.68135	9.83467	.68339	9.83595	.68541	9.83723	.68744	9.83851	.68946	56
5	.83339	.68139	.83469	.68342	.83597	.68545	.83725	.68747	.83853	.68949	55
6	.83342	.68142	.83471	.68345	.83600	.68548	.83728	.68751	.83855	.68953	54
7	.83344	.68146	.83473	.68349	.83602	.68552	.83730	.68754	.83857	.68956	53
+ 2′	9.83346	.68149	9.83475	.68352	9.83604	.68555	9.83732	.68757	9.83859	.68959	52
9	.83348	.68152	.83477	.68356	.83606	.68558	.83734	.68761	.83861	.68963	51
10	.83350	.68156	.83480	.68359	.83608	.68562	.83736	.68764	.83864	.68966	50
11	.83352	.68159	.83482	.68362	.83610	.68565	.83738	.68767	.83866	.68969	49
+ 3′	9.83355	.68163	9.83484	.68366	9.83612	.68568	9.83740	.68771	9.83868	.68973	48
13	.83357	.68166	.83486	.68369	.83615	.68572	.83743	.68774	.83870	.68976	47
14	.83359	.68169	.83488	.68372	.83617	.68575	.83745	.68778	.83872	.68980	46
15	.83361	.68173	.83490	.68376	.83619	.68579	.83747	.68781	.83874	.68983	45
+ 4′	9.83363	.68176	9.83492	.68379	9.83621	.68582	9.83749	.68784	9.83876	.68986	44
17	.83365	.68180	.83495	.68383	.83623	.68585	.83751	.68788	.83878	.68990	43
18	.83368	.68183	.83497	.68386	.83625	.68589	.83753	.68791	.83881	.68993	42
19	.83370	.68186	.83499	.68389	.83627	.68592	.83755	.68794	.83883	.68996	41
+ 5′	9.83372	.68190	9.83501	.68393	9.83630	.68595	9.83757	.68798	9.83885	.69000	40
21	.83374	.68193	.83503	.68396	.83632	.68599	.83760	.68801	.83887	.69003	39
22	.83376	.68196	.83505	.68399	.83634	.68602	.83762	.68804	.83889	.69006	38
23	.83378	.68200	.83507	.68403	.83636	.68606	.83764	.68808	.83891	.69010	37
+ 6′	9.83380	.68203	9.83510	.68406	9.83638	.68609	9.83766	.68811	9.83893	.69013	36
25	.83383	.68207	.83512	.68410	.83640	.68612	.83768	.68815	.83895	.69017	35
26	.83385	.68210	.83514	.68413	.83642	.68616	.83770	.68818	.83897	.69020	34
27	.83387	.68213	.83516	.68416	.83644	.68619	.83772	.68821	.83900	.69023	33
+ 7′	9.83389	.68217	9.83518	.68420	9.83647	.68622	9.83774	.68825	9.83902	.69027	32
29	.83391	.68220	.83520	.68423	.83649	.68626	.83777	.68828	.83904	.69030	31
30	.83393	.68224	.83522	.68427	.83651	.68629	.83779	.68831	.83906	.69033	30
31	.83396	.68227	.83525	.68430	.83653	.68633	.83781	.68835	.83908	.69037	29
+ 8′	9.83398	.68230	9.83527	.68433	9.83655	.68636	9.83783	.68838	9.83910	.69040	28
33	.83400	.68234	.83529	.68437	.83657	.68639	.83785	.68842	.83912	.69044	27
34	.83402	.68237	.83531	.68440	.83659	.68643	.83787	.68845	.83914	.69047	26
35	.83404	.68240	.83533	.68443	.83662	.68646	.83789	.68848	.83916	.69050	25
+ 9′	9.83406	.68244	9.83535	.68447	9.83664	.68649	9.83791	.68852	9.83919	.69054	24
37	.83409	.68247	.83537	.68450	.83666	.68653	.83794	.68855	.83921	.69057	23
38	.83411	.68251	.83540	.68454	.83668	.68656	.83796	.68858	.83923	.69060	22
39	.83413	.68254	.83542	.68457	.83670	.68660	.83798	.68862	.83925	.69064	21
+ 10′	9.83415	.68257	9.83544	.68460	9.83672	.68663	9.83800	.68865	9.83927	.69067	20
41	.83417	.68261	.83546	.68464	.83674	.68666	.83802	.68869	.83929	.69070	19
42	.83419	.68264	.83548	.68467	.83676	.68670	.83804	.68872	.83931	.69074	18
43	.83421	.68268	.83550	.68470	.83679	.68673	.83806	.68875	.83933	.69077	17
+ 11′	9.83424	.68271	9.83552	.68474	9.83681	.68676	9.83808	.68879	9.83935	.69080	16
45	.83426	.68274	.83555	.68477	.83683	.68680	.83811	.68882	.83938	.69084	15
46	.83428	.68278	.83557	.68481	.83685	.68683	.83813	.68885	.83940	.69087	14
47	.83430	.68281	.83559	.68484	.83687	.68687	.83815	.68889	.83942	.69091	13
+ 12′	9.83432	.68284	9.83561	.68487	9.83689	.68690	9.83817	.68892	9.83944	.69094	12
49	.83434	.68288	.83563	.68491	.83691	.68693	.83819	.68895	.83946	.69097	11
50	.83436	.68291	.83565	.68494	.83694	.68697	.83821	.68899	.83948	.69101	10
51	.83439	.68295	.83567	.68497	.83696	.68700	.83823	.68902	.83950	.69104	9
+ 13′	9.83441	.68298	9.83570	.68501	9.83698	.68703	9.83825	.68906	9.83952	.69107	8
53	.83443	.68301	.83572	.68504	.83700	.68707	.83828	.68909	.83955	.69111	7
54	.83445	.68305	.83574	.68508	.83702	.68710	.83830	.68912	.83957	.69114	6
55	.83447	.68308	.83576	.68511	.83704	.68713	.83832	.68916	.83959	.69117	5
+ 14′	9.83449	.68312	9.83578	.68515	9.83706	.68717	9.83834	.68919	9.83961	.69121	4
57	.83452	.68315	.83580	.68518	.83708	.68720	.83836	.68922	.83963	.69124	3
58	.83454	.68318	.83582	.68521	.83711	.68724	.83838	.68926	.83965	.69127	2
59	.83456	.68322	.83585	.68525	.83713	.68727	.83840	.68929	.83967	.69131	1
+ 15′	9.83458	.68325	9.83587	.68528	9.83715	.68730	9.83842	.68932	9.83969	.69134	0
	16h 34m		16h 33m		16h 32m		16h 31m		16h 30m		

TABLE 34.

Haversines.

s	7h 30m 112° 30′		7h 31m 112° 45′		7h 32m 113° 0′		7h 33m 113° 15′		7h 34m 113° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.83969	.69134	9.84096	.69336	9.84221	.69537	9.84346	.69737	9.84471	.69937	60
1	.83971	.69138	.84098	.69339	.84223	.69540	.84349	.69741	.84473	.69941	59
2	.83974	.69141	.84100	.69342	.84226	.69543	.84351	.69744	.84475	.69944	58
3	.83976	.69144	.84102	.69346	.84228	.69547	.84353	.69747	.84477	.69947	57
+ 1′	9.83978	.69148	9.84104	.69349	9.84230	.69550	9.84355	.69751	9.84479	.69951	56
5	.83980	.69151	.84106	.69352	.84232	.69553	.84357	.69754	.84481	.69954	55
6	.83982	.69154	.84108	.69356	.84234	.69557	.84359	.69757	.84483	.69957	54
7	.83984	.69158	.84110	.69359	.84236	.69560	.84361	.69761	.84485	.69961	53
+ 2′	9.83986	.69161	9.84112	.69362	9.84238	.69563	9.84363	.69764	9.84488	.69964	52
9	.83988	.69164	.84114	.69366	.84240	.69567	.84365	.69767	.84490	.69967	51
10	.83990	.69168	.84117	.69369	.84242	.69570	.84367	.69771	.84492	.69971	50
11	.83992	.69171	.84119	.69372	.84244	.69573	.84369	.69774	.84494	.69974	49
+ 3′	9.83995	.69174	9.84121	.69376	9.84246	.69577	9.84371	.69777	9.84496	.69977	48
13	.83997	.69178	.84123	.69379	.84248	.69580	.84373	.69781	.84498	.69981	47
14	.83999	.69181	.84125	.69382	.84251	.69583	.84376	.69784	.84500	.69984	46
15	.84001	.69185	.84127	.69386	.84253	.69587	.84378	.69787	.84502	.69987	45
+ 4′	9.84003	.69188	9.84129	.69389	9.84255	.69590	9.84380	.69791	9.84504	.69991	44
17	.84005	.69191	.84131	.69393	.84257	.69593	.84382	.69794	.84506	.69994	43
18	.84007	.69195	.84133	.69396	.84259	.69597	.84384	.69797	.84508	.69997	42
19	.84009	.69198	.84135	.69399	.84261	.69600	.84386	.69801	.84510	.70001	41
+ 5′	9.84011	.69201	9.84138	.69403	9.84263	.69603	9.84388	.69804	9.84512	.70004	40
21	.84014	.69205	.84140	.69406	.84265	.69607	.84390	.69807	.84514	.70007	39
22	.84016	.69208	.84142	.69409	.84267	.69610	.84392	.69811	.84517	.70011	38
23	.84018	.69211	.84144	.69413	.84269	.69614	.84394	.69814	.84519	.70014	37
+ 6′	9.84020	.69215	9.84146	.69416	9.84271	.69617	9.84396	.69817	9.84521	.70017	36
25	.84022	.69218	.84148	.69419	.84274	.69620	.84398	.69821	.84523	.70021	35
26	.84024	.69221	.84150	.69423	.84276	.69624	.84400	.69824	.84525	.70024	34
27	.84026	.69225	.84152	.69426	.84278	.69627	.84403	.69827	.84527	.70027	33
+ 7′	9.84028	.69228	9.84154	.69429	9.84280	.69630	9.84405	.69831	9.84529	.70031	32
29	.84030	.69232	.84156	.69433	.84282	.69634	.84407	.69834	.84531	.70034	31
30	.84033	.69235	.84159	.69436	.84284	.69637	.84409	.69837	.84533	.70037	30
31	.84035	.69238	.84161	.69439	.84286	.69640	.84411	.69841	.84535	.70041	29
+ 8′	9.84037	.69242	9.84163	.69443	9.84288	.69644	9.84413	.69844	9.84537	.70044	28
33	.84039	.69245	.84165	.69446	.84290	.69647	.84415	.69847	.84539	.70047	27
34	.84041	.69248	.84167	.69450	.84292	.69650	.84417	.69851	.84541	.70051	26
35	.84043	.69252	.84169	.69453	.84294	.69654	.84419	.69854	.84543	.70054	25
+ 9′	9.84045	.69255	9.84171	.69456	9.84296	.69657	9.84421	.69857	9.84545	.70057	24
37	.84047	.69258	.84173	.69460	.84299	.69660	.84423	.69861	.84547	.70061	23
38	.84049	.69262	.84175	.69463	.84301	.69664	.84425	.69864	.84550	.70064	22
39	.84051	.69265	.84177	.69466	.84303	.69667	.84427	.69867	.84552	.70067	21
+ 10′	9.84054	.69268	9.84179	.69470	9.84305	.69670	9.84430	.69871	9.84554	.70071	20
41	.84056	.69272	.84182	.69473	.84307	.69674	.84432	.69874	.84556	.70074	19
42	.84058	.69275	.84184	.69476	.84309	.69677	.84434	.69877	.84558	.70077	18
43	.84060	.69279	.84186	.69480	.84311	.69680	.84436	.69881	.84560	.70081	17
+ 11′	9.84062	.69282	9.84188	.69483	9.84313	.69684	9.84438	.69884	9.84562	.70084	16
45	.84064	.69285	.84190	.69486	.84315	.69687	.84440	.69887	.84564	.70087	15
46	.84066	.69289	.84192	.69490	.84317	.69690	.84442	.69891	.84566	.70091	14
47	.84068	.69292	.84194	.69493	.84319	.69694	.84444	.69894	.84568	.70094	13
+ 12′	9.84070	.69295	9.84196	.69496	9.84321	.69697	9.84446	.69897	9.84570	.70097	12
49	.84072	.69299	.84198	.69500	.84324	.69700	.84448	.69901	.84572	.70101	11
50	.84075	.69302	.84200	.69503	.84326	.69704	.84450	.69904	.84574	.70104	10
51	.84077	.69305	.84203	.69506	.84328	.69707	.84452	.69907	.84576	.70107	9
+ 13′	9.84079	.69309	9.84205	.69510	9.84330	.69710	9.84454	.69911	9.84578	.70111	8
53	.84081	.69312	.84207	.69513	.84332	.69714	.84456	.69914	.84581	.70114	7
54	.84083	.69315	.84209	.69516	.84334	.69717	.84459	.69917	.84583	.70117	6
55	.84085	.69319	.84211	.69520	.84336	.69720	.84461	.69921	.84585	.70121	5
+ 14′	9.84087	.69322	9.84213	.69523	9.84338	.69724	9.84463	.69924	9.84587	.70124	4
57	.84089	.69326	.84215	.69527	.84340	.69727	.84465	.69927	.84589	.70127	3
58	.84091	.69329	.84217	.69530	.84342	.69731	.84467	.69931	.84591	.70131	2
59	.84093	.69332	.84219	.69533	.84344	.69734	.84469	.69934	.84593	.70134	1
+ 15′	9.84096	.69336	9.84221	.69537	9.84346	.69737	9.84471	.69937	9.84595	.70137	0
	16h 29m		16h 28m		16h 27m		16h 26m		16h 25m		

Haversines.

	7h 35m 113° 45′		7h 36m 114° 0′		7h 37m 114° 15′		7h 38m 114° 30′		7h 39m 114° 45′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.84595	.70137	9.84718	.70337	9.84841	.70536	9.84963	.70735	9.85085	.70933	60
1	.84597	.70141	.84720	.70340	.84843	.70539	.84965	.70738	.85087	.70936	59
2	.84599	.70144	.84722	.70343	.84845	.70543	.84967	.70741	.85089	.70940	58
3	.84601	.70147	.84724	.70347	.84847	.70546	.84969	.70745	.85091	.70943	57
+ 1′	9.84603	.70151	9.84726	.70350	9.84849	.70549	9.84971	.70748	9.85093	.70946	56
5	.84605	.70154	.84729	.70353	.84851	.70553	.84973	.70751	.85095	.70950	55
6	.84607	.70157	.84731	.70357	.84853	.70556	.84975	.70755	.85097	.70953	54
7	.84609	.70161	.84733	.70360	.84855	.70559	.84977	.70758	.85099	.70956	53
+ 2′	9.84611	.70164	9.84735	.70363	9.84857	.70562	9.84979	.70761	9.85101	.70959	52
9	.84613	.70167	.84737	.70367	.84859	.70566	.84982	.70764	.85103	.70963	51
10	.84616	.70171	.84739	.70370	.84861	.70569	.84984	.70768	.85105	.70966	50
11	.84618	.70174	.84741	.70373	.84863	.70572	.84986	.70771	.85107	.70969	49
+ 3′	9.84620	.70177	9.84743	.70377	9.84866	.70576	9.84988	.70774	9.85109	.70973	48
13	.84622	.70181	.84745	.70380	.84868	.70579	.84990	.70778	.85111	.70976	47
14	.84624	.70184	.84747	.70383	.84870	.70582	.84992	.70781	.85113	.70979	46
15	.84626	.70187	.84749	.70387	.84872	.70586	.84994	.70784	.85115	.70983	45
+ 4′	9.84628	.70191	9.84751	.70390	9.84874	.70589	9.84996	.70788	9.85117	.70986	44
17	.84630	.70194	.84753	.70393	.84876	.70592	.84998	.70791	.85119	.70989	43
18	.84632	.70197	.84755	.70397	.84878	.70596	.85000	.70794	.85121	.70992	42
19	.84634	.70201	.84757	.70400	.84880	.70599	.85002	.70798	.85123	.70996	41
+ 5′	9.84636	.70204	9.84759	.70403	9.84882	.70602	9.85004	.70801	9.85125	.70999	40
21	.84638	.70207	.84761	.70407	.84884	.70606	.85006	.70804	.85127	.71002	39
22	.84640	.70211	.84763	.70410	.84886	.70609	.85008	.70807	.85129	.71006	38
23	.84642	.70214	.84765	.70413	.84888	.70612	.85010	.70811	.85131	.71009	37
+ 6′	9.84644	.70217	9.84767	.70417	9.84890	.70615	9.85012	.70814	9.85133	.71012	36
25	.84646	.70221	.84770	.70420	.84892	.70619	.85014	.70817	.85135	.71016	35
26	.84648	.70224	.84772	.70423	.84894	.70622	.85016	.70821	.85137	.71019	34
27	.84651	.70227	.84774	.70426	.84896	.70625	.85018	.70824	.85139	.71022	33
+ 7′	9.84653	.70230	9.84776	.70430	9.84898	.70629	9.85020	.70827	9.85141	.71025	32
29	.84655	.70234	.84778	.70433	.84900	.70632	.85022	.70831	.85143	.71029	31
30	.84657	.70237	.84780	.70436	.84902	.70635	.85024	.70834	.85145	.71032	30
31	.84659	.70240	.84782	.70440	.84904	.70639	.85026	.70837	.85147	.71035	29
+ 8′	9.84661	.70244	9.84784	.70443	9.84906	.70642	9.85028	.70840	9.85149	.71039	28
33	.84663	.70247	.84786	.70446	.84908	.70645	.85030	.70844	.85151	.71042	27
34	.84665	.70250	.84788	.70450	.84910	.70649	.85032	.70847	.85153	.71045	26
35	.84667	.70254	.84790	.70453	.84912	.70652	.85034	.70850	.85155	.71049	25
+ 9′	9.84669	.70257	9.84792	.70456	9.84914	.70655	9.85036	.70854	9.85158	.71052	24
37	.84671	.70260	.84794	.70460	.84916	.70659	.85038	.70857	.85160	.71055	23
38	.84673	.70264	.84796	.70463	.84919	.70662	.85040	.70860	.85162	.71058	22
39	.84675	.70267	.84798	.70466	.84921	.70665	.85042	.70864	.85164	.71062	21
+ 10′	9.84677	.70270	9.84800	.70470	9.84923	.70668	9.85044	.70867	9.85166	.71065	20
41	.84679	.70274	.84802	.70473	.84925	.70672	.85046	.70870	.85168	.71068	19
42	.84681	.70277	.84804	.70476	.84927	.70675	.85048	.70874	.85170	.71072	18
43	.84683	.70280	.84806	.70480	.84929	.70678	.85050	.70877	.85172	.71075	17
+ 11′	9.84685	.70284	9.84808	.70483	9.84931	.70682	9.85052	.70880	9.85174	.71078	16
45	.84688	.70287	.84810	.70486	.84933	.70685	.85054	.70884	.85176	.71082	15
46	.84690	.70290	.84812	.70490	.84935	.70688	.85057	.70887	.85178	.71085	14
47	.84692	.70294	.84815	.70493	.84937	.70692	.85059	.70890	.85180	.71088	13
+ 12′	9.84694	.70297	9.84817	.70496	9.84939	.70695	9.85061	.70893	9.85182	.71091	12
49	.84696	.70300	.84819	.70499	.84941	.70698	.85063	.70897	.85184	.71095	11
50	.84698	.70304	.84821	.70503	.84943	.70702	.85065	.70900	.85186	.71098	10
51	.84700	.70307	.84823	.70506	.84945	.70705	.85067	.70903	.85188	.71101	9
+ 13′	9.84702	.70310	9.84825	.70509	9.84947	.70708	9.85069	.70907	9.85190	.71105	8
53	.84704	.70314	.84827	.70513	.84949	.70712	.85071	.70910	.85192	.71108	7
54	.84706	.70317	.84829	.70516	.84951	.70715	.85073	.70913	.85194	.71111	6
55	.84708	.70320	.84831	.70519	.84953	.70718	.85075	.70916	.85196	.71114	5
+ 14′	9.84710	.70324	9.84833	.70523	9.84955	.70721	9.85077	.70920	9.85198	.71118	4
57	.84712	.70327	.84835	.70526	.84957	.70725	.85079	.70923	.85200	.71121	3
58	.84714	.70330	.84837	.70529	.84959	.70729	.85081	.70926	.85202	.71124	2
59	.84716	.70333	.84839	.70533	.84961	.70731	.85083	.70930	.85204	.71128	1
+ 15′	9.84718	.70337	9.84841	.70536	9.84963	.70735	9.85085	.70933	9.85206	.71131	0
	16h 24m		16h 23m		16h 22m		16h 21m		16h 20m		

TABLE 34.

Haversines.

s	7h 40m 115° 0′		7h 41m 115° 15′		7h 42m 115° 30′		7h 43m 115° 45′		7h 44m 116° 0′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.85206	.71131	9.85326	.71328	9.85446	.71526	9.85565	.71722	9.85684	.71919	60
1	.85208	.71134	.85328	.71332	.85448	.71529	.85567	.71726	.85686	.71922	59
2	.85210	.71138	.85330	.71335	.85450	.71532	.85569	.71729	.85688	.71925	58
3	.85212	.71141	.85332	.71338	.85452	.71535	.85571	.71732	.85690	.71928	57
+ 1′	9.85214	.71144	9.85334	.71342	9.85454	.71539	9.85573	.71735	9.85692	.71932	56
5	.85216	.71147	.85336	.71345	.85456	.71542	.85575	.71739	.85694	.71935	55
6	.85218	.71151	.85338	.71348	.85458	.71545	.85577	.71742	.85696	.71938	54
7	.85220	.71154	.85340	.71351	.85460	.71549	.85579	.71745	.85698	.71941	53
+ 2′	9.85222	.71157	9.85342	.71355	9.85462	.71552	9.85581	.71748	9.85700	.71945	52
9	.85224	.71161	.85344	.71358	.85464	.71555	.85583	.71752	.85702	.71948	51
10	.85226	.71164	.85346	.71361	.85466	.71558	.85585	.71755	.85704	.71951	50
11	.85228	.71167	.85348	.71365	.85468	.71562	.85587	.71758	.85706	.71955	49
+ 3′	9.85230	.71170	9.85350	.71368	9.85470	.71565	9.85589	.71762	9.85708	.71958	48
13	.85232	.71174	.85352	.71371	.85472	.71568	.85591	.71765	.85710	.71961	47
14	.85234	.71177	.85354	.71374	.85474	.71571	.85593	.71768	.85712	.71964	46
15	.85236	.71180	.85356	.71378	.85476	.71575	.85595	.71771	.85714	.71968	45
+ 4′	9.85238	.71184	9.85358	.71381	9.85478	.71578	9.85597	.71775	9.85716	.71971	44
17	.85240	.71187	.85360	.71384	.85480	.71581	.85599	.71778	.85718	.71974	43
18	.85242	.71190	.85362	.71388	.85482	.71585	.85601	.71781	.85720	.71977	42
19	.85244	.71194	.85364	.71391	.85484	.71588	.85603	.71784	.85722	.71981	41
+ 5′	9.85246	.71197	9.85366	.71394	9.85486	.71591	9.85605	.71788	9.85724	.71984	40
21	.85248	.71200	.85368	.71397	.85488	.71594	.85607	.71791	.85726	.71987	39
22	.85250	.71203	.85370	.71401	.85490	.71598	.85609	.71794	.85727	.71990	38
23	.85252	.71207	.85372	.71404	.85492	.71601	.85611	.71798	.85729	.71994	37
+ 6′	9.85254	.71210	9.85374	.71407	9.85494	.71604	9.85613	.71801	9.85731	.71997	36
25	.85256	.71213	.85376	.71411	.85496	.71608	.85615	.71804	.85733	.72000	35
26	.85258	.71217	.85378	.71414	.85498	.71611	.85617	.71807	.85735	.72003	34
27	.85260	.71220	.85380	.71417	.85500	.71614	.85619	.71811	.85737	.72007	33
+ 7′	9.85262	.71223	9.85382	.71420	9.85502	.71617	9.85621	.71814	9.85739	.72010	32
29	.85264	.71226	.85384	.71424	.85504	.71621	.85623	.71817	.85741	.72013	31
30	.85266	.71230	.85386	.71427	.85506	.71624	.85625	.71820	.85743	.72017	30
31	.85268	.71233	.85388	.71430	.85508	.71627	.85627	.71824	.85745	.72020	29
+ 8′	9.85270	.71236	9.85390	.71434	9.85510	.71631	9.85629	.71827	9.85747	.72023	28
33	.85272	.71240	.85392	.71437	.85512	.71634	.85631	.71830	.85749	.72026	27
34	.85274	.71243	.85394	.71440	.85514	.71637	.85633	.71834	.85751	.72030	26
35	.85276	.71246	.85396	.71443	.85516	.71640	.85635	.71837	.85753	.72033	25
+ 9′	9.85278	.71249	9.85398	.71447	9.85518	.71644	9.85637	.71840	9.85755	.72036	24
37	.85280	.71253	.85400	.71450	.85520	.71647	.85639	.71843	.85757	.72039	23
38	.85282	.71256	.85402	.71453	.85522	.71650	.85641	.71847	.85759	.72043	22
39	.85284	.71259	.85404	.71456	.85524	.71653	.85643	.71850	.85761	.72046	21
+ 10′	9.85286	.71263	9.85406	.71460	9.85526	.71657	9.85645	.71853	9.85763	.72049	20
41	.85288	.71266	.85408	.71463	.85528	.71660	.85647	.71856	.85765	.72052	19
42	.85290	.71269	.85410	.71466	.85530	.71663	.85649	.71860	.85767	.72056	18
43	.85292	.71273	.85412	.71470	.85532	.71667	.85651	.71863	.85769	.72059	17
+ 11′	9.85294	.71276	9.85414	.71473	9.85534	.71670	9.85653	.71866	9.85771	.72062	16
45	.85296	.71279	.85416	.71476	.85536	.71673	.85654	.71870	.85773	.72066	15
46	.85298	.71282	.85418	.71480	.85538	.71676	.85656	.71873	.85775	.72069	14
47	.85300	.71286	.85420	.71483	.85540	.71680	.85658	.71876	.85777	.72072	13
+ 12′	9.85302	.71289	9.85422	.71486	9.85542	.71683	9.85660	.71879	9.85779	.72075	12
49	.85304	.71292	.85424	.71489	.85544	.71686	.85662	.71883	.85781	.72079	11
50	.85306	.71296	.85426	.71493	.85546	.71690	.85664	.71886	.85783	.72082	10
51	.85308	.71299	.85428	.71496	.85548	.71693	.85666	.71889	.85785	.72085	9
+ 13′	9.85310	.71302	9.85430	.71499	9.85550	.71696	9.85668	.71892	9.85787	.72088	8
53	.85312	.71305	.85432	.71503	.85552	.71699	.85670	.71896	.85788	.72092	7
54	.85314	.71309	.85434	.71506	.85554	.71703	.85672	.71899	.85790	.72095	6
55	.85316	.71312	.85436	.71509	.85555	.71706	.85674	.71902	.85792	.72098	5
+ 14′	9.85318	.71315	9.85438	.71512	9.85557	.71709	9.85676	.71905	9.85794	.72101	4
57	.85320	.71319	.85440	.71516	.85559	.71712	.85678	.71909	.85796	.72105	3
58	.85322	.71322	.85442	.71519	.85561	.71716	.85680	.71912	.85798	.72108	2
59	.85324	.71325	.85444	.71522	.85563	.71719	.85682	.71915	.85800	.72111	1
+ 15′	9.85326	.71328	9.85446	.71526	9.85565	.71722	9.85684	.71919	9.85802	.72114	0
	16h 19m		16h 18m		16h 17m		16h 16m		16h 15m		

TABLE 34.

Haversines.

S	7h 45m 116° 15′		7h 46m 116° 30′		7h 47m 116° 45′		7h 48m 117° 0′		7h 49m 117° 15′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.85802	.72114	9.85920	.72310	9.86037	.72505	9.86153	.72700	9.86269	.72894	60
1	.85804	.72118	.85922	.72313	.86039	.72508	.86155	.72703	.86271	.72897	59
2	.85806	.72121	.85924	.72316	.86041	.72511	.86157	.72706	.86273	.72900	58
3	.85808	.72124	.85926	.72320	.86043	.72515	.86159	.72709	.86275	.72903	57
+ 1′	9.85810	.72127	9.85928	.72323	9.86045	.72518	9.86161	.72712	9.86277	.72907	56
5	.85812	.72131	.85930	.72326	.86046	.72521	.86163	.72716	.86279	.72910	55
6	.85814	.72134	.85931	.72329	.86048	.72524	.86165	.72719	.86281	.72913	54
7	.85816	.72137	.85933	.72333	.86050	.72528	.86167	.72722	.86282	.72916	53
+ 2′	9.85818	.72141	9.85935	.72336	9.86052	.72531	9.86169	.72725	9.86284	.72920	52
9	.85820	.72144	.85937	.72339	.86054	.72534	.86171	.72729	.86286	.72923	51
10	.85822	.72147	.85939	.72342	.86056	.72537	.86173	.72732	.86288	.72926	50
11	.85824	.72150	.85941	.72346	.86058	.72541	.86174	.72735	.86290	.72929	49
+ 3′	9.85826	.72154	9.85943	.72349	9.86060	.72544	9.86176	.72738	9.86292	.72932	48
13	.85828	.72157	.85945	.72352	.86062	.72547	.86178	.72742	.86294	.72936	47
14	.85830	.72160	.85947	.72355	.86064	.72550	.86180	.72745	.86296	.72939	46
15	.85832	.72163	.85949	.72359	.86066	.72554	.86182	.72748	.86298	.72942	45
+ 4′	9.85834	.72167	9.85951	.72362	9.86068	.72557	9.86184	.72751	9.86300	.72945	44
17	.85836	.72170	.85953	.72365	.86070	.72560	.86186	.72755	.86302	.72949	43
18	.85838	.72173	.85955	.72368	.86072	.72563	.86188	.72758	.86304	.72953	42
19	.85840	.72176	.85957	.72372	.86074	.72567	.86190	.72761	.86306	.72955	41
+ 5′	9.85841	.72180	9.85959	.72375	9.86076	.72570	9.86192	.72764	9.86307	.72958	40
21	.85843	.72183	.85961	.72378	.86078	.72573	.86194	.72768	.86309	.72962	39
22	.85845	.72186	.85963	.72381	.86080	.72576	.86196	.72771	.86311	.72965	38
23	.85847	.72189	.85965	.72385	.86081	.72580	.86198	.72774	.86313	.72968	37
+ 6′	9.85849	.72193	9.85967	.72388	9.86083	.72583	9.86200	.72777	9.86315	.72971	36
25	.85851	.72196	.85969	.72391	.86085	.72586	.86201	.72780	.86317	.72974	35
26	.85853	.72199	.85971	.72394	.86087	.72589	.86203	.72784	.86319	.72978	34
27	.85855	.72202	.85972	.72398	.86089	.72593	.86205	.72787	.86321	.72981	33
+ 7′	9.85857	.72206	9.85974	.72401	9.86091	.72596	9.86207	.72790	9.86323	.72984	32
29	.85859	.72209	.85976	.72404	.86093	.72599	.86209	.72793	.86325	.72987	31
30	.85861	.72212	.85978	.72407	.86095	.72602	.86211	.72797	.86327	.72991	30
31	.85863	.72215	.85980	.72411	.86097	.72606	.86213	.72800	.86329	.72994	29
+ 8′	9.85865	.72219	9.85982	.72414	9.86099	.72609	9.86215	.72803	9.86331	.72997	28
33	.85867	.72222	.85984	.72417	.86101	.72612	.86217	.72806	.86332	.73000	27
34	.85869	.72225	.85986	.72420	.86103	.72615	.86219	.72810	.86334	.73004	26
35	.85871	.72229	.85988	.72424	.86105	.72618	.86221	.72813	.86336	.73007	25
+ 9′	9.85873	.72232	9.85990	.72427	9.86107	.72622	9.86223	.72816	9.86338	.73010	24
37	.85875	.72235	.85992	.72430	.86109	.72625	.86225	.72819	.86340	.73013	23
38	.85877	.72238	.85994	.72433	.86111	.72628	.86227	.72823	.86342	.73016	22
39	.85879	.72242	.85996	.72437	.86112	.72631	.86229	.72826	.86344	.73020	21
+ 10′	9.85881	.72245	9.85998	.72440	9.86114	.72635	9.86230	.72829	9.86346	.73023	20
41	.85883	.72248	.86000	.72443	.86116	.72638	.86232	.72832	.86348	.73026	19
42	.85885	.72251	.86002	.72446	.86118	.72641	.86234	.72835	.86350	.73029	18
43	.85887	.72255	.86004	.72450	.86120	.72644	.86236	.72839	.86352	73033	17
+ 11′	9.85888	.72258	9.86006	.72453	9.86122	.72648	9.86238	.72842	9.86354	.73036	16
45	.85890	.72261	.86008	.72456	.86124	.72651	.86240	.72845	.86355	.73039	15
46	.85892	.72264	.86010	.72459	.86126	.72654	.86242	.72848	.86357	.73042	14
47	.85894	.72268	.86011	.72463	.86128	.72657	.86244	.72852	.86359	.73046	13
+ 12′	9.85896	.72271	9.86013	.72466	9.86130	.72661	9.86246	.72855	9.86361	.73049	12
49	.85898	.72274	.86015	.72469	.86132	.72664	.86248	.72858	.86363	.73052	11
50	.85900	.72277	.86017	.72472	.86134	.72667	.86250	.72861	.86365	.73055	10
51	.85902	.72281	.86019	72476	.86136	.72670	.86252	.72865	.86367	.73058	9
+ 13′	9.85904	.72284	9.86021	.72479	9.86138	.72674	9.86254	.72868	9.86369	.73062	8
53	.85906	.72287	.86023	.72482	.86140	.72677	.86256	.72871	.86371	.73065	7
54	.85908	.72290	.86025	.72485	.86142	.72680	.86257	.72874	.86373	.73068	6
55	.85910	.72294	.86027	.72489	.86143	.72683	.86259	.72878	.86375	.73071	5
+ 14′	9.85912	.72297	9.86029	.72492	9.86145	.72687	9.86261	.72881	9.86377	.73076	4
57	.85914	.72300	.86031	.72495	.86147	.72690	.86263	.72884	.86379	.73078	3
58	.85916	.72303	.86033	.72498	.86149	.72693	.86265	.72887	.86380	.73081	2
59	.85918	72307	.86035	.72502	.86151	.72696	.86267	.72890	.86382	.73084	1
+ 15′	9.85920	.72310	9.86037	.72505	9.86153	.72700	9.86269	.72894	9.86384	.73087	0
	16h 14m		16h 13m		16h 12m		16h 11m		16h 10m		

TABLE 34.

Haversines.

s	7h 50m 117° 30′		7h 51m 117° 45′		7h 52m 118° 0′		7h 53m 118° 15′		7h 54m 118° 30′		s
	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav	Nat. Hav	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	9.86384	.73087	9.86499	.73281	9.86613	.73474	9.86727	.73666	9.86840	.73858	60
1	.86386	.73091	.86501	.73284	.86615	.73477	.86729	.73669	.86842	.73861	59
2	.86388	.73094	.86503	.73287	.86617	.73480	.86730	.73672	.86843	.73864	58
3	.86390	.73097	.86505	.73290	.86619	73483	.86732	.73676	.86845	.73868	57
+ 1′	9.86392	.73100	9.86507	.73294	9.86621	.73486	9.86734	.73679	9.86847	.73871	56
5	.86394	.73104	.86509	.73297	.86623	.73490	.86736	.73682	.86849	.73874	55
6	.86396	.73107	.86510	.73300	.86625	.73493	.86738	.73685	.86851	.73877	54
7	.86398	.73110	.86512	.73303	.86626	.73496	.86740	.73688	.86853	.73880	53
+ 2′	9.86400	.73113	9.86514	.73306	9.86628	.73499	9.86742	.73692	9.86855	.73884	52
9	.86401	.73116	.86516	.73310	.86630	.73502	.86744	.73695	.86857	.73887	51
10	.86403	.73120	.86518	.73313	.86632	.73506	.86746	.73698	.86859	.73890	50
11	.86405	.73123	.86520	.73316	.86634	.73509	.86747	.73701	.86860	.73893	49
+ 3′	9.86407	.73126	9.86522	.73319	9.86636	.73512	9.86749	.73704	9.86862	.73896	48
13	.86409	.73129	.86524	.73323	.86638	.73515	.86751	.73708	.86864	.73899	47
14	.86411	.73133	.86526	.73326	.86640	.73519	.86753	.73711	.86866	.73903	46
15	.86413	.73136	.86528	.73329	.86642	.73522	.86755	.73714	.86868	.73906	45
+ 4′	9.86415	.73139	9.86529	.73332	9.86643	.73525	9.86757	.73717	9.86870	.73909	44
17	.86417	.73142	.86531	.73335	.86645	.73528	.86759	.73720	.86872	.73912	43
18	.86419	.73145	.86533	.73339	.86647	.73531	.86761	.73724	.86874	.73915	42
19	.86421	.73149	.86535	.73342	.86649	.73535	.86763	.73727	.86875	.73919	41
+ 5′	9.86423	.73152	9.86537	.73345	9.86651	.73538	9.86764	.73730	9.86877	.73922	40
21	.86424	.73155	.86539	.73348	.86653	.73541	.86766	.73733	.86879	.73925	39
22	.86426	.73158	.86541	.73351	.86655	.73544	.86768	.73736	.86881	.73928	38
23	.86428	.73162	.86543	.73355	.86657	.73547	.86770	.73740	.86883	.73931	37
+ 6′	9.86430	.73165	9.86545	.73358	9.86659	.73551	9.86772	.73743	9.86885	.73935	36
25	.86432	.73168	.86547	.73361	.86661	.73554	.86774	.73746	.86887	.73938	35
26	.86434	.73171	.86549	.73364	.86662	.73557	.86776	.73749	.86889	.73941	34
27	.86436	.73174	.86550	.73368	.86664	.73560	.86778	.73752	.86890	.73944	33
+ 7′	9.86438	.73178	9.86552	.73371	9.86666	.73563	9.86780	.73756	9.86892	.73947	32
29	.86440	.73181	.86554	.73374	.86668	.73567	.86781	.73759	.86894	.73951	31
30	.86442	.73184	.86556	.73377	.86670	.73570	.86783	73762	.86896	.73954	30
31	.86444	.73187	.86558	.73380	.86672	.73573	.86785	.73765	.86898	.73957	29
+ 8′	9.86446	.73191	9.86560	.73384	9.86674	.73576	9.86787	.73768	9.86900	.73960	28
33	.86447	.73194	.86562	.73387	.86676	.73579	.86789	.73772	.86902	.73963	27
34	.86449	.73197	.86564	.73390	.86678	.73583	.86791	.73775	.86904	.73967	26
35	.86451	.73200	.86566	.73393	.86679	.73586	.86793	.73778	.86905	.73970	25
+ 9′	9.86453	.73203	9.86568	.73396	9.86681	.73589	9.86795	.73781	9.86907	.73973	24
37	.86455	.73207	.86569	.73400	.86683	.73592	.86796	.73784	.86909	.73976	23
38	.86457	.73210	.86571	.73403	.86685	.73595	.86798	.73788	.86911	.73979	22
39	.86459	.73213	.86573	.73406	.86687	.73599	.86800	.73791	.86913	.73982	21
+ 10′	9.86461	.73216	9.86575	.73409	9.86689	.73602	9.86802	.73794	9.86915	.73986	20
41	.86463	.73220	.86577	.73413	.86691	.73605	.86804	.73797	.86917	.73989	19
42	.86465	.73223	.86579	.73416	.86693	.73608	.86806	.73800	.86919	.73992	18
43	.86467	.73226	.86581	.73419	.86695	.73611	.86808	.73804	.86920	.73995	17
+ 11′	9.86468	.73229	9.86583	.73422	9.86696	.73615	9.86810	.73807	9.86922	.73998	16
45	.86470	.73232	.86585	.73425	.86698	.73618	.86812	.73810	.86924	.74002	15
46	.86472	.73236	.86587	.73429	.86700	.73621	.86813	.73813	.86926	.74005	14
47	.86474	.73239	.86588	.73432	.86702	.73624	.86815	.73816	.86928	.74008	13
+ 12′	9.86476	.73242	9.86590	.73435	9.86704	.73628	9.86817	.73820	9.86930	.74011	12
49	.86478	.73245	.86592	.73438	.86706	.73631	.86819	.73823	.86932	.74014	11
50	.86480	.73249	.86594	.73441	.86708	.73634	.86821	.73826	.86933	.74018	10
51	.86482	.73252	.86596	.73445	.86710	.73637	.86823	.73829	.86935	.74021	9
+ 13′	9.86484	.73255	9.86598	.73448	9.86712	.73640	9.86825	.73832	9.86937	.74024	8
53	.86486	.73258	.86600	.73451	.86713	.73644	.86827	.73836	.86939	.74027	7
54	.86488	.73261	.86602	.73454	.86715	.73647	.86828	.73839	.86941	.74030	6
55	.86489	.73265	.86604	.73458	.86717	.73650	.86830	.73842	.86943	.74033	5
+ 14′	9.86491	.73268	9.86606	.73461	9.86719	.73653	9.86832	.73845	9.86945	.74037	4
57	.86493	.73271	.86607	.73464	.86721	.73656	.86834	.73848	.86947	.74040	3
58	.86495	.73274	.86609	.73467	.86723	.73660	.86836	.73852	.86948	.74043	2
59	.86497	.73278	.86611	.73470	.86725	.73663	.86838	.73855	.86950	.74046	1
+ 15′	9.86499	.73281	9.86613	.73474	9.86727	.73666	9.86840	.73858	9.86952	.74049	0
	16h 9m		16h 8m		16h 7m		16h 6m		16h 5m		

Haversines.

	7h 55m 118° 45′		7h 56m 119° 0′		7h 57m 119° 15′		7h 58m 119° 30′		7h 59m 119° 45′		
s	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	s
0	9.86952	.74049	9.87064	.74240	9.87175	.74431	9.87286	.74621	9.87396	.74811	60
1	.86954	.74052	.87066	.74244	.87177	.74434	.87288	.74624	.87398	.74814	59
2	.86956	.74056	.87068	.74247	.87179	.74437	.87290	.74628	.87400	.74817	58
3	.86958	.74059	.87070	.74250	.87181	.74441	.87292	.74631	.87402	.74820	57
+ 1′	9.86960	.74062	9.87072	.74253	9.87183	.74444	9.87294	.74634	9.87404	.74823	56
5	.86962	.74065	.87073	.74256	.87185	.74447	.87295	.74637	.87406	.74827	55
6	.86963	.74069	.87075	.74260	.87187	.74450	.87297	.74640	.87407	.74830	54
7	.86965	.74072	.87077	.74263	.87188	.74453	.87299	.74643	.87409	.74833	53
+ 2′	9.86967	.74075	9.87079	.74266	9.87190	.74456	9.87301	.74646	9.87411	.74836	52
9	.86969	.74078	.87081	.74269	.87192	.74460	.87303	.74650	.87413	.74839	51
10	.86971	.74081	.87083	.74272	.87194	.74463	.87305	.74653	.87415	.74842	50
11	.86973	.74084	.87085	.74275	.87196	.74466	.87306	.74656	.87417	.74846	49
+ 3′	9.86975	.74088	9.87086	.74279	9.87198	.74469	9.87308	.74659	9.87418	.74849	48
13	.86977	.74091	.87088	.74282	.87199	.74472	.87310	.74662	.87420	.74852	47
14	.86978	.74094	.87090	.74285	.87201	.74475	.87312	.74665	.87422	.74855	46
15	.86980	.74097	.87092	.74288	.87203	.74479	.87314	.74669	.87424	.74858	45
+ 4′	9.86982	.74100	9.87094	.74291	9.87205	.74482	9.87316	.74672	9.87426	.74861	44
17	.86984	.74104	.87096	.74294	.87207	.74485	.87318	.74675	.87428	.74864	43
18	.86986	.74107	.87098	.74298	.87209	.74488	.87319	.74678	.87429	.74868	42
19	.86988	.74110	.87100	.74301	.87211	.74491	.87321	.74681	.87431	74871	41
+ 5′	9.86990	.74113	9.87101	.74304	9.87212	.74494	9.87323	.74684	9.87433	.74874	40
21	.86991	.74116	.87103	.74307	.87214	.74498	.87325	.74688	.87435	.74877	39
22	.86993	.74120	.87105	.74310	.87216	.74501	.87327	.74691	.87437	.74880	38
23	.86995	.74123	.87107	.74314	.87218	.74504	.87329	.74694	.87439	.74883	37
+ 6′	9.86997	.74126	9.87109	.74317	9.87220	.74507	9.87330	.74697	9.87440	.74887	36
25	.86999	.74129	.87111	.74320	.87222	.74510	.87332	.74700	.87442	.74890	35
26	.87001	.74132	.87112	.74323	.87224	.74514	.87334	.74703	.87444	.74893	34
27	.87003	.74135	.87114	.74326	.87225	.74517	.87336	.74707	.87446	.74896	33
+ 7′	9.87004	.74139	9.87116	.74329	9.87227	.74520	9.87338	.74710	9.87448	.74899	32
29	.87006	.74142	.87118	.74333	.87229	.74523	.87340	.74713	.87450	.74902	31
30	.87008	.74145	.87120	.74336	.87231	.74526	.87341	.74716	.87451	.74905	30
31	.87010	.74148	.87122	.74339	.87233	.74529	.87343	.74719	.87453	.74908	29
+ 8′	9.87012	.74151	9.87124	.74342	9.87235	.74533	9.87345	.74722	9.87455	.74912	28
33	.87014	.74155	.87125	.74345	.87236	.74536	.87347	.74726	.87457	.74915	27
34	.87016	.74158	.87127	.74349	.87238	.74539	.87349	.74729	.87459	.74918	26
35	.87018	.74161	.87129	.74352	.87240	.74542	.87351	.74732	.87460	.74921	25
+ 9′	9.87019	.74164	9.87131	.74355	9.87242	.74545	9.87352	.74735	9.87462	.74924	24
37	.87021	.74167	.87133	.74358	.87244	.74548	.87354	.74738	.87464	.74928	23
38	.87023	.74170	.87135	.74361	.87246	.74552	.87356	.74741	.87466	.74931	22
39	.87025	.74174	.87137	.74364	.87248	.74555	.87358	.74744	.87468	.74934	21
+ 10′	9.87027	.74177	9.87138	.74368	9.87249	.74558	9.87360	.74748	9.87470	.74937	20
41	.87029	.74180	.87140	.74371	.87251	.74561	.87362	.74751	.87471	.74940	19
42	.87031	.74183	.87142	.74374	.87253	.74564	.87363	.74754	.87473	.74943	18
43	.87032	.74186	.87144	.74377	.87255	.74567	.87365	.74757	.87475	.74946	17
+ 11′	9.87034	.74190	9.87146	.74380	9.87257	.74571	9.87367	.74760	9.87477	.74950	16
45	.87036	.74193	.87148	.74383	.87259	.74574	.87369	.74763	.87479	.74953	15
46	.87038	.74196	.87149	.74387	.87260	.74577	.87371	.74767	.87481	.74956	14
47	.87040	.74199	.87151	.74390	.87262	.74580	.87373	.74770	.87482	.74959	13
+ 12′	9.87042	.74202	9.87153	.74393	9.87264	.74583	9.87374	.74773	9.87484	.74962	12
49	.87044	.74205	.87155	.74396	.87266	.74586	.87376	.74776	.87486	.74965	11
50	.87045	.74209	.87157	.74399	.87268	.74590	.87378	.74779	.87488	.74969	10
51	.87047	.74212	.87159	.74402	.87270	.74593	.87380	.74782	.87490	.74972	9
+ 13′	9.87049	.74215	9.87161	.74406	9.87271	.74596	9.87382	.74786	9.87492	.74975	8
53	.87051	.74218	.87162	.74409	.87273	.74599	.87384	.74789	.87493	.74978	7
54	.87053	.74221	.87164	.74412	.87275	.74602	.87385	.74792	.87495	.74981	6
55	.87055	.74225	.87166	.74415	.87277	.74605	.87387	.74795	.87497	.74984	5
+ 14′	9.87057	.74228	9.87168	.74418	9.87279	.74609	9.87389	.74798	9.87499	.74987	4
57	.87059	.74231	.87170	.74422	.87281	.74612	.87391	.74801	.87501	.74991	3
58	.87060	.74234	.87172	.74425	.87283	.74615	.87393	.74805	.87502	.74994	2
59	.87062	.74237	.87174	.74428	.87284	.74618	.87395	.74808	.87504	.74997	1
+ 15′	9.87064	.74240	9.87175	.74431	9.87286	.74621	9.87396	.74811	9.87506	.75000	0
	16h 4m		16h 3m		16h 2m		16h 1m		16h 0m		

TABLE 34.

Haversines.

s ′	8h 0m 120° 0′ Log. Hav.	Nat. Hav.	8h 2m 120° 30′ Log. Hav.	Nat. Hav.	8h 4m 121° 0′ Log. Hav.	Nat. Hav.	8h 6m 121° 30′ Log. Hav.	Nat. Hav.	8h 8m 122° 0′ Log. Hav.	Nat. Hav.	s
0 0	9.87506	0.75000	9.87724	0.75377	9.87939	0.75752	9.88153	0.76125	9.88364	0.76496	60
2	.87510	.75006	.87727	.75383	.87943	.75758	.88156	.76131	.88367	.76502	58
4+ 1	.87513	.75013	.87731	.75389	.87947	.75764	.88160	.76137	.88371	.76508	56
6	.87517	.75019	.87735	.75396	.87950	.75771	.88163	.76144	.88374	.76514	54
8+ 2	9.87521	0.75025	9.87738	0.75402	9.87954	0.75777	9.88167	0.76150	9.88378	0.76521	52
10	.87524	.75032	.87742	.75408	.87957	.75783	.88170	.76156	.88381	.76527	50
12+ 3	.87528	.75038	.87745	.75415	.87961	.75789	.88174	.76162	.88385	.76533	48
14	.87532	.75044	.87749	.75421	.87964	.75795	.88177	.76168	.88388	.76539	46
16+ 4	9.87535	0.75050	9.87753	0.75427	9.87968	0.75802	9.88181	0.76175	9.88392	0.76545	44
18	.87539	.75057	.87756	.75433	.87971	.75808	.88185	.76181	.88395	.76551	42
20+ 5	.87543	.75063	.87760	.75440	.87975	.75814	.88188	.76187	.88399	.76558	40
22	.87546	.75069	.87764	.75446	.87979	.75820	.88192	.76193	.88402	.76564	38
24+ 6	9.87550	0.75075	9.87767	0.75452	9.87982	0.75827	9.88195	0.76199	9.88406	0.76570	36
26	.87553	.75082	.87771	.75458	.87986	.75833	.88199	.76205	.88409	.76576	34
28+ 7	.87557	.75088	.87774	.75465	.87989	.75839	.88202	.76212	.88413	.76582	32
30	.87561	.75094	.87778	.75471	.87993	.75845	.88206	.76218	.88416	.76588	30
32+ 8	9.87564	0.75101	9.87782	0.75477	9.87996	0.75852	9.88209	0.76224	9.88420	0.76595	28
34	.87568	.75107	.87785	.75483	.88000	.75858	.88213	.76230	.88423	.76601	26
36+ 9	.87572	.75113	.87789	.75490	.88004	.75864	.88216	.76236	.88427	.76607	24
38	.87575	.75120	.87792	.75496	.88007	.75870	.88220	.76243	.88430	.76613	22
40+10	9.87579	0.75126	9.87796	0.75502	9.88011	0.75876	9.88223	0.76249	9.88434	0.76619	20
42	.87583	.75132	.87800	.75508	.88014	.75883	.88227	.76255	.88437	.76625	18
44+11	.87586	.75138	.87803	.75515	.88018	.75889	.88230	.76261	.88441	.76632	16
46	.87590	.75145	.87807	.75521	.88021	.75895	.88234	.76267	.88444	.76638	14
48+12	9.87593	0.75151	9.87810	0.75527	9.88025	0.75901	9.88237	0.76274	9.88448	0.76644	12
50	.87597	.75157	.87814	.75533	.88029	.75908	.88241	.76280	.88451	.76650	10
52+13	.87601	.75164	.87818	.75540	.88032	.75914	.88244	.76286	.88455	.76656	8
54	.87604	.75170	.87821	.75546	.88036	.75920	.88248	.76292	.88458	.76662	6
56+14	9.87608	0.75176	9.87825	0.75552	9.88039	0.75926	9.88252	0.76298	9.88462	0.76668	4
58	9.87612	0.75182	9.87828	0.75558	9.88043	0.75932	9.88255	0.76305	9.88465	0.76675	2
	15h 59m		15h 57m		15h 55m		15h 53m		15h 51m		

s ′	8h 1m 120° 0′ Log. Hav.	Nat. Hav.	8h 3m 120° 30′ Log. Hav.	Nat. Hav.	8h 5m 121° 0′ Log. Hav.	Nat. Hav.	8h 7m 121° 30′ Log. Hav.	Nat. Hav.	8h 9m 122° 0′ Log. Hav.	Nat. Hav.	s
0+15	9.87615	0.75189	9.87832	0.75565	9.88046	0.75939	9.88259	0.76311	9.88469	0.76681	60
2	.87619	.75195	.87835	.75571	.88050	.75945	.88262	.76317	.88472	.76687	58
4+16	.87623	.75201	.87839	.75577	.88053	.75951	.88266	.76323	.88476	.76693	56
6	.87626	.75208	.87843	.75583	.88057	.75957	.88269	.76329	.88479	.76699	54
8+17	9.87630	0.75214	9.87846	0.75590	9.88061	0.75964	9.88273	0.76335	9.88483	0.76705	52
10	.87633	.75220	.87850	.75596	.88064	.75970	.88276	.76342	.88486	.76711	50
12+18	.87637	.75226	.87853	.75602	.88068	.75976	.88280	.76348	.88490	.76718	48
14	.87641	.75233	.87857	.75608	.88071	.75982	.88283	.76354	.88493	.76724	46
16+19	9.87644	0.75239	9.87861	0.75615	9.88075	0.75988	9.88287	0.76360	9.88496	0.76730	44
18	.87648	.75245	.87864	.75621	.88078	.75995	.88290	.76366	.88500	.76736	42
20+20	.87652	.75251	.87868	.75627	.88082	.76001	.88294	.76373	.88503	.76742	40
22	.87655	.75258	.87871	.75633	.88085	.76007	.88297	.76379	.88507	.76748	38
24+21	9.87659	0.75264	9.87875	0.75640	9.88089	0.76013	9.88301	0.76385	9.88510	0.76754	36
26	.87662	.75270	.87879	.75646	.88092	.76019	.88304	.76391	.88514	.76761	34
28+22	.87666	.75277	.87882	.75652	.88096	.76026	.88308	.76397	.88517	.76767	32
30	.87670	.75283	.87886	.75658	.88100	.76032	.88311	.76403	.88521	.76773	30
32+23	9.87673	0.75289	9.87889	0.75665	9.88103	0.76038	9.88315	0.76410	9.88524	0.76779	28
34	.87677	.75295	.87893	.75671	.88107	.76044	.88318	.76416	.88528	.76785	26
36+24	.87680	.75302	.87896	.75677	.88110	.76050	.88322	.76422	.88531	.76791	24
38	.87684	.75308	.87900	.75683	.88114	.76057	.88325	.76428	.88535	.76797	22
40+25	9.87688	0.75314	9.87904	0.75690	9.88117	0.76063	9.88329	0.76434	9.88538	0.76804	20
42	.87691	.75321	.87907	.75696	.88121	.76069	.88332	.76440	.88542	.76810	18
44+26	.87695	.75327	.87911	.75702	.88124	.76075	.88336	.76447	.88545	.76816	16
46	.87699	.75333	.87914	.75708	.88128	.76082	.88339	.76453	.88549	.76822	14
48+27	9.87702	0.75339	9.87918	0.75714	9.88131	0.76088	9.88343	0.76459	9.88552	0.76828	12
50	.87706	.75346	.87921	.75721	.88135	.76094	.88346	.76465	.88556	.76834	10
52+28	.87709	.75352	.87925	.75727	.88139	.76100	.88350	.76471	.88559	.76840	8
54	.87713	.75358	.87929	.75733	.88142	.76106	.88353	.76477	.88562	.76847	6
56+29	9.87717	0.75364	9.87932	0.75739	9.88146	0.76113	9.88357	0.76484	9.88566	0.76853	4
58	.87720	.75371	.87936	.75746	.88149	.76119	.88360	.76490	.88569	.76859	2
60+30	9.87724	0.75377	9.87939	0.75752	9.88153	0.76125	9.88364	0.76496	9.88573	0.76865	0
	15h 58m		15h 56m		15h 54m		15h 52m		15h 50m		

TABLE 34.

Haversines.

s ′	8h 10m 122° 30′ Log. Hav.	Nat. Hav.	8h 12m 123° 0′ Log. Hav.	Nat. Hav.	8h 14m 123° 30′ Log. Hav.	Nat. Hav.	8h 16m 124° 0′ Log. Hav.	Nat. Hav.	8h 18m 124° 30′ Log. Hav.	Nat. Hav.	s
0 0	9.88573	0.76865	9.88780	0.77232	9.88984	0.77597	9.89187	0.77960	9.89387	0.78320	60
2	.88576	.76871	.88783	.77238	.88988	.77603	.89190	.77966	.89391	.78326	58
4+ 1	.88580	.76877	.88787	.77244	.88991	.77609	.89194	.77972	.89394	.78332	56
6	.88583	.76883	.88790	.77250	.88995	.77615	.89197	.77978	.89397	.78338	54
8+ 2	9.88587	0.76890	9.88793	0.77256	9.88998	0.77621	9.89200	0.77984	9.89400	0.78344	52
10	.88590	.76896	.88797	.77262	.89001	.77627	.89204	.77990	.89404	.78350	50
12+ 3	.88594	.76902	.88800	.77269	.89005	.77633	.89207	.77996	.89407	.78356	48
14	.88597	.76908	.88804	.77275	.89008	.77639	.89210	.78002	.89411	.78362	46
16+ 4	9.88600	0.76914	9.88807	0.77281	9.89012	0.77645	9.89214	0.78008	9.89414	0.78368	44
18	.88604	.76920	.88811	.77287	.89015	.77651	.89217	.78014	.89417	.78374	42
20+ 5	.88607	.76926	.88814	.77293	.89018	.77657	.89221	.78020	.89421	.78380	40
22	.88611	.76932	.88817	.77299	.89022	.77664	.89224	.78026	.89424	.78386	38
24+ 6	9.88614	.076939	9.88821	0.77305	9.89025	0.77670	9.89227	0.78032	9.89427	0.78392	36
26	.88618	.76945	.88824	.77311	.89028	.77676	.89231	.78038	.89431	.78398	34
28+ 7	.88621	.76951	.88828	.77317	.89032	.77682	.89234	.78044	.89434	.78404	32
30	.88625	.76957	.88831	.77323	.89035	.77688	.89237	.78050	.89437	.78410	30
32+ 8	9.88628	0.76963	9.88835	0.77329	9.89039	0.77694	9.89241	0.78056	9.89441	0.78416	28
34	.88632	.76969	.88838	.77336	.89042	.77700	.89244	.78062	.89444	.78422	26
36+ 9	.88635	.76975	.88841	.77342	.89045	.77706	.89247	.78068	.89447	.78428	24
38	.88639	.76981	.88845	.77348	.89049	.77712	.89251	.78074	.89450	.78434	22
40+10	9.88642	0.76988	9.88848	0.77354	9.89052	0.77718	9.89254	0.78080	9.89454	0.78440	20
42	.88645	.76994	.88852	.77360	.89056	.77724	.89257	.78086	.89457	.78446	18
44+11	.88649	.77000	.88855	.77366	.89059	.77730	.89261	.78092	.89460	.78452	16
46	.88652	.77006	.88858	.77372	.89062	.77736	.89264	.78098	.89464	.78458	14
48+12	9.88656	0.77012	9.88862	0.77378	9.89066	0.77742	9.89267	0.78104	9.89467	0.78464	12
50	.88659	.77018	.88865	.77384	.89069	.77748	.89271	.78110	.89470	.78470	10
52+13	.88663	.77024	.88869	.77390	.89072	.77754	.89274	.78116	.89474	.78476	8
54	.88666	.77030	.88872	.77396	.89076	.77760	.89277	.78122	.89477	.78482	6
56+14	9.88670	0.77036	9.88876	0.77403	9.89079	0.77766	9.89281	0.78128	9.89480	0.78488	4
58	9.88673	0.77043	9.88879	0.77409	9.89083	0.77772	9.89284	0.78134	.9.89484	0.78494	2
	15h 49m		15h 47m		15h 45m		15h 43m		15h 41m		

s ′	8h 11m 122° 30′ Log. Hav.	Nat. Hav.	8h 13m 123° 0′ Log. Hav.	Nat. Hav.	8h 15m 123° 30′ Log. Hav.	Nat. Hav.	8h 17m 124° 0′ Log. Hav.	Nat. Hav.	8h 19m 124° 30′ Log. Hav.	Nat. Hav.	s
0+15	9.88677	0.77049	9.88882	0.77415	9.89086	0.77779	9.89287	0.78140	9.89487	0.78500	60
2	.88680	.77055	.88886	.77412	.89089	.77785	.89291	.78146	.89490	.78506	58
4+16	.88683	.77061	.88889	.77427	.89093	.77791	.89294	.78152	.89493	.78512	56
6	.88687	.77067	.88893	.77433	.89096	.77797	.89298	.78158	.89497	.78518	54
8+17	9.88690	0.77073	9.88896	0.77439	9.89099	0.77803	9.89301	0.78164	9.89500	0.78524	52
10	.88694	.77079	.88899	.77445	.89102	.77809	.89304	.78170	.89503	.78530	50
12+18	.88697	.77085	.88903	.77451	.89106	.77815	.89308	.78176	.89507	.78536	48
14	.88701	.77092	.88906	.77457	.89110	.77821	.89311	.78182	.89510	.78542	46
16+19	9.88704	0.77098	9.88910	0.77463	9.89113	0.77827	9.89314	0.78188	9.89513	0.78548	44
18	.88708	.77104	.88913	.77469	.89116	.77833	.89318	.78194	.89517	.78554	42
20+20	.88711	.77110	.88916	.77475	.89120	.77839	.89321	.78200	.89520	.78560	40
22	.88714	.77116	.88920	.77482	.89123	.77845	.89324	.78206	.89523	.78566	38
24+21	9.88718	0.77122	9.88923	0.77488	9.89126	0.77851	9.89328	0.78212	9.89527	0.78572	36
26	.88721	.77128	.88927	.77494	.89130	.77857	.89331	.78218	.89530	.78577	34
28+22	.88725	.77134	.88930	.77500	.89133	.77863	.89334	.78224	.89533	.78583	32
30	.88728	.77140	.88933	.77506	.89137	.77869	.89338	.78230	.89536	.78589	30
32+23	9.88732	0.77147	9.88937	0.77512	9.89140	0.77875	9.89341	0.78236	9.89540	0.78595	28
34	.88735	.77153	.88940	.77518	.89143	.77881	.89344	.78242	.89543	.78601	26
36+24	.88739	.77159	.88944	.77524	.89147	.77887	.89348	.78248	.89546	.78607	24
38	.88742	.77165	.88947	.77530	.89150	.77893	.89351	.78254	.89550	.78613	22
40+25	9.88745	0.77171	9.88950	0.77536	9.89153	0.77899	9.89354	0.78260	9.89553	0.78619	20
42	.88749	.77177	.88954	.77542	.89157	.77905	.89358	.78266	.89556	.78625	18
44+26	.88752	.77183	.88957	.77548	.89160	.77911	.89361	.78272	.89559	.78531	16
46	.88756	.77189	.88961	.77554	.89163	.77917	.89364	.78278	.89563	.78637	14
48+27	9.88759	0.77195	9.88964	0.77560	9.89167	0.77923	9.89368	0.78284	9.89566	0.78643	12
50	.88763	.77201	.88967	.77567	.89170	.77929	.89371	.78290	.89569	.78649	10
52+28	.88766	.77208	.88971	.77573	.89174	.77936	.89374	.78296	.89573	.78655	8
54	.88769	.77214	.88974	.77579	.89177	.77942	.89378	.78302	.89576	.78661	6
56+29	9.88773	0.77220	9.88978	0.77585	9.89180	0.77948	9.89381	0.78308	9.89579	0.78667	4
58	.88776	.77226	.88981	.77591	.89184	.77954	.89384	.78314	.89583	.78673	2
60+30	9.88780	0.77232	9.88984	0.77597	9.89187	0.77960	9.89387	0.78320	9.89586	0.78679	0
	15h 48m		15h 46m		15h 44m		15h 42m		15h 40m		

TABLE 34.

Haversines.

s ′	8h 20m 125° 0′ Log. Hav.	Nat. Hav.	8h 22m 125° 30′ Log. Hav.	Nat. Hav.	8h 24m 126° 0′ Log. Hav.	Nat. Hav.	8h 26m 126° 30′ Log. Hav.	Nat. Hav.	8h 28m 127° 0′ Log. Hav.	Nat. Hav.	s
0 0	9.89586	0.78679	9.89782	0.79035	9.89976	0.79389	9.90168	0.79741	9.90358	0.80091	60
2	.89589	.78685	.89785	.79041	.89979	.79395	.90171	.79747	.90361	.80097	58
4+ 1	.89592	.78691	.89789	.79047	.89983	.79401	.90175	.79753	.90365	.80102	56
6	.89596	.78697	.89792	.79053	.89986	.79407	.90178	.79759	.90368	.80108	54
8+ 2	9.89599	0.78703	9.89795	0.79059	9.89989	0.79413	9.90181	0.79765	9.90371	0.80114	52
10	.89602	.78709	.89798	.79065	.89992	.79419	.90184	.79770	.90374	.80120	50
12+ 3	.89606	.78715	.89802	.79071	.89995	.79425	.90187	.79776	.90377	.80126	48
14	.89609	.78721	.89805	.79077	.89999	.79430	.90191	.79782	.90380	.80131	46
16+ 4	9.89612	0.78726	9.89808	0.79082	9.90002	0.79436	9.90194	0.79788	9.90383	0.80137	44
18	.89615	.78732	.89811	.79088	.90005	.79442	.90197	.79794	.90387	.80143	42
20+ 5	.89619	.78738	.89815	.79094	.90008	.79448	.90200	.79800	.90390	.80149	40
22	.89622	.78744	.89818	.79100	.90012	.79454	.90203	.79805	.90393	.80155	38
24+ 6	9.89625	0.78750	9.89821	0.79106	9.90015	0.79460	9.90206	0.79811	9.90396	0.80160	36
26	.89628	.78756	.89824	.79112	.90018	.79466	.90210	.79817	.90399	.80166	34
28+ 7	.89632	.78762	.89828	.79118	.90021	.79471	.90213	.79823	.90402	.80172	32
30	.89635	.78768	.89831	.79124	.90024	.79477	.90216	.79829	.90405	.80178	30
32+ 8	9.89638	0.78774	9.89834	0.79130	9.90028	0.79483	9.90219	0.79835	9.90409	0.80184	28
34	.89642	.78780	.89837	.79136	.90031	.79489	.90222	.79840	.90412	.80189	26
36+ 9	.89645	.78786	.89840	.79142	.90034	.79495	.90225	.79846	.90415	.80195	24
38	.89648	.78792	.89844	.79148	.90037	.79501	.90229	.79852	.90418	.80201	22
40+10	9.89651	0.78798	9.89847	0.79153	9.90040	0.79507	9.90232	0.79858	9.90421	0.80207	20
42	.89655	.78804	.89850	.79159	.90044	.79513	.90235	.79864	.90425	.80213	18
44+11	.89658	.78810	.89853	.79165	.90047	.79519	.90238	.79870	.90428	.80218	16
46	.89661	.78816	.89857	.79171	.90050	.79524	.90241	.79875	.90431	.80224	14
48+12	9.89665	0.78822	9.89860	0.79177	9.90053	0.79530	9.90244	0.79881	9.90434	0.80230	12
50	.89668	.78828	.89863	.79183	.90056	.79536	.90248	.79887	.90437	.80236	10
52+13	.89671	.78834	.89866	.79189	.90060	.79542	.90251	.79893	.90440	.80242	8
54	.89674	.78839	.89870	.79195	.90063	.79548	.90254	.79899	.90443	.80247	6
56+14	9.89678	0.78845	9.89873	0.79201	9.90066	0.79554	9.90257	0.79905	9.90446	0.80253	4
58	9.89681	0.78851	9.89876	0.79207	9.90069	0.79560	9.90260	0.79910	9.90449	0.80259	2
	15h 39m		15h 37m		15h 35m		15h 33m		15h 31m		

s ′	8h 21m 125° 0′		8h 23m 125° 30′		8h 25m 126° 0′		8h 27m 126° 30′		8h 29m 127° 0′		s
0+15	9.89684	0.78857	9.89879	0.79212	9.90072	0.79565	9.90264	0.79916	9.90452	0.80265	60
2	.89687	.78863	.89883	.79218	.90076	.79571	.90267	.79922	.90456	.80270	58
4+16	.89691	.78869	.89886	.79224	.90079	.79577	.90270	.79928	.90459	.80276	56
6	.89694	.78875	.89889	.79230	.90082	.79583	.90273	.79934	.90462	.80282	54
8+17	9.89697	0.78881	9.89892	0.79236	9.90085	0.79589	9.90276	0.79940	9.90465	0.80288	52
10	.89701	.78887	.89896	.79242	.90088	.79595	.90279	.79945	.90468	.80294	50
12+18	.89704	.78893	.89899	.79248	.90092	.79601	.90282	.79951	.90471	.80299	48
14	.89707	.78899	.89902	.79254	.90095	.79607	.90286	.79957	.90475	.80305	46
16+19	9.89710	0.78905	9.89905	0.79260	9.90098	0.79612	9.90289	0.79963	9.90478	0.80311	44
18	.89714	.78911	.89908	.79266	.90101	.79618	.90292	.79969	.90481	.80317	42
20+20	.89717	.78917	.89912	.79271	.90104	.79624	.90295	.79974	.90484	.80323	40
22	.89720	.78923	.89915	.79277	.90108	.79630	.90298	.79980	.90487	.80328	38
24+21	9.89723	0.78928	9.89918	0.79283	9.90111	0.79636	9.90301	0.79986	9.90490	0.80334	36
26	.89727	.78934	.89921	.79289	.90114	.79642	.90305	.79992	.90493	.80340	34
28+22	.89730	.78940	.89925	.79295	.90117	.79648	.90308	.79998	.90496	.80346	32
30	.89733	.78946	.89928	.79301	.90120	.79653	.90311	.80004	.90499	.80351	30
32+23	9.89736	0.78952	9.89931	0.79307	9.90124	0.79659	9.90314	0.80009	9.90503	0.80357	28
34	.89740	.78958	.89934	.79313	.90127	.79665	.90317	.80015	.90506	.80363	26
36+24	.89743	.78964	.89938	.79319	.90130	.79671	.90320	.80021	.90509	.80369	24
38	.89746	.78970	.89941	.79325	.90133	.79677	.90324	.80027	.90512	.80375	22
40+25	9.89749	0.78976	9.89944	0.79330	9.90136	0.79683	9.90327	0.80033	9.90515	0.80380	20
42	.89753	.78982	.89947	.79336	.90140	.79688	.90330	.80038	.90518	.80386	18
44+26	.89756	.78988	.89950	.79342	.90143	.79694	.90333	.80044	.90521	.80392	16
46	.89759	.78994	.89954	.79348	.90146	.79700	.90336	.80050	.90524	.80398	14
48+27	9.89763	0.79000	9.89957	0.79354	9.90149	0.79706	9.90339	0.80056	9.90527	0.80403	12
50	.89766	.79006	.89960	.79360	.90152	.79712	.90342	.80062	.90531	.80409	10
52+28	.89769	.79011	.89963	.79366	.90356	.79718	.90346	.80068	.90534	.80415	8
54	.89772	.79017	.89966	.79372	.90159	.79724	.90349	.80073	.90537	.80421	6
56+29	9.89776	0.79023	9.89970	0.79377	9.90162	0.79729	9.90352	0.80079	9.90540	0.80427	4
58	.89779	.79029	.89973	.79383	.90165	.79735	.90355	.80085	.90543	.80432	2
60+30	9.89782	0.79035	9.89976	0.79389	9.90168	0.79741	9.90358	0.80091	9.90546	0.80438	0
	15h 38m		15h 36m		15h 34m		15h 32m		15h 30m		

TABLE 34.

Haversines.

s ′	8h 30m 127° 30′ Log. Hav.	Nat. Hav.	8h 32m 128° 0′ Log. Hav.	Nat. Hav.	8h 34m 128° 30′ Log. Hav.	Nat. Hav.	8h 36m 129° 0′ Log. Hav.	Nat. Hav.	8h 38m 129° 30′ Log. Hav.	Nat. Hav.	s
0 0	9.90546	0.80438	9.90732	0.80783	9.90916	0.81126	9.91098	0.81466	9.91277	0.81804	60
2	.90549	.80444	.90735	.80789	.90919	.81131	.91101	.81472	.91280	.81810	58
4+ 1	.90552	.80450	.90738	.80795	.90922	.81137	.91104	.81477	.91283	.81815	56
6	.90556	.80455	.90741	.80800	.90925	.81143	.91107	.81483	.91286	.81821	54
8+ 2	9.90559	0.80461	9.90744	0.80806	9.90928	0.81148	9.91110	0.81489	9.91289	0.81826	52
10	.90562	.80467	.90747	.80812	.90931	.81154	.91113	.81494	.91292	.81832	50
12+ 3	.90565	.80473	.90751	.80817	.90934	.81160	.91116	.81500	.91295	.81838	48
14	.90568	.80478	.90754	.80823	.90937	.81165	.91119	.81506	.91298	.81843	46
16+ 4	9.90571	0.80484	9.90757	0.80829	9.90940	0.81171	9.91122	0.81511	9.91301	0.81849	44
18	.90574	.80490	.90760	.80835	.90943	.81177	.91125	.81517	.91304	.81854	42
20+ 5	.90577	.80496	.90763	.80840	.90946	.81183	.91128	.81523	.91307	.81860	40
22	.90580	.80502	.90766	.80846	.90949	.81188	.91131	.81528	.91310	.81866	38
24+ 6	9.90584	0.80507	9.90769	0.80852	9.90952	0.81194	9.91134	0.81534	9.91313	0.81871	36
26	.90587	.80513	.90772	.80858	.90955	.81200	.91137	.81539	.91316	.81877	34
28+ 7	.90590	.80519	.90775	.80863	.90958	.81205	.91140	.81545	.91319	.81882	32
30	.90593	.80525	.90778	.80869	.90962	.81211	.91143	.81551	.91322	.81888	30
32+ 8	9.90596	0.80530	9.90781	0.80875	9.90965	0.81217	9.91146	0.81556	9.91325	0.81894	28
34	.90599	.80536	.90784	.80880	.90968	.81222	.91149	.81562	.91328	.81899	26
36+ 9	.90602	.80542	.90787	.80886	.90971	.81228	.91152	.81568	.91331	.81905	24
38	.90605	.80548	.90790	.80892	.90974	.81234	.91155	.81573	.91334	.81910	22
40+10	9.90608	0.80553	9.90794	0.80898	9.90977	0.81239	9.91158	0.81579	9.91337	0.81916	20
42	.90611	.80559	.90797	.80903	.90980	.81245	.91161	.81585	.91340	.81922	18
44+11	.90615	.80565	.90800	.80909	.90983	.81251	.91164	.81590	.91343	.81927	16
46	.90618	.80571	.90803	.80915	.90986	.81256	.91167	.81596	.91346	.81933	14
48+12	9.90621	0.80576	9.90806	0.80920	9.90989	0.81262	9.91170	0.81601	9.91349	0.81938	12
50	.90624	.80582	.90809	.80926	.90992	.81268	.91173	.81607	.91352	.81944	10
52+13	.90627	.80588	.90812	.80932	.90995	.81273	.91176	.81613	.91355	.81950	8
54	.90630	.80594	.90815	.80938	.90998	.81279	.91179	.81618	.91358	.81955	6
56+14	9.90633	0.80599	9.90818	0.80943	9.91001	0.81285	9.91182	0.81624	9.91361	0.81961	4
58	9.90636	0.80605	9.90821	0.80949	9.91004	0.81291	9.91185	0.81630	9.91364	0.81966	2
	15h 29m		15h 27m		15h 25m		15h 23m		15h 21m		

s ′	8h 31m 127° 30′ Log. Hav.	Nat. Hav.	8h 33m 128° 0′ Log. Hav.	Nat. Hav.	8h 35m 128° 30′ Log. Hav.	Nat. Hav.	8h 37m 129° 0′ Log. Hav.	Nat. Hav.	8h 39m 129° 30′ Log. Hav.	Nat. Hav.	s
0+15	9.90639	0.80611	9.90824	0.80955	9.91007	0.81296	9.91188	0.81635	9.91367	0.81972	60
2	.90642	.80617	.90827	.80960	.91010	.81302	.91191	.81641	.91369	.81978	58
4+16	.90646	.80622	.90830	.80966	.91013	.81308	.91194	.81647	.91372	.81983	56
6	.90646	.80628	.90833	.80972	.91016	.81313	.91197	.81652	.91375	.81989	54
8+17	9.90652	0.80634	9.90836	0.80978	9.91019	0.81319	9.91200	0.81658	9.91378	0.81994	52
10	.90655	.80640	.90840	.80983	.91022	.81325	.91203	.81663	.91381	.82000	50
12+18	.90658	.80645	.90843	.80989	.91025	.81330	.91206	.81669	.91384	.82005	48
14	.90661	.80651	.90846	.80995	.91028	.81336	.91209	.81675	.91387	.82011	46
16+19	9.90664	0.80657	9.90849	0.81000	9.91031	0.81342	9.91212	0.81680	9.91390	0.82017	44
18	.90667	.80663	.90852	.81006	.91034	.81347	.91215	.81686	.91393	.82022	42
20+20	.90670	.80668	.90855	.81012	.91037	.81353	.91218	.81692	.91396	.82028	40
22	.90673	.80674	.90858	.81017	.91040	.81359	.91221	.81697	.91399	.82033	38
24+21	9.90676	0.80680	9.90861	0.81023	9.91043	0.81364	9.91224	0.81703	9.91402	0.82039	36
26	.90680	.80686	.90864	.81029	.91046	.81370	.91227	.81708	.91405	.82045	34
28+22	.90683	.80691	.90867	.81035	.91049	.81376	.91230	.81714	.91408	.82050	32
30	.90686	.80697	.90870	.81040	.91052	.81381	.91233	.81720	.91411	.82056	30
32+23	9.90689	0.80703	9.90873	0.81046	9.91055	0.81387	9.91236	0.81725	9.91414	0.82061	28
34	.90692	.80709	.90876	.81052	.91058	.81392	.91239	.81731	.91417	.82067	26
36+24	.90695	.80714	.90879	.81057	.91061	.81398	.91242	.81737	.91420	.82072	24
38	.90698	.80720	.90882	.81063	.91064	.81404	.91245	.81742	.91423	.82078	22
40+25	9.90701	0.80726	9.90885	0.81068	9.91067	0.81409	9.91248	0.81748	9.91426	0.82084	20
42	.90704	.80731	.90888	.81074	.91071	.81415	.91251	.81753	.91429	.82089	18
44+26	.90707	.80737	.90892	.81080	.91074	.81421	.91254	.81759	.91432	.82095	16
46	.90710	.80743	.90895	.81086	.91077	.81426	.91257	.81765	.91435	.82100	14
48+27	9.90714	0.80749	9.90898	0.81092	9.91080	0.81432	9.91260	0.81770	9.91437	0.82106	12
50	.90717	.80754	.90901	.81097	.91083	.81438	.91263	.81776	.91440	.82112	10
52+28	.90720	.80760	.90904	.81103	.91086	.81443	.91265	.81781	.91443	.82117	8
54	.90723	.80766	.90907	.81109	.91089	.81449	.91268	.81787	.91446	.82123	6
56+29	9.90726	0.80772	9.90910	0.81114	9.91092	0.81455	9.91271	0.81793	9.91449	0.82128	4
58	.90729	.80777	.90913	.81120	.91095	.81460	.91274	.81798	.91452	.82134	2
60+30	9.90732	0.80783	9.90916	0.81126	9.91098	0.81466	9.91277	0.81804	9.91455	0.82139	0
	15h 28m		15h 26m		15h 24m		15h 22m		15h 20m		

TABLE 34.

Haversines.

s ′	8h 40m 130° 0′ Log. Hav.	Nat. Hav.	8h 42m 130° 30′ Log. Hav.	Nat. Hav.	8h 44m 131° 0′ Log. Hav.	Nat. Hav.	8h 46m 131° 30′ Log. Hav.	Nat. Hav.	8h 48m 132° 0′ Log. Hav.	Nat. Hav.	s
0 0	9.91455	0.82139	9.91631	0.82472	9.91805	0.82803	9.91976	0.83131	9.92146	0.83457	60
2	.91458	.82145	.91634	.82478	.91807	.82808	.91979	.83136	.92149	.83462	58
4+ 1	.91461	.82151	.91637	.82483	.91810	.82814	.91982	.83142	.92152	.83467	56
6	.91464	.82156	.91640	.82489	.91813	.82819	.91985	.83147	.92154	.83473	54
8+ 2	9.91467	0.82162	9.91643	0.82495	9.91816	0.82825	9.91988	0.83153	9.92157	0.83478	52
10	.91470	.82167	.91645	.82500	.91819	.82830	.91991	.83158	.92160	.83484	50
12+ 3	.91473	.82173	.91648	.82506	.91822	.82836	.91993	.83164	.92163	.83489	48
14	.91476	.82178	.91651	.82511	.91825	.82841	.91996	.83169	.92166	.83494	46
16+ 4	9.91479	0.82184	9.91654	0.82517	9.91828	0.82847	9.91999	0.83175	9.92169	0.83500	44
18	.91482	.82189	.91657	.82522	.91830	.82852	.92002	.83180	.92171	.83505	42
20+ 5	.91485	.82195	.91660	.82528	.91833	.82858	.92005	.83185	.92174	.83511	40
22	.91488	.82200	.91663	.82533	.91836	.82863	.92008	.83191	.92177	.83516	38
24+ 6	9.91490	0.82206	9.91666	0.82539	9.91839	0.82869	9.92010	0.83196	9.92180	0.83521	36
26	.91493	.82212	.91669	.82544	.91842	.82874	.92013	.83202	.92183	.83527	34
28+ 7	.91496	.82217	.91672	.82550	.91845	.82880	.92016	.83207	.92185	.83532	32
30	.91499	.82223	.91674	.82555	.91848	.82885	.92019	.83213	.92188	.83538	30
32+ 8	9.91502	0.82228	9.91677	0.82561	9.91851	0.82891	9.92022	0.83218	9.92191	0.83543	28
34	.91505	.82234	.91680	.82566	.91853	.82896	.92025	.83224	.92194	.83548	26
36+ 9	.91508	.82240	.91683	.82572	.91856	.82902	.92027	.83229	.92197	.83554	24
38	.91511	.82245	.91686	.82577	.91859	.82907	.92030	.83234	.92199	.83559	22
40+10	9.91514	0.82251	9.91689	0.82583	9.91862	0.82913	9.92033	0.83240	9.92202	0.83564	20
42	.91517	.82256	.91692	.82588	.91865	.82918	.92036	.83245	.92205	.83570	18
44+11	.91520	.82262	.91695	.82594	.91868	.82924	.92039	.83251	.92208	.83575	16
46	.91523	.82267	.91698	.82599	.91871	.82929	.92042	.83256	.92211	.83581	14
48+12	9.91526	0.82273	9.91701	0.82605	9.91874	0.82934	9.92044	0.83262	9.92213	0.83586	12
50	.91529	.82278	.91703	.82610	.91876	.82940	.92047	.83267	.92216	.83591	10
52+13	.91532	.82284	.91706	.82616	.91879	.82945	.92050	.83272	.92219	.83597	8
54	.91534	.82290	.91709	.82621	.91882	.82951	.92053	.83278	.92222	.83602	6
56+14	9.91537	0.82295	9.91712	0.82627	9.91885	0.82956	9.92056	0.83283	9.92225	0.83608	4
58	9.91540	0.82301	9.91715	0.82632	9.91888	0.82962	9.92059	0.83289	9.92227	0.83613	2
	15h 19m		15h 17m		15h 15m		15h 13m		15h 11m		

s ′	8h 41m 130° 0′		8h 43m 130° 30′		8h 45m 131° 0′		8h 47m 131° 30:		8h 49m 132° 0′		s
0+15	9.91543	0.82306	9.91718	0.82638	9.91891	0.82967	9.92061	0.83294	9.92230	0.83618	60
2	.91546	.82312	.91721	.82644	.91894	.82973	.92064	.83300	.92233	.83624	58
4+16	.91549	.82317	.91724	.82649	.91896	.82978	.92067	.83305	.92236	.83629	56
6	.91552	.82323	.91727	.82655	.91899	.82984	.92070	.83310	.92239	.83635	54
8+17	9.91555	0.82328	9.91730	0.82660	9.91902	0.82989	9.92073	0.83316	9.92241	0.83640	52
10	.91558	.82334	.91732	.82666	.91905	.82995	.92076	.83321	.92244	.83645	50
12+18	.91561	.82339	.91735	.82671	.91908	.83000	.92078	.83327	.92247	.83651	48
14	.91564	.82345	.91738	.82677	.91911	.83006	.92081	.83332	.92250	.83656	46
16+19	9.91567	0.82351	9.91741	0.82682	9.91914	0.83011	9.92084	0.83337	9.92253	0.83661	44
18	.91570	.82356	.91744	.82688	.91916	.83016	.92087	.83343	.92255	.83667	42
20+20	.91573	.82362	.91747	.82693	.91919	.83022	.92090	.83348	.92258	.83672	40
22	.91575	.82367	.91750	.82699	.91922	.83027	.92093	.83354	.92261	.83678	38
24+21	9.91578	0.82373	9.91753	0.82704	9.91925	0.83033	9.92095	0.83359	9.92264	0.83683	36
26	.91581	.82378	.91756	.82710	.91928	.83038	.92098	.83365	.92266	.83688	34
28+22	.91584	.82384	.91758	.82715	.91931	.83044	.92101	.83370	.92269	.83694	32
30	.91587	.82389	.91761	.82721	.91934	.83049	.92104	.83375	.92272	.83699	30
32+23	9.91590	0.82395	9.91764	0.82726	9.91936	0.83055	9.92107	0.83381	9.92275	0.83704	28
34	.91593	.82400	.91767	.82732	.91939	.83060	.92109	.83386	.92278	.83710	26
36+24	.91596	.82406	.91770	.82737	.91942	.83066	.92112	.83392	.92280	.83715	24
38	.91599	.82412	.91773	.82743	.91945	.83071	.92115	.83397	.92283	.83720	22
40+25	9.91602	0.82417	9.91776	0.82748	9.91948	0.83077	9.92118	0.83402	9.92286	0.83726	20
42	.91605	.82423	.91779	.82754	.91951	.83082	.92121	.83408	.92289	.83731	18
44+26	.91608	.82428	.91782	.82759	.91954	.83087	.92124	.83413	.92292	.83737	16
46	.91610	.82434	.91784	.82765	.91956	.83093	.92126	.83419	.92294	.83742	14
48+27	9.91613	0.82439	9.91787	0.82770	9.91959	0.83098	9.92129	0.83424	9.92297	0.83747	12
50	.91616	.82445	.91790	.82776	.91962	.83104	.92132	.83430	.92300	.83753	10
52+28	.91619	.82450	.91793	.82781	.91965	.83109	.92135	.83435	.92303	.83758	8
54	.91622	.82456	.91796	.82786	.91968	.83115	.92138	.83440	.92305	.83763	6
56+29	9.91625	0.82461	9.91799	0.82792	9.91971	0.83120	9.92140	0.83446	9.92308	0.83769	4
58	.91628	.82467	.91802	.82797	.91973	.83126	.92143	.83451	.92311	.83774	2
60+30	9.91631	0.82472	9.91805	0.82803	9.91976	0.83131	9.92146	0.83457	9.92314	0.83780	0
	15h 18m		15h 16m		15h 14m		15h 12m		15h 10m		

Haversines.

s ′	8h 50m 132° 30′ Log. Hav.	Nat. Hav.	8h 52m 133° 0′ Log. Hav.	Nat. Hav.	8h 54m 133° 30′ Log. Hav.	Nat. Hav.	8h 56m 134° 0′ Log. Hav.	Nat. Hav.	8h 58m 134° 30′ Log. Hav.	Nat. Hav.	s
0 0	9.92314	0.83780	9.92480	0.84100	9.92643	0.84418	9.92805	0.84733	9.92965	0.85045	60
2	.92317	.83785	.92482	.84105	.92646	.84423	.92808	.84738	.92968	.85051	58
4+ 1	.92319	.83790	.92485	.84111	.92649	.84428	.92811	.84743	.92970	.85056	56
6	.92322	.83796	.92488	.84116	.92652	.84434	.92813	.84749	.92973	.85061	54
8+ 2	9.92325	0.83801	9.92491	0.84121	9.92654	0.84439	9.92816	0.84754	9.92975	0.85066	52
10	.92328	.83806	.92493	.84127	.92657	.84444	.92819	.84759	.92978	.85071	50
12+ 3	.92330	.83812	.92496	.84132	.92660	.84449	.92821	.84764	.92981	.85077	48
14	.92333	.83817	.92499	.84137	.92662	.84455	.92824	.84770	.92984	.85082	46
16+ 4	9.92336	0.83822	9.92502	0.84142	9 92665	0.84460	9.92827	0.84775	9.92986	0.85087	44
18	.92339	.83828	.92504	.84148	.92668	.84465	.92829	.84780	.92989	.85092	42
20+ 5	.92342	.83833	.92507	.84153	.92670	.84470	.92832	.84785	.92992	.85097	40
22	.92344	.83838	.92510	.84158	.92673	.84476	.92835	.84790	.92994	.85102	38
24+ 6	9.92347	0.83844	9.92512	0.84164	9.92676	0.84481	9.92837	0.84796	9.92997	0.85108	36
26	.92350	.83849	.92515	.84169	.92679	.84486	.92840	.84801	.93001	.85113	34
28+ 7	.92353	.83855	.92518	.84174	.92681	.84492	.92843	.84806	.93002	.85118	32
30	.92355	.83860	.92521	.84180	.92684	.84497	.92845	.84811	.93005	.85123	30
32+ 8	9.92358	0.83865	9.92523	0.84185	9.92687	0.84502	9.92848	0.84817	9.93007	0.85128	28
34	.92361	.83871	.92526	.84190	.92689	.84507	.92851	.84822	.93010	.85134	26
36+ 9	.92364	.83876	.92529	.84196	.92692	.84513	.92853	.84827	.93013	.85139	24
38	.92366	.83881	.92532	.84201	.92695	.84518	.92856	.84832	.93015	.85144	22
40+10	9.92369	0.83887	9.92534	0.84206	9.92698	0.84523	9.92859	0.84837	9.93018	0.85149	20
42	.92372	.83892	.92537	.84211	.92700	.84528	.92861	.84843	.93021	.85154	18
44+11	.92375	.83897	.92540	.84217	.92703	.84534	.92864	.84848	.93023	.85159	16
46	.92378	.83903	.92543	.84222	.92706	.84539	.92867	.84853	.93026	.85165	14
48+12	9.92380	0.83908	9.92545	0.84227	9.92708	0.84544	9.92869	0.84858	9.93029	0.85170	12
50	.92383	.83913	.92548	.84233	.92711	.84549	.92872	.84863	.93031	.85175	10
52+13	.92386	.83919	.92551	.84238	.92714	.84555	.92875	.84869	.93034	.85180	8
54	.92389	.83924	.92554	.84243	.92716	.84560	.92877	.84874	.93036	.85185	6
56+14	9.92391	0.83929	9.92556	0.84249	9.92719	0.84565	9.92880	0.84879	9.93039	0.85190	4
58	9.92394	0.83935	9.92559	0.84254	9.92722	0.84570	9.92883	0.84884	9.93042	0.85196	2
	15h 9m		15h 7m		15h 5m		15h 3m		15h 1m		

s ′	8h 51m 132° 30′ Log. Hav.	Nat. Hav.	8h 53m 133° 0′ Log. Hav.	Nat. Hav.	8h 55m 133° 30′ Log. Hav.	Nat. Hav.	8h 57m 134° 0′ Log. Hav.	Nat. Hav.	8h 59m 134° 30′ Log. Hav.	Nat. Hav.	s
0+15	9.92397	0.83940	9.92562	0.84259	9.92725	0.84576	9.92885	0.84890	9.93044	0.85201	60
2	.92400	.83945	.92564	.84264	.92727	.84581	.92888	.84895	.93047	.85206	58
4+16	.92402	.83951	.92567	.84270	.92730	.84586	.92891	.84900	.93050	.85211	56
6	.92405	.83956	.92570	.84275	.92733	.84591	.92893	.84905	.93052	.85216	54
8+17	9.92408	0.83961	9.92573	0.84280	9.92735	0.84597	9.92896	0.84910	9.93055	0.85221	52
10	.92411	.83967	.92575	.84286	.92738	.84602	.92899	.84916	.93057	.85227	50
12+18	.92413	.83972	.92578	.84291	.92741	.84607	.92901	.84921	.93060	.85232	48
14	.92416	.83977	.92581	.84296	.92743	.84612	.92904	.84926	.93063	.85237	46
16+19	9.92419	0.83983	9.92584	0.84302	9.92746	0.84618	9.92907	0.84931	9.93065	0.85242	44
18	.92422	.83988	.92586	.84307	.92749	.84623	.92909	.84936	.93068	.85247	42
20+20	.92425	.83993	.92589	.84312	.92751	.84628	.92912	.84942	.93071	.85252	40
22	.92427	.83999	.92592	.84317	.92754	.84633	.92915	.84947	.93073	.85258	38
24+21	9.92430	0.84004	9.92594	0.84323	9.92757	0.84639	9.92917	0.84952	9.93076	0.85263	36
26	.92433	.84009	.92597	.84328	.92760	.84644	.92920	.84957	.93079	.85268	34
28+22	.92436	.84015	.92600	.84333	.92762	.84649	.92923	.84962	.93081	.85273	32
30	.92438	.84020	.92603	.84339	.92765	.84654	.92925	.84968	.93084	.85278	30
32+23	9.92441	0.84025	9.92605	0.84344	9.92768	0.84660	9.92928	0.84973	9.93086	0.85283	28
34	.92444	.84031	.92608	.84349	.92770	.84665	.92931	.84978	.93089	.85288	26
36+24	.92447	.84036	.92611	.84354	.92773	.84670	.92933	.84983	.93092	.85294	24
38	.92449	.84041	.92613	.84360	.92776	.84675	.92936	.84988	.93094	.85299	22
40+25	9.92452	0.84047	9.92616	0.84365	9.92778	0.84681	9.92939	0.84994	9.93097	0.85304	20
42	.92455	.84052	.92619	.84370	.92781	.84686	.92941	.84999	.93100	.85309	18
44+26	.92458	.84057	.92622	.84376	.92784	.84691	.92944	.85004	.93102	.85314	16
46	.92460	.84063	.92624	.84381	.92786	.84696	.92947	.85009	.93105	.85319	14
48+27	9.92463	0.84068	9.92627	0.84386	9.92789	0.84702	9.92949	0.85014	9.93107	0.85324	12
50	.92466	.84073	.92630	.84391	.92792	.84707	.92952	.85020	.93110	.85330	10
52+28	.92469	.84079	.92633	.84397	.92794	.84712	.92955	.85025	.93113	.85335	8
54	.92471	.84084	.92635	.84402	.92797	.84717	.92957	.85030	.93115	.85340	6
56+29	9.92474	0.84089	9.92638	0.84407	9.92800	0.84722	9.92960	0.85035	9.93118	0.85345	4
58	.92477	.84095	.92641	.84412	.92802	.84728	.92962	.85040	.93120	.85350	2
60+30	9.92480	0.84100	9.92643	0.84418	9.92805	0.84733	9.92965	0.85045	9.93123	0.85355	0
	15h 8m		15h 6m		15h 4m		15h 2m		15h 0m		

TABLE 34.

Haversines.

s	′	9h 0m	135°	9h 4m	136°	9h 8m	137°	9h 12m	138°	9h 16m	139°	s
		Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	0	9.93123	**0.85355**	9.93433	**0.85967**	9.93736	**0.86568**	9.94030	**0.87157**	9.94318	**0.87735**	60
4	1	.93128	**.85366**	.93438	**.85977**	.93741	**.86578**	.94035	**.87167**	.94322	**.87745**	56
8	2	.93134	**.85376**	.93443	**.85987**	.93746	**.86588**	.94040	**.87177**	.94327	**.87755**	52
12	3	.93139	**.85386**	.93448	**.85997**	.93751	**.86597**	.94045	**.87186**	.94332	**.87764**	48
16	4	9.93144	**0.85396**	9.93454	**0.86007**	9.93755	**0.86607**	9.94050	**0.87196**	9.94336	**0.87774**	44
20	5	.93149	**.85407**	.93459	**.86017**	.93760	**.86617**	.94055	**.87206**	.94341	**.87783**	40
24	6	.93154	**.85417**	.93464	**.86028**	.93765	**.86627**	.94059	**.87216**	.94346	**.87793**	36
28	7	.93160	**.85427**	.93469	**.86038**	.93770	**.86637**	.94064	**.87225**	.94351	**.87802**	32
32	8	9.93165	**0.85438**	9.93474	**0.86048**	9.93775	**0.86647**	9.94069	**0.87235**	9.94355	**0.87812**	28
36	9	.93170	**.85448**	.93479	**.86058**	.93780	**.86657**	.94074	**.87245**	.94360	**.87821**	24
40	10	.93175	**.85458**	.93484	**.86068**	.93785	**.86667**	.94079	**.87254**	.94365	**.87831**	20
44	11	.93181	**.85468**	.93489	**.86078**	.93790	**.86677**	.94084	**.87264**	.94369	**.87840**	16
48	12	9.93186	**0.85479**	9.93494	**0.86088**	9.93795	**0.86686**	9.94088	**0.87274**	9.94374	**0.87850**	12
52	13	.93191	**.85489**	.93499	**.86098**	.93800	**.86696**	.94093	**.87283**	.94379	**.87859**	8
56	14	9.93196	**0.85499**	9.93504	**0.86108**	9.93805	**0.86706**	9.94098	**0.87293**	9.94383	**0.87869**	4
		14h 59m		14h 55m		14h 51m		14h 47m		14h 43m		

s	′	9h 1m	135°	9h 5m	136°	9h 9m	137°	9h 13m	138°	9h 17m	139°	s
0	15	9.93201	**0.85509**	9.93509	**0.86118**	9.93810	**0.86716**	9.94103	**0.87303**	9.94388	**0.87878**	60
4	16	.93207	**.85520**	.93515	**.86128**	.93815	**.86726**	.94108	**.87313**	.94393	**.87888**	56
8	17	.93212	**.85530**	.93520	**.86138**	.93820	**.86736**	.94112	**.87322**	.94398	**.87897**	52
12	18	.93217	**.85540**	.93525	**.86148**	.93825	**.86746**	.94117	**.87332**	.94402	**.87907**	48
16	19	9.93222	**0.85550**	9.93530	**0.86158**	9.93830	**0.86756**	9.94122	**0.87342**	9.94407	**0.87916**	44
20	20	.93227	**.85560**	.93535	**.86168**	.93835	**.86765**	.94127	**.87351**	.94412	**.87926**	40
24	21	.93232	**.85571**	.93540	**.86178**	.93840	**.86775**	.94132	**.87361**	.94416	**.87935**	36
28	22	.93238	**.85581**	.93545	**.86189**	.93845	**.86785**	.94137	**.87371**	.94421	**.87945**	32
32	23	9.93243	**0.85591**	9.93550	**0.86199**	9.93849	**0.86795**	9.94141	**0.87380**	9.94426	**0.87954**	28
36	24	.93248	**.85601**	.93555	**.86209**	.93854	**.86805**	.94146	**.87390**	.94430	**.87964**	24
40	25	.93253	**.85612**	.93560	**.86219**	.93859	**.86815**	.94151	**.87400**	.94435	**.87973**	20
44	26	.93258	**.85622**	.93565	**.86229**	.93864	**.86825**	.94156	**.87409**	.94440	**.87983**	16
48	27	9.93264	**0.85632**	9.93570	**0.86239**	9.93869	**0.86834**	9.94161	**0.87419**	9.94444	**0.87992**	12
52	28	.93269	**.85642**	.93575	**.86249**	.93874	**.86844**	.94165	**.87428**	.94449	**.88001**	8
56	29	9.93274	**0.85652**	9.93580	**0.86259**	9.93879	**0.86854**	9.94170	**0.87438**	9.94454	**0.88011**	4
		14h 58m		14h 54m		14h 50m		14h 46m		14h 42m		

s	′	9h 2m	135°	9h 6m	136°	9h 10m	137°	9h 14m	138°	9h 18m	139°	s
0	30	9.93279	**0.85663**	9.93585	**0.86269**	9.93884	**0.86864**	9.94175	**0.87448**	9.94458	**0.88020**	60
4	31	.93284	**.85673**	.93590	**.86279**	.93889	**.86874**	.94180	**.87457**	.94463	**.88030**	56
8	32	.93289	**.85683**	.93595	**.86289**	.93894	**.86884**	.94184	**.87467**	.94468	**.88039**	52
12	33	.93295	**.85693**	.93600	**.86299**	.93899	**.86893**	.94189	**.87477**	.94472	**.88049**	48
16	34	9.93300	**0.85703**	9.93605	**0.86309**	9.93904	**0.86903**	9.94194	**0.87486**	9.94477	**0.88058**	44
20	35	.93305	**.85713**	.93611	**.86319**	.93908	**.86913**	.94199	**.87496**	.94482	**.88068**	40
24	36	.93310	**.85724**	.93616	**.86329**	.93913	**.86923**	.94204	**.87505**	.94486	**.88077**	36
28	37	.93315	**.85734**	.93621	**.86339**	.93918	**.86933**	.94208	**.87515**	.94491	**.88086**	32
32	38	9.93320	**0.85744**	9.93626	**0.86349**	9.93923	**0.86942**	9.94213	**0.87525**	9.94496	**0.88096**	28
36	39	.93326	**.85754**	.93631	**.86359**	.93928	**.86952**	.94218	**.87534**	.94500	**.88105**	24
40	40	.93331	**.85764**	.93636	**.86369**	.93933	**.86962**	.94223	**.87544**	.94505	**.88115**	20
44	41	.93336	**.85774**	.93641	**.86379**	.93938	**.86972**	.94227	**.87554**	.94509	**.88124**	16
48	42	9.93341	**0.85785**	9.93646	**0.86389**	9.93943	**0.86982**	9.94232	**0.87563**	9.94514	**0.88133**	12
52	43	.93346	**.85795**	.93651	**.86399**	.93948	**.86991**	.94237	**.87573**	.94519	**.88143**	8
56	44	9.93351	**0.85805**	9.93656	**0.86409**	9.93952	**0.87001**	9.94242	**0.87582**	9.94523	**0.88152**	4
		14h 57m		14h 53m		14h 49m		14h 45m		14h 41m		

s	′	9h 3m	135°	9h 7m	136°	9h 11m	137°	9h 15m	138°	9h 19m	139°	s
0	45	9.93356	**0.85815**	9.93661	**0.86419**	9.93957	**0.87011**	9.94246	**0.87592**	9.94528	**0.88162**	60
4	46	.93362	**.85825**	.93666	**.86429**	.93962	**.87021**	.94251	**.87602**	.94533	**.88171**	56
8	47	.93367	**.85835**	.93671	**.86438**	.93967	**.87030**	.94256	**.87611**	.94537	**.88180**	52
12	48	.93372	**.85846**	.93676	**.86448**	.93972	**.87040**	.94261	**.87621**	.94542	**.88190**	48
16	49	9.93377	**0.85856**	9.93681	**0.86458**	9.93977	**0.87050**	9.94265	**0.87630**	9.94546	**0.88199**	44
20	50	.93382	**.85866**	.93686	**.86468**	.93982	**.87060**	.94270	**.87640**	.94551	**.88209**	40
24	51	.93387	**.85876**	.93691	**.86478**	.93987	**.87070**	.94275	**.87649**	.94556	**.88218**	36
28	52	.93392	**.85886**	.93696	**.86488**	.93991	**.87079**	.94280	**.87659**	.94560	**.88227**	32
32	53	9.93397	**0.85896**	9.93701	**0.86498**	9.93996	**0.87089**	9.94284	**0.87669**	9.94565	**0.88237**	28
36	54	.93403	**.85906**	.93706	**.86508**	.94001	**.87099**	.94289	**.87678**	.94570	**.88246**	24
40	55	.93408	**.85916**	.93711	**.86518**	.94006	**.87109**	.94294	**.87688**	.94574	**.88255**	20
44	56	.93413	**.85926**	.93716	**.86528**	.94011	**.87118**	.94299	**.87697**	.94579	**.88265**	16
48	57	9.93418	**0.85937**	9.93721	**0.86538**	9.94016	**0.87128**	9.94303	**0.87707**	9.94583	**0.88274**	12
52	58	.93423	**.85947**	.93726	**.86548**	.94021	**.87138**	.94308	**.87716**	.94588	**.88284**	8
56	59	.93428	**.85957**	.93731	**.86558**	.94026	**.87148**	.94313	**.87726**	.94593	**.88293**	4
60	60	9.93433	**0.85967**	9.93736	**0.86568**	9.94030	**0.87157**	9.94318	**0.87735**	9.94597	**0.88302**	0
		14h 56m		14h 52m		14h 48m		14h 44m		14h 40m		

Haversines.

s	′	9h 20m	140°	9h 24m	141°	9h 28m	142°	9h 32m	143°	9h 36m	144°	s
		Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	0	9.94597	0.88302	9.94869	0.88857	9.95134	0.89401	9.95391	0.89932	9.95641	0.90451	60
4	1	.94602	.88312	.94874	.88866	.95138	.89409	.95396	.89941	.95645	.90459	56
8	2	.94606	.88321	.94878	.88876	.95143	.89418	.95400	.89949	.95649	.90468	52
12	3	.94611	.88330	.94883	.88885	.95147	.89427	.95404	.89958	.95654	.90476	48
16	4	9.94616	0.88340	9.94887	0.88894	9.95151	0.89436	9.95408	0.89967	9.95658	0.90485	44
20	5	.94620	.88349	.94892	.88903	.95156	.89445	.95412	.89976	.95662	.90494	40
24	6	.94625	.88358	.94896	.88912	.95160	.89454	.95417	.89984	.95666	.90502	36
28	7	.94629	.88368	.94901	.88921	.95164	.89463	.95421	.89993	.95670	.90511	32
32	8	9.94634	0.88377	9.94905	0.88930	9.95169	0.89472	9.95425	0.90002	9.95674	0.90519	28
36	9	.94638	.88386	.94909	.88940	.95173	.89481	.95429	.90010	.95678	.90528	24
40	10	.94643	.88396	.94914	.88949	.95177	.89490	.95433	.90019	.95682	.90537	20
44	11	.94648	.88405	.94918	.88958	.95182	.89499	.95438	.90028	.95686	.90545	16
48	12	9.94652	0.88414	9.94923	0.88967	9.95186	0.89508	9.95442	0.90037	9.95690	0.90553	12
52	13	.94657	.88423	.94927	.88976	.95190	.89517	.95446	.90045	.95694	.90562	8
56	14	9.94661	0.88433	9.94932	0.88985	9.95195	0.89526	9.95450	0.90054	9.95699	0.90570	4
		14h 39m		14h 35m		14h 31m		14h 27m		14h 23m		
s	′	9h 21m	140°	9h 25m	141°	9h 29m	142°	9h 33m	143°	9h 37m	144°	s
0	15	9.94666	0.88442	9.94936	0.88994	9.95199	0.89534	9.95454	0.90063	9.95703	0.90579	60
4	16	.94670	.88451	.94941	.89003	.95203	.89543	.95459	.90071	.95707	.90588	56
8	17	.94675	.88461	.94945	.89012	.95208	.89552	.95463	.90080	.95711	.90596	52
12	18	.94680	.88470	.94950	.89022	.95212	.89561	.95467	.90089	.95715	.90604	48
16	19	9.94684	0.88479	9.94954	0.89031	9.95216	0.89570	9.95471	0.90097	9.95719	0.90613	44
20	20	.94689	.88489	.94958	.89040	.95221	.89579	.95475	.90106	.95723	.90621	40
24	21	.94693	.88498	.94963	.89049	.95225	.89588	.95480	.90115	.95727	.90630	36
28	22	.94698	.88507	.94967	.89058	.95229	.89597	.95484	.90124	.95731	.90638	32
32	23	9.94702	0.88516	9.94972	0.89067	o.95234	0.89606	9.95488	0.90132	9.95735	0.90647	28
36	24	.94707	.88526	.94976	.89076	.95238	.89614	.95492	.90141	.95739	.90655	24
40	25	.94711	.88535	.94981	.89085	.95242	.89623	.95496	.90150	.95743	.90664	20
44	26	.94716	.88544	.94985	.89094	.95246	.89632	.95501	.90158	.95747	.90672	16
48	27	9.94721	0.88553	9.94989	0.89103	9.95251	0.89641	9.95505	0.90167	9.95751	0.90680	12
52	28	.94725	.88563	.94994	.89112	.95255	.89650	.95509	.90176	.95755	.90689	8
56	29	9.94730	0.88572	9.94998	0.89121	9.95259	0.89659	9.95513	0.90184	9.95759	0.90697	4
		14h 38m		14h 34m		14h 30m		14h 26m		14h 22m		
s	′	9h 22m	140°	9h 26m	141°	9h 30m	142°	9h 34m	143°	9h 38m	144°	s
0	30	9.94734	0.88581	9.95003	0.89130	9.95264	0.89668	9.95517	0.90193	9.95763	0.90706	60
4	31	.94739	.88590	.95007	.89139	.95268	.89677	.95521	.90201	.95768	.90714	56
8	32	.94743	.88600	.95011	.89149	.95272	.89685	.95526	.90210	.95772	.90723	52
12	33	.94748	.88609	.95016	.89158	.95276	.89694	.95530	.90219	.95776	.90731	48
16	34	9.94752	0.88618	9.95020	0.89167	9.95281	0.89703	9.95534	0.90227	9.95780	0.90740	44
20	35	.94757	.88627	.95025	.89176	.95285	.89712	.95538	.90236	.95784	.90748	40
24	36	.94761	.88637	.95029	.89185	.95289	.89721	.95542	.90245	.95788	.90756	36
28	37	.94766	.88646	.95033	.89194	.95294	.89730	.95546	.90253	.95792	.90765	32
32	38	9.94770	0.88655	9.95038	0.89203	9.95298	0.89738	9.95550	0.90262	9.95796	0.90773	28
36	39	.94774	.88664	.95042	.89212	.95302	.89747	.95555	.90271	.95800	.90792	24
40	40	.94779	.88674	.95047	.89221	.95306	.89756	.95559	.90279	.95804	.90790	20
44	41	.94784	.88683	.95051	.89230	.95311	.89765	.95563	.90288	.95808	.90798	16
48	42	9.94788	0.88692	9.95055	0.89239	9.95315	0.89774	9.95567	0.90296	9.95812	0.90807	12
52	43	.94793	.88701	.95060	.89248	.95319	.89783	.95571	.90305	.95816	.90815	8
56	44	9.94797	0.88710	9.95064	0.89257	9.95323	0.89791	9.95575	0.90314	9.95820	0.90824	4
		14h 37m		14h 33m		14h 29m		14h 25m		14h 21m		
s	′	9h 23m	140°	9h 27m	141°	9h 31m	142°	9h 35m	143°	9h 39m	144°	s
0	45	9.94802	0.88720	9.95069	0.89266	9.95328	0.89800	9.95579	0.90322	9.95824	0.90832	60
4	46	.94806	.88729	.95073	.89275	.95332	.89809	.95584	.90331	.95828	.90840	56
8	47	.94811	.88738	.95077	.89284	.95336	.89818	.95588	.90339	.95832	.90849	52
12	48	.94815	.88747	.95082	.89293	.95340	.89827	.95592	.90348	.95836	.90857	48
16	49	9.94820	0.88756	9.95086	0.89302	9.95345	0.89835	9.95596	0.90357	9.95840	0.90866	44
20	50	.94824	.88766	.95090	.89311	.95349	.89844	.95600	.90365	.95844	.90874	40
24	51	.94829	.88775	.95095	.89320	.95353	.89853	.95604	.90374	.95848	.90882	36
28	52	.94833	.88784	.95099	.89329	.95357	.89862	.95608	.90382	.95852	.90891	32
32	53	9.94838	0.88793	9.95104	0.89338	9.95362	0.89870	9.95613	0.90391	.9 95856	0.90899	28
36	54	.94842	.88802	.95108	.89347	.95366	.89879	.95617	.90399	.95860	.90907	24
40	55	.94847	.88811	.95112	.89356	.95370	.89888	.95621	.90408	.95864	.90916	20
44	56	.94851	.88821	.95117	.89365	.95374	.89897	.95625	.90417	.95868	.90924	16
48	57	9.94856	0.88830	9.95121	0.89374	9.95379	0.89906	9.95629	0.90425	9.95872	0.90933	12
52	58	.94860	.88839	.95125	.89383	.95383	.89914	.95633	.90434	.95876	.90941	8
56	59	.94865	.88848	.95130	.89392	.95387	.89923	.95637	.90442	.95880	.90949	4
60	60	9.94869	0.88857	9.95134	0.89401	9.95391	0.89932	9.95641	0.90451	9.95884	0.90958	0
		14h 36m		14h 32m		14h 28m		14h 24m		14h 20m		

TABLE 34.

Haversines.

s	′	9h 40m	145°	9h 44m	146°	9h 48m	147°	9h 52m	148°	9h 56m	149°	s
		Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	0	9.95884	**0.90958**	9.96119	**0.91452**	9.96347	**0.91934**	9.96568	**0.92402**	9.96782	**0.92858**	60
4	1	.95888	**.90966**	.96123	**.91460**	.96351	**.91941**	.96572	**.92410**	.96786	**.92866**	56
8	2	.95892	**.90974**	.96127	**.91468**	.96355	**.91949**	.96576	**.92418**	.96789	**.92873**	52
12	3	.95896	**.90983**	.96131	**.91476**	.96359	**.91957**	.96579	**.92426**	.96793	**.92881**	48
16	4	9.95900	**0.90991**	9.96135	**0.91484**	9.96362	**0.91965**	9.96583	**0.92433**	9.96796	**0.92888**	44
20	5	.95904	**.90999**	.96139	**.91493**	.96366	**.91973**	.96586	**.92441**	.96800	**.92896**	40
24	6	.95908	**.91008**	.96142	**.91501**	.96370	**.91981**	.96590	**.92449**	.96803	**.92903**	36
28	7	.95912	**.91016**	.96146	**.91509**	.96374	**.91989**	.96594	**.92456**	.96807	**.92911**	32
32	8	9.95916	**0.91024**	9.96150	**0.91517**	9.96377	**0.91997**	9.96597	**0.92464**	9.96810	**0.92918**	28
36	9	.95920	**.91033**	.96154	**.91525**	.96381	**.92005**	.96601	**.92472**	.96814	**.92926**	24
40	10	.95924	**.91041**	.96158	**.91533**	.96385	**.92013**	.96604	**.92479**	.96817	**.92933**	20
44	11	.95928	**.91049**	.96162	**.91541**	.96388	**.92020**	.96608	**.92487**	.96821	**.92941**	16
48	12	9.95932	**0.91057**	9.96165	**0.91549**	9.96392	**0.92028**	9.96612	**0.92495**	9.96824	**0.92948**	12
52	13	.95936	**.91066**	.96169	**.91557**	.96396	**.92036**	.96615	**.92502**	.96827	**.92955**	8
56	14	9.95939	**0.91074.**	9.96173	**0.91565**	9.96400	**0.92044**	9.96619	**0.92510**	9.96831	**0.92963**	4
		14h 19m		14h 15m		14h 11m		14h 7m		14h 3m		

s	′	9h 41m	145°	9h 45m	146°	9h 49m	147°	9h 53m	148°	9h 57m	149°	s
0	15	9.95943	**0.91082**	9.96177	**0.91574**	9.96403	**0.92052**	9.96622	**0.92518**	9.96834	**0.92970**	60
4	16	.95947	**.91091**	.96181	**.91582**	.96407	**.92060**	.96626	**.92525**	.96837	**.92978**	56
8	17	.95951	**.91099**	.96185	**.91590**	.96411	**.92068**	.96630	**.92533**	.96841	**.92985**	52
12	18	.95955	**.91107**	.96188	**.91598**	.96414	**.92076**	.96633	**.92541**	.96845	**.92993**	48
16	19	9.95959	**0.91115**	9.96192	**0.91606**	9.96418	**0.92083**	9.96637	**0.92548**	9.96848	**0.93000**	44
20	20	.95963	**.91124**	.96196	**.91614**	.96422	**.92091**	.96640	**.92556**	.96852	**.93007**	40
24	21	.95967	**.91132**	.96200	**.91622**	.96426	**.92099**	.96644	**.92563**	.96855	**.93015**	36
28	22	.95971	**.91140**	.96204	**.91630**	.96429	**.92107**	.96648	**.92571**	.96859	**.93022**	32
32	23	9.95975	**0.91149**	9.96208	**0.91638**	9.96433	**0.92115**	9.96651	**0.92579**	9.96862	**0.93030**	28
36	24	.95979	**.91157**	.96211	**.91646**	.96437	**.92123**	.96655	**.92586**	.96866	**.93037**	24
40	25	.95983	**.91165**	.96215	**.91654**	.96440	**.92130**	.96658	**.92594**	.96869	**.93045**	20
44	26	.95987	**.91173**	.96219	**.91662**	.96444	**.92138**	.96662	**.92602**	.96873	**.93052**	16
48	27	9.95991	**0.91182**	9.96223	**0.91670**	9.96448	**0.92146**	9.96665	**0.92609**	9.96876	**0.93059**	12
52	28	.95995	**.91190**	.96227	**.91678**	.96451	**.92154**	.96669	**.92617**	.96879	**.93067**	8
56	29	9.95999	**0.91198**	9.96230	**0.91686**	9.96455	**0.92162**	9.96673	**0.92624**	9.96883	**0.93074**	4
		14h 18m		14h 14m		14h 10m		14h 6m		14h 2m		

s	′	9h 42m	145°	9h 46m	146°	9h 50m	147°	9h 54m	148°	9h 58m	149°	s
0	30	9.96002	**0.91206**	9.96234	**0.91694**	9.96459	**0.92170**	9.96676	**0.92632**	9.96886	**0.93081**	60
4	31	.96006	**.91215**	.96238	**.91702**	.96462	**.92177**	.96680	**.92640**	.96890	**.93089**	56
8	32	.96010	**.91223**	.96242	**.91710**	.96466	**.92185**	.96683	**.92647**	.96894	**.93096**	52
12	33	.96014	**.91231**	.96246	**.91718**	.96470	**.92193**	.96687	**.92655**	.96897	**.93104**	48
16	34	9.96018	**0.91239**	9.96249	**0.91726**	9.96473	**0.92201**	9.96690	**0.92662**	9.96900	**0.93111**	44
20	35	.96022	**.91247**	.96253	**.91734**	.96477	**.92209**	.96694	**.92670**	.96904	**.93118**	40
24	36	.96026	**.91256**	.96257	**.91742**	.96481	**.92216**	.96697	**.92678**	.96907	**.93126**	36
28	37	.96030	**.91264**	.96261	**.91750**	.96484	**.92224**	.96701	**.92685**	.96910	**.93133**	32
32	38	9.96034	**0.91272**	9.96265	**0.91758**	9.96488	**0.92232**	9.96705	**0.92693**	9.96914	**0.93140**	28
36	39	.96038	**.91280**	.96268	**.91766**	.96492	**.92240**	.96708	**.92700**	.96917	**.93148**	24
40	40	.96042	**.91289**	.96272	**.91774**	.96495	**.92248**	.96712	**.92708**	.96921	**.93155**	20
44	41	.96046	**.91297**	.96276	**.91782**	.96499	**.92255**	.96715	**.92715**	.96924	**.93162**	16
48	42	9.96049	**0.91305**	9.96280	**0.91790**	9.96503	**0.92263**	9.96719	**0.92723**	9.96928	**0.93170**	12
52	43	.96053	**.91313**	.96283	**.91798**	.96506	**.92271**	.96722	**.92731**	.96931	**.93177**	8
56	44	9.96057	**0.91321**	9.96287	**0.91806**	9.96510	**0.92279**	9.96726	**0.92738**	9.96934	**0.93184**	4
		14h 17m		14h 13m		14h 9m		14h 5m		14h 1m		

s	′	9h 43m	145°	9h 47m	146°	9h 51m	147°	9h 55m	148°	9h 59m	149°	s
0	45	9.96061	**0.91329**	9.96291	**0.91814**	9.96514	**0.92286**	9.96729	**0.92746**	9.96938	**0.93192**	60
4	46	.96065	**.91338**	.96295	**.91822**	.96517	**.92294**	.96733	**.92753**	.96941	**.93199**	56
8	47	.96069	**.91346**	.96299	**.91830**	.96521	**.92302**	.96736	**.92761**	.96945	**.93206**	52
12	48	.96073	**.91354**	.96302	**.91838**	.96525	**.92310**	.96740	**.92768**	.96948	**.93214**	48
16	49	9.96077	**0.91362**	9.96306	**0.91846**	9.96528	**0.92317**	9.96743	**0.92776**	9.96951	**0.93221**	44
20	50	.96081	**.91370**	.96310	**.91854**	.96532	**.92325**	.96747	**.92783**	.96955	**.93228**	40
24	51	.96084	**.91379**	.96314	**.91862**	.96536	**.92333**	.96750	**.92791**	.96958	**.93236**	36
28	52	.96088	**.91387**	.96317	**.91870**	.96539	**.92341**	.96754	**.92798**	.96962	**.93243**	32
32	53	9.96092	**0.91395**	9.96321	**0.91878**	9.96543	**0.92348**	9.96758	**0.92806**	9.96965	**0.93250**	28
36	54	.96096	**.91403**	.96325	**.91886**	.96547	**.92356**	.96761	**.92813**	.96968	**.93258**	24
40	55	.96100	**.91411**	.96329	**.91894**	.96550	**.92364**	.96765	**.92821**	.96972	**.93265**	20
44	56	.96104	**.91419**	.96332	**.91902**	.96554	**.92372**	.96768	**.92828**	.96975	**.93272**	16
48	57	9.96108	**0.91427**	9.96336	**0.91910**	9.96557	**0.92379**	9.96772	**0.92836**	9.96979	**0.93279**	12
52	58	.96112	**.91436**	.96340	**.91918**	.96561	**.92387**	.96775	**.92843**	.96982	**.93287**	8
56	59	.96115	**.91444**	.96344	**.91926**	.96565	**.92394**	.96779	**.92851**	.96985	**.93294**	4
60	60	9.96119	**0.91452**	9.96347	**0.91934**	9.96568	**0.92402**	9.96782	**0.92858**	9.96989	**0.93301**	0
		14h 16m		14h 12m		14h 8m		14h 4m		14h 0m		

Haversines.

s	′	10h 0m	150°	10h 4m	151°	10h 8m	152°	10h 12m	153°	10h 16m	154°	s
		Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	0	9.96989	**0.93301**	9.97188	**0.93731**	9.97381	**0.94147**	9.97566	**0.94550**	9.97745	**0.94940**	60
4	1	.96992	**.93309**	.97192	**.93738**	.97384	**.94154**	.97569	**.95557**	.97748	**.94946**	56
8	2	.96996	**.93316**	.97195	**.93745**	.97387	**.94161**	.97572	**.94564**	.97751	**.94952**	52
12	3	.96999	**.93323**	.97198	**.93752**	.97390	**.94168**	.97575	**.94570**	.97754	**.94959**	48
16	4	9.97002	**0.93330**	9.97201	**0.93759**	9.97393	**0.94175**	9.97578	**0.94577**	9.97756	**0.94965**	44
20	5	.97006	**.93338**	.97205	**.93766**	.97397	**.94181**	.97581	**.94583**	.97759	**.94972**	40
24	6	.97009	**.93345**	.97208	**.93773**	.97400	**.94188**	.97584	**.94590**	.97762	**.94978**	36
28	7	.97012	**.93352**	.97211	**.93780**	.97403	**.94195**	.97587	**.94596**	.97765	**.94984**	32
32	8	9.97016	**0.93359**	9.97214	**0.93787**	9.97406	**0.94202**	9.97591	**0.94603**	9.97768	**0.94991**	28
36	9	.97019	**.93367**	.97218	**.93794**	.97409	**.94209**	.97594	**.94610**	.97771	**.94997**	24
40	10	.97022	**.93374**	.97221	**.93801**	.97412	**.94215**	.97597	**.94616**	.97774	**.95003**	20
44	11	.97026	**.93381**	.97224	**.93808**	.97415	**.94222**	.97600	**.94623**	.97777	**.95010**	16
48	12	9.97029	**0.93388**	9.97227	**0.93815**	9.97418	**0.94229**	9.97603	**0.94629**	9.97780	**0.95016**	12
52	13	.97033	**.93395**	.97231	**.93822**	.97422	**.94236**	.97606	**.94636**	.97783	**.95022**	8
56	14	9.97036	**0.93403**	9.97234	**0.93829**	9.97425	**0.94243**	9.97609	**0.94642**	9.97785	**0.95029**	4
		13h 59m		13h 55m		13h 51m		13h 47m		13h 43m		
s	′	10h 1m	150°	10h 5m	151°	10h 9m	152°	10h 13m	153°	10h 17m	154°	s
0	15	9.97039	**0.93410**	9.97237	**0.93836**	9.97428	**0.94249**	9.97612	**0.94649**	9.97788	**0.95035**	60
4	16	.97043	**.93417**	.97240	**.93843**	.97431	**.94256**	.97615	**.94655**	.97791	**.95041**	56
8	17	.97046	**.93424**	.97244	**.93850**	.97434	**.94263**	.97618	**.94662**	.97794	**.95048**	52
12	18	.97049	**.93432**	.97247	**.93857**	.97437	**.94270**	.97621	**.94669**	.97797	**.95054**	48
16	19	9.97052	**0.93439**	9.97250	**0.93864**	9.97440	**0.94276**	9.97624	**0.94675**	9.97800	**0.95060**	44
20	20	.97056	**.93446**	.97253	**.93871**	.97443	**.94283**	.97627	**.94682**	.97803	**.95066**	40
24	21	.97059	**.93453**	.97257	**.93878**	.97447	**.94290**	.97630	**.94688**	.97806	**.95073**	36
28	22	.97063	**.93460**	.97260	**.93885**	.97450	**.94297**	.97633	**.94695**	.97808	**.95079**	32
32	23	9.97066	**0.93468**	9.97263	**0.93892**	9.97453	**0.94303**	9.97636	**0.94701**	9.97811	**0.95085**	28
36	24	.97069	**.93475**	.97266	**.93899**	.97456	**.94310**	.97639	**.94708**	.97814	**.95092**	24
40	25	.97073	**.93482**	.97269	**.93906**	.97459	**.94317**	.97642	**.94714**	.97817	**.95098**	20
44	26	.97076	**.93489**	.97273	**.93913**	.97462	**.94324**	.97645	**.94721**	.97820	**.95104**	16
48	27	9.97079	**0.93496**	9.97276	**0.93920**	9.97465	**0.94330**	9.97647	**0.94727**	9.97823	**0.95111**	12
52	28	.97083	**.93503**	.97279	**.93927**	.97468	**.94337**	.97650	**.94734**	.97826	**.95117**	8
56	29	9.97086	**0.93511**	9.97282	**0.93934**	9.97471	**0.94344**	9.97653	**0.94740**	9.97829	**0.95123**	4
		13h 58m		13h 54m		13h 50m		13h 46m		13h 42m		
s	′	10h 2m	150°	10h 6m	151°	10h 10m	152°	10h 14m	153°	10h 18m	154°	s
0	30	9.97089	**0.93518**	9.97285	**0.93941**	9.97474	**0.94351**	9.97656	**0.94747**	9.97831	**0.95129**	60
4	31	.97093	**.93525**	.97289	**.93948**	.97478	**.94357**	.97659	**.94753**	.97834	**.95136**	56
8	32	.97096	**.93532**	.97292	**.93955**	.97481	**.94364**	.97662	**.94760**	.97837	**.95142**	52
12	33	.97099	**.93539**	.97295	**.93962**	.97484	**.94371**	.97665	**.94766**	.97840	**.95148**	48
16	34	9.97103	**0.93546**	9.97298	**0.93969**	9.97487	**0.94377**	9.97668	**0.94773**	9.97843	**0.95154**	44
20	35	.97106	**.93554**	.97301	**.93976**	.97490	**.94384**	.97671	**.94779**	.97846	**.95161**	40
24	36	.97109	**.93561**	.97305	**.93982**	.97493	**.94391**	.97674	**.94786**	.97849	**.95167**	36
28	37	.97113	**.93568**	.97308	**.93989**	.97496	**.94397**	.97677	**.94792**	.97851	**.95173**	32
32	38	9.97116	**0.93575**	9.97311	**0.93996**	9.97499	**0.94404**	9.97680	**0.94799**	9.97854	**0.95179**	28
36	39	.97119	**.93582**	.97314	**.94003**	.97502	**.94411**	.97683	**.94805**	.97857	**.95185**	24
40	40	.97123	**.93589**	.97317	**.94010**	.97505	**.94418**	.97686	**.94811**	.97860	**.95192**	20
44	41	.97126	**.93596**	.97321	**.94017**	.97508	**.94424**	.97689	**.94818**	.97863	**.95198**	16
48	42	9.97129	**0.93603**	9.97324	**0.94024**	9.97511	**0.94431**	9.97692	**0.94824**	9.97866	**0.95204**	12
52	43	.97132	**.93611**	.97327	**.94031**	.97514	**.94438**	.97695	**.94831**	.97868	**.95210**	8
56	44	9.97136	**0.93618**	9.97330	**0.94038**	9.97518	**0.94444**	9.97698	**0.94837**	9.97871	**0.95217**	4
		13h 57m		13h 53m		13h 49m		13h 45m		13h 41m		
s	′	10h 3m	150°	10h 7m	151°	10h 11m	152°	10h 15m	153°	10h 19m	154°	s
0	45	9.97139	**0.93625**	9.97333	**0.94045**	9.97521	**0.94451**	9.97701	**0.94844**	9.97874	**0.95223**	60
4	46	.97142	**.93632**	.97337	**.94051**	.97524	**.94458**	.97704	**.94850**	.97877	**.95229**	56
8	47	.97146	**.93639**	.97340	**.94058**	.97527	**.94464**	.97707	**.94857**	.97880	**.95235**	52
12	48	.97149	**.93646**	.97343	**.94065**	.97530	**.94471**	.97710	**.94863**	.97883	**.95241**	48
16	49	9.97152	**0.93653**	9.97346	**0.94072**	9.97533	**0.94477**	9.97713	**0.94869**	9.97885	**0.95248**	44
20	50	.97156	**.93660**	.97349	**.94079**	.97536	**.94484**	.97716	**.94876**	.97888	**.95254**	40
24	51	.97159	**.93667**	.97352	**.94086**	.97539	**.94491**	.97718	**.94882**	.97891	**.95260**	36
28	52	.97162	**.93674**	.97356	**.94093**	.97542	**.94497**	.97721	**.94889**	.97894	**.95266**	32
32	53	9.97165	**0.93682**	9.97359	**0.94099**	9.97545	**0.94504**	9.97724	**0.94895**	9.97897	**0.95272**	28
36	54	.97169	**.93689**	.97362	**.94106**	.97548	**.94511**	.97727	**.94901**	.97899	**.95278**	24
40	55	.97172	**.93696**	.97365	**.94113**	.97551	**.94517**	.97730	**.94908**	.97902	**.95285**	20
44	56	.97175	**.93703**	.97368	**.94120**	.97554	**.94524**	.97733	**.94914**	.97905	**.95291**	16
48	57	9.97179	**0.93710**	9.97371	**0.94127**	9.97557	**0.94531**	9.97736	**0.94921**	9.97908	**0.95297**	12
52	58	.97182	**.93717**	.97375	**.94134**	.97560	**.94537**	.97739	**.94927**	.97911	**.95303**	8
56	59	.97185	**.93724**	.97378	**.94141**	.97563	**.94544**	.97742	**.94933**	.97914	**.95309**	4
60	60	9.97188	**0.93731**	9.97381	**0.94147**	9.97566	**0.94550**	9.97745	**0.94940**	9.97916	**0.95315**	0
		13h 56m		13h 52m		13h 48m		13h 44m		13h 40m		

TABLE 34.

Haversines.

s	′	10h 20m 155° Log. Hav.	Nat. Hav.	10h 24m 156° Log. Hav.	Nat. Hav.	10h 28m 157° Log. Hav.	Nat. Hav.	10h 32m 158° Log. Hav.	Nat. Hav.	10h 36m 159° Log. Hav.	Nat. Hav.	s
0	0	9.97916	**0.95315**	9.98081	**0.95677**	9.98239	**0.96025**	9.98389	**0.96359**	9.98533	**0.96679**	60
4	1	.97919	**.95322**	.98084	**.95683**	.98241	**.96031**	.98392	**.96365**	.98536	**.96684**	56
8	2	.97922	**.95328**	.98086	**.95689**	.98244	**.96037**	.98394	**.96370**	.98538	**.96689**	52
12	3	.97925	**.95334**	.98089	**.95695**	.98246	**.96042**	.98397	**.96376**	.98540	**.96695**	48
16	4	9.97927	**0.95340**	9.98092	**0.95701**	9.98249	**0.96048**	9.98399	**0.96381**	9.98543	**0.96700**	44
20	5	.97930	**.95346**	.98094	**.95707**	.98251	**.96054**	.98402	**.96386**	.98545	**.96705**	40
24	6	.97933	**.95352**	.98097	**.95713**	.98254	**.96059**	.98404	**.96392**	.98547	**.96710**	36
28	7	.97936	**.95358**	.98100	**.95719**	.98256	**.96065**	.98406	**.96397**	.98550	**.96715**	32
32	8	9.97939	**0.95364**	9.98102	**0.95724**	9.98259	**0.96071**	9.98409	**0.96403**	9.98552	**0.96721**	28
36	9	.97941	**.95371**	.98105	**.95730**	.98262	**.96076**	.98411	**.96408**	.98554	**.96726**	24
40	10	.97944	**.95377**	.98108	**.95736**	.98264	**.96082**	.98414	**.96413**	.98557	**.96731**	20
44	11	.97947	**.95383**	.98110	**.95742**	.98267	**.96088**	.98416	**.96419**	.98559	**.96736**	16
48	12	9.97950	**0.95389**	9.98113	**0.95748**	9.98269	**0.96093**	9.98419	**0.96424**	9.98561	**0.96741**	12
52	13	.97953	**.95395**	.98116	**.95754**	.98272	**.96099**	.98421	**.96430**	.98564	**.96746**	8
56	14	9.97955	**0.95401**	9.98118	**0.95760**	9.98274	**0.96104**	9.98424	**0.96435**	9.98566	**0.96752**	4
		13h 39m		13h 35m		13h 31m		13h 27m		13h 23m		
s	′	10h 21m 155° Log. Hav.	Nat. Hav.	10h 25m 156° Log. Hav.	Nat. Hav.	10h 29m 157° Log. Hav.	Nat. Hav.	10h 33m 158° Log. Hav.	Nat. Hav.	10h 37m 159° Log. Hav.	Nat. Hav.	s
0	15	9.97958	**0.95407**	9.98121	**0.95766**	9.98277	**0.96110**	9.98426	**0.96440**	9.98568	**0.96757**	60
4	16	.97961	**.95413**	.98124	**.95771**	.98279	**.96116**	.98428	**.96446**	.98570	**.96762**	56
8	17	.97964	**.95419**	.98126	**.95777**	.98282	**.96121**	.98431	**.96451**	.98573	**.96767**	52
12	18	.97966	**.95425**	.98129	**.95783**	.98285	**.96127**	.98433	**.96457**	.98575	**.96772**	48
16	19	9.97969	**0.95431**	9.98132	**0.95789**	9.98287	**0.96133**	9.98436	**0.96462**	9.98577	**0.96777**	44
20	20	.97972	**.95438**	.98134	**.95795**	.98290	**.96138**	.98438	**.96467**	.98580	**.96782**	40
24	21	.97975	**.95444**	.98137	**.95801**	.98292	**.96144**	.98440	**.96473**	.98582	**.96788**	36
28	22	.97977	**.95450**	.98139	**.95806**	.98295	**.96149**	.98443	**.96478**	.98584	**.96793**	32
32	23	9.97980	**0.95456**	9.98142	**0.95812**	9.98297	**0.96155**	9.98445	**0.96483**	9.98587	**0.96798**	28
36	24	.97983	**.95462**	.98145	**.95818**	.98300	**.96161**	.98448	**.96489**	.98589	**.96803**	24
40	25	.97986	**.95468**	.98147	**.95824**	.98302	**.96166**	.98450	**.96494**	.98591	**.96808**	20
44	26	.97988	**.95474**	.98150	**.95830**	.98305	**.96172**	.98453	**.96500**	.98593	**.96813**	16
48	27	9.97991	**0.95480**	9.98153	**0.95836**	9.98307	**0.96177**	9.98455	**0.96505**	9.98596	**0.96818**	12
52	28	.97994	**.95486**	.98155	**.95841**	.98310	**.96183**	.98457	**.96510**	.98598	**.96823**	8
56	29	9.97997	**0.95492**	9.98158	**0.95847**	9.98312	**0.96188**	9.98460	**0.96516**	9.98600	**0.96829**	4
		13h 38m		13h 34m		13h 30m		13h 26m		13h 22m		
s	′	10h 22m 155° Log. Hav.	Nat. Hav.	10h 26m 156° Log. Hav.	Nat. Hav.	10h 30m 157° Log. Hav.	Nat. Hav.	10h 34m 158° Log. Hav.	Nat. Hav.	10h 38m 159° Log. Hav.	Nat. Hav.	s
0	30	9.97999	**0.95498**	9.98161	**0.95853**	9.98315	**0.96194**	9.98462	**0.96521**	9.98603	**0.96834**	60
4	31	.98002	**.95504**	.98163	**.95859**	.98317	**.96200**	.98465	**.96526**	.98605	**.96839**	56
8	32	.98005	**.95510**	.98166	**.95865**	.98320	**.96205**	.98467	**.96532**	.98607	**.96844**	52
12	33	.98008	**.95516**	.98168	**.95870**	.98322	**.96211**	.98469	**.96537**	.98609	**.96849**	48
16	34	9.98010	**0.95522**	9.98171	**0.95876**	9.98325	**0.96216**	9.98472	**0.96542**	9.98612	**0.96854**	44
20	35	.98013	**.95528**	.98174	**.95882**	.98327	**.96222**	.98474	**.96547**	.98614	**.96859**	40
24	36	.98016	**.95534**	.98176	**.95888**	.98330	**.96227**	.98476	**.96553**	.98616	**.96864**	36
28	37	.98019	**.95540**	.98179	**.95894**	.98332	**.96223**	.98479	**.96558**	.98619	**.96869**	32
32	38	9.98021	**0.95546**	9.98182	**0.95899**	9.98335	**0.96238**	9.98481	**0.96563**	9.98621	**0.96874**	28
36	39	.98024	**.95552**	.98184	**.95905**	.98337	**.96244**	.98484	**.96569**	.98623	**.96879**	24
40	40	.98027	**.95558**	.98187	**.95911**	.98340	**.96249**	.98486	**.96574**	.98625	**.96884**	20
44	41	.98030	**.95564**	.98189	**.95917**	.98342	**.96255**	.98488	**.96579**	.98628	**.96889**	16
48	42	9.98032	**0.95570**	9.98192	**0.95922**	9.98345	**0.96260**	9.98491	**0.96585**	9.98630	**0.96894**	12
52	43	.98035	**.95576**	.98195	**.95928**	.98347	**.96266**	.98493	**.96590**	.98632	**.96899**	8
56	44	9.98038	**0.95582**	9.98197	**0.95934**	9.98350	**0.96272**	9.98496	**0.96595**	9.98634	**0.96905**	4
		13h 37m		13h 33m		13h 29m		13h 25m		13h 21m		
s	′	10h 23m 155° Log. Hav.	Nat. Hav.	10h 27m 156° Log. Hav.	Nat. Hav.	10h 31m 157° Log. Hav.	Nat. Hav.	10h 35m 158° Log. Hav.	Nat. Hav.	10h 39m 159° Log. Hav.	Nat. Hav.	s
0	45	9.98040	**0.95588**	9.98200	**0.95940**	9.98352	**0.96277**	9.98498	**0.96600**	9.98637	**0.96910**	60
4	46	.98043	**.95594**	.98202	**.95945**	.98355	**.96283**	.98500	**.96606**	.98639	**.96915**	56
8	47	.98046	**.95600**	.98205	**.95951**	.98357	**.96288**	.98503	**.96611**	.98641	**.96920**	52
12	48	.98049	**.95606**	.98208	**.95957**	.98360	**.96294**	.98505	**.96616**	.98643	**.96925**	48
16	49	9.98051	**0.95612**	9.98210	**0.95962**	9.98362	**0.96299**	9.98507	**0.96621**	9.98646	**0.96930**	44
20	50	.98054	**.95618**	.98213	**.95968**	.98365	**.96305**	.98510	**.96627**	.98648	**.96935**	40
24	51	.98057	**.95624**	.98215	**.95974**	.98367	**.96310**	.98512	**.96632**	.98650	**.96940**	36
28	52	.98059	**.95630**	.98218	**.95980**	.98370	**.96315**	.98514	**.96637**	.98652	**.96945**	32
32	53	9.98062	**0.95636**	9.98221	**0.95985**	9.98372	**0.96321**	9.98517	**0.96642**	9.98655	**0.96950**	28
36	54	.98065	**.95642**	.98223	**.95991**	.98375	**.96326**	.98519	**.96648**	.98657	**.96955**	24
40	55	.98067	**.95648**	.98226	**.95997**	.98377	**.96332**	.98521	**.96653**	.98659	**.96960**	20
44	56	.98070	**.95654**	.98228	**.96002**	.98379	**.96337**	.98524	**.96658**	.98661	**.96965**	16
48	57	9.98073	**0.95660**	9.98231	**0.96008**	9.98382	**0.96343**	9.98526	**0.96663**	9.98664	**0.96970**	12
52	58	.98076	**.95665**	.98233	**.96014**	.98384	**.96348**	.98529	**.96669**	.98666	**.96975**	8
56	59	.98078	**.95671**	.98236	**.96020**	.98387	**.96354**	.98531	**.96674**	.98668	**.96980**	4
60	60	9.98081	**0.95677**	9.98239	**0.96025**	9.98389	**0.96359**	9.98533	**0.96679**	9.98670	**0.96985**	0
		13h 36m		13h 32m		13h 28m		13h 24m		13h 20m		

Haversines.

s	′	10h 40m 160° Log. Hav.	Nat. Hav.	10h 44m 161° Log. Hav.	Nat. Hav.	10h 48m 162° Log. Hav.	Nat. Hav.	10h 52m 163° Log. Hav.	Nat. Hav.	10h 56m 164° Log. Hav.	Nat. Hav.	s
0	0	9.98670	**0.96985**	9.98801	**0.97276**	9.98924	**0.97553**	9.99041	**0.97815**	9.99151	**0.98063**	60
4	1	.98673	**.96990**	.98803	**.97281**	.98926	**.97557**	.99043	**.97819**	.99152	**.98067**	56
8	2	.98675	**.96995**	.98805	**.97285**	.98928	**.97562**	.99044	**.97824**	.99154	**.98071**	52
12	3	.98677	**.97000**	.98807	**.97290**	.98930	**.97566**	.99046	**.97828**	.99156	**.98075**	48
16	4	9.98679	**0.97005**	9.98809	**0.97295**	9.98932	**0.97571**	9.99048	**0.97832**	9.99158	**0.98079**	44
20	5	.98681	**.97009**	.98811	**.97300**	.98934	**.97575**	.99050	**.97836**	.99159	**.98083**	40
24	6	.98684	**.97014**	.98813	**.97304**	.98936	**.97580**	.99052	**.97841**	.99161	**.98087**	36
28	7	.98686	**.97019**	.98815	**.97309**	.98938	**.97584**	.99054	**.97845**	.99163	**.98091**	32
32	8	9.98688	**0.97024**	9.98817	**0.97314**	9.98940	**0.97589**	9.99056	**0.97849**	9.99165	**0.98095**	28
36	9	.98690	**.97029**	.98819	**.97318**	.98942	**.97593**	.99058	**.97853**	.99166	**.98099**	24
40	10	.98692	**.97034**	.98822	**.97323**	.98944	**.97598**	.99059	**.97858**	.99168	**.98103**	20
44	11	.98695	**.97039**	.98824	**.97328**	.98946	**.97602**	.99061	**.97862**	.99170	**.98107**	16
48	12	9.98697	**0.97044**	9.98826	**0.97332**	9.98948	**0.97606**	9.99063	**0.97866**	9.99172	**0.98111**	12
52	13	.98699	**.97049**	.98828	**.97337**	.98950	**.97611**	.99065	**.97870**	.99173	**.98115**	8
56	14	9.98701	**0.97054**	9.98830	**0.97342**	9.98952	**0.97615**	9.99067	**0.97874**	9.99175	**0.98119**	4
		13h 19m		13h 15m		13h 11m		13h 7m		13h 3m		
s	′	10h 41m 160°		10h 45m 161°		10h 49m 162°		10h 53m 163°		10h 57m 164°		s
0	15	9.98703	**0.97059**	9.98832	**0.97347**	9.98954	**0.97620**	9.99069	**0.97879**	9.99177	**0.98123**	60
4	16	.98706	**.97064**	.98834	**.97351**	.98956	**.97624**	.99071	**.97883**	.99179	**.98127**	56
8	17	.98708	**.97069**	.98836	**.97356**	.98958	**.97629**	.99072	**.97887**	.99180	**.98131**	52
12	18	.98710	**.97074**	.98838	**.97361**	.98960	**.97633**	.99074	**.97891**	.99182	**.98135**	48
16	19	9.98712	**0.97078**	9.98840	**0.97365**	9.98962	**0.97637**	9.99076	**0.97895**	9.99184	**0.98139**	44
20	20	.98714	**.97083**	.98842	**.97370**	.98964	**.97642**	.99078	**.97899**	.99186	**.98142**	40
24	21	.98717	**.97088**	.98845	**.97374**	.98966	**.97646**	.99080	**.97904**	.99187	**.98146**	36
28	22	.98719	**.97093**	.98847	**.97379**	.98968	**.97651**	.99082	**.97908**	.99189	**.98150**	32
32	23	9.98721	**0.97098**	9.98849	**0.97384**	9.98970	**0.97655**	9.99084	**0.97912**	9.99191	**0.98154**	28
36	24	.98723	**.97103**	.98851	**.97388**	.98971	**.97660**	.99085	**.97916**	.99193	**.98158**	24
40	25	.98725	**.97108**	.98853	**.97393**	.98973	**.97664**	.99087	**.97920**	.99194	**.98162**	20
44	26	.98728	**.97113**	.98855	**.97398**	.98975	**.97668**	.99089	**.97924**	.99196	**.98166**	16
48	27	9.98730	**0.97117**	9.98857	**0.97402**	9.98977	**0.97673**	9.99091	**0.97929**	9.99198	**0.98170**	12
52	28	.98732	**.97122**	.98859	**.97407**	.98979	**.97677**	.99093	**.97933**	.99200	**.98174**	8
56	29	9.98734	**0.97127**	9.98861	**0.97412**	9.98981	**0.97681**	9.99095	**0.97937**	9.99201	**0.98178**	4
		13h 18m		13h 14m		13h 10m		13h 6m		13h 2m		
s	′	10h 42m 160°		10h 46m 161°		10h 50m 162°		10h 54m 163°		10h 58m 164°		s
0	30	9.98736	**0.97132**	9.98863	**0.97416**	9.98983	**0.97686**	9.99096	**0.97941**	9.99203	**0.98182**	60
4	31	.98738	**.97137**	.98865	**.97421**	.98985	**.97690**	.99098	**.97945**	.99205	**.98185**	56
8	32	.98741	**.97142**	.98867	**.97425**	.98987	**.97695**	.99100	**.97949**	.99206	**.98189**	52
12	33	.98743	**.97147**	.98869	**.97430**	.98989	**.97699**	.99102	**.97953**	.99208	**.98193**	48
16	34	9.98745	**0.97151**	9.98871	**0.97435**	9.98991	**0.97703**	9.99104	**0.97957**	9.99210	**0.98197**	44
20	35	.98747	**.97156**	.98873	**.97439**	.98993	**.97708**	.99106	**.97962**	.99212	**.98201**	40
24	36	.98749	**.97161**	.98875	**.97444**	.98995	**.97712**	.99107	**.97966**	.99213	**.98205**	36
28	37	.98751	**.97166**	.98877	**.97448**	.98997	**.97716**	.99109	**.97970**	.99215	**.98209**	32
32	38	9.98754	**0.97171**	9.98880	**0.97453**	9.98999	**0.97721**	9.99111	**0.97974**	9.99217	**0.98212**	28
36	39	.98756	**.97176**	.98882	**.97458**	.99001	**.97725**	.99113	**.97978**	.99218	**.98216**	24
40	40	.98758	**.97180**	.98884	**.97462**	.99003	**.97729**	.99115	**.97982**	.99220	**.98220**	20
44	41	.98760	**.97185**	.98886	**.97467**	.99004	**.97734**	.99116	**.97986**	.99222	**.98224**	16
48	42	9.98762	**0.97190**	9.98888	**0.97471**	9.99006	**0.97738**	9.99118	**0.97990**	9.99223	**0.98228**	12
52	43	.98764	**.97195**	.98890	**.97476**	.99008	**.97742**	.99120	**.97994**	.99225	**.98232**	8
56	44	9.98766	**0.97200**	9.98892	**0.97480**	9.99010	**0.97747**	9.99122	**0.97998**	9.99227	**0.98236**	4
		13h 17m		13h 13m		13h 9m		13h 5m		13h 1m		
s	′	10h 43m 160°		10h 47m 161°		10h 51m 162°		10h 55m 163°		10h 59m 164°		s
0	45	9.98769	**0.97204**	9.98894	**0.97485**	9.99012	**0.97751**	9.99124	**0.98002**	9.99229	**0.98239**	60
4	46	.98771	**.97209**	.98896	**.97490**	.99014	**.97755**	.99126	**.98007**	.99230	**.98243**	56
8	47	.98773	**.97214**	.98898	**.97494**	.99016	**.97760**	.99127	**.98011**	.99232	**.98247**	52
12	48	.98775	**.97219**	.98900	**.97499**	.99018	**.97764**	.99129	**.98015**	.99234	**.98251**	48
16	49	9.98777	**0.97224**	9.98902	**0.97503**	9.99020	**0.97768**	9.99131	**0.98019**	9.99235	**0.98255**	44
20	50	98779	**.97228**	.98904	**.97508**	.99022	**.97773**	.99133	**.98023**	.99237	**.98258**	40
24	51	.98781	**.97233**	.98906	**.97512**	.99024	**.97777**	.99135	**.98027**	.99239	**.98262**	36
28	52	.98784	**.97238**	.98908	**.97517**	.99026	**.97781**	.99136	**.98031**	.99240	**.98266**	32
32	53	9.98786	**0.97243**	9.98910	**0.97521**	9.99027	**0.97785**	9.99138	**0.98035**	9.99242	**0.98270**	28
36	54	.98788	**.97247**	.98912	**.97526**	.99029	**.97790**	.99140	**.98039**	.99244	**.98274**	24
40	55	.98790	**.97252**	.98914	**.97530**	.99031	**.97794**	.99142	**.98043**	.99245	**.98277**	20
44	56	.98792	**.97257**	.98916	**.97535**	.99033	**.97798**	.99143	**.98047**	.99247	**.98281**	16
48	57	9.98794	**0.97262**	9.98918	**0.97539**	9.99035	**0.97802**	9.99145	**0.98051**	9.99249	**0.98285**	12
52	58	.98796	**.97266**	.98920	**.97544**	.99037	**.97807**	.99147	**.98055**	.99250	**.98289**	8
56	59	.98798	**.97271**	.98922	**.97548**	.99039	**.97811**	.99149	**.98059**	.99252	**.98293**	4
60	60	9.98801	**0.97276**	9.98924	**0.97553**	9.99041	**0.97815**	9.99151	**0.98063**	9.99254	**0.98296**	0
		13h 16m		13h 12m		13h 8m		13h 4m		13h 0m		

TABLE 34.

Haversines.

s	′	11h 0m	165°	11h 4m	166°	11h 8m	167°	11h 12m	168°	11h 16m	169°	s
		Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	0	9.99254	**0.98296**	9.99350	**0.98515**	9.99440	**0.98719**	9.99523	**0.98907**	9.99599	**0.99081**	60
4	1	.99255	**.98300**	.99352	**.98518**	.99441	**.98722**	.99524	**.98910**	.99600	**.99084**	56
8	2	.99257	**.98304**	.99353	**.98522**	.99443	**.98725**	.99526	**.98913**	.99602	**.99087**	52
12	3	.99259	**.98308**	.99355	**.98525**	.99444	**.98728**	.99527	**.98916**	.99603	**.99090**	48
16	4	9.99260	**0.98311**	9.99356	**0.98529**	9.99446	**0.98732**	9.99528	**0.98919**	9.99604	**0.99092**	44
20	5	.99262	**.98315**	.99358	**.98532**	.99447	**.98735**	.99529	**.98922**	.99605	**.99095**	40
24	6	.99264	**.98319**	.99359	**.98536**	.99448	**.98738**	.99531	**.98925**	.99606	**.99098**	36
28	7	.99265	**.98323**	.99361	**.98539**	.99450	**.98741**	.99532	**.98928**	.99608	**.99101**	32
32	8	9.99267	**0.98326**	9.99362	**0.98543**	9.99451	**0.98745**	9.99533	**0.98931**	9.99609	**0.99103**	28
36	9	.99269	**.98330**	.99364	**.98546**	.99453	**.98748**	.99535	**.98934**	.99610	**.99106**	24
40	10	.99270	**.98334**	.99366	**.98550**	.99454	**.98751**	.99536	**.98937**	.99611	**.99109**	20
44	11	.99272	**.98337**	.99367	**.98553**	.99456	**.98754**	.99537	**.98940**	.99612	**.99112**	16
48	12	9.99274	**0.98341**	9.99369	**0.98557**	9.99457	**0.98757**	9.99539	**0.98943**	9.99614	**0.99114**	12
52	13	.99275	**.98345**	.99370	**.98560**	.99458	**.98761**	.99540	**.98946**	.99615	**.99117**	8
56	14	9.99277	**0.98349**	9.99372	**0.98564**	9.99460	**0.98764**	9.99541	**0.98949**	9.99616	**0.99120**	4
		12h 59m		12h 55m		12h 51m		12h 47m		12h 43m		
s	′	11h 1m	165°	11h 5m	166°	11h 9m	167°	11h 13m	168°	11h 17m	169°	s
0	15	9.99278	**0.98352**	9.99373	**0.98567**	9.99461	**0.98767**	9.99543	**0.98952**	9.99617	**0.99123**	60
4	16	.99280	**.98356**	.99375	**.98571**	.99463	**.98770**	.99544	**.98955**	.99618	**.99125**	56
8	17	.99282	**.98360**	.99376	**.98574**	.99464	**.98774**	.99545	**.98958**	.99620	**.99128**	52
12	18	.99283	**.98363**	.99378	**.98577**	.99465	**.98777**	.99546	**.98961**	.99621	**.99131**	48
16	19	9.99285	**0.98367**	9.99379	**0.98581**	9.99467	**0.98780**	9.99548	**0.98964**	9.99622	**0.99133**	44
20	20	.99287	**.98371**	.99381	**.98584**	.99468	**.98783**	.99549	**.98967**	.99623	**.99136**	40
24	21	.99288	**.98374**	.99382	**.98588**	.99470	**.98786**	.99550	**.98970**	.99624	**.99139**	36
28	22	.99290	**.98378**	.99384	**.98591**	.99471	**.98789**	.99552	**.98973**	.99626	**.99141**	32
32	23	9.99291	**0.98382**	9.99385	**0.98595**	9.99472	**0.98793**	9.99553	**0.98976**	9.99627	**0.99144**	28
36	24	.99293	**.98385**	.99387	**.98598**	.99474	**.98796**	.99554	**.98979**	.99628	**.99147**	24
40	25	.99295	**.98389**	.99388	**.98601**	.99475	**.98799**	.99555	**.98982**	.99629	**.99149**	20
44	26	.99296	**.98393**	.99390	**.98605**	.99477	**.98802**	.99557	**.98985**	.99630	**.99152**	16
48	27	9.99298	**0.98396**	9.99391	**0.98608**	9.99478	**0.98805**	9.99558	**0.98987**	9.99631	**0.99155**	12
52	28	.99300	**.98400**	.99393	**.98611**	.99479	**.98809**	.99559	**.98990**	.99633	**.99157**	8
56	29	9.99301	**0.98404**	9.99394	**0.98615**	9.99481	**0.98812**	9.99561	**0.98993**	9.99634	**0.99160**	4
		12h 58m		12h 54m		12h 50m		12h 46m		12h 42m		
s	′	11h 2m	165°	11h 6m	166°	11h 10m	167°	11h 14m	168°	11h 18m	169°	s
0	30	9.99303	**0.98407**	9.99396	**0.98619**	9.99482	**0.98815**	9.99562	**0.98996**	9.99635	**0.99163**	60
4	31	.99304	**.98411**	.99397	**.98622**	.99484	**.98818**	.99563	**.98999**	.99636	**.99165**	56
8	32	.99306	**.98415**	.99399	**.98625**	.99485	**.98821**	.99564	**.99002**	.99637	**.99168**	52
12	33	.99308	**.98418**	.99400	**.98629**	.99486	**.98824**	.99566	**.99005**	.99638	**.99171**	48
16	34	9.99309	**0.98422**	9.99402	**0.98632**	9.99488	**0.98827**	9.99567	**0.99008**	9.99639	**0.99173**	44
20	35	.99311	**.98426**	.99403	**.98635**	.99489	**.98830**	.99568	**.99011**	.99641	**.99176**	40
24	36	.99312	**.98429**	.99405	**.98639**	.99490	**.98834**	.99569	**.99014**	.99642	**.99179**	36
28	37	.99314	**.98433**	.99406	**.98642**	.99492	**.98837**	.99571	**.99016**	.99643	**.99181**	32
32	38	9.99316	**0.98436**	9.99408	**0.98646**	9.99493	**0.98840**	9.99572	**0.99019**	9.99644	**0.99184**	28
36	39	.99317	**.98440**	.99409	**.98649**	.99495	**.98843**	.99573	**.99022**	.99645	**.99186**	24
40	40	.99319	**.98444**	.99411	**.98652**	.99496	**.98846**	.99575	**.99025**	.99646	**.99189**	20
44	41	.99320	**.98447**	.99412	**.98656**	.99497	**.98849**	.99576	**.99028**	.99648	**.99192**	16
48	42	9.99322	**0.98451**	9.99414	**0.98659**	9.99499	**0.98852**	9.99577	**0.99031**	9.99649	**0.99194**	12
52	43	.99324	**.98454**	.99415	**.98662**	.99500	**.98855**	.99578	**.99034**	.99650	**.99197**	8
56	44	9.99325	**0.98458**	9.99417	**0.98666**	9.99501	**0.98858**	9.99580	**0.99036**	9.99651	**0.99199**	4
		12h 57m		12h 53m		12h 49m		12h 45m		12h 41m		
s	′	11h 3m	165°	11h 7m	166°	11h 11m	167°	11h 15m	168°	11h 19m	169°	s
0	45	9.99327	**0.98462**	9.99418	**0.98669**	9.99503	**0.98862**	9.99581	**0.99039**	9.99652	**0.99202**	60
4	46	.99328	**.98465**	.99420	**.98672**	.99504	**.98865**	.99582	**.99042**	.99653	**.99205**	56
8	47	.99330	**.98469**	.99421	**.98676**	.99505	**.98868**	.99583	**.99045**	.99654	**.99207**	52
12	48	.99331	**.98472**	.99422	**.98679**	.99507	**.98871**	.99584	**.99048**	.99655	**.99210**	48
16	49	9.99333	**0.98476**	9.99424	**0.98682**	9.99508	**0.98874**	9.99586	**0.99051**	9.99657	**0.99212**	44
20	50	.99335	**.98479**	.99425	**.98686**	.99510	**.98877**	.99587	**.99053**	99658	**.99215**	40
24	51	.99336	**.98483**	.99427	**.98689**	.99511	**.98880**	.99588	**.99056**	.99659	**.99217**	36
28	52	.99338	**.98487**	.99429	**.98692**	.99512	**.98883**	.99589	**.99059**	.99660	**.99220**	32
32	53	9.99339	**0.98490**	9.99430	**0.98696**	9.99514	**0.98886**	9.99591	**0.99062**	9.99661	**0.99223**	28
36	54	.99341	**.98494**	.99431	**.98699**	.99515	**.98889**	.99592	**.99065**	.99662	**.99225**	24
40	55	.99342	**.98497**	.99433	**.98702**	.99516	**.98892**	.99593	**.99067**	.99663	**.99228**	20
44	56	.99344	**.98501**	.99434	**.98705**	.99518	**.98895**	.99594	**.99070**	.99664	**.99230**	16
48	57	9.99345	**0.98504**	9.99436	**0.98709**	9.99519	**0.98898**	9.99596	**0.99073**	9.99666	**0.99233**	12
52	58	.99347	**.98508**	.99437	**.98712**	.99520	**.98901**	.99597	**.99076**	.99667	**.99235**	8
56	59	.99349	**.98511**	.99438	**.98715**	.99522	**.98904**	.99598	**.99079**	.99668	**.99238**	4
60	60	9.99350	**0.98515**	9.99440	**0.98719**	9.99523	**0.98907**	9.99599	**0.99081**	9.99669	**0.99240**	0
		12h 56m		12h 52m		12h 48m		12h 44m		12h 40m		

Haversines.

s	′	11h 20m	170°	11h 24m	171°	11h 28m	172°	11h 32m	173°	11h 36m	174°	s
		Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	0	9.99669	**0.99240**	9.99732	**0.99384**	9.99788	**0.99513**	9.99838	**0.99627**	9.99881	**0.99726**	60
4	1	.99670	**.99243**	.99733	**.99387**	.99789	**.99515**	.99839	**.99629**	.99882	**.99728**	56
8	2	.99671	**.99245**	.99734	**.99389**	.99790	**.99517**	.99839	**.99631**	.99882	**.99729**	52
12	3	.99672	**.99248**	.99735	**.99391**	.99791	**.99519**	.99840	**.99633**	.99883	**.99731**	48
16	4	9.99673	**0.99250**	9.99736	**0.99393**	9.99792	**0.99521**	9.99841	**0.99634**	9.99884	**0.99732**	44
20	5	.99674	**.99253**	.99737	**.99396**	.99793	**.99523**	.99842	**.99636**	.99884	**.99734**	40
24	6	.99675	**.99255**	.99738	**.99398**	.99793	**.99525**	.99842	**.99638**	.99885	**.99735**	36
28	7	.99677	**.99258**	.99739	**.99400**	.99794	**.99527**	.99843	**.99640**	.99885	**.99737**	32
32	8	9.99678	**0.99260**	9.99740	**0.99402**	9.99795	**0.99529**	9.99844	**0.99641**	9.99886	**0.99738**	28
36	9	.99679	**.99263**	.99741	**.99405**	.99796	**.99531**	.99845	**.99643**	.99887	**.99740**	24
40	10	.99680	**.99265**	.99742	**.99407**	.99797	**.99533**	.99845	**.99645**	.99887	**.99741**	20
44	11	.99681	**.99268**	.99743	**.99409**	.99798	**.99535**	.99846	**.99647**	.99888	**.99743**	16
48	12	9.99682	**0.99270**	9.99744	**0.99411**	9.99799	**0.99537**	9.99847	**0.99648**	9.99889	**0.99744**	12
52	13	.99683	**.99273**	.99745	**.99414**	.99800	**.99539**	.99848	**.99650**	.99889	**.99746**	8
56	14	9.99684	**0.99275**	9.99746	**0.99416**	9.99800	**0.99541**	9.99848	**0.99652**	9.99890	**0.99747**	4
		12h 39m		12h 35m		12h 31m		12h 27m		12h 23m		
s	′	11h 21m	170°	11h 25m	171°	11h 29m	172°	11h 33m	173°	11h 37m	174°	s
0	15	9.99685	**0.99278**	9.99747	**0.99418**	9.99801	**0.99543**	9.99849	**0.99653**	9.99891	**0.99748**	60
4	16	.99686	**.99280**	.99748	**.99420**	.99802	**.99545**	.99850	**.99655**	.99891	**.99750**	56
8	17	.99687	**.99283**	.99748	**.99422**	.99803	**.99547**	.99851	**.99657**	.99892	**.99751**	52
12	18	.99688	**.99285**	.99749	**.99425**	.99804	**.99549**	.99851	**.99659**	.99893	**.99753**	48
16	19	9.99690	**0.99288**	9.99750	**0.99427**	9.99805	**0.99551**	9.99852	**0.99660**	9.99893	**0.99754**	44
20	20	.99691	**.99290**	.99751	**.99429**	.99805	**.99553**	.99853	**.99662**	.99894	**.99756**	40
24	21	.99692	**.99293**	.99752	**.99431**	.99806	**.99555**	.99854	**.99664**	.99894	**.99757**	36
28	22	.99693	**.99295**	.99753	**.99433**	.99807	**.99557**	.99854	**.99665**	.99895	**.99759**	32
32	23	9.99694	**0.99297**	9.99754	**0.99436**	9.99808	**0.99559**	9.99855	**0.99667**	9.99896	**0.99760**	28
36	24	.99695	**.99300**	.99755	**.99438**	.99809	**.99561**	.99856	**.99669**	.99896	**.99761**	24
40	25	.99696	**.99302**	.99756	**.99440**	.99810	**.99563**	.99857	**.99670**	.99897	**.99763**	20
44	26	.99697	**.99305**	.99757	**.99442**	.99811	**.99565**	.99857	**.99672**	.99897	**.99764**	16
48	27	9.99698	**0.99307**	9.99758	**0.99444**	9.99811	**0.99567**	9.99858	**0.99674**	9.99898	**0.99766**	12
52	28	.99699	**.99309**	.99759	**.99446**	.99812	**.99568**	.99859	**.99675**	.99899	**.99767**	8
56	29	9.99700	**0.99312**	9.99760	**0.99449**	9.99813	**0.99570**	9.99859	**0.99677**	9.99899	**0.99768**	4
		12h 38m		12h 34m		12h 30m		12h 26m		12h 22m		
s	′	11h 22m	170°	11h 26m	171°	11h 30m	172°	11h 34m	173°	11h 38m	174°	s
0	30	9.99701	**0.99314**	9.99761	**0.99451**	9.99814	**0.99572**	9.99860	**0.99679**	9.99900	**0.99770**	60
4	31	.99702	**.99317**	.99762	**.99453**	.99815	**.99574**	.99861	**.99680**	.99901	**.99771**	56
8	32	.99703	**.99319**	.99763	**.99455**	.99815	**.99576**	.99862	**.99682**	.99901	**.99773**	52
12	33	.99704	**.99321**	.99764	**.99457**	.99816	**.99578**	.99862	**.99684**	.99902	**.99774**	48
16	34	9.99705	**0.99324**	9.99765	**0.99459**	9.99817	**0.99580**	9.99863	**0.99685**	9.99902	**0.99775**	44
20	35	.99706	**.99326**	.99766	**.99461**	.99818	**.99582**	.99864	**.99687**	.99903	**.99777**	40
24	36	.99707	**.99329**	.99766	**.99464**	.99819	**.99584**	.99864	**.99688**	.99904	**.99778**	36
28	37	.99708	**.99331**	.99767	**.99466**	.99820	**.99585**	.99865	**.99690**	.99904	**.99780**	32
32	38	9.99710	**0.99333**	9.99768	**0.99468**	9.99820	**0.99587**	9.99866	**0.99692**	9.99905	**0.99781**	28
36	39	.99711	**.99336**	.99769	**.99470**	.99821	**.99589**	.99867	**.99693**	.99905	**.99782**	24
40	40	.99712	**.99338**	.99770	**.99472**	.99822	**.99591**	.99867	**.99695**	.99906	**.99784**	20
44	41	.99713	**.99340**	.99771	**.99474**	.99823	**.99593**	.99868	**.99696**	.99906	**.99785**	16
48	42	9.99714	**0.99343**	9.99772	**0.99476**	9.99824	**0.99595**	9.99869	**0.99698**	9.99907	**0.99786**	12
52	43	.99715	**.99345**	.99773	**.99478**	.99824	**.99597**	.99869	**.99700**	.99908	**.99788**	8
56	44	9.99716	**0.99347**	9.99774	**0.99480**	9.99825	**0.99598**	9.99870	**0.99701**	9.99908	**0.99789**	4
		12h 37m		12h 33m		12h 29m		12h 25m		12h 21m		
s	′	11h 23m	170°	11h 27m	171°	11h 31m	172°	11h 35m	173°	11h 39m	174°	s
0	45	9.99717	**0.99350**	9.99774	**0.99483**	9.99826	**0.99600**	9.99871	**0.99703**	9.99909	**0.99790**	60
4	46	.99718	**.99352**	.99775	**.99485**	.99827	**.99602**	.99871	**.99704**	.99909	**.99792**	56
8	47	.99719	**.99354**	.99776	**.99487**	.99828	**.99604**	.99872	**.99706**	.99910	**.99793**	52
12	48	.99720	**.99357**	.99777	**.99489**	.99828	**.99606**	.99873	**.99708**	.99911	**.99794**	48
16	49	9.99721	**0.99359**	9.99778	**0.99491**	9.99829	**0.99608**	9.99874	**0.99709**	9.99911	**0.99796**	44
20	50	.99722	**.99361**	.99779	**.99493**	.99830	**.99609**	.99874	**.99711**	.99912	**.99797**	40
24	51	.99723	**.99364**	.99780	**.99495**	.99831	**.99611**	.99875	**.99712**	.99912	**.99798**	36
28	52	.99724	**.99366**	.99781	**.99497**	.99832	**.99613**	.99876	**.99714**	.99913	**.99799**	32
32	53	9.99725	**0.99368**	9.99782	**0.99499**	9.99832	**0.99615**	9.99876	**0.99715**	9.99913	**0.99801**	28
36	54	.99726	**.99371**	.99783	**.99501**	.99833	**.99617**	.99877	**.99717**	.99914	**.99802**	24
40	55	.99727	**.99373**	.99784	**.99503**	.99834	**.99618**	.99878	**.99719**	.99915	**.99803**	20
44	56	.99728	**.99375**	.99785	**.99505**	.99835	**.99620**	.99878	**.99720**	.99915	**.99805**	16
48	57	9.99729	**0.99378**	9.99786	**0.99507**	9.99836	**0.99622**	9.99879	**0.99722**	9.99916	**0.99806**	12
52	58	.99730	**.99380**	.99786	**.99509**	.99836	**.99624**	.99880	**.99723**	.99916	**.99807**	8
56	59	.99731	**.99382**	.99787	**.99511**	.99837	**.99626**	.99880	**.99725**	.99917	**.99808**	4
60	60	9.99732	**0.99384**	9.99788	**0.99513**	9.99838	**0.99627**	9.99881	**0.99726**	9.99917	**0.99810**	0
		12h 36m		12h 32m		12h 28m		12h 24m		12h 20m		

TABLE 34.

Haversines.

s	′	11h 40m	175°	11h 44m	176°	11h 48m	177°	11h 52m	178°	11h 56m	179°	s
		Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	Log. Hav.	Nat. Hav.	
0	0	9.99917	**0.99810**	9.99947	**0.99878**	9.99970	**0.99931**	9.99987	**0.99970**	9.99997	**0.99992**	60
4	1	.99918	**.99811**	.99948	**.99879**	.99971	**.99932**	.99987	**.99971**	.99997	**.99993**	56
8	2	.99918	**.99812**	.99948	**.99880**	.99971	**.99933**	.99987	**.99971**	.99997	**.99993**	52
12	3	.99919	**.99814**	.99948	**.99881**	.99971	**.99934**	.99987	**.99971**	.99997	**.99993**	48
16	4	9.99919	**0.99815**	9.99949	**0.99882**	9.99972	**0.99934**	9.99988	**0.99972**	9.99997	**0.99994**	44
20	5	.99920	**.99816**	.99949	**.99883**	.99972	**.99935**	.99988	**.99972**	.99997	**.99994**	40
24	6	.99921	**.99817**	.99950	**.99884**	.99972	**.99936**	.99988	**.99973**	.99997	**.99994**	36
28	7	.99921	**.99819**	.99950	**.99885**	.99973	**.99937**	.99988	**.99973**	.99997	**.99994**	32
32	8	9.99922	**0.99820**	9.99951	**0.99886**	9.99973	**0.99937**	9.99988	**0.99973**	9.99998	**0.99994**	28
36	9	.99922	**.99821**	.99951	**.99887**	.99973	**.99938**	.99989	**.99974**	.99998	**.99995**	24
40	10	.99923	**.99822**	.99951	**.99888**	.99973	**.99939**	.99989	**.99974**	.99998	**.99995**	20
44	11	.99923	**.99823**	.99952	**.99889**	.99974	**.99940**	.99989	**.99975**	.99998	**.99995**	16
48	12	9.99924	**0.99825**	9.99952	**0.99890**	9.99974	**0.99940**	9.99989	**0.99975**	9.99998	**0.99995**	12
52	13	.99924	**.99826**	.99953	**.99891**	.99974	**.99941**	.99989	**.99976**	.99998	**.99995**	8
56	14	9.99925	**0.99827**	9.99953	**0.99892**	9.99975	**0.99942**	9.99990	**0.99976**	9.99998	**0.99996**	4
		12h 19m		12h 15m		12h 11m		12h 7m		12h 3m		
s	′	11h 41m	175°	11h 45m	176°	11h 49m	177	11h 53m	178°	11h 57m	179°	s
0	15	9.99925	**0.99828**	9.99953	**0.99893**	9.99975	**0.99942**	9.99990	**0.99977**	9.99998	**0.99996**	60
4	16	.99926	**.99829**	.99954	**.99894**	.99975	**.99943**	.99990	**.99977**	.99998	**.99996**	56
8	17	.99926	**.99831**	.99954	**.99895**	.99976	**.99944**	.99990	**.99978**	.99998	**.99996**	52
12	18	.99927	**.99832**	.99954	**.99896**	.99976	**.99944**	.99990	**.99978**	.99998	**.99996**	48
16	19	9.99927	**0.99833**	9.99955	**0.99897**	9.99976	**0.99945**	9.99991	**0.99978**	9.99998	**0.99996**	44
20	20	.99928	**.99834**	.99955	**.99898**	.99976	**.99946**	.99991	**.99979**	.99999	**.99997**	40
24	21	.99928	**.99835**	.99956	**.99899**	.99977	**.99947**	.99991	**.99979**	.99999	**.99997**	36
28	22	.99929	**.99837**	.99956	**.99900**	.99977	**.99947**	.99991	**.99980**	.99999	**.99997**	32
32	23	9.99929	**0.99838**	9.99957	**0.99900**	9.99977	**0.99948**	9.99991	**0.99980**	9.99999	**0.99997**	28
36	24	.99930	**.99839**	.99957	**.99901**	.99978	**.99949**	.99992	**.99981**	.99999	**.99997**	24
40	25	.99931	**.99840**	.99958	**.99902**	.99978	**.99949**	.99992	**.99981**	.99999	**.99997**	20
44	26	.99931	**.99841**	.99958	**.99903**	.99978	**.99950**	.99992	**.99981**	.99999	**.99998**	16
48	27	9.99932	**0.99842**	9.99958	**0.99904**	9.99978	**0.99950**	9.99992	**0.99982**	9.99999	**0.99998**	12
52	28	.99932	**.99844**	.99959	**.99905**	.99979	**.99951**	.99992	**.99982**	.99999	**.99998**	8
56	29	9.99933	**0.99845**	9.99959	**0.99906**	9.99979	**0.99952**	9.99992	**0.99982**	9.99999	**0.99998**	4
		12h 18m		12h 14m		12h 10m		12h 6m		12h 2m		
s	′	11h 42m	175°	11h 46m	176°	11h 50m	177°	11h 54m	178°	11h 58m	179°	s
0	30	9.99933	**0.99846**	9.99958	**0.99907**	9.99979	**0.99952**	9.99993	**0.99983**	9.99999	**0.99998**	60
4	31	.99934	**.99847**	.99960	**.99908**	.99980	**.99953**	.99993	**.99983**	.99999	**.99998**	56
8	32	.99934	**.99848**	.99960	**.99909**	.99980	**.99954**	.99993	**.99984**	.99999	**.99998**	52
12	33	.99935	**.99849**	.99961	**.99909**	.99980	**.99954**	.99993	**.99984**	.99999	**.99998**	48
16	34	9.99935	**0.99850**	9.99961	**0.99910**	9.99980	**0.99955**	9.99993	**0.99984**	9.99999	**0.99999**	44
20	35	.99935	**.99851**	.99961	**.99911**	.99981	**.99956**	.99993	**.99985**	.99999	**.99999**	40
24	36	.99936	**.99853**	.99962	**.99912**	.99981	**.99956**	.99994	**.99985**	9.99999	**.99999**	36
28	37	.99936	**.99854**	.99962	**.99913**	.99981	**.99957**	.99994	**.99985**	0.00000	**.99999**	32
32	38	9.99937	**0.99855**	9.99963	**0.99914**	9.99981	**0.99957**	9.99994	**0.99986**	0.00000	**0.99999**	28
36	39	.99937	**.99856**	.99963	**.99915**	.99982	**.99958**	.99994	**.99986**	.00000	**.99999**	24
40	40	.99938	**.99857**	.99963	**.99915**	.99982	**.99959**	.99994	**.99986**	.00000	**.99999**	20
44	41	.99938	**.99858**	.99964	**.99916**	.99982	**.99959**	.99994	**.99987**	.00000	**.99999**	16
48	42	9.99939	**0.99859**	9.99964	**0.99917**	9.99983	**0.99960**	9.99994	**0.99987**	0.00000	**0.99999**	12
52	43	.99939	**.99860**	.99964	**.99918**	.99983	**.99960**	.99995	**.99987**	.00000	**.99999**	8
56	44	9.99940	**0.99861**	9.99965	**0.99919**	9.99983	**0.99961**	9.99995	**0.99988**	0.00000	**0.99999**	4
		12h 17m		12h 13m		12h 9m		12h 5m		12h 1m		
s	′	11h 43m	175°	11h 47m	176°	11h 51m	177°	11h 55m	178°	11h 59m	179°	s
0	45	9.99940	**0.99863**	9.99965	**0.99920**	9.99983	**0.99961**	9.99995	**0.99988**	0.00000	**1.00000**	60
4	46	.99941	**.99864**	.99965	**.99920**	.99983	**.99962**	.99995	**.99988**	.00000	**.00000**	56
8	47	.99941	**.99865**	.99966	**.99921**	.99984	**.99963**	.99995	**.99989**	.00000	**.00000**	52
12	48	.99942	**.99866**	.99966	**.99922**	.99984	**.99963**	.99995	**.99989**	.00000	**.00000**	48
16	49	9.99942	**0.99867**	9.99966	**0.99923**	9.99984	**0.99964**	9.99995	**0.99989**	0.00000	**1.00000**	44
20	50	.99943	**.99868**	.99967	**.99924**	.99984	**.99964**	.99996	**.99990**	.00000	**.00000**	40
24	51	.99943	**.99869**	.99967	**.99924**	.99985	**.99965**	.99996	**.99990**	.00000	**.00000**	36
28	52	.99943	**.99870**	.99968	**.99925**	.99985	**.99965**	.99996	**.99990**	.00000	**.00000**	32
32	53	9.99944	**0.99871**	9.99968	**0.99926**	9.99985	**0.99966**	9.99996	**0.99991**	0.00000	**1.00000**	28
36	54	.99944	**.99872**	.99968	**.99927**	.99985	**.99966**	.99996	**.99991**	.00000	**.00000**	24
40	55	.99945	**.99873**	.99969	**.99928**	.99986	**.99967**	.99996	**.99991**	.00000	**.00000**	20
44	56	.99945	**.99874**	.99969	**.99928**	.99986	**.99967**	.99996	**.99991**	.00000	**.00000**	16
48	57	9.99946	**0.99875**	9.99969	**0.99929**	9.99986	**0.99968**	9.99996	**0.99992**	0.00000	**1.00000**	12
52	58	.99946	**.99876**	.99970	**.99930**	.99986	**.99969**	.99996	**.99992**	.00000	**.00000**	8
56	59	.99947	**.99877**	.99970	**.99931**	.99987	**.99969**	.99997	**.99992**	.00000	**.00000**	4
60	60	9.99947	**0.99878**	9.99970	**0.99931**	9.99987	**0.99970**	9.99997	**0.99992**	0.00000	**1.00000**	0
		12h 16m		12h 12m		12h 8m		12h 4m		12h 0m		

TABLE 35.

Longitude Factors.

F is the change in longitude due to a change of 1′ in latitude.

Bearing.	Latitude. 0°	1°	2°	4°	6°	8°	10°	12°	Bearing.
°	′	′	′	′	′	′	′	′	°
1	57.29	57.30	57.32	57.43	57.61	57.85	58.17	58.57	**1**
2	28.64	28.64	28.65	28.71	28.79	28.92	29.08	29.28	**2**
3	19.08	19.08	19.09	19.13	19.19	19.27	19.38	19.51	**3**
4	14.30	14.30	14.31	14.34	14.38	14.44	14.52	14.62	**4**
5	11.43	11.43	11.44	11.46	11.49	11.54	11.61	11.69	**5**
6	9.51	9.52	9.52	9.54	9.57	9.61	9.66	9.73	**6**
7	8.14	8.15	8.15	8.16	8.19	8.22	8.27	8.33	**7**
8	7.12	7.12	7.12	7.13	7.15	7.18	7.22	7.27	**8**
10	5.67	5.67	5.68	5.69	5.70	5.73	5.76	5.80	**10**
12	4.71	4.71	4.71	4.72	4.73	4.75	4.78	4.81	**12**
14	4.01	4.01	4.01	4.02	4.03	4.05	4.07	4.10	**14**
16	3.49	3.49	3.49	3.50	3.51	3.52	3.54	3.56	**16**
18	3.08	3.08	3.08	3.08	3.10	3.11	3.13	3.15	**18**
20	2.75	2.75	2.75	2.75	2.76	2.77	2.79	2.81	**20**
22	2.47	2.47	2.48	2.48	2.49	2.50	2.51	2.53	**22**
24	2.25	2.25	2.25	2.25	2.26	2.27	2.28	2.30	**24**
26	2.05	2.05	2.05	2.05	2.06	2.07	2.08	2.10	**26**
28	1.88	1.88	1.88	1.88	1.89	1.90	1.91	1.92	**28**
30	1.73	1.73	1.73	1.74	1.74	1.75	1.76	1.77	**30**
32	1.60	1.60	1.60	1.60	1.61	1.62	1.63	1.64	**32**
34	1.48	1.48	1.48	1.49	1.49	1.50	1.50	1.52	**34**
36	1.38	1.38	1.38	1.38	1.38	1.39	1.40	1.41	**36**
38	1.28	1.28	1.28	1.28	1.29	1.29	1.30	1.31	**38**
40	1.19	1.19	1.19	1.19	1.20	1.20	1.21	1.22	**40**
42	1.11	1.11	1.11	1.11	1.12	1.12	1.13	1.14	**42**
44	1.04	1.04	1.04	1.04	1.04	1.05	1.05	1.06	**44**
46	.97	.97	.97	.97	.97	.98	.98	.99	**46**
48	.90	.90	.90	.90	.90	.91	.91	.92	**48**
50	.84	.84	.84	.84	.84	.85	.85	.86	**50**
52	.78	.78	.78	.78	.79	.79	.79	.80	**52**
54	.73	.73	.73	.73	.73	.73	.74	.74	**54**
56	.67	.67	.67	.68	.68	.68	.68	.69	**56**
58	.63	.63	.63	.63	.63	.63	.63	.64	**58**
60	.58	.58	.58	.58	.58	.58	.59	.59	**60**
62	.53	.53	.53	.53	.53	.54	.54	.54	**62**
64	.49	.49	.49	.49	.49	.49	.50	.50	**64**
66	.45	.45	.45	.45	.45	.45	.45	.46	**66**
68	.40	.40	.40	.40	.40	.41	.41	.41	**68**
70	.36	.36	.36	.36	.37	.37	.37	.37	**70**
72	.33	.33	.33	.33	.33	.33	.33	.33	**72**
74	.29	.29	.29	.29	.29	.29	.29	.29	**74**
76	.25	.25	.25	.25	.25	.25	.25	.25	**76**
78	.21	.21	.21	.21	.21	.21	.22	.22	**78**
80	.18	.18	.18	.18	.18	.18	.18	.18	**80**
81	.16	.16	.16	.16	.16	.16	.16	.16	**81**
82	.14	.14	.14	.14	.14	.14	.14	.14	**82**
83	.12	.12	.12	.12	.12	.12	.12	.13	**83**
84	.10	.10	.10	.10	.10	.10	.11	.11	**84**
85	.09	.09	.09	.09	.09	.09	.09	.09	**85**
86	.07	.07	.07	.07	.07	.07	.07	.07	**86**
87	.05	.05	.05	.05	.05	.05	.05	.05	**87**
88	.03	.03	.03	.03	.03	.03	.03	.04	**88**
89	.02	.02	.02	.02	.02	.02	.02	.02	**89**
90	.00	.00	.00	.00	.00	.00	.00	.00	**90**
	0°	**1°**	**2°**	**4°**	**6°**	**8°**	**10°**	**12°**	

Corr. to Long.=Error in Lat.×**F**.

TABLE 35.

Longitude Factors.

F is the change in longitude due to a change of 1′ in latitude.

Latitude.

Bearing.	14°	16°	18°	20°	22°	24°	26°	28°	Bearing.
°	′	′	′	′	′	′	′	′	°
1	59.04	59.60	60.24	60.97	61.79	62.71	63.74	64.88	**1**
2	29.51	29.79	30.11	30.47	30.89	31.35	31.86	32.43	**2**
3	19.67	19.85	20.06	20.31	20.58	20.89	21.23	21.61	**3**
4	14.74	14.88	15.04	15.22	15.42	15.65	15.91	16.20	**4**
5	11.78	11.89	12.02	12.16	12.33	12.51	12.72	12.95	**5**
6	9.81	9.90	10.00	10.12	10.26	10.41	10.59	10.78	**6**
7	8.39	8.47	8.56	8.67	8.78	8.91	9.06	9.22	**7**
8	7.33	7.40	7.48	7.57	7.67	7.79	7.92	8.06	**8**
10	5.85	5.90	5.96	6.03	6.12	6.21	6.31	6.42	**10**
12	4.85	4.89	4.95	5.01	5.07	5.15	5.23	5.33	**12**
14	4.13	4.17	4.22	4.27	4.33	4.39	4.46	4.54	**14**
16	3.59	3.63	3.67	3.71	3.76	3.82	3.88	3.95	**16**
18	3.17	3.20	3.24	3.28	3.32	3.37	3.42	3.49	**18**
20	2.83	2.86	2.89	2.92	2.96	3.01	3.06	3.11	**20**
22	2.55	2.58	2.60	2.63	2.67	2.71	2.75	2.80	**22**
24	2.32	2.34	2.36	2.39	2.42	2.46	2.50	2.54	**24**
26	2.11	2.13	2.16	2.18	2.21	2.24	2.28	2.32	**26**
28	1.94	1.96	1.98	2.00	2.03	2.06	2.09	2.13	**28**
30	1.78	1.80	1.82	1.84	1.87	1.90	1.93	1.96	**30**
32	1.65	1.66	1.68	1.70	1.73	1.75	1.78	1.81	**32**
34	1.53	1.54	1.56	1.58	1.60	1.62	1.65	1.68	**34**
36	1.42	1.43	1.45	1.47	1.48	1.51	1.53	1.56	**36**
38	1.32	1.33	1.35	1.36	1.38	1.40	1.42	1.45	**38**
40	1.23	1.24	1.25	1.27	1.28	1.30	1.33	1.35	**40**
42	1.14	1.15	1.17	1.18	1.20	1.22	1.24	1.26	**42**
44	1.07	1.08	1.09	1.10	1.12	1.13	1.15	1.17	**44**
46	1.00	1.01	1.02	1.03	1.04	1.06	1.07	1.09	**46**
48	.93	.94	.95	.96	.97	.99	1.00	1.02	**48**
50	.87	.87	.88	.89	.91	.92	.93	.95	**50**
52	.80	.81	.82	.83	.84	.85	.87	.88	**52**
54	.75	.76	.76	.77	.78	.79	.81	.82	**54**
56	.69	.70	.71	.72	.73	.74	.75	.76	**56**
58	.64	.65	.66	.66	.67	.68	.69	.71	**58**
60	.60	.60	.61	.61	.62	.63	.64	.65	**60**
62	.55	.55	.56	.57	.57	.58	.59	.60	**62**
64	.50	.51	.51	.52	.53	.53	.54	.55	**64**
66	.46	.46	.47	.47	.48	.49	.50	.50	**66**
68	.42	.42	.42	.43	.44	.44	.45	.46	**68**
70	.37	.38	.38	.39	.39	.40	.40	.41	**70**
72	.34	.34	.34	.35	.35	.36	.36	.37	**72**
74	.30	.30	.30	.31	.31	.31	.32	.33	**74**
76	.26	.26	.26	.27	.27	.27	.28	.28	**76**
78	.22	.22	.22	.23	.23	.23	.24	.24	**78**
80	.18	.18	.18	.19	.19	.19	.20	.20	**80**
81	.16	.16	.17	.17	.17	.17	.18	.18	**81**
82	.14	.15	.15	.15	.15	.15	.16	.16	**82**
83	.13	.13	.13	.13	.13	.13	.14	.14	**83**
84	.11	.11	.11	.11	.11	.11	.12	.12	**84**
85	.09	.09	.09	.09	.09	.10	.10	.10	**85**
86	.07	.07	.07	.07	.08	.08	.08	.08	**86**
87	.05	.05	.05	.06	.06	.06	.06	.06	**87**
88	.04	.04	.04	.04	.04	.04	.04	.04	**88**
89	.02	.02	.02	.02	.02	.02	.02	.02	**89**
90	.00	.00	.00	.00	.00	.00	.00	.00	**90**
	14°	**16°**	**18°**	**20°**	**22°**	**24°**	**26°**	**28°**	

Corr. to Long.=Error in Lat.×**F**.

TABLE 35.

Longitude Factors.

F is the change in longitude due to a change of 1′ in latitude.

Latitude.

Bearing.	30°	32°	34°	36°	38°	40°	42°	44°	Bearing.
°	′	′	′	′	′	′	′	′	°
1	66.15	67.56	69.10	70.81	72.70	74.79	77.09	79.64	1
2	33.07	33.77	34.54	35.40	36.34	37.38	38.53	39.81	2
3	22.03	22.50	23.02	23.59	24.21	24.91	25.68	26.53	3
4	16.51	16.86	17.25	17.68	18.15	18.67	19.24	19.88	4
5	13.20	13.48	13.79	14.13	14.50	14.92	15.38	15.89	5
6	10.99	11.22	11.48	11.76	12.07	12.42	12.80	13.23	6
7	9.40	9.60	9.82	10.07	10.34	10.63	10.96	11.32	7
8	8.22	8.39	8.58	8.79	9.03	9.29	9.57	9.89	8
10	6.55	6.69	6.84	7.01	7.20	7.40	7.63	7.88	10
12	5.43	5.55	5.67	5.81	5.97	6.14	6.33	6.54	12
14	4.63	4.73	4.84	4.96	5 09	5.24	5.40	5.58	14
16	4.03	4.11	4.21	4.31	4.43	4.55	4.69	4.85	16
18	3.55	3.63	3.71	3.80	3.91	4.02	4.14	4.28	18
20	3.17	3.24	3.31	3.40	3.49	3.59	3.70	3.82	20
22	2.86	2.92	2.98	3.06	3.14	3.23	3.33	3.44	22
24	2.59	2.65	2.71	2.78	2.85	2.93	3.02	3.12	24
26	2.37	2.42	2.47	2.53	2.60	2.68	2.76	2.85	26
28	2.17	2.22	2.27	2.32	2.39	2.45	2.53	2.61	28
30	2.00	2.04	2.09	2.14	2.20	2.26	2.33	2.41	30
32	1.85	1.89	1.93	1.98	2.03	2.09	2.15	2.22	32
34	1.71	1.75	1.79	1.83	1.88	1.93	1.99	2.06	34
36	1.59	1.62	1.66	1.70	1.75	1.80	1.85	1.91	36
38	1.48	1.51	1.54	1.58	1.62	1.67	1.72	1.78	38
40	1.38	1.41	1.44	1.47	1.51	1.56	1.60	1.66	40
42	1.28	1.31	1.34	1.37	1.41	1.45	1.49	1.54	42
44	1.20	1.22	1.25	1.28	1.31	1.35	1.39	1.44	44
46	1.11	1.14	1.16	1.19	1.23	1.26	1.30	1.34	46
48	1.04	1.06	1.09	1.11	1.14	1.17	1.21	1.25	48
50	.97	.99	1.01	1.04	1.06	1.09	1.13	1.17	50
52	.90	.92	.94	.97	.99	1.02	1.05	1.09	52
54	.84	.86	.88	.90	.92	.95	.98	1.01	54
56	.78	.79	.81	.83	.86	.88	.91	.94	56
58	.72	.74	.75	.77	.79	.82	.84	.87	58
60	.67	.68	.70	.71	.73	.75	.78	.80	60
62	.61	.63	.64	.66	.67	.69	.72	.74	62
64	.56	.57	.59	.60	.62	.64	.66	.68	64
66	.51	.52	.54	.55	.56	.58	.60	.62	66
68	.47	.48	.49	.50	.51	.53	.54	.56	68
70	.42	.43	.44	.45	.46	.47	.49	.51	70
72	.37	.38	.39	.40	.41	.42	.44	.45	72
74	.33	.34	.35	.35	.36	.37	.39	.40	74
76	.29	.29	.30	.31	.32	.32	.34	.35	76
78	.24	.25	.26	.26	.27	.28	.29	.29	78
80	.20	.21	.21	.22	.22	.23	.24	.24	80
81	.18	.19	.19	.20	.20	.21	.21	.22	81
82	.16	.17	.17	.17	.18	.18	.19	.19	82
83	.14	.14	.15	.15	.16	.16	.16	.17	83
84	.12	.12	.13	.13	.13	.14	.14	.15	84
85	.10	.10	.11	.11	.11	.11	.12	.12	85
86	.08	.08	.08	.09	.09	.09	.09	.10	86
87	.06	.06	.06	.06	.07	.07	.07	.07	87
88	.04	.04	.04	.04	.04	.05	.05	.05	88
89	.02	.02	.02	.02	.02	.02	.02	.02	89
90	.00	.00	.00	.00	.00	.00	.00	.00	90
	30°	32°	34°	36°	38°	40°	42°	44°	

Corr. to Long.=Error in Lat.×F.

TABLE 35.

Longitude Factors.

F is the change in longitude due to a change of 1′ in latitude.

Bearing.	46°	48°	50°	52°	54°	56°	58°	60°	Bearing.
	Latitude.								
°	′	′	′	′	′	′	′	′	°
1	82.47	85.62	89.13	93.05	97.47	102.5	108.1	114.6	**1**
2	41.22	42.80	44.55	46.51	48.72	51.21	54.04	57.27	**2**
3	27.47	28.52	29.68	30.99	32.46	34.12	36.01	38.16	**3**
4	20.59	21.37	22.25	23.23	24.33	25.57	26.99	28.60	**4**
5	16.45	17.08	17.78	18.57	19.45	20.44	21.57	22.86	**5**
6	13.70	14.22	14.80	15.45	16.19	17.01	17.95	19.03	**6**
7	11.72	12.17	12.67	13.23	13.86	14.56	15.37	16.29	**7**
8	10.24	10.63	11.07	11.56	12.11	12.72	13.43	14.23	**8**
10	8.16	8.48	8.82	9.21	9.65	10.14	10.70	11.34	**10**
12	6.77	7.03	7.32	7.64	8.00	8.41	8.88	9.41	**12**
14	5.77	5.99	6.24	6.51	6.82	7.17	7.57	8.02	**14**
16	5.02	5.21	5.42	5.66	5.93	6.24	6.58	6.97	**16**
18	4.43	4.60	4.79	5.00	5.24	5.50	5.81	6.15	**18**
20	3.95	4.11	4.27	4.46	4.67	4.91	5.19	5.49	**20**
22	3.56	3.70	3.85	4.02	4.21	4.43	4.67	4.95	**22**
24	3.23	3.36	3.49	3.65	3.82	4.02	4.24	4.49	**24**
26	2.95	3.06	3.19	3.33	3.49	3.66	3.87	4.10	**26**
28	2.71	2.81	2.93	3.05	3.20	3.36	3.55	3.76	**28**
30	2.49	2.59	2.69	2.81	2.95	3.10	3.27	3.46	**30**
32	2.30	2.39	2.49	2.60	2.72	2.86	3.02	3.20	**32**
34	2.13	2.22	2.31	2.41	2.52	2.65	2.80	2.96	**34**
36	1.98	2.06	2.14	2.24	2.34	2.46	2.60	2.75	**36**
38	1.84	1.91	1.99	2.08	2.18	2.29	2.41	2.56	**38**
40	1.71	1.78	1.85	1.94	2.03	2.13	2.25	2.38	**40**
42	1.60	1.66	1.73	1.80	1.89	1.99	2.09	2.22	**42**
44	1.49	1.55	1.61	1.68	1.76	1.85	1.95	2.07	**44**
46	1.39	1.44	1.50	1.57	1.64	1.73	1.82	1.93	**46**
48	1.30	1.35	1.40	1.46	1.53	1.61	1.70	1.80	**48**
50	1.21	1.25	1.31	1.36	1.43	1.50	1.58	1.68	**50**
52	1.12	1.17	1.22	1.27	1.33	1.40	1.47	1.56	**52**
54	1.05	1.09	1.13	1.18	1.23	1.30	1.37	1.45	**54**
56	.97	1.01	1.05	1.10	1.15	1.21	1.27	1.35	**56**
58	.90	.93	.97	1.01	1.06	1.12	1.18	1.25	**58**
60	.83	.86	.90	.94	.98	1.03	1.09	1.15	**60**
62	.77	.79	.83	.86	.90	.95	1.00	1.06	**62**
64	.70	.73	.76	.79	.83	.87	.92	.97	**64**
66	.64	.66	.69	.72	.76	.79	.84	.89	**66**
68	.58	.60	.63	.65	.69	.72	.76	.81	**68**
70	.52	.54	.57	.59	.62	.65	.68	.73	**70**
72	.47	.49	.51	.53	.55	.58	.61	.65	**72**
74	.41	.43	.45	.46	.49	.51	.54	.57	**74**
76	.36	.37	.39	.40	.42	.45	.47	.50	**76**
78	.31	.32	.33	.34	.36	.38	.40	.42	**78**
80	.25	.26	.27	.29	.30	.31	.33	.35	**80**
81	.23	.24	.25	.26	.27	.28	.30	.32	**81**
82	.20	.21	.22	.23	.24	.25	.26	.28	**82**
83	.18	.18	.19	.20	.21	.22	.23	.25	**83**
84	.15	.16	.16	.17	.18	.19	.20	.21	**84**
85	.13	.13	.14	.14	.15	.16	.16	.17	**85**
86	.10	.10	.11	.11	.12	.12	.13	.14	**86**
87	.08	.08	.08	.08	.09	.09	.10	.10	**87**
88	.05	.05	.05	.06	.06	.06	.07	.07	**88**
89	.02	.03	.03	.03	.03	.03	.03	.03	**89**
90	.00	.00	.00	.00	.00	.00	.00	.00	**90**
	46°	**48°**	**50°**	**52°**	**54°**	**56°**	**58°**	**60°**	

Corr. to Long.=Error in Lat.×**F**.

TABLE 36.

Latitude Factors.

f is the change in latitude due to a change of 1′ in longitude.

Bearing.	Latitude. 0°	1°	2°	4°	6°	8°	10°	12°	Bearing.
°	′	′	′	′	′	′	′	′	°
1	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	1
2	.03	.03	.03	.03	.03	.03	.03	.03	2
3	.05	.05	.05	.05	.05	.05	.05	.05	3
4	.07	.07	.07	.07	.07	.07	.07	.07	4
5	.09	.09	.09	.09	.09	.09	.09	.09	5
6	.11	.11	.11	.10	.10	.10	.10	.10	6
7	.12	.12	.12	.12	.12	.12	.12	.12	7
8	.14	.14	.14	.14	.14	.14	.14	.14	8
10	.18	.18	.18	.18	.18	.17	.17	.17	10
12	.21	.21	.21	.21	.21	.21	.21	.21	12
14	.25	.25	.25	.25	.25	.25	.25	.24	14
16	.29	.29	.29	.29	.28	.28	.28	.28	16
18	.32	.32	.32	.32	.32	.32	.32	.32	18
20	.36	.36	.36	.36	.36	.36	.36	.36	20
22	.40	.40	.40	.40	.40	.40	.40	.40	22
24	.44	.44	.44	.44	.44	.44	.44	.43	24
26	.49	.49	.49	.49	.49	.48	.48	.48	26
28	.53	.53	.53	.53	.53	.53	.52	.52	28
30	.58	.58	.58	.57	.57	.57	.57	.56	30
32	.63	.63	.63	.63	.62	.62	.61	.61	32
34	.68	.68	.68	.67	.67	.67	.67	.66	34
36	.72	.72	.72	.72	.72	.72	.71	.71	36
38	.78	.78	.78	.78	.78	.78	.77	.76	38
40	.84	.84	.84	.84	.83	.83	.83	.82	40
42	.90	.90	.90	.90	.89	.89	.88	.88	42
44	.96	.96	.96	.96	.96	.95	.95	.94	44
46	1.04	1.04	1.04	1.03	1.03	1.03	1.02	1.01	46
48	1.11	1.11	1.11	1.11	1.11	1.10	1.10	1.09	48
50	1.19	1.19	1.19	1.19	1.19	1.18	1.17	1.17	50
52	1.28	1.28	1.28	1.28	1.27	1.27	1.26	1.25	52
54	1.38	1.38	1.38	1.37	1.37	1.36	1.36	1.35	54
56	1.48	1.48	1.48	1.48	1.47	1.47	1.46	1.45	56
58	1.60	1.60	1.60	1.60	1.59	1.58	1.58	1.57	58
60	1.73	1.73	1.73	1.73	1.72	1.72	1.71	1.69	60
62	1.88	1.88	1.88	1.88	1.87	1.86	1.85	1.84	62
64	2.05	2.05	2.05	2.05	2.04	2.03	2.02	2.01	64
66	2.25	2.25	2.24	2.24	2.23	2.22	2.21	2.20	66
68	2.48	2.48	2.47	2.47	2.46	2.45	2.44	2.42	68
70	2.75	2.75	2.75	2.74	2.73	2.72	2.71	2.69	70
72	3.08	3.08	3.08	3.07	3.06	3.05	3.03	3.01	72
74	3.49	3.49	3.49	3.48	3.47	3.45	3.43	3.41	74
76	4.01	4.01	4.01	4.00	3.99	3.97	3.95	3.92	76
78	4.70	4.70	4.70	4.69	4.68	4.66	4.63	4.60	78
80	5.67	5.67	5.67	5.66	5.64	5.62	5.59	5.55	80
81	6.31	6.31	6.31	6.30	6.28	6.25	6.22	6.18	81
82	7.12	7.11	7.11	7.10	7.07	7.05	7.01	6.96	82
83	8.15	8.14	8.14	8.13	8.10	8.07	8.02	7.97	83
84	9.52	9.51	9.51	9.49	9.46	9.42	9.37	9.31	84
85	11.43	11.43	11.42	11.40	11.37	11.32	11.25	11.18	85
86	14.30	14.30	14.29	14.27	14.22	14.16	14.08	13.99	86
87	19.08	19.08	19.07	19.03	18.98	18.91	18.79	18.66	87
88	28.63	28.63	28.62	28.57	28.48	28.35	28.20	28.01	88
89	57.29	57.28	57.26	57.15	56.98	56.73	56.42	56.04	89
	0°	1°	2°	4°	6°	8°	10°	12°	

Cor. to Lat. = Error in Long. × f.

TABLE 36.

Latitude Factors.

f is the change in latitude due to a change of 1′ in longitude.

Bearing.	14°	16°	18°	20°	22°	24°	26°	28°	Bearing.
	Latitude.								
°	′	′	′	′	′	′	′	′	°
1	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	1
2	.03	.03	.03	.03	.03	.03	.03	.03	2
3	.05	.05	.05	.05	.05	.05	.05	.05	3
4	.07	.07	.07	.07	.06	.06	.06	.06	4
5	.08	.08	.08	.08	.08	.08	.08	.08	5
6	.10	.10	.10	.10	.10	.10	.09	.09	6
7	.12	.12	.12	.12	.11	.11	.11	.11	7
8	.14	.14	.13	.13	.13	.13	.13	.12	8
10	.17	.17	.17	.17	.16	.16	.16	.16	10
12	.21	.20	.20	.20	.20	.19	.19	.19	12
14	.24	.24	.24	.23	.23	.23	.22	.22	14
16	.28	.28	.27	.27	.27	.26	.26	.25	16
18	.32	.31	.31	.30	.30	.30	.29	.29	18
20	.35	.35	.35	.34	.34	.33	.33	.32	20
22	.39	.39	.38	.38	.38	.37	.36	.36	22
24	.43	.43	.42	.42	.41	.41	.40	.39	24
26	.47	.47	.46	.46	.45	.45	.44	.43	26
28	.52	.51	.51	.50	.49	.49	.48	.47	28
30	.56	.56	.55	.54	.53	.53	.52	.51	30
32	.61	.60	.60	.59	.58	.57	.56	.55	32
34	.65	.65	.64	.63	.63	.62	.61	.59	34
36	.70	.70	.69	.68	.68	.66	.65	.64	36
38	.76	.75	.74	.74	.72	.71	.70	.69	38
40	.81	.81	.80	.79	.78	.77	.75	.74	40
42	.88	.87	.85	.85	.83	.82	.81	.79	42
44	.93	.93	.92	.91	.89	.88	.87	.85	44
46	1.01	1.00	.99	.97	.96	.95	.93	.91	46
48	1.08	1.07	1.06	1.04	1.03	1.02	1.00	.98	48
50	1.16	1.15	1.13	1.12	1.10	1.09	1.07	1.05	50
52	1.24	1.23	1.22	1.20	1.19	1.17	1.15	1.13	52
54	1.34	1.32	1.31	1.29	1.28	1.26	1.24	1.22	54
56	1.44	1.43	1.41	1.39	1.38	1.35	1.33	1.31	56
58	1.55	1.54	1.52	1.50	1.48	1.46	1.44	1.41	58
60	1.68	1.67	1.65	1.63	1.61	1.58	1.56	1.53	60
62	1.83	1.81	1.79	1.77	1.74	1.72	1.69	1.66	62
64	1.99	1.97	1.95	1.93	1.90	1.87	1.84	1.81	64
66	2.18	2.16	2.14	2.11	2.08	2.05	2.02	1.98	66
68	2.40	2.38	2.35	2.33	2.30	2.26	2.23	2.18	68
70	2.67	2.64	2.61	2.58	2.55	2.51	2.47	2.43	70
72	2.99	2.96	2.93	2.89	2.85	2.81	2.77	2.72	72
74	3.38	3.35	3.32	3.28	3.23	3.19	3.14	3.08	74
76	3.89	3.86	3.81	3.77	3.72	3.66	3.61	3.54	76
78	4.56	4.52	4.47	4.42	4.36	4.30	4.23	4.15	78
80	5.50	5.45	5.39	5.33	5.26	5.18	5.10	5.01	80
81	6.13	6.07	6.01	5.93	5.86	5.77	5.68	5.58	81
82	6.90	6.84	6.77	6.69	6.60	6.50	6.40	6.28	82
83	7.90	7.83	7.75	7.65	7.55	7.44	7.32	7.19	83
84	9.23	9.15	9.05	8.94	8.82	8.69	8.55	8.40	84
85	11.09	10.99	10.87	10.74	10.60	10.44	10.26	10.09	85
86	13.88	13.75	13.60	13.44	13.26	13.07	12.86	12.63	86
87	18.51	18.34	18.15	17.93	17.69	17.43	17.15	16.85	87
88	27.78	27.52	27.23	26.91	26.55	26.16	25.74	25.28	88
89	55.59	55.07	54.49	53.84	53.12	52.33	51.50	50.58	89
	14°	16°	18°	20°	22°	24°	26°	28°	

Corr. to Lat.=Error in Long.×f.

TABLE 36.

Latitude Factors.

f is the change in latitude due to a change of 1′ in longitude.

Bearing.	Latitude. 30°	32°	34°	36°	38°	40°	42°	44°	Bearing.
°	′	′	′	′	′	′	′	′	°
1	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1
2	.03	.03	.03	.03	.03	.03	.03	.03	2
3	.05	.05	.04	.04	.04	.04	.04	.04	3
4	.06	.06	.06	.06	.06	.05	.05	.05	4
5	.08	.07	.07	.07	.07	.07	.07	.06	5
6	.09	.09	.09	.09	.08	.08	.08	.08	6
7	.11	.10	.10	.10	.10	.09	.09	.09	7
8	.12	.12	.12	.11	.11	.11	.10	.10	8
10	.15	.15	.15	.14	.14	.14	.13	.13	10
12	.18	.18	.18	.17	.17	.16	.16	.15	12
14	.22	.21	.21	.20	.20	.19	.19	.18	14
16	.25	.24	.24	.23	.23	.22	.21	.21	16
18	.28	.28	.27	.26	.26	.25	.24	.23	18
20	.32	.31	.30	.29	.29	.28	.27	.26	20
22	.35	.34	.34	.33	.32	.31	.30	.29	22
24	.39	.38	.37	.36	.35	.34	.33	.32	24
26	.42	.41	.40	.40	.38	.37	.36	.35	26
28	.46	.45	.44	.43	.42	.41	.40	.38	28
30	.50	.49	.48	.47	.45	.44	.43	.41	30
32	.54	.53	.52	.51	.49	.48	.47	.45	32
34	.58	.57	.56	.55	.53	.52	.50	.49	34
36	.63	.62	.60	.59	.57	.56	.54	.52	36
38	.68	.66	.65	.63	.62	.60	.58	.56	38
40	.72	.71	.69	.68	.66	.64	.63	.60	40
42	.78	.76	.75	.73	.71	.69	.67	.65	42
44	.83	.82	.80	.78	.76	.74	.72	.69	44
46	.90	.88	.86	.84	.82	.79	.77	.74	46
48	.96	.94	.92	.90	.88	.85	.83	.80	48
50	1.03	1.01	.99	.96	.94	.91	.88	.86	50
52	1.11	1.09	1.06	1.04	1.01	.98	.95	.92	52
54	1.19	1.16	1.14	1.11	1.08	1.05	1.02	.99	54
56	1.28	1.26	1.23	1.20	1.17	1.14	1.10	1.07	56
58	1.39	1.36	1.33	1.30	1.26	1.23	1.19	1.15	58
60	1.49	1.47	1.44	1.40	1.37	1.33	1.29	1.25	60
62	1.63	1.59	1.56	1.52	1.48	1.44	1.40	1.35	62
64	1.78	1.74	1.70	1.66	1.62	1.57	1.52	1.48	64
66	1.95	1.91	1.85	1.82	1.77	1.72	1.67	1.62	66
68	2.14	2.10	2.05	2.00	1.95	1.90	1.84	1.78	68
70	2.38	2.33	2.28	2.22	2.17	2.10	2.04	1.98	70
72	2.67	2.61	2.55	2.50	2.43	2.36	2.29	2.21	72
74	3.02	2.96	2.89	2.82	2.75	2.67	2.59	2.51	74
76	3.47	3.40	3.33	3.25	3.16	3.07	2.98	2.89	76
78	4.07	3.99	3.90	3.81	3.71	3.60	3.50	3.38	78
80	4.91	4.81	4.70	4.59	4.47	4.34	4.22	4.08	80
81	5.47	5.35	5.24	5.11	4.98	4.84	4.69	4.54	81
82	6.16	6.03	5.90	5.76	5.61	5.45	5.29	5.12	82
83	7.05	6.91	6.75	6.59	6.42	6.24	6.05	5.86	83
84	8.24	8.07	7.93	7.70	7.50	7.29	7.07	6.84	84
85	9.90	9.69	9.48	9.25	9.01	8.75	8.49	8.22	85
86	12.39	12.13	11.86	11.57	11.27	10.95	10.63	10.29	86
87	16.52	16.18	15.82	15.44	15.04	14.62	14.18	13.73	87
88	24.80	24.28	23.74	23.17	22.56	21.93	21.28	20.60	88
89	49.61	48.58	47.50	46.36	45.14	43.98	42.58	41.21	89
	30°	32°	34°	36°	38°	40°	42°	44°	

Corr. to Lat. = Error in Long. × f.

TABLE 36.

Latitude Factors.

f is the change in latitude due to a change of 1′ in longitude.

Bearing.	Latitude. 46°	48°	50°	52°	54°	56°	58°	60°	Bearing.
°	′	′	′	′	′	′	′	′	°
1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1
2	.02	.02	.02	.02	.02	.02	.02	.02	2
3	.04	.03	.03	.03	.03	.03	.03	.03	3
4	.05	.05	.04	.04	.04	.04	.04	.03	4
5	.06	.06	.06	.05	.05	.05	.05	.04	5
6	.07	.07	.07	.06	.06	.06	.06	.05	6
7	.08	.08	.08	.08	.07	.07	.06	.06	7
8	.10	.09	.09	.08	.08	.08	.07	.07	8
10	.12	.12	.11	.11	.10	.10	.09	.09	10
12	.15	.14	.14	.13	.13	.12	.11	.11	12
14	.17	.17	.16	.15	.15	.14	.13	.12	14
16	.20	.19	.18	.18	.17	.16	.15	.14	16
18	.23	.22	.21	.20	.19	.18	.17	.16	18
20	.25	.24	.23	.22	.21	.20	.19	.18	20
22	.28	.27	.26	.25	.24	.23	.21	.20	22
24	.31	.30	.29	.27	.26	.25	.24	.22	24
26	.34	.33	.31	.30	.29	.27	.26	.24	26
28	.37	.36	.34	.33	.31	.30	.28	.27	28
30	.40	.39	.37	.36	.34	.32	.31	.29	30
32	.43	.42	.40	.38	.37	.35	.33	.31	32
34	.47	.45	.43	.41	.40	.38	.36	.34	34
36	.51	.49	.47	.45	.43	.41	.38	.36	36
38	.54	.52	.50	.48	.46	.44	.41	.39	38
40	.58	.56	.54	.52	.49	.47	.44	.42	40
42	.63	.60	.58	.56	.53	.50	.48	.45	42
44	.67	.65	.62	.60	.57	.54	.51	.48	44
46	.72	.69	.67	.64	.61	.58	.55	.52	46
48	.77	.74	.71	.68	.65	.62	.59	.56	48
50	.83	.80	.77	.73	.70	.67	.63	.60	50
52	.89	.86	.82	.79	.75	.72	.68	.64	52
54	.96	.92	.88	.85	.81	.77	.73	.69	54
56	1.03	.99	.95	.91	.87	.83	.79	.74	56
58	1.11	1.07	1.03	.99	.94	.89	.85	.80	58
60	1.20	1.16	1.11	1.07	1.02	.97	.92	.87	60
62	1.31	1.26	1.21	1.16	1.11	1.05	1.00	.94	62
64	1.42	1.37	1.32	1.26	1.20	1.15	1.09	1.03	64
66	1.56	1.50	1.44	1.38	1.32	1.26	1.19	1.12	66
68	1.72	1.66	1.59	1.52	1.45	1.38	1.31	1.24	68
70	1.91	1.84	1.77	1.69	1.61	1.54	1.45	1.37	70
72	2.14	2.06	1.99	1.89	1.81	1.72	1.63	1.54	72
74	2.42	2.33	2.24	2.15	2.05	1.95	1.85	1.74	74
76	2.79	2.68	2.58	2.47	2.36	2.24	2.13	2.01	76
78	3.27	3.15	3.02	2.90	2.77	2.63	2.49	2.35	78
80	3.94	3.80	3.70	3.49	3.33	3.17	3.01	2.84	80
81	4.39	4.23	4.06	3.89	3.71	3.53	3.35	3.16	81
82	4.94	4.76	4.57	4.38	4.18	3.98	3.77	3.56	82
83	5.66	5.45	5.24	5.01	4.79	4.56	4.32	4.07	83
84	6.61	6.37	6.12	5.86	5.59	5.32	5.04	4.76	84
85	7.94	7.65	7.35	7.04	6.72	6.39	6.06	5.72	85
86	9.94	9.57	9.19	8.81	8.41	8.00	7.58	7.15	86
87	13.26	12.77	12.27	11.75	11.22	10.67	10.11	9.54	87
88	19.89	19.16	18.41	17.64	16.83	16.01	15.17	14.32	88
89	39.80	38.34	36.83	35.24	33.68	32.04	30.36	28.65	89
	46°	48°	50°	52°	54°	56°	58°	60°	

Corr. to Lat.=Error in Long.×f.

TABLE 37.

Noon Interval Factor.

Easterly hourly change in longitude.

M	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0	1. 00000	0. 99989	0. 99978	0. 99967	0. 99956	0. 99944	0. 99933	0. 99922	0. 99911	0. 99900
1	. 99889	. 99878	. 99867	. 99856	. 99845	. 99834	. 99823	. 99812	. 99801	. 99790
2	. 99778	. 99767	. 99756	. 99745	. 99734	. 99723	. 99712	. 99701	. 99690	. 99679
3	. 99668	. 99657	. 99646	. 99635	. 99624	. 99613	. 99602	. 99591	. 99580	. 99569
4	. 99558	. 99547	. 99536	. 99525	. 99514	. 99503	. 99492	. 99481	. 99470	. 99459
5	. 99448	. 99437	. 99426	. 99415	. 99404	. 99393	. 99382	. 99371	. 99360	. 99349
6	. 99338	. 99327	. 99316	. 99305	. 99294	. 99283	. 99272	. 99261	. 99250	. 99239
7	. 99228	. 99217	. 99206	. 99196	. 99185	. 99174	. 99163	. 99152	. 99141	. 99130
8	. 99119	. 99108	. 99097	. 99086	. 99075	. 99064	. 99054	. 99043	. 99032	. 99021
9	. 99010	. 98999	. 98988	. 98977	. 98966	. 98956	. 98945	. 98934	. 98923	. 98912
10	. 98901	. 98890	. 98879	. 98868	. 98857	. 98847	. 98836	. 98825	. 98814	. 98803
11	. 98793	. 98782	. 98771	. 98760	. 98749	. 98738	. 98727	. 98717	. 98706	. 98695
12	. 98684	. 98674	. 98663	. 98652	. 98641	. 98630	. 98620	. 98609	. 98598	. 98587
13	. 98576	. 98565	. 98555	. 98544	. 98533	. 98522	. 98511	. 98501	. 98490	. 98479
14	. 98468	. 98457	. 98447	. 98436	. 98425	. 98414	. 98404	. 98393	. 98382	. 98371
15	. 98361	. 98350	. 98339	. 98329	. 98318	. 98307	. 98296	. 98285	. 98275	. 98264
16	. 98253	. 98242	. 98232	. 98221	. 98210	. 98200	. 98189	. 98178	. 98168	. 98157
17	. 98146	. 98135	. 98125	. 98114	. 98103	. 98093	. 98082	. 98071	. 98061	. 98050
18	. 98039	. 98028	. 98018	. 98007	. 97997	. 97986	. 97975	. 97964	. 97954	. 97943
19	. 97933	. 97922	. 97911	. 97901	. 97890	. 97879	. 97869	. 97858	. 97847	. 97836
20	. 97826	. 97816	. 97805	. 97794	. 97784	. 97773	. 97762	. 97752	. 97741	. 97731
21	. 97720	. 97709	. 97698	. 97688	. 97678	. 97667	. 97657	. 97646	. 97635	. 97624
22	. 97614	. 97603	. 97593	. 97582	. 97572	. 97561	. 97550	. 97540	. 97530	. 97519
23	. 97508	. 97498	. 97487	. 97477	. 97466	. 97455	. 97445	. 97434	. 97424	. 97413
24	. 97402	. 97391	. 97381	. 97371	. 97360	. 97350	. 97339	. 97329	. 97318	. 97308
25	. 97298	. 97287	. 97276	. 97266	. 97255	. 97245	. 97234	. 97224	. 97213	. 97203
26	. 97192	. 97182	. 97171	. 97161	. 97150	. 97140	. 97130	. 97119	. 97108	. 97098
27	. 97088	. 97077	. 97067	. 97056	. 97045	. 97035	. 97025	. 97014	. 97004	. 96993
28	. 96983	. 96972	. 96962	. 96952	. 96941	. 96931	. 96920	. 96910	. 96899	. 96889
29	. 96878	. 96868	. 96858	. 96847	. 96837	. 96826	. 96816	. 96806	. 96795	. 96785
30	. 96774	. 96764	. 96754	. 96743	. 96733	. 96722	. 96712	. 96702	. 96691	. 96681
31	. 96670	. 96660	. 96650	. 96639	. 96629	. 96618	. 96608	. 96598	. 96587	. 96577
32	. 96567	. 96556	. 96546	. 96535	. 96525	. 96515	. 96505	. 96494	. 96484	. 96473
33	. 96463	. 96453	. 96442	. 96432	. 96422	. 96411	. 96401	. 96391	. 96380	. 96370
34	. 96360	. 96350	. 96339	. 96329	. 96319	. 96308	. 96298	. 96288	. 96277	. 96267
35	. 96257	. 96247	. 96236	. 96226	. 96216	. 96205	. 96195	. 96185	. 96175	. 96164
36	. 96154	. 96144	. 96133	. 96123	. 96113	. 96103	. 96092	. 96082	. 96072	. 96061
37	. 96051	. 96041	. 96031	. 96021	. 96010	. 96000	. 95990	. 95979	. 95969	. 95959
38	. 95949	. 95939	. 95929	. 95918	. 95908	. 95898	. 95888	. 95877	. 95867	. 95857
39	. 95847	. 95837	. 95826	. 95816	. 95806	. 95796	. 95786	. 95775	. 95765	. 95755
40	. 95745	. 95734	. 95724	. 95714	. 95704	. 95694	. 95684	. 95674	. 95663	. 95653
41	. 95643	. 95633	. 95623	. 95613	. 95602	. 95592	. 95582	. 95572	. 95562	. 95552
42	. 95541	. 95531	. 95521	. 95511	. 95501	. 95491	. 95481	. 95471	. 95460	. 95450
43	. 95440	. 95430	. 95420	. 95410	. 95400	. 95390	. 95380	. 95369	. 95359	. 95349
44	. 95339	. 95329	. 95319	. 95309	. 95299	. 95289	. 95279	. 95268	. 95258	. 95248
45	. 95238	. 95228	. 95218	. 95208	. 95198	. 95188	. 95178	. 95168	. 95158	. 95148
46	. 95137	. 95127	. 95117	. 95107	. 95097	. 95087	. 95077	. 95067	. 95057	. 95047
47	. 95037	. 95027	. 95017	. 95007	. 94997	. 94987	. 94977	. 94967	. 94957	. 94947
48	. 94937	. 94927	. 94917	. 94907	. 94897	. 94887	. 94877	. 94867	. 94857	. 94847
49	. 94837	. 94827	. 94817	. 94807	. 94797	. 94787	. 94777	. 94767	. 94757	. 94747
50	. 94737	. 94727	. 94717	. 94707	. 94697	. 94687	. 94677	. 94667	. 94657	. 94647
51	. 94637	. 94627	. 94617	. 94607	. 94597	. 94587	. 94577	. 94568	. 94558	. 94548
52	. 94538	. 94528	. 94518	. 94508	. 94498	. 94488	. 94478	. 94468	. 94459	. 94449
53	. 94438	. 94429	. 94419	. 94409	. 94399	. 94389	. 94379	. 94369	. 94359	. 94349
54	. 94339	. 94329	. 94320	. 94310	. 94300	. 94290	. 94280	. 94270	. 94261	. 94251
55	. 94241	. 94231	. 94221	. 94211	. 94201	. 94191	. 94181	. 94171	. 94162	. 94152
56	. 94142	. 94133	. 94123	. 94113	. 94103	. 94093	. 94083	. 94073	. 94064	. 94054
57	. 94044	. 94034	. 94024	. 94014	. 94005	. 93995	. 93985	. 93975	. 93965	. 93956
58	. 93946	. 93936	. 93926	. 93916	. 93906	. 93897	. 93887	. 93877	. 93868	. 93858
59	. 93848	. 93838	. 93828	. 93818	. 93809	. 92799	. 93789	. 93779	. 93769	. 93759
60	. 93750	. 93740	. 93730	. 93721	. 93711	. 93701	. 93691	. 93682	. 93672	. 93662

Combine change in longitude due to vessels course and speed, with change due to current, take factor from table and multiply it by hour angle obtained from morning observation.

TABLE 37.

Noon Interval Factor.

Westerly hourly change in longitude.

M	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0	1. 0000	1. 0001	1. 0002	1. 0003	1. 0005	1. 0006	1. 0007	1. 0008	1. 0009	1. 0010
1	1. 0011	1. 0012	1. 0013	1. 0014	1. 0016	1. 0017	1. 0018	1. 0019	1. 0020	1. 0021
2	1. 0022	1. 0023	1. 0025	1. 0026	1. 0027	1. 0028	1. 0029	1. 0030	1. 0031	1. 0032
3	1. 0034	1. 0035	1. 0036	1. 0037	1. 0038	1. 0039	1. 0040	1. 0041	1. 0042	1. 0043
4	1. 0045	1. 0046	1. 0047	1. 0048	1. 0049	1. 0050	1. 0051	1. 0053	1. 0054	1. 0055
5	1. 0056	1. 0057	1. 0058	1. 0059	1. 0060	1. 0062	1. 0063	1. 0064	1. 0065	1. 0066
6	1. 0067	1. 0068	1. 0070	1. 0071	1. 0072	1. 0073	1. 0074	1. 0075	1. 0076	1. 0077
7	1. 0078	1. 0079	1. 0080	1. 0082	1. 0083	1. 0084	1. 0085	1. 0086	1. 0087	1. 0089
8	1. 0090	1. 0091	1. 0092	1. 0093	1. 0094	1. 0095	1. 0096	1. 0098	1. 0099	1. 0100
9	1. 0101	1. 0102	1. 0103	1. 0104	1. 0105	1. 0106	1. 0108	1. 0109	1. 0110	1. 0111
10	1. 0112	1. 0113	1. 0115	1. 0116	1. 0117	1. 0118	1. 0119	1. 0120	1. 0121	1. 0123
11	1. 0124	1. 0125	1. 0126	1. 0127	1. 0128	1. 0129	1. 0130	1. 0131	1. 0133	1. 0134
12	1. 0135	1. 0136	1. 0137	1. 0139	1. 0140	1. 0141	1. 0142	1. 0143	1. 0144	1. 0145
13	1. 0146	1. 0148	1. 0149	1. 0150	1. 0151	1. 0152	1. 0154	1. 0155	1. 0156	1. 0157
14	1. 0158	1. 0159	1. 0161	1. 0162	1. 0163	1. 0164	1. 0165	1. 0166	1. 0167	1. 0168
15	1. 0169	1. 0171	1. 0172	1. 0173	1. 0174	1. 0175	1. 0177	1. 0178	1. 0179	1. 0180
16	1. 0181	1. 0182	1. 0183	1. 0184	1. 0185	1. 0186	1. 0187	1. 0188	1. 0190	1. 0191
17	1. 0193	1. 0194	1. 0195	1. 0196	1. 0197	1. 0198	1. 0199	1. 0201	1. 0202	1. 0203
18	1. 0204	1. 0205	1. 0206	1. 0208	1. 0209	1. 0210	1. 0211	1. 0212	1. 0213	1. 0214
19	1. 0216	1. 0217	1. 0218	1. 0219	1. 0220	1. 0222	1. 0223	1. 0224	1. 0225	1. 0226
20	1. 0227	1. 0228	1. 0229	1. 0231	1. 0232	1. 0233	1. 0234	1. 0235	1. 0236	1. 0238
21	1. 0239	1. 0240	1. 0241	1. 0242	1. 0244	1. 0245	1. 0246	1. 0247	1. 0248	1. 0249
22	1. 0250	1. 0252	1. 0253	1. 0254	1. 0255	1. 0256	1. 0258	1. 0259	1. 0260	1. 0261
23	1. 0262	1. 0263	1. 0265	1. 0266	1. 0267	1. 0268	1. 0269	1. 0270	1. 0271	1. 0273
24	1. 0274	1. 0275	1. 0276	1. 0277	1. 0279	1. 0280	1. 0281	1. 0282	1. 0283	1. 0285
25	1. 0286	1. 0287	1. 0288	1. 0289	1. 0291	1. 0292	1. 0293	1. 0294	1. 0295	1. 0296
26	1. 0297	1. 0299	1. 0300	1. 0301	1. 0302	1. 0303	1. 0304	1. 0306	1. 0307	1. 0308
27	1. 0309	1. 0311	1. 0312	1. 0313	1. 0314	1. 0315	1. 0316	1. 0318	1. 0319	1. 0320
28	1. 0321	1. 0322	1. 0324	1. 0325	1. 0326	1. 0327	1. 0328	1. 0329	1. 0330	1. 0332
29	1. 0333	1. 0334	1. 0335	1. 0336	1. 0338	1. 0339	1. 0340	1. 0341	1. 0342	1. 0344
30	1. 0345	1. 0346	1. 0347	1. 0348	1. 0350	1. 0351	1. 0352	1. 0353	1. 0354	1. 0355
31	1. 0357	1. 0358	1. 0359	1. 0360	1. 0362	1. 0363	1. 0364	1. 0365	1. 0366	1. 0367
32	1. 0369	1. 0370	1. 0371	1. 0372	1. 0374	1. 0375	1. 0376	1. 0377	1. 0378	1. 0379
33	1. 0381	1. 0382	1. 0383	1. 0384	1. 0386	1. 0387	1. 0388	1. 0389	1. 0390	1. 0391
34	1. 0393	1. 0394	1. 0395	1. 0396	1. 0397	1. 0399	1. 0400	1. 0401	1. 0402	1. 0403
35	1. 0405	1. 0406	1. 0407	1. 0408	1. 0409	1. 0411	1. 0412	1. 0413	1. 0414	1. 0415
36	1. 0416	1. 0418	1. 0419	1. 0420	1. 0421	1. 0422	1. 0424	1. 0425	1. 0426	1. 0427
37	1. 0429	1. 0430	1. 0431	1. 0432	1. 0433	1. 0435	1. 0436	1. 0437	1. 0438	1. 0439
38	1. 0441	1. 0442	1. 0443	1. 0445	1. 0446	1. 0447	1. 0448	1. 0449	1. 0451	1. 0452
39	1. 0453	1. 0454	1. 0455	1. 0457	1. 0458	1. 0459	1. 0460	1. 0462	1. 0463	1. 0464
40	1. 0465	1. 0466	1. 0468	1. 0469	1. 0470	1. 0471	1. 0472	1. 0474	1. 0475	1. 0476
41	1. 0477	1. 0478	1. 0480	1. 0481	1. 0482	1. 0483	1. 0485	1. 0486	1. 0487	1. 0488
42	1. 0489	1. 0491	1. 0492	1. 0493	1. 0494	1. 0496	1. 0497	1. 0498	1. 0499	1. 0500
43	1. 0502	1. 0503	1. 0504	1. 0505	1. 0507	1. 0508	1. 0509	1. 0510	1. 0511	1. 0513
44	1. 0514	1. 0515	1. 0517	1. 0518	1. 0519	1. 0520	1. 0522	1. 0523	1. 0524	1. 0525
45	1. 0526	1. 0528	1. 0529	1. 0530	1. 0531	1. 0532	1. 0534	1. 0535	1. 0536	1. 0537
46	1. 0539	1. 0540	1. 0541	1. 0542	1. 0543	1. 0545	1. 0546	1. 0547	1. 0549	1. 0550
47	1. 0551	1. 0552	1. 0553	1. 0555	1. 0556	1. 0557	1. 0558	1. 0560	1. 0561	1. 0562
48	1. 0564	1. 0565	1. 0566	1. 0567	1. 0569	1. 0570	1. 0571	1. 0572	1. 0573	1. 0575
49	1. 0576	1. 0577	1. 0578	1. 0580	1. 0581	1. 0582	1. 0583	1. 0585	1. 0586	1. 0587
50	1. 0588	1. 0589	1. 0591	1. 0592	1. 0593	1. 0594	1. 0596	1. 0597	1. 0598	1. 0599
51	1. 0601	1. 0602	1. 0603	1. 0604	1. 0605	1. 0607	1. 0608	1. 0609	1. 0611	1. 0612
52	1. 0613	1. 0614	1. 0616	1. 0617	1. 0618	1. 0620	1. 0621	1. 0622	1. 0623	1. 0624
53	1. 0626	1. 0627	1. 0628	1. 0630	1. 0631	1. 0632	1. 0633	1. 0635	1. 0636	1. 0637
54	1. 0638	1. 0639	1. 0641	1. 0642	1. 0643	1. 0644	1. 0646	1. 0647	1. 0648	1. 0650
55	1. 0651	1. 0652	1. 0653	1. 0655	1. 0656	1. 0657	1. 0658	1. 0660	1. 0661	1. 0662
56	1. 0664	1. 0665	1. 0666	1. 0667	1. 0668	1. 0670	1. 0671	1. 0672	1. 0674	1. 0675
57	1. 0676	1. 0677	1. 0678	1. 0680	1. 0681	1. 0683	1. 0684	1. 0685	1. 0686	1. 0688
58	1. 0689	1. 0690	1. 0691	1. 0693	1. 0694	1. 0695	1. 0696	1. 0698	1. 0699	1. 0700
59	1. 0701	1. 0703	1. 0704	1. 0705	1. 0707	1. 0708	1. 0709	1. 0710	1. 0712	1. 0713
60	1. 0714	1. 0716	1. 0717	1. 0718	1. 0719	1. 0721	1. 0722	1. 0723	1. 0724	1. 0726

Combine change in longitude due to vessel's course and speed with change due to current, take factor from table and multiply it by hour angle obtained from morning observation

Sidereal into Mean Solar Time.

Sidereal.	To be subtracted from a sidereal time interval.									
	0h	1h	2h	3h	4h	5h	6h	7h	For seconds.	
m.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	s.	s.
0	0 0.000	0 9.830	0 19.659	0 29.489	0 39.318	0 49.148	0 58.977	1 8.807		
1	0 0.164	0 9.993	0 19.823	0 29.653	0 39.482	0 49.312	0 59.141	1 8.971	1	0.003
2	0 0.328	0 10.157	0 19.987	0 29.816	0 39.646	0 49.475	0 59.305	1 9.135	2	.005
3	0 0.491	0 10.321	0 20.151	0 29.980	0 39.810	0 49.639	0 59.469	1 9.298	3	.008
4	0 0.655	0 10.485	0 20.314	0 30.144	0 39.974	0 49.803	0 59.633	1 9.462	4	.011
5	0 0.819	0 10.649	0 20.478	0 30.308	0 40.137	0 49.967	0 59.796	1 9.626	5	.014
6	0 0.983	0 10.813	0 20.642	0 30.472	0 40.301	0 50.131	0 59.960	1 9.790	6	.016
7	0 1.147	0 10.976	0 20.806	0 30.635	0 40.465	0 50.295	1 0.124	1 9.954	7	.019
8	0 1.311	0 11.140	0 20.970	0 30.799	0 40.629	0 50.458	1 0.288	1 10.118	8	.022
9	0 1.474	0 11.304	0 21.134	0 30.963	0 40.793	0 50.622	1 0.452	1 10.281	9	.025
10	0 1.638	0 11.468	0 21.297	0 31.127	0 40.956	0 50.786	1 0.616	1 10.445	10	.027
11	0 1.802	0 11.632	0 21.461	0 31.291	0 41.120	0 50.950	1 0.779	1 10.609	11	.030
12	0 1.966	0 11.795	0 21.625	0 31.455	0 41.284	0 51.114	1 0.943	1 10.773	12	.033
13	0 2.130	0 11.959	0 21.789	0 31.618	0 41.448	0 51.278	1 1.107	1 10.937	13	.035
14	0 2.294	0 12.123	0 21.953	0 31.782	0 41.612	0 51.441	1 1.271	1 11.100	14	.038
15	0 2.457	0 12.287	0 22.117	0 31.946	0 41.776	0 51.605	1 1.435	1 11.264	15	.041
16	0 2.621	0 12.451	0 22.280	0 32.110	0 41.939	0 51.769	1 1.599	1 11.428	16	.044
17	0 2.785	0 12.615	0 22.444	0 32.274	0 42.103	0 51.933	1 1.762	1 11.592	17	.046
18	0 2.949	0 12.778	0 22.608	0 32.438	0 42.267	0 52.097	1 1.926	1 11.756	18	.049
19	0 3.113	0 12.942	0 22.772	0 32.601	0 42.431	0 52.260	1 2.090	1 11.920	19	.052
20	0 3.277	0 13.106	0 22.936	0 32.765	0 42.595	0 52.424	1 2.254	1 12.083	20	.055
21	0 3.440	0 13.270	0 23.099	0 32.929	0 42.759	0 52.588	1 2.418	1 12.247	21	.057
22	0 3.604	0 13.434	0 23.263	0 33.093	0 42.922	0 52.752	1 2.582	1 12.411	22	.060
23	0 3.768	0 13.598	0 23.427	0 33.257	0 43.086	0 52.916	1 2.745	1 12.575	23	.063
24	0 3.932	0 13.761	0 23.591	0 33.420	0 43.250	0 53.080	1 2.909	1 12.739	24	.066
25	0 4.096	0 13.925	0 23.755	0 33.584	0 43.414	0 53.243	1 3.073	1 12.903	25	.068
26	0 4.259	0 14.089	0 23.919	0 33.748	0 43.578	0 53.407	1 3.237	1 13.066	26	.071
27	0 4.423	0 14.253	0 24.082	0 33.912	0 43.742	0 53.571	1 3.401	1 13.230	27	.074
28	0 4.587	0 14.417	0 24.246	0 34.076	0 43.905	0 53.735	1 3.564	1 13.394	28	.076
29	0 4.751	0 14.581	0 24.410	0 34.240	0 44.069	0 53.899	1 3.728	1 13.558	29	.079
30	0 4.915	0 14.744	0 24.574	0 34.403	0 44.233	0 54.063	1 3.892	1 13.722	30	.082
31	0 5.079	0 14.908	0 24.738	0 34.567	0 44.397	0 54.226	1 4.056	1 13.886	31	.085
32	0 5.242	0 15.072	0 24.902	0 34.731	0 44.561	0 54.390	1 4.220	1 14.049	32	.087
33	0 5.406	0 15.236	0 25.065	0 34.895	0 44.724	0 54.554	1 4.384	1 14.213	33	.090
34	0 5.570	0 15.400	0 25.229	0 35.059	0 44.888	0 54.718	1 4.547	1 14.377	34	.093
35	0 5.734	0 15.563	0 25.393	0 35.223	0 45.052	0 54.882	1 4.711	1 14.541	35	.096
36	0 5.898	0 15.727	0 25.557	0 35.386	0 45.216	0 55.046	1 4.875	1 14.705	36	.098
37	0 6.062	0 15.891	0 25.721	0 35.550	0 45.380	0 55.209	1 5.039	1 14.868	37	.101
38	0 6.225	0 16.055	0 25.885	0 35.714	0 45.544	0 55.373	1 5.203	1 15.032	38	.104
39	0 6.389	0 16.219	0 26.048	0 35.878	0 45.707	0 55.537	1 5.367	1 15.196	39	.106
40	0 6.553	0 16.383	0 26.212	0 36.042	0 45.871	0 55.701	1 5.530	1 15.360	40	.109
41	0 6.717	0 16.546	0 26.376	0 36.206	0 46.035	0 55.865	1 5.694	1 15.524	41	.112
42	0 6.881	0 16.710	0 26.540	0 36.369	0 46.199	0 56.028	1 5.858	1 15.688	42	.115
43	0 7.045	0 16.874	0 26.704	0 36.533	0 46.363	0 56.192	1 6.022	1 15.851	43	.117
44	0 7.208	0 17.038	0 26.867	0 36.697	0 46.527	0 56.356	1 6.186	1 16.015	44	.120
45	0 7.372	0 17.202	0 27.031	0 36.861	0 46.690	0 56.520	1 6.350	1 16.179	45	.123
46	0 7.536	0 17.366	0 27.195	0 37.025	0 46.854	0 56.684	1 6.513	1 16.343	46	.126
47	0 7.700	0 17.529	0 27.359	0 37.188	0 47.018	0 56.848	1 6.677	1 16.507	47	.128
48	0 7.864	0 17.693	0 27.523	0 37.352	0 47.182	0 57.011	1 6.841	1 16.671	48	.131
49	0 8.027	0 17.857	0 27.687	0 37.516	0 47.346	0 57.175	1 7.005	1 16.834	49	.134
50	0 8.191	0 18.021	0 27.850	0 37.680	0 47.510	0 57.339	1 7.169	1 16.998	50	.137
51	0 8.355	0 18.185	0 28.014	0 37.844	0 47.673	0 57.503	1 7.332	1 17.162	51	.139
52	0 8.519	0 18.349	0 28.178	0 38.008	0 47.837	0 57.667	1 7.496	1 17.326	52	.142
53	0 8.683	0 18.512	0 28.342	0 38.171	0 48.001	0 57.831	1 7.660	1 17.490	53	.145
54	0 8.847	0 18.676	0 28.506	0 38.335	0 48.165	0 57.994	1 7.824	1 17.654	54	.147
55	0 9.010	0 18.840	0 28.670	0 38.499	0 48.329	0 58.158	1 7.988	1 17.817	55	.150
56	0 9.174	0 19.004	0 28.833	0 38.663	0 48.492	0 58.322	1 8.152	1 17.981	56	.153
57	0 9.338	0 19.168	0 28.997	0 38.827	0 48.656	0 58.486	1 8.315	1 18.145	57	.156
58	0 9.502	0 19.331	0 29.161	0 38.991	0 48.820	0 58.650	1 8.479	1 18.309	58	.158
59	0 9.666	0 19.495	0 29.325	0 39.154	0 48.984	0 58.814	1 8.643	1 18.473	59	0.161

TABLE 38.

Sidereal into Mean Solar Time.

Sidereal.	To be subtracted from a sidereal time interval.								For seconds.	
	8h	9h	10h	11h	12h	13h	14h	15h		
m.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	s.	s.
0	1 18.636	1 28.466	1 38.296	1 48.125	1 57.955	2 7.784	2 17.614	2 27.443		
1	1 18.800	1 28.630	1 38.459	1 48.289	1 58.119	2 7.948	2 17.778	2 27.607	1	0.003
2	1 18.964	1 28.794	1 38.623	1 48.453	1 58.282	2 8.112	2 17.941	2 27.771	2	.005
3	1 19.128	1 28.958	1 38.787	1 48.617	1 58.446	2 8.276	2 18.105	2 27.935	3	.008
4	1 19.292	1 29.121	1 38.951	1 48.780	1 58.610	2 8.440	2 18.269	2 28.099	4	.011
5	1 19.456	1 29.285	1 39.115	1 48.944	1 58.774	2 8.603	2 18.433	2 28.263	5	.014
6	1 19.619	1 29.449	1 39.279	1 49.108	1 58.938	2 8.767	2 18.597	2 28.426	6	.016
7	1 19.783	1 29.613	1 39.442	1 49.272	1 59.101	2 8.931	2 18.761	2 28.590	7	.019
8	1 19.947	1 29.777	1 39.606	1 49.436	1 59.265	2 9.095	2 18.924	2 28.754	8	.022
9	1 20.111	1 29.940	1 39.770	1 49.600	1 59.429	2 9.259	2 19.088	2 28.918	9	.025
10	1 20.275	1 30.104	1 39.934	1 49.763	1 59.593	2 9.423	2 19.252	2 29.082	10	.027
11	1 20.439	1 30.268	1 40.098	1 49.927	1 59.757	2 9.586	2 19.416	2 29.245	11	.030
12	1 20.602	1 30.432	1 40.261	1 50.091	1 59.921	2 9.750	2 19.580	2 29.409	12	.033
13	1 20.766	1 30.596	1 40.425	1 50.255	2 0.084	2 9.914	2 19.744	2 29.573	13	.035
14	1 20.930	1 30.760	1 40.589	1 50.419	2 0.248	2 10.078	2 19.907	2 29.737	14	.038
15	1 21.094	1 30.923	1 40.753	1 50.583	2 0.412	2 10.242	2 20.071	2 29.901	15	.041
16	1 21.258	1 31.087	1 40.917	1 50.746	2 0.576	2 10.405	2 20.235	2 30.065	16	.044
17	1 21.422	1 31.251	1 41.081	1 50.910	2 0.740	2 10.569	2 20.399	2 30.228	17	.046
18	1 21.585	1 31.415	1 41.244	1 51.074	2 0.904	2 10.733	2 20.563	2 30.392	18	.049
19	1 21.749	1 31.579	1 41.408	1 51.238	2 1.067	2 10.897	2 20.727	2 30.556	19	.052
20	1 21.913	1 31.743	1 41.572	1 51.402	2 1.231	2 11.061	2 20.890	2 30.720	20	.055
21	1 22.077	1 31.906	1 41.736	1 51.565	2 1.395	2 11.225	2 21.054	2 30.884	21	.057
22	1 22.241	1 32.070	1 41.900	1 51.729	2 1.559	2 11.388	2 21.218	2 31.048	22	.060
23	1 22.404	1 32.234	1 42.064	1 51.893	2 1.723	2 11.552	2 21.382	2 31.211	23	.063
24	1 22.568	1 32.398	1 42.227	1 52.057	2 1.887	2 11.716	2 21.546	2 31.375	24	.066
25	1 22.732	1 32.562	1 42.391	1 52.221	2 2.050	2 11.880	2 21.709	2 31.539	25	.068
26	1 22.896	1 32.726	1 42.555	1 52.385	2 2.214	2 12.044	2 21.873	2 31.703	26	.071
27	1 23.060	1 32.889	1 42.719	1 52.548	2 2.378	2 12.208	2 22.037	2 31.867	27	.074
28	1 23.224	1 33.053	1 42.883	1 52.712	2 2.542	2 12.371	2 22.201	2 32.031	28	.076
29	1 23.387	1 33.217	1 43.047	1 52.876	2 2.706	2 12.535	2 22.365	2 32.194	29	.079
30	1 23.551	1 33.381	1 43.210	1 53.040	2 2.869	2 12.699	2 22.529	2 32.358	30	.082
31	1 23.715	1 33.545	1 43.374	1 53.204	2 3.033	2 12.863	2 22.692	2 32.522	31	.085
32	1 23.879	1 33.708	1 43.538	1 53.368	2 3.197	2 13.027	2 22.856	2 32.686	32	.087
33	1 24.043	1 33.872	1 43.702	1 53.531	2 3.361	2 13.191	2 23.020	2 32.850	33	.090
34	1 24.207	1 34.036	1 43.866	1 53.695	2 3.525	2 13.354	2 23.184	2 33.013	34	.093
35	1 24.370	1 34.200	1 44.029	1 53.859	2 3.689	2 13.518	2 23.348	2 33.177	35	.096
36	1 24.534	1 34.364	1 44.193	1 54.023	2 3.852	2 13.682	2 23.512	2 33.341	36	.098
37	1 24.698	1 34.528	1 44.357	1 54.187	2 4.016	2 13.846	2 23.675	2 33.505	37	.101
38	1 24.862	1 34.691	1 44.521	1 54.351	2 4.180	2 14.010	2 23.839	2 33.669	38	.104
39	1 25.026	1 34.855	1 44.685	1 54.514	2 4.344	2 14.173	2 24.003	2 33.833	39	.106
40	1 25.190	1 35.019	1 44.849	1 54.678	2 4.508	2 14.337	2 24.167	2 33.996	40	.109
41	1 25.353	1 35.183	1 45.012	1 54.842	2 4.672	2 14.501	2 24.331	2 34.160	41	.112
42	1 25.517	1 35.347	1 45.176	1 55.006	2 4.835	2 14.665	2 24.495	2 34.324	42	.115
43	1 25.681	1 35.511	1 45.340	1 55.170	2 4.999	2 14.829	2 24.658	2 34.488	43	.117
44	1 25.845	1 35.674	1 45.504	1 55.333	2 5.163	2 14.993	2 24.822	2 34.652	44	.120
45	1 26.009	1 35.838	1 45.668	1 55.497	2 5.327	2 15.156	2 24.986	2 34.816	45	.123
46	1 26.172	1 36.002	1 45.832	1 55.661	2 5.491	2 15.320	2 25.150	2 34.979	46	.126
47	1 26.336	1 36.166	1 45.995	1 55.825	2 5.655	2 15.484	2 25.314	2 35.143	47	.128
48	1 26.500	1 36.330	1 46.159	1 55.989	2 5.818	2 15.648	2 25.477	2 35.307	48	.131
49	1 26.664	1 36.493	1 46.323	1 56.153	2 5.982	2 15.812	2 25.641	2 35.471	49	.134
50	1 26.828	1 36.657	1 46.487	1 56.316	2 6.146	2 15.976	2 25.805	2 35.635	50	.137
51	1 26.992	1 36.821	1 46.651	1 56.480	2 6.310	2 16.139	2 25.969	2 35.798	51	.139
52	1 27.155	1 36.985	1 46.815	1 56.644	2 6.474	2 16.303	2 26.133	2 35.962	52	.142
53	1 27.319	1 37.149	1 46.978	1 56.808	2 6.637	2 16.467	2 26.297	2 36.126	53	.145
54	1 27.483	1 37.313	1 47.142	1 56.972	2 6.801	2 16.631	2 26.460	2 36.290	54	.147
55	1 27.647	1 37.476	1 47.306	1 57.136	2 6.965	2 16.795	2 26.624	2 36.454	55	.150
56	1 27.811	1 37.640	1 47.470	1 57.299	2 7.129	2 16.959	2 26.788	2 36.618	56	.153
57	1 27.975	1 37.804	1 47.634	1 57.463	2 7.293	2 17.122	2 26.952	2 36.781	57	.156
58	1 28.138	1 37.968	1 47.797	1 57.627	2 7.457	2 17.286	2 27.116	2 36.945	58	.158
59	1 28.302	1 38.132	1 47.961	1 57.791	2 7.620	2 17.450	2 27.280	2 37.109	59	0.161

TABLE 38.

Sidereal into Mean Solar Time.

Sidereal.	To be subtracted from a sidereal time interval.								For seconds.	
	16h	17h	18h	19h	20h	21h	22h	23h		
m.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	s.	s.
0	2 37.273	2 47.102	2 56.932	3 6.762	3 16.591	3 26.421	3 36.250	3 46.080		
1	2 37.437	2 47.266	2 57.096	3 6.925	3 16.755	3 26.585	3 36.414	3 46.244	1	0.003
2	2 37.601	2 47.430	2 57.260	3 7.089	3 16.919	3 26.748	3 36.578	3 46.407	2	.005
3	2 37.764	2 47.594	2 57.424	3 7.253	3 17.083	3 26.912	3 36.742	3 46.571	3	.008
4	2 37.928	2 47.758	2 57.587	3 7.417	3 17.246	3 27.076	3 36.906	3 46.735	4	.011
5	2 38.092	2 47.922	2 57.751	3 7.581	3 17.410	3 27.240	3 37.069	3 46.899	5	.014
6	2 38.256	2 48.085	2 57.915	3 7.745	3 17.574	3 27.404	3 37.233	3 47.063	6	.016
7	2 38.420	2 48.249	2 58.079	3 7.908	3 17.738	3 27.568	3 37.397	3 47.227	7	.019
8	2 38.584	2 48.413	2 58.243	3 8.072	3 17.902	3 27.731	3 37.561	3 47.390	8	.022
9	2 38.747	2 48.577	2 58.406	3 8.236	3 18.066	3 27.895	3 37.725	3 47.554	9	.025
10	2 38.911	2 48.741	2 58.570	3 8.400	3 18.229	3 28.059	3 37.889	3 47.718	10	.027
11	2 39.075	2 48.905	2 58.734	3 8.564	3 18.393	3 28.223	3 38.052	3 47.882	11	.030
12	2 39.239	2 49.068	2 58.898	3 8.728	3 18.557	3 28.387	3 38.216	3 48.046	12	.033
13	2 39.403	2 49.232	2 59.062	3 8.891	3 18.721	3 28.550	3 38.380	3 48.210	13	.035
14	2 39.566	2 49.396	2 59.226	3 9.055	3 18.885	3 28.714	3 38.544	3 48.373	14	.038
15	2 39.730	2 49.560	2 59.389	3 9.219	3 19.049	3 28.878	3 38.708	3 48.537	15	.041
16	2 39.894	2 49.724	2 59.553	3 9.383	3 19.212	3 29.042	3 38.871	3 48.701	16	.044
17	2 40.058	2 49.888	2 59.717	3 9.547	3 19.376	3 29.206	3 39.035	3 48.865	17	.046
18	2 40.222	2 50.051	2 59.881	3 9.710	3 19.540	3 29.370	3 39.199	3 49.029	18	.049
19	2 40.386	2 50.215	3 0.045	3 9.874	3 19.704	3 29.533	3 39.363	3 49.193	19	.052
20	2 40.549	2 50.379	3 0.209	3 10.038	3 19.868	3 29.697	3 39.527	3 49.356	20	.055
21	2 40.713	2 50.543	3 0.372	3 10.202	3 20.032	3 29.861	3 39.691	3 49.520	21	.057
22	2 40.877	2 50.707	3 0.536	3 10.366	3 20.195	3 30.025	3 39.854	3 49.684	22	.060
23	2 41.041	2 50.870	3 0.700	3 10.530	3 20.359	3 30.189	3 40.018	3 49.848	23	.063
24	2 41.205	2 51.034	3 0.864	3 10.693	3 20.523	3 30.353	3 40.182	3 50.012	24	.066
25	2 41.369	2 51.198	3 1.028	3 10.857	3 20.687	3 30.516	3 40.346	3 50.175	25	.068
26	2 41.532	2 51.362	3 1.192	3 11.021	3 20.851	3 30.680	3 40.510	3 50.339	26	.071
27	2 41.696	2 51.526	3 1.355	3 11.185	3 21.014	3 30.844	3 40.674	3 50.503	27	.074
28	2 41.860	2 51.690	3 1.519	3 11.349	3 21.178	3 31.008	3 40.837	3 50.667	28	.076
29	2 42.024	2 51.853	3 1.683	3 11.513	3 21.342	3 31.172	3 41.001	3 50.831	29	.079
30	2 42.188	2 52.017	3 1.847	3 11.676	3 21.506	3 31.336	3 41.165	3 50.995	30	.082
31	2 42.352	2 52.181	3 2.011	3 11.840	3 21.670	3 31.499	3 41.329	3 51.158	31	.085
32	2 42.515	2 52.345	3 2.174	3 12.004	3 21.834	3 31.663	3 41.493	3 51.322	32	.087
33	2 42.679	2 52.509	3 2.338	3 12.168	3 21.997	3 31.827	3 41.657	3 51.486	33	.090
34	2 42.843	2 52.673	3 2.502	3 12.332	3 22.161	3 31.991	3 41.820	3 51.650	34	.093
35	2 43.007	2 52.836	3 2.666	3 12.496	3 22.325	3 32.155	3 41.984	3 51.814	35	.096
36	2 43.171	2 53.000	3 2.830	3 12.659	3 22.489	3 32.318	3 42.148	3 51.978	36	.098
37	2 43.334	2 53.164	3 2.994	3 12.823	3 22.653	3 32.482	3 42.312	3 52.141	37	.101
38	2 43.498	2 53.328	3 3.157	3 12.987	3 22.817	3 32.646	3 42.476	3 52.305	38	.104
39	2 43.662	2 53.492	3 3.321	3 13.151	3 22.980	3 32.810	3 42.639	3 52.469	39	.106
40	2 43.826	2 53.656	3 3.485	3 13.315	3 23.144	3 32.974	3 42.803	3 52.633	40	.109
41	2 43.990	2 53.819	3 3.649	3 13.478	3 23.308	3 33.138	3 42.967	3 52.797	41	.112
42	2 44.154	2 53.983	3 3.813	3 13.642	3 23.472	3 33.301	3 43.131	3 52.961	42	.115
43	2 44.317	2 54.147	3 3.977	3 13.806	3 23.636	3 33.465	3 43.295	3 53.124	43	.117
44	2 44.481	2 54.311	3 4.140	3 13.970	3 23.800	3 33.629	3 43.459	3 53.288	44	.120
45	2 44.645	2 54.475	3 4.304	3 14.134	3 23.963	3 33.793	3 43.622	3 53.452	45	.123
46	2 44.809	2 54.638	3 4.468	3 14.298	3 24.127	3 33.957	3 43.786	3 53.616	46	.126
47	2 44.973	2 54.802	3 4.632	3 14.461	3 24.291	3 34.121	3 43.950	3 53.780	47	.128
48	2 45.137	2 54.966	3 4.796	3 14.625	3 24.455	3 34.284	3 44.114	3 53.943	48	.131
49	2 45.300	2 55.130	3 4.960	3 14.789	3 24.619	3 34.448	3 44.278	3 54.107	49	.134
50	2 45.464	2 55.294	3 5.123	3 14.953	3 24.782	3 34.612	3 44.442	3 54.271	50	.137
51	2 45.628	2 55.458	3 5.287	3 15.117	3 24.946	3 34.776	3 44.605	3 54.435	51	.139
52	2 45.792	2 55.621	3 5.451	3 15.281	3 25.110	3 34.940	3 44.769	3 54.599	52	.142
53	2 45.956	2 55.785	3 5.615	3 15.444	3 25.274	3 35.104	3 44.933	3 54.763	53	.145
54	2 46.120	2 55.949	3 5.779	3 15.608	3 25.438	3 35.267	3 45.097	3 54.926	54	.147
55	2 46.283	2 56.113	3 5.942	3 15.772	3 25.602	3 35.431	3 45.261	3 55.090	55	.150
56	2 46.447	2 56.277	3 6.106	3 15.936	3 25.765	3 35.595	3 45.425	3 55.254	56	.153
57	2 46.611	2 56.441	3 6.270	3 16.100	3 25.929	3 35.759	3 45.588	3 55.418	57	.156
58	2 46.755	2 56.604	3 6.434	3 16.264	3 26.093	3 35.923	3 45.752	3 55.582	58	.158
59	2 46.939	2 56.768	3 6.598	3 16.427	3 26.257	3 36.086	3 45.916	3 55.746	59	0.161

TABLE 39.

Mean Solar into Sidereal Time.

Mean.	To be added to a mean time interval.								For seconds.	
	0h	1h	2h	3h	4h	5h	6h	7h		
m.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	s.	s.
0	0 0.000	0 9.856	0 19.713	0 29.569	0 39.426	0 49.282	0 59.139	1 8.995		
1	0 0.164	0 10.021	0 19.877	0 29.734	0 39.590	0 49.447	0 59.303	1 9.160	1	0.003
2	0 0.329	0 10.185	0 20.041	0 29.898	0 39.764	0 49.611	0 59.467	1 9.324	2	.005
3	0 0.493	0 10.349	0 20.206	0 30.062	0 39.919	0 49.775	0 59.632	1 9.488	3	.008
4	0 0.657	0 10.514	0 20.370	0 30.227	0 40.083	0 49.939	0 59.796	1 9.652	4	.011
5	0 0.821	0 10.678	0 20.534	0 30.391	0 40.247	0 50.104	0 59.960	1 9.817	5	.014
6	0 0.986	0 10.842	0 20.699	0 30.555	0 40.412	0 50.268	1 0.124	1 9.981	6	.016
7	0 1.150	0 11.006	0 20.863	0 30.719	0 40.576	0 50.432	1 0.289	1 10.145	7	.019
8	0 1.314	0 11.171	0 21.027	0 30.884	0 40.740	0 50.597	1 0.453	1 10.310	8	.022
9	0 1.478	0 11.335	0 21.191	0 31.048	0 40.904	0 50.761	1 0.617	1 10.474	9	.025
10	0 1.643	0 11.499	0 21.356	0 31.212	0 41.069	0 50.925	1 0.782	1 10.638	10	.027
11	0 1.807	0 11.663	0 21.520	0 31.376	0 41.233	0 51.089	1 0.946	1 10.802	11	.030
12	0 1.971	0 11.828	0 21.684	0 31.541	0 41.397	0 51.254	1 1.110	1 10.967	12	.033
13	0 2.136	0 11.992	0 21.849	0 31.705	0 41.561	0 51.418	1 1.274	1 11.131	13	.036
14	0 2.300	0 12.156	0 22.013	0 31.869	0 41.726	0 51.582	1 1.439	1 11.295	14	.038
15	0 2.464	0 12.321	0 22.177	0 32.034	0 41.890	0 51.746	1 1.603	1 11.459	15	.041
16	0 2.628	0 12.485	0 22.341	0 32.198	0 42.054	0 51.911	1 1.767	1 11.624	16	.044
17	0 2.793	0 12.649	0 22.506	0 32.362	0 42.219	0 52.075	1 1.932	1 11.788	17	.047
18	0 2.957	0 12.813	0 22.670	0 32.526	0 42.383	0 52.239	1 2.096	1 11.952	18	.049
19	0 3.121	0 12.978	0 22.834	0 32.691	0 42.547	0 52.404	1 2.260	1 12.117	19	.052
20	0 3.285	0 13.142	0 22.998	0 32.855	0 42.711	0 52.568	1 2.424	1 12.281	20	.055
21	0 3.450	0 13.306	0 23.163	0 33.019	0 42.876	0 52.732	1 2.589	1 12.445	21	.057
22	0 3.614	0 13.471	0 23.327	0 33.183	0 43.040	0 52.896	1 2.753	1 12.609	22	.060
23	0 3.778	0 13.635	0 23.491	0 33.348	0 43.204	0 53.061	1 2.917	1 12.774	23	.063
24	0 3.943	0 13.799	0 23.656	0 33.512	0 43.368	0 53.225	1 3.081	1 12.938	24	.066
25	0 4.107	0 13.963	0 23.820	0 33.676	0 43.533	0 53.389	1 3.246	1 13.102	25	.068
26	0 4.271	0 14.128	0 23.984	0 33.841	0 43.697	0 53.554	1 3.410	1 13.266	26	.071
27	0 4.435	0 14.292	0 24.148	0 34.005	0 43.861	0 53.718	1 3.574	1 13.431	27	.074
28	0 4.600	0 14.456	0 24.313	0 34.169	0 44.026	0 53.882	1 3.739	1 13.595	28	.077
29	0 4.764	0 14.620	0 24.477	0 34.333	0 44.190	0 54.046	1 3.903	1 13.759	29	.079
30	0 4.928	0 14.785	0 24.641	0 34.498	0 44.354	0 54.211	1 4.067	1 13.924	30	.082
31	0 5.093	0 14.949	0 24.805	0 34.662	0 44.518	0 54.375	1 4.231	1 14.088	31	.085
32	0 5.257	0 15.113	0 24.970	0 34.826	0 44.683	0 54.539	1 4.396	1 14.252	32	.088
33	0 5.421	0 15.278	0 25.134	0 34.990	0 44.847	0 54.703	1 4.560	1 14.416	33	.090
34	0 5.585	0 15.442	0 25.298	0 35.155	0 45.011	0 54.868	1 4.724	1 14.581	34	.093
35	0 5.750	0 15.606	0 25.463	0 35.319	0 45.176	0 55.032	1 4.888	1 14.745	35	.096
36	0 5.914	0 15.770	0 25.627	0 35.483	0 45.340	0 55.196	1 5.053	1 14.909	36	.099
37	0 6.078	0 15.935	0 25.791	0 35.648	0 45.504	0 55.361	1 5.217	1 15.073	37	.101
38	0 6.242	0 16.099	0 25.955	0 35.812	0 45.668	0 55.525	1 5.381	1 15.238	38	.104
39	0 6.407	0 16.263	0 26.120	0 35.976	0 45.833	0 55.689	1 5.546	1 15.402	39	.107
40	0 6.571	0 16.427	0 26.284	0 36.140	0 45.997	0 55.853	1 5.710	1 15.566	40	.110
41	0 6.735	0 16.592	0 26.448	0 36.305	0 46.161	0 56.018	1 5.874	1 15.731	41	.112
42	0 6.900	0 16.756	0 26.612	0 36.469	0 46.325	0 56.182	1 6.038	1 15.895	42	.115
43	0 7.064	0 16.920	0 26.777	0 36.633	0 46.490	0 56.346	1 6.203	1 16.059	43	.118
44	0 7.228	0 17.085	0 26.941	0 36.798	0 46.654	0 56.510	1 6.367	1 16.223	44	.120
45	0 7.392	0 17.249	0 27.105	0 36.962	0 46.818	0 56.675	1 6.531	1 16.388	45	.123
46	0 7.557	0 17.413	0 27.270	0 37.126	0 46.983	0 56.839	1 6.695	1 16.552	46	.126
47	0 7.721	0 17.577	0 27.434	0 37.290	0 47.147	0 57.003	1 6.860	1 16.716	47	.129
48	0 7.885	0 17.742	0 27.598	0 37.455	0 47.311	0 57.168	1 7.024	1 16.881	48	.131
49	0 8.049	0 17.906	0 27.762	0 37.619	0 47.475	0 57.332	1 7.188	1 17.045	49	.134
50	0 8.214	0 18.070	0 27.927	0 37.783	0 47.640	0 57.496	1 7.353	1 17.209	50	.137
51	0 8.378	0 18.234	0 28.091	0 37.947	0 47.804	0 57.660	1 7.517	1 17.373	51	.140
52	0 8.542	0 18.399	0 28.255	0 38.112	0 47.968	0 57.825	1 7.681	1 17.538	52	.142
53	0 8.707	0 18.563	0 28.420	0 38.276	0 48.132	0 57.989	1 7.845	1 17.702	53	.145
54	0 8.871	0 18.727	0 28.584	0 38.440	0 48.297	0 58.153	1 8.010	1 17.866	54	.148
55	0 9.035	0 18.892	0 28.748	0 38.605	0 48.461	0 58.317	1 8.174	1 18.030	55	.151
56	0 9.199	0 19.056	0 28.912	0 38.769	0 48.625	0 58.482	1 8.338	1 18.195	56	.153
57	0 9.364	0 19.220	0 29.077	0 38.933	0 48.790	0 58.646	1 8.502	1 18.359	57	.156
58	0 9.528	0 19.384	0 29.241	0 39.097	0 48.954	0 58.810	1 8.667	1 18.523	58	.159
59	0 9.692	0 19.549	0 29.405	0 39.262	0 49.118	0 58.975	1 8.831	1 18.688	59	0.162

TABLE 39.

Mean Solar into Sidereal Time.

Mean.	To be added to a mean time interval.								
	8h	9h	10h	11h	12h	13h	14h	15h	For seconds.
m.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	s. s.
0	1 18.852	1 28.708	1 38.565	1 48.421	1 58.278	2 8.134	2 17.991	2 27.847	
1	1 19.016	1 28.873	1 38.729	1 48.585	1 58.442	2 8.298	2 18.155	2 28.011	1 0.003
2	1 19.180	1 29.037	1 38.893	1 48.750	1 58.606	2 8.463	2 18.319	2 28.176	2 .005
3	1 19.345	1 29.201	1 39.058	1 48.914	1 58.771	2 8.627	2 18.483	2 28.340	3 .008
4	1 19.509	1 29.365	1 39.222	1 49.078	1 58.935	2 8.791	2 18.648	2 28.504	4 .011
5	1 19.673	1 29.530	1 39.386	1 49.243	1 59.099	2 8.956	2 18.812	2 28.668	5 .014
6	1 19.837	1 29.694	1 39.550	1 49.407	1 59.263	2 9.120	2 18.976	2 28.833	6 .016
7	1 20.002	1 29.858	1 39.715	1 49.571	1 59.428	2 9.284	2 19.141	2 28.997	7 .019
8	1 20.166	1 30.022	1 39.879	1 49.735	1 59.592	2 9.448	2 19.305	2 29.161	8 .022
9	1 20.330	1 30.187	1 40.043	1 49.900	1 59.756	2 9.613	2 19.469	2 29.326	9 .025
10	1 20.495	1 30.351	1 40.207	1 50.064	1 59.920	2 9.777	2 19.633	2 29.490	10 .027
11	1 20.659	1 30.515	1 40.372	1 50.228	2 0.085	2 9.941	2 19.798	2 29.654	11 .030
12	1 20.823	1 30.680	1 40.536	1 50.393	2 0.249	2 10.105	2 19.962	2 29.818	12 .033
13	1 20.987	1 30.844	1 40.700	1 50.557	2 0.413	2 10.270	2 20.126	2 29.983	13 .036
14	1 21.152	1 31.008	1 40.865	1 50.721	2 0.578	2 10.434	2 20.290	2 30.147	14 .038
15	1 21.316	1 31.172	1 41.029	1 50.885	2 0.742	2 10.598	2 20.455	2 30.311	15 .041
16	1 21.480	1 31.337	1 41.193	1 51.050	2 0.906	2 10.763	2 20.619	2 30.476	16 .044
17	1 21.644	1 31.501	1 41.357	1 51.214	2 1.070	2 10.927	2 20.783	2 30.640	17 .047
18	1 21.809	1 31.665	1 41.522	1 51.378	2 1.235	2 11.091	2 20.948	2 30.804	18 .049
19	1 21.973	1 31.829	1 41.686	1 51.542	2 1.399	2 11.255	2 21.112	2 30.968	19 .052
20	1 22.137	1 31.994	1 41.850	1 51.707	2 1.563	2 11.420	2 21.276	2 31.133	20 .055
21	1 22.302	1 32.158	1 42.015	1 51.871	2 1.727	2 11.584	2 21.440	2 31.297	21 .057
22	1 22.466	1 32.322	1 42.179	1 52.035	2 1.892	2 11.748	2 21.605	2 31.461	22 .060
23	1 22.630	1 32.487	1 42.343	1 52.200	2 2.056	2 11.912	2 21.769	2 31.625	23 .063
24	1 22.794	1 32.651	1 42.507	1 52.364	2 2.220	2 12.077	2 21.933	2 31.790	24 .066
25	1 22.959	1 32.815	1 42.672	1 52.528	2 2.385	2 12.241	2 22.098	2 31.954	25 .068
26	1 23.123	1 32.979	1 42.836	1 52.692	2 2.549	2 12.405	2 22.262	2 32.118	26 .071
27	1 23.287	1 33.144	1 43.000	1 52.857	2 2.713	2 12.570	2 22.426	2 32.283	27 .074
28	1 23.451	1 33.308	1 43.164	1 53.021	2 2.877	2 12.734	2 22.590	2 32.447	28 .077
29	1 23.616	1 33.472	1 43.329	1 53.185	2 3.042	2 12.898	2 22.755	2 32.611	29 .079
30	1 23.780	1 33.637	1 43.493	1 53.349	2 3.206	2 13.062	2 22.919	2 32.775	30 .082
31	1 23.944	1 33.801	1 43.657	1 53.514	2 3.370	2 13.227	2 23.083	2 32.940	31 .085
32	1 24.109	1 33.965	1 43.822	1 53.678	2 3.534	2 13.391	2 23.247	2 33.104	32 .088
33	1 24.273	1 34.129	1 43.986	1 53.842	2 3.699	2 13.555	2 23.412	2 33.268	33 .090
34	1 24.437	1 34.294	1 44.150	1 54.007	2 3.863	2 13.720	2 23.576	2 33.432	34 .093
35	1 24.601	1 34.458	1 44.314	1 54.171	2 4.027	2 13.884	2 23.740	2 33.597	35 .096
36	1 24.766	1 34.622	1 44.479	1 54.335	2 4.192	2 14.048	2 23.905	2 33.761	36 .099
37	1 24.930	1 34.786	1 44.643	1 54.499	2 4.356	2 14.212	2 24.069	2 33.925	37 .101
38	1 25.094	1 34.951	1 44.807	1 54.664	2 4.520	2 14.377	2 24.233	2 34.090	38 .104
39	1 25.259	1 35.115	1 44.971	1 54.828	2 4.684	2 14.541	2 24.397	2 34.254	39 .107
40	1 25.423	1 35.279	1 45.136	1 54.992	2 4.849	2 14.705	2 24.562	2 34.418	40 .110
41	1 25.587	1 35.444	1 45.300	1 55.156	2 5.013	2 14.869	2 24.726	2 34.582	41 .112
42	1 25.751	1 35.608	1 45.464	1 55.321	2 5.177	2 15.034	2 24.890	2 34.747	42 .115
43	1 25.916	1 35.772	1 45.629	1 55.485	2 5.342	2 15.198	2 25.054	2 34.911	43 .118
44	1 26.080	1 35.936	1 45.793	1 55.649	2 5.506	2 15.362	2 25.219	2 35.075	44 .120
45	1 26.244	1 36.101	1 45.957	1 55.814	2 5.670	2 15.527	2 25.383	2 35.239	45 .123
46	1 26.408	1 36.265	1 46.121	1 55.978	2 5.834	2 15.691	2 25.547	2 35.404	46 .126
47	1 26.573	1 36.429	1 46.286	1 56.142	2 5.999	2 15.855	2 25.712	2 35.568	47 .129
48	1 26.737	1 36.593	1 46.450	1 56.306	2 6.163	2 16.019	2 25.876	2 35.732	48 .131
49	1 26.901	1 36.758	1 46.614	1 56.471	2 6.327	2 16.184	2 26.040	2 35.897	49 .134
50	1 27.066	1 36.922	1 46.778	1 56.635	2 6.491	2 16.348	2 26.204	2 36.061	50 .137
51	1 27.230	1 37.086	1 46.943	1 56.799	2 6.656	2 16.512	2 26.369	2 36.225	51 .140
52	1 27.394	1 37.251	1 47.107	1 56.964	2 6.820	2 16.676	2 26.533	2 36.389	52 .142
53	1 27.558	1 37.415	1 47.271	1 57.128	2 6.984	2 16.841	2 26.697	2 36.554	53 .145
54	1 27.723	1 37.579	1 47.436	1 57.292	2 7.149	2 17.005	2 26.861	2 36.718	54 .148
55	1 27.887	1 37.743	1 47.600	1 57.456	2 7.313	2 17.169	2 27.026	2 36.882	55 .151
56	1 28.051	1 37.908	1 47.764	1 57.621	2 7.477	2 17.334	2 27.190	2 37.047	56 .153
57	1 28.215	1 38.072	1 47.928	1 57.785	2 7.641	2 17.498	2 27.354	2 37.211	57 .156
58	1 28.380	1 38.236	1 48.093	1 57.949	2 7.806	2 17.662	2 27.519	2 37.375	58 .159
59	1 28.544	1 38.400	1 48.257	1 58.113	2 7.970	2 17.826	2 27.683	2 37.539	59 0.162

TABLE 39.

Mean Solar into Sidereal time.

Mean.	To be added to a mean time interval.									
	16h	17h	18h	19h	20h	21h	22h	23h	For seconds	
m.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	s.	s.
0	2 37.704	2 47.560	2 57.417	3 7.273	3 17.129	3 26.986	3 36.842	3 46.699		
1	2 37.868	2 47.724	2 57.581	3 7.437	3 17.294	3 27.150	3 37.007	3 46.863	1	0.003
2	2 38.032	2 47.889	2 57.745	3 7.602	3 17.458	3 27.315	3 37.171	3 47.027	2	.005
3	2 38.196	2 48.053	2 57.909	3 7.766	3 17.622	3 27.479	3 37.335	3 47.192	3	.008
4	2 38.361	2 48.217	2 58.074	3 7.930	3 17.787	3 27.643	3 37.500	3 47.356	4	.011
5	2 38.525	2 48.381	2 58.238	3 8.094	3 17.951	3 27.807	3 37.664	3 47.520	5	.014
6	2 38.689	2 48.546	2 58.402	3 8.259	3 18.115	3 27.972	3 37.828	3 47.685	6	.016
7	2 38.854	2 48.710	2 58.566	3 8.423	3 18.279	3 28.136	3 37.992	3 47.849	7	.019
8	2 39.018	2 48.874	2 58.731	3 8.587	3 18.444	3 28.300	3 38.157	3 48.013	8	.022
9	2 39.182	2 49.039	2 58.895	3 8.751	3 18.608	3 28.464	3 38.321	3 48.177	9	.025
10	2 39.346	2 49.203	2 59.059	3 8.916	3 18.772	3 28.629	3 38.485	3 48.342	10	.027
11	2 39.511	2 49.367	2 59.224	3 9.080	3 18.937	3 28.793	3 38.649	3 48.506	11	.030
12	2 39.675	2 49.531	2 59.388	3 9.244	3 19.101	3 28.957	3 38.814	3 48.670	12	.033
13	2 39.839	2 49.696	2 59.552	3 9.409	3 19.265	3 29.122	3 38.978	3 48.834	13	.036
14	2 40.003	2 49.860	2 59.716	3 9.573	3 19.429	3 29.286	3 39.142	3 48.999	14	.038
15	2 40.168	2 50.024	2 59.881	3 9.737	3 19.594	3 29.450	3 39.307	3 49.163	15	.041
16	2 40.332	2 50.188	3 0.045	3 9.901	3 19.758	3 29.614	3 39.471	3 49.327	16	.044
17	2 40.496	2 50.353	3 0.209	3 10.066	3 19.922	3 29.779	3 39.635	3 49.492	17	.047
18	2 40.661	2 50.517	3 0.373	3 10.230	3 20.086	3 29.943	3 39.799	3 49.656	18	.049
19	2 40.825	2 50.681	3 0.538	3 10.394	3 20.251	3 30.107	3 39.964	3 49.820	19	.052
20	2 40.989	2 50.846	3 0.702	3 10.559	3 20.415	3 30.271	3 40.128	3 49.984	20	.055
21	2 41.153	2 51.010	3 0.866	3 10.723	3 20.579	3 30.436	3 40.292	3 50.149	21	.057
22	2 41.318	2 51.174	3 1.031	3 10.887	3 20.744	3 30.600	3 40.456	3 50.313	22	.060
23	2 41.482	2 51.338	3 1.195	3 11.051	3 20.908	3 30.764	3 40.621	3 50.477	23	.063
24	2 41.646	2 51.503	3 1.359	3 11.216	3 21.072	3 30.929	3 40.785	3 50.642	24	.066
25	2 41.810	2 51.667	3 1.523	3 11.380	3 21.236	3 31.093	3 40.949	3 50.806	25	.068
26	2 41.975	2 51.831	3 1.688	3 11.544	3 21.401	3 31.257	3 41.114	3 50.970	26	.071
27	2 42.139	2 51.995	3 1.852	3 11.708	3 21.565	3 31.421	3 41.278	3 51.134	27	.074
28	2 42.303	2 52.160	3 2.016	3 11.873	3 21.729	3 31.586	3 41.442	3 51.299	28	.077
29	2 42.468	2 52.324	3 2.181	3 12.037	3 21.893	3 31.750	3 41.606	3 51.463	29	.079
30	2 42.632	2 52.488	3 2.345	3 12.201	3 22.058	3 31.914	3 41.771	3 51.627	30	.082
31	2 42.796	2 52.653	3 2.509	3 12.366	3 22.222	3 32.078	3 41.935	3 51.791	31	.085
32	2 42.960	2 52.817	3 2.673	3 12.530	3 22.386	3 32.243	3 42.099	3 51.956	32	.088
33	2 43.125	2 52.981	3 2.838	3 12.694	3 22.551	3 32.407	3 42.264	3 52.120	33	.090
34	2 43.289	2 53.145	3 3.002	3 12.858	3 22.715	3 32.571	3 42.428	3 52.284	34	.093
35	2 43.453	2 53.310	3 3.166	3 13.023	3 22.879	3 32.736	3 42.592	3 52.449	35	.096
36	2 43.617	2 53.474	3 3.330	3 13.187	3 23.043	3 32.900	3 42.756	3 52.613	36	.099
37	2 43.782	2 53.638	3 3.495	3 13.351	3 23.208	3 33.064	3 42.921	3 52.777	37	.101
38	2 43.946	2 53.803	3 3.659	3 13.515	3 23.372	3 33.228	3 43.085	3 52.941	38	.104
39	2 44.110	2 53.967	3 3.823	3 13.680	3 23.536	3 33.393	3 43.249	3 53.106	39	.107
40	2 44.275	2 54.131	3 3.988	3 13.844	3 23.700	3 33.557	3 43.413	3 53.270	40	.110
41	2 44.439	2 54.295	3 4.152	3 14.008	3 23.865	3 33.721	3 43.578	3 53.434	41	.112
42	2 44.603	2 54.460	3 4.316	3 14.173	3 24.029	3 33.886	3 43.742	3 53.598	42	.115
43	2 44.767	2 54.624	3 4.480	3 14.337	3 24.193	3 34.050	3 43.906	3 53.763	43	.118
44	2 44.932	2 54.788	3 4.645	3 14.501	3 24.358	3 34.214	3 44.071	3 53.927	44	.120
45	2 45.096	2 54.952	3 4.809	3 14.665	3 24.522	3 34.378	3 44.235	3 54.091	45	.123
46	2 45.260	2 55.117	3 4.973	3 14.830	3 24.686	3 34.543	3 44.399	3 54.256	46	.126
47	2 45.425	2 55.281	3 5.137	3 14.994	3 24.850	3 34.707	3 44.563	3 54.420	47	.129
48	2 45.589	2 55.445	3 5.302	3 15.158	3 25.015	3 34.871	3 44.728	3 54.584	48	.131
49	2 45.753	2 55.610	3 5.466	3 15.322	3 25.179	3 35.035	3 44.892	3 54.748	49	.134
50	2 45.917	2 55.774	3 5.630	3 15.487	3 25.343	3 35.200	3 45.056	3 54.913	50	.137
51	2 46.082	2 55.938	3 5.795	3 15.651	3 25.508	3 35.364	3 45.220	3 55.077	51	.140
52	2 46.246	2 56.102	3 5.959	3 15.815	3 25.672	3 35.528	3 45.385	3 55.241	52	.142
53	2 46.410	2 56.267	3 6.123	3 15.980	3 25.836	3 35.693	3 45.549	3 55.405	53	.145
54	2 46.574	2 56.431	3 6.287	3 16.144	3 26.000	3 35.857	3 45.713	3 55.570	54	.148
55	2 46.739	2 56.595	3 6.452	3 16.308	3 26.165	3 36.021	3 45.878	3 55.734	55	.151
56	2 46.903	2 56.759	3 6.616	3 16.472	3 26.329	3 36.185	3 46.042	3 55.898	56	.153
57	2 47.067	2 56.924	3 6.780	3 16.637	3 26.493	3 36.350	3 46.206	3 56.063	57	.156
58	2 47.232	2 57.088	3 6.944	3 16.801	3 26.657	3 36.514	3 46.370	3 56.227	58	.159
59	2 47.396	2 57.252	3 7.109	3 16.965	3 26.822	3 36.678	3 46.535	3 56.391	59	0.162

TABLE 40.

Corrections To Be Applied to the Observed Altitude of a Star or of the Sun's Lower Limb, To Find the True Altitude.

Observed Altitude.	☉ Sun's Corr.	★ Star's Corr.
° ′	′	′
6 30	+ 8.2	−7.9
6 40	8.4	7.7
6 50	8.6	7.6
7 0	8.7	7.4
7 10	8.9	7.2
7 20	+ 9.0	−7.1
7 30	9.2	7.0
7 40	9.3	6.8
7 50	9.5	6.7
8 0	9.6	6.6
8 10	+ 9.7	−6.4
8 20	9.8	6.3
8 30	10.0	6.2
8 40	10.1	6.1
8 50	10.2	6.0
9 0	+10.3	−5.9
9 20	10.5	5.7
9 40	10.6	5.5
10 0	10.8	5.3
10 20	11.0	5.2
10 40	+11.2	−5.0
11 0	11.3	4.9
11 30	11.5	4.7
12 0	11.7	4.5
12 30	11.9	4.3
13 0	+12.0	−4.1
13 30	12.2	4.0
14 0	12.3	3.8
15 0	12.6	3.6
16 0	12.8	3.4
17 0	+13.0	−3.2
18 0	13.2	3.0
19 0	13.3	2.8
20 0	13.5	2.6
22 0	13.7	2.4
24 0	+14.0	−2.2
26 0	14.1	2.0
28 0	14.3	1.8
30 0	14.4	1.7
32 0	14.6	1.6
34 0	+14.7	−1.4
36 0	14.8	1.3
38 0	14.9	1.3
40 0	15.0	1.2
45 0	15.1	1.0
50 0	+15.3	−0.8
55 0	15.4	0.7
60 0	15.5	0.6
65 0	15.6	0.5
70 0	15.7	0.4
75 0	+15.8	−0.3
80 0	15.8	0.2
85 0	15.9	−0.1
90 0	+16.0	0.0

Date.	☉ Additional Sun's Corr.
	′
Jan. 1	+0.3
15	+0.3
Feb. 1	+0.3
15	+0.2
Mar. 1	+0.2
15	+0.1
Apr. 1	0.0
15	0.0
May 1	−0.1
15	−0.1
June 1	−0.2
15	−0.2
July 1	−0.2
15	−0.2
Aug. 1	−0.2
15	−0.2
Sept. 1	−0.1
15	−0.1
Oct. 1	0.0
15	+0.1
Nov. 1	+0.2
15	+0.2
Dec. 1	+0.3
15	+0.3
31	+0.3

Correction for Height of Eye.	
Height of Eye (feet).	Corr.
	′
0	0.0
1	−1.0
2	1.4
3	1.7
4	2.0
5	−2.2
6	2.4
7	2.6
8	2.8
9	2.9
10	−3.1
11	3.2
12	3.4
13	3.5
14	3.7
15	−3.8
16	3.9
17	4.0
18	4.1
19	4.3
20	−4.4
21	4.5
22	4.6
23	4.7
24	4.8
25	−4.9
26	5.0
27	5.1
28	5.2
29	5.3
30	−5.4
31	5.4
32	5.5
33	5.6
34	5.7
35	−5.8
37	6.0
39	6.1
41	6.3
43	6.4
45	−6.6
47	6.7
49	6.9
51	7.0
53	7.1
55	−7.3
60	7.6
65	7.9
70	8.2
75	8.5
80	−8.8
85	9.0
90	9.3
95	9.6
100	−9.8

TABLE 41.

Correction to the Observed Altitude of the Moon.

FOR REFRACTION, PARALLAX, AND SEMIDIAMETER.

Obs. Alt. Lower Limb.	Lower Limb. Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
°	′	′	′	′	′	′	′	′
5. 5	+59. 6	+60. 9	+62. 1	+63. 4	+64. 7	+66. 0	+67. 3	+68. 5
6. 0	60. 2	61. 4	62. 7	64. 0	65. 3	66. 5	67. 8	69. 1
6. 5	60. 7	61. 9	63. 2	64. 5	65. 8	67. 0	68. 3	69. 6
7. 0	61. 1	62. 4	63. 6	64. 9	66. 2	67. 4	68. 7	70. 0
7. 5	61. 5	62. 7	64. 0	65. 3	66. 5	67. 8	69. 1	70. 4
8. 0	+61. 8	+63. 1	+64. 3	+65. 6	+66. 9	+68. 1	+69. 4	+70. 7
8. 5	62. 1	63. 3	64. 6	65. 9	67. 1	68. 4	69. 7	70. 9
9. 0	62. 3	63. 6	64. 8	66. 1	67. 4	68. 6	69. 9	71. 1
9. 5	62. 5	63. 8	65. 0	66. 3	67. 6	68. 8	70. 1	71. 3
10. 0	62. 7	64. 0	65. 2	66. 5	67. 7	69. 0	70. 3	71. 5
11	+63. 0	+64. 2	+65. 5	+66. 7	+68. 0	+69. 3	+70. 5	+71. 8
12	63. 2	64. 4	65. 7	66. 9	68. 2	69. 5	70. 7	72. 0
13	63. 3	64. 6	65. 8	67. 0	68. 3	69. 6	70. 8	72. 1
14	63. 4	64. 6	65. 9	67. 1	68. 4	69. 6	70. 9	72. 1
15	63. 4	64. 6	65. 9	67. 1	68. 4	69. 6	70. 9	72. 1
16	+63. 4	+64. 6	+65. 8	+67. 1	+68. 3	+69. 6	+70. 8	+72. 0
17	63. 3	64. 5	65. 8	67. 0	68. 2	69. 5	70. 7	71. 9
18	63. 2	64. 4	65. 6	66. 9	68. 1	69. 3	70. 6	71. 8
19	63. 1	64. 3	65. 5	66. 7	67. 9	69. 2	70. 4	71. 6
20	62. 9	64. 1	65. 3	66. 5	67. 8	69. 0	70. 2	71. 4
21	+62. 7	+63. 9	+65. 1	+66. 3	+67. 5	+68. 7	+70. 0	+71. 2
22	62. 5	63. 7	64. 9	66. 1	67. 3	68. 5	69. 7	70. 9
23	62. 2	63. 4	64. 6	65. 9	67. 0	68. 2	69. 4	70. 6
24	62. 0	63. 1	64. 3	65. 5	66. 7	67. 9	69. 1	70. 3
25	61. 7	62. 9	64. 0	65. 2	66. 4	67. 6	68. 8	69. 9
26	+61. 3	+62. 5	+63. 7	+64. 9	+66. 0	+67. 2	+68. 4	+69. 6
27	61. 0	62. 2	63. 3	64. 5	65. 7	66. 8	68. 0	69. 2
28	60. 7	61. 8	63. 0	64. 1	65. 3	66. 4	67. 6	68. 8
29	60. 3	61. 4	62. 6	63. 7	64. 9	66. 0	67. 2	68. 4
30	59. 9	61. 0	62. 2	63. 3	64. 4	65. 6	66. 7	67. 9
31	+59. 5	+60. 6	+61. 7	+62. 9	+64. 0	+65. 1	+66. 3	+67. 4
32	59. 0	60. 2	61. 3	62. 4	63. 5	64. 7	65. 8	66. 9
33	58. 6	59. 7	60. 8	61. 9	63. 1	64. 2	65. 3	66. 4
34	58. 1	59. 2	60. 3	61. 4	62. 5	63. 6	64. 8	65. 9
35	57. 7	58. 7	59. 8	60. 9	62. 0	63. 1	64. 2	65. 3
36	+57. 2	+58. 2	+59. 3	+60. 4	+61. 5	+62. 6	+63. 7	+64. 7
37	56. 7	57. 7	58. 8	59. 8	60. 9	62. 0	63. 1	64. 2
38	56. 1	57. 2	58. 2	59. 3	60. 4	61. 4	62. 5	63. 6
39	55. 6	56. 6	57. 7	58. 7	59. 8	60. 8	61. 9	62. 9
40	55. 0	56. 1	57. 1	58. 1	59. 2	60. 2	61. 3	62. 3
41	+54. 4	+55. 5	+56. 5	+57. 5	+58. 6	+59. 6	+60. 6	+61. 6
42	53. 9	54. 9	55. 9	56. 9	57. 9	59. 0	60. 0	61. 0
43	53. 3	54. 3	55. 3	56. 3	57. 3	58. 3	59. 3	60. 3
44	52. 7	53. 7	54. 6	55. 6	56. 6	57. 6	58. 6	59. 6
45	52. 0	53. 0	54. 0	55. 0	56. 0	56. 9	57. 9	58. 9

Obs. Alt. Lower Limb.	Lower Limb. Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
°	′	′	′	′	′	′	′	′
46	+51. 4	+52. 4	+53. 3	+54. 3	+55. 3	+56. 2	+57. 2	+58. 2
47	50. 7	51. 7	52. 6	53. 6	54. 6	55. 5	56. 5	57. 4
48	50. 1	51. 0	52. 0	52. 9	53. 9	54. 8	55. 7	56. 7
49	49. 4	50. 3	51. 3	52. 2	53. 1	54. 1	55. 0	55. 9
50	48. 7	49. 6	50. 5	51. 5	52. 4	53. 3	54. 2	55. 1
51	+48. 0	+48. 9	+49. 8	+50. 7	+51. 6	+52. 5	+53. 4	+54. 3
52	47. 3	48. 2	49. 1	50. 0	50. 9	51. 8	52. 7	53. 5
53	46. 6	47. 5	48. 3	49. 2	50. 1	51. 0	51. 8	52. 7
54	45. 8	46. 7	47. 6	48. 4	49. 3	50. 2	51. 0	51. 9
55	45. 1	46. 0	46. 8	47. 6	48. 5	49. 3	50. 2	51. 0
56	+44. 4	+45. 2	+46. 0	+46. 8	+47. 7	+48. 5	+49. 4	+50. 2
57	43. 6	44. 4	45. 2	46. 0	46. 9	47. 7	48. 5	49. 3
58	42. 8	43. 6	44. 4	45. 2	46. 0	46. 9	47. 7	48. 5
59	42. 1	42. 9	43. 6	44. 4	45. 2	46. 0	46. 8	47. 6
60	41. 3	42. 1	42. 8	43. 6	44. 4	45. 1	45. 9	46. 7
61	+40. 5	+41. 2	+42. 0	+42. 7	+43. 5	+44. 3	+45. 0	+45. 8
62	39. 6	40. 4	41. 1	41. 9	42. 6	43. 4	44. 1	44. 9
63	38. 8	39. 6	40. 3	41. 0	41. 8	42. 5	43. 2	43. 9
64	38. 0	38. 7	39. 4	40. 2	40. 9	41. 6	42. 3	43. 0
65	37. 2	37. 9	38. 6	39. 3	40. 0	40. 7	41. 4	42. 1
66	+36. 4	+37. 0	+37. 7	+38. 4	+39. 1	+39. 8	+40. 4	+41. 1
67	35. 5	36. 2	36. 8	37. 5	38. 2	38. 8	39. 5	40. 2
68	34. 7	35. 3	36. 0	36. 6	37. 3	37. 9	38. 6	39. 2
69	33. 8	34. 4	35. 1	35. 7	36. 3	37. 0	37. 6	38. 2
70	32. 9	33. 6	34. 2	34. 8	35. 4	36. 0	36. 7	37. 3
71	+32. 1	+32. 7	+33. 3	+33. 9	+34. 5	+35. 1	+35. 7	+36. 3
72	31. 2	31. 8	32. 3	32. 9	33. 5	34. 1	34. 7	35. 3
73	30. 3	30. 9	31. 4	32. 0	32. 6	33. 2	33. 7	34. 3
74	29. 4	30. 0	30. 5	31. 1	31. 6	32. 2	32. 7	33. 3
75	28. 5	29. 1	29. 6	30. 1	30. 7	31. 2	31. 8	32. 3
76	+27. 7	+28. 2	+28. 7	+29. 2	+29. 7	+30. 2	+30. 8	+31. 3
77	26. 8	27. 3	27. 7	28. 2	28. 8	29. 3	29. 8	30. 2
78	25. 8	26. 3	26. 8	27. 3	27. 8	28. 3	28. 7	29. 2
79	24. 9	25. 4	25. 9	26. 3	26. 8	27. 3	27. 7	28. 2
80	24. 0	24. 5	24. 9	25. 4	25. 8	26. 3	26. 7	27. 2
81	+23. 1	+23. 6	+24. 0	+24. 4	+24. 8	+25. 3	+25. 7	+26. 2
82	22. 2	22. 6	23. 0	23. 4	23. 9	24. 3	24. 7	25. 1
83	21. 3	21. 7	22. 1	22. 5	22. 9	23. 3	23. 7	24. 1
84	20. 4	20. 8	21. 1	21. 5	21. 9	22. 3	22. 6	23. 0
85	19. 4	19. 8	20. 2	20. 5	20. 9	21. 3	21. 6	22. 0
86	+18. 5	+18. 9	+19. 2	+19. 6	+19. 9	+20. 3	+20. 6	+20. 9
87	17. 6	17. 9	18. 2	18. 6	18. 9	19. 2	19. 6	19. 9
88	16. 7	17. 0	17. 3	17. 6	17. 9	18. 2	18. 5	18. 8
89	15. 7	16. 0	16. 3	16. 6	16. 9	17. 2	17. 5	17. 8
90	+14. 7	+15. 0	+15. 3	+15. 6	+15. 8	+16. 1	+16. 4	+16. 7

Height of Eye Correction.

H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.
	′		′		′		′		′		′
0	0.0	10	−3.1	20	−4.4	30	−5.4	45	−6.6	80	−8.8
1	−1.0	11	−3.2	21	−4.5	31	−5.4	47	−6.7	85	−9.0
2	−1.4	12	−3.4	22	−4.6	32	−5.5	49	−6.9	90	−9.3
3	−1.7	13	−3.5	23	−4.7	33	−5.6	51	−7.0	95	−9.6
4	−2.0	14	−3.7	24	−4.8	34	−5.7	53	−7.1	100	−9.8
5	−2.2	15	−3.8	25	−4.9	35	−5.8	55	−7.3	105	−10.0
6	−2.4	16	−3.9	26	−5.0	37	−6.0	60	−7.6	110	−10.3
7	−2.6	17	−4.0	27	−5.1	39	−6.1	65	−7.9	115	−10.5
8	−2.8	18	−4.1	28	−5.2	41	−6.3	70	−8.2	120	−10.7
9	−2.9	19	−4.3	29	−5.3	43	−6.4	75	−8.5	125	−11.0

TABLE 41.

Correction to the Observed Altitude of the Moon.

FOR REFRACTION, PARALLAX, AND SEMIDIAMETER.

Obs. Alt. Upper Limb.	Upper Limb. Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
°	′	′	′	′	′	′	′	′
5. 5	+29. 4	+30. 2	+30. 9	+31. 6	+32. 3	+33. 0	+33. 7	+34. 4
6. 0	30. 1	30. 8	31. 5	32. 3	33. 0	33. 7	34. 4	35. 1
6. 5	30. 7	31. 4	32. 1	32. 8	33. 5	34. 3	35. 0	35. 7
7. 0	31. 2	31. 9	32. 6	33. 3	34. 0	34. 8	35. 5	36. 2
7. 5	31. 6	32. 3	33. 0	33. 7	34. 5	35. 2	35. 9	36. 6
8. 0	+32. 0	+32. 7	+33. 4	+34. 1	+34. 8	+35. 5	+36. 3	+37. 0
8. 5	32. 3	33. 0	33. 7	34. 4	35. 1	35. 9	36. 6	37. 3
9. 0	32. 6	33. 3	34. 0	34. 7	35. 4	36. 1	36. 8	37. 5
9. 5	32. 8	33. 5	34. 2	34. 9	35. 6	36. 3	37. 1	37. 8
10. 0	33. 0	33. 7	34. 4	35. 1	35. 8	36. 5	37. 3	38. 0
11	+33. 3	+34. 0	+34. 7	+35. 4	+36. 2	+36. 9	+37. 6	+38. 3
12	33. 6	34. 3	35. 0	35. 7	36. 4	37. 1	37. 8	38. 5
13	33. 7	34. 4	35. 1	35. 8	36. 5	37. 2	37. 9	38. 6
14	33. 8	34. 5	35. 2	35. 9	36. 6	37. 3	38. 0	38. 7
15	33. 8	34. 5	35. 2	35. 9	36. 6	37. 3	38. 0	38. 7
16	+33. 8	+34. 5	+35. 2	+35. 9	+36. 6	+37. 3	+38. 0	+38. 6
17	33. 8	34. 5	35. 1	35. 8	36. 5	37. 2	37. 9	38. 6
18	33. 7	34. 3	35. 0	35. 7	36. 4	37. 1	37. 7	38. 4
19	33. 5	34. 2	34. 9	35. 6	36. 2	36. 9	37. 6	38. 2
20	33. 4	34. 0	34. 7	35. 4	36. 0	36. 7	37. 4	38. 1
21	+33. 2	+33. 9	+34. 5	+35. 2	+35. 8	+36. 5	+37. 2	+37. 8
22	33. 0	33. 6	34. 3	34. 9	35. 6	36. 3	36. 9	37. 6
23	32. 7	33. 4	34. 0	34. 7	35. 3	36. 0	36. 6	37. 3
24	32. 5	33. 1	33. 7	34. 4	35. 0	35. 7	36. 3	37. 0
25	32. 2	32. 8	33. 4	34. 1	34. 7	35. 4	36. 0	36. 6
26	+31. 9	+32. 5	+33. 1	+33. 7	+34. 4	+35. 0	+35. 6	+36. 2
27	31. 5	32. 1	32. 8	33. 4	34. 0	34. 6	35. 2	35. 9
28	31. 2	31. 8	32. 4	33. 0	33. 6	34. 2	34. 9	35. 5
29	30. 8	31. 4	32. 0	32. 6	33. 2	33. 8	34. 4	35. 0
30	30. 4	31. 0	31. 6	32. 2	32. 8	33. 4	34. 0	34. 6
31	+30. 0	+30. 6	+31. 2	+31. 8	+32. 3	+32. 9	+33. 5	+34. 1
32	29. 6	30. 1	30. 7	31. 3	31. 9	32. 5	33. 0	33. 6
33	29. 1	29. 7	30. 3	30. 8	31. 4	32. 0	32. 5	33. 1
34	28. 7	29. 2	29. 8	30. 3	30. 9	31. 5	32. 0	32. 6
35	28. 2	28. 7	29. 3	29. 8	30. 4	30. 9	31. 5	32. 0
36	+27. 7	+28. 2	+28. 8	+29. 3	+29. 8	+30. 4	+30. 9	+31. 5
37	27. 2	27. 7	28. 2	28. 8	29. 3	29. 8	30. 3	30. 9
38	26. 7	27. 2	27. 7	28. 2	28. 7	29. 2	29. 7	30. 3
39	26. 1	26. 6	27. 1	27. 6	28. 1	28. 6	29. 1	29. 6
40	25. 6	26. 1	26. 6	27. 1	27. 6	28. 0	28. 5	29. 0
41	+25. 0	+25. 5	+26. 0	+26. 4	+26. 9	+27. 4	+27. 9	+28. 4
42	24. 4	24. 9	25. 4	25. 8	26. 3	26. 8	27. 2	27. 7
43	23. 8	24. 3	24. 7	25. 2	25. 6	26. 1	26. 6	27. 0
44	23. 2	23. 6	24. 1	24. 6	25. 0	25. 4	25. 9	26. 3
45	22. 6	23. 0	23. 4	23. 9	24. 3	24. 7	25. 2	25. 6

Obs. Alt. Upper Limb.	Upper Limb. Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
°	′	′	′	′	′	′	′	′
46	+21. 9	+22. 4	+22. 8	+23. 2	+23. 6	+24. 0	+24. 5	+24. 9
47	21. 3	21. 7	22. 1	22. 5	22. 9	23. 3	23. 8	24. 2
48	20. 6	21. 0	21. 4	21. 8	22. 2	22. 6	23. 0	23. 4
49	19. 9	20. 3	20. 7	21. 1	21. 5	21. 9	22. 3	22. 6
50	19. 2	19. 6	20. 0	20. 4	20. 7	21. 1	21. 5	21. 9
51	+18. 5	+18. 9	+19. 3	+19. 6	+20. 0	+20. 3	+20. 7	+21. 1
52	17. 8	18. 2	18. 5	18. 9	19. 2	19. 6	19. 9	20. 3
53	17. 1	17. 5	17. 8	18. 1	18. 4	18. 8	19. 1	19. 4
54	16. 4	16. 7	17. 0	17. 3	17. 7	18. 0	18. 3	18. 6
55	15. 7	16. 0	16. 3	16. 6	16. 9	17. 2	17. 5	17. 8
56	+14. 9	+15. 2	+15. 5	+15. 8	+16. 1	+16. 3	+16. 6	+16. 9
57	14. 2	14. 4	14. 7	15. 0	15. 2	15. 5	15. 8	16. 1
58	13. 4	13. 6	13. 9	14. 2	14. 4	14. 7	14. 9	15. 2
59	12. 6	12. 8	13. 1	13. 3	13. 6	13. 8	14. 1	14. 3
60	11. 8	12. 0	12. 3	12. 5	12. 7	13. 0	13. 2	13. 4
61	+11. 0	+11. 2	+11. 4	+11. 6	+11. 9	+12. 1	+12. 3	+12. 5
62	10. 2	10. 4	10. 6	10. 8	11. 0	11. 2	11. 4	11. 6
63	9. 4	9. 6	9. 8	9. 9	10. 1	10. 3	10. 5	10. 7
64	8. 6	8. 7	8. 9	9. 1	9. 2	9. 4	9. 6	9. 7
65	7. 7	7. 9	8. 0	8. 2	8. 3	8. 5	8. 7	8. 8
66	+ 6. 9	+ 7. 0	+ 7. 2	+ 7. 3	+ 7. 5	+ 7. 6	+ 7. 7	+ 7. 9
67	6. 1	6. 2	6. 3	6. 4	6. 5	6. 7	6. 8	6. 9
68	5. 2	5. 3	5. 4	5. 5	5. 6	5. 7	5. 8	5. 9
69	4. 3	4. 4	4. 5	4. 6	4. 7	4. 8	4. 8	4. 9
70	3. 5	3. 5	3. 6	3. 7	3. 8	3. 8	3. 9	4. 0
71	+ 2. 6	+ 2. 7	+2. 7	+ 2. 8	+ 2. 8	+ 2. 9	+ 2. 9	+ 3. 0
72	1. 7	1. 8	1. 8	1. 9	1. 9	1. 9	2. 0	2. 0
73	+ 0. 9	+ 0. 9	+ 0. 9	+ 0. 9	+ 0. 9	+ 1. 0	+ 1. 0	+ 1. 0
74	0. 0	0. 0	0. 0	0. 0	0. 0	0. 0	0. 0	0. 0
75	− 0. 9	− 0. 9	− 0. 9	− 1. 0	− 1. 0	− 1. 0	− 1. 0	− 1. 0
76	− 1. 8	− 1. 9	− 1. 9	− 1. 9	− 1. 9	− 2. 0	− 2. 0	− 2. 0
77	2. 7	2. 8	2. 8	2. 9	2. 9	2. 9	3. 0	3. 0
78	3. 6	3. 7	3. 8	3. 8	3. 9	3. 9	4. 0	4. 1
79	4. 5	4. 6	4. 7	4. 8	4. 8	4. 9	5. 0	5. 1
80	5. 4	5. 5	5. 6	5. 7	5. 8	5. 9	6. 0	6. 1
81	− 6. 3	− 6. 5	− 6. 6	− 6. 7	− 6. 8	− 6. 9	− 7. 0	− 7. 2
82	7. 3	7. 4	7. 5	7. 7	7. 8	7. 9	8. 1	8. 2
83	8. 2	8. 3	8. 5	8. 6	8. 8	8. 9	9. 1	9. 2
84	9. 1	9. 3	9. 4	9. 6	9. 8	9. 9	10. 1	10. 3
85	10. 0	10. 2	10. 4	10. 6	10. 8	10. 9	11. 1	11. 3
86	−10. 9	−11. 2	−11. 4	−11. 5	−11. 7	−12. 0	−12. 2	−12. 3
87	11. 9	12. 1	12. 3	12. 5	12. 7	13. 0	13. 2	13. 4
88	12. 8	13. 0	13. 3	13. 5	13. 7	14. 0	14. 2	14. 4
89	13. 7	14. 0	14. 3	14. 5	14. 7	15. 0	15. 3	15. 5
90	−14. 7	−15. 0	−15. 3	−15. 6	−15. 8	−16. 1	−16. 4	−16. 7

Height of Eye Correction.

H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.	H. E. feet.	Corr.
	′		′		′		′		′		′
0	0. 0	10	−3. 1	20	−4. 4	30	−5. 4	45	−6. 6	80	−8. 8
1	−1. 0	11	−3. 2	21	−4. 5	31	−5. 4	47	−6. 7	85	−9. 0
2	−1. 4	12	−3. 4	22	−4. 6	32	−5. 5	49	−6. 9	90	−9. 3
3	−1. 7	13	−3. 5	23	−4. 7	33	−5. 6	51	−7. 0	95	−9. 6
4	−2. 0	14	−3. 7	24	−4. 8	34	−5. 7	53	−7. 1	100	−9. 8
5	−2. 2	15	−3. 8	25	−4. 9	35	−5. 8	55	−7. 3	105	−10. 0
6	−2. 4	16	−3. 9	26	−5. 0	37	−6. 0	60	−7. 6	110	−10. 3
7	−2. 6	17	−4. 0	27	−5. 1	39	−6. 1	65	−7. 9	115	−10. 5
8	−2. 8	18	−4. 1	28	−5. 2	41	−6. 3	70	−8. 2	120	−10. 7
9	−2. 9	19	−4. 3	29	−5. 3	43	−6. 4	75	−8. 5	125	−11. 0

TABLE 42.

For Conversion of Arc and Time.

°	h. m.	°	h. m.	°	h. m.	°	h. m.	°	h. m.	°	h. m.
0	0 0	60	4 0	120	8 0	180	12 0	240	16 0	300	20 0
1	0 4	61	4 4	121	8 4	181	12 4	241	16 4	301	20 4
2	0 8	62	4 8	122	8 8	182	12 8	242	16 8	302	20 8
3	0 12	63	4 12	123	8 12	183	12 12	243	16 12	303	20 12
4	0 16	64	4 16	124	8 16	184	12 16	244	16 16	304	20 16
5	0 20	65	4 20	125	8 20	185	12 20	245	16 20	305	20 20
6	0 24	66	4 24	126	8 24	186	12 24	246	16 24	306	20 24
7	0 28	67	4 28	127	8 28	187	12 28	247	16 28	307	20 28
8	0 32	68	4 32	128	8 32	188	12 32	248	16 32	308	20 32
9	0 36	69	4 36	129	8 36	189	12 36	249	16 36	309	20 36
10	0 40	70	4 40	130	8 40	190	12 40	250	16 40	310	20 40
11	0 44	71	4 44	131	8 44	191	12 44	251	16 44	311	20 44
12	0 48	72	4 48	132	8 48	192	12 48	252	16 48	312	20 48
13	0 52	73	4 52	133	8 52	193	12 52	253	16 52	313	20 52
14	0 56	74	4 56	134	8 56	194	12 56	254	16 56	314	20 56
15	1 0	75	5 0	135	9 0	195	13 0	255	17 0	315	21 0
16	1 4	76	5 4	136	9 4	196	13 4	256	17 4	316	21 4
17	1 8	77	5 8	137	9 8	197	13 8	257	17 8	317	21 8
18	1 12	78	5 12	138	9 12	198	13 12	258	17 12	318	21 12
19	1 16	79	5 16	139	9 16	199	13 16	259	17 16	319	21 16
20	1 20	80	5 20	140	9 20	200	13 20	260	17 20	320	21 20
21	1 24	81	5 24	141	9 24	201	13 24	261	17 24	321	21 24
22	1 28	82	5 28	142	9 28	202	13 28	262	17 28	322	21 28
23	1 32	83	5 32	143	9 32	203	13 32	263	17 32	323	21 32
24	1 36	84	5 36	144	9 36	204	13 36	264	17 36	324	21 36
25	1 40	85	5 40	145	9 40	205	13 40	265	17 40	325	21 40
26	1 44	86	5 44	146	9 44	206	13 44	266	17 44	326	21 44
27	1 48	87	5 48	147	9 48	207	13 48	267	17 48	327	21 48
28	1 52	88	5 52	148	9 52	208	13 52	268	17 52	328	21 52
29	1 56	89	5 56	149	9 56	209	13 56	269	17 56	329	21 56
30	2 0	90	6 0	150	10 0	210	14 0	270	18 0	330	22 0
31	2 4	91	6 4	151	10 4	211	14 4	271	18 4	331	22 4
32	2 8	92	6 8	152	10 8	212	14 8	272	18 8	332	22 8
33	2 12	93	6 12	153	10 12	213	14 12	273	18 12	333	22 12
34	2 16	94	6 16	154	10 16	214	14 16	274	18 16	334	22 16
35	2 20	95	6 20	155	10 20	215	14 20	275	18 20	335	22 20
36	2 24	96	6 24	156	10 24	216	14 24	276	18 24	336	22 24
37	2 28	97	6 28	157	10 28	217	14 28	277	18 28	337	22 28
38	2 32	98	6 32	158	10 32	218	14 32	278	18 32	338	22 32
39	2 36	99	6 36	159	10 36	219	14 36	279	18 36	339	22 36
40	2 40	100	6 40	160	10 40	220	14 40	280	18 40	340	22 40
41	2 44	101	6 44	161	10 44	221	14 44	281	18 44	341	22 44
42	2 48	102	6 48	162	10 48	222	14 48	282	18 48	342	22 48
43	2 52	103	6 52	163	10 52	223	14 52	283	18 52	343	22 52
44	2 56	104	6 56	164	10 56	224	14 56	284	18 56	344	22 56
45	3 0	105	7 0	165	11 0	225	15 0	285	19 0	345	23 0
46	3 4	106	7 4	166	11 4	226	15 4	286	19 4	346	23 4
47	3 8	107	7 8	167	11 8	227	15 8	287	19 8	347	23 8
48	3 12	108	7 12	168	11 12	228	15 12	288	19 12	348	23 12
49	3 16	109	7 16	169	11 16	229	15 16	289	19 16	349	23 16
50	3 20	110	7 20	170	11 20	230	15 20	290	19 20	350	23 20
51	3 24	111	7 24	171	11 24	231	15 24	291	19 24	351	23 24
52	3 28	112	7 28	172	11 28	232	15 28	292	19 28	352	23 28
53	3 32	113	7 32	173	11 32	233	15 32	293	19 32	353	23 32
54	3 36	114	7 36	174	11 36	234	15 36	294	19 36	354	23 36
55	3 40	115	7 40	175	11 40	235	15 40	295	19 40	355	23 40
56	3 44	116	7 44	176	11 44	236	15 44	296	19 44	356	23 44
57	3 48	117	7 48	177	11 48	237	15 48	297	19 48	357	23 48
58	3 52	118	7 52	178	11 52	238	15 52	298	19 52	358	23 52
59	3 56	119	7 56	179	11 56	239	15 56	299	19 56	359	23 56
60	4 0	120	8 0	180	12 0	240	16 0	300	20 0	360	24 0

′	m. s.	″	s.
0	0 0	0	0. 00
1	0 4	1	0. 07
2	0 8	2	0. 13
3	0 12	3	0. 20
4	0 16	4	0. 27
5	0 20	5	0. 33
6	0 24	6	0. 40
7	0 28	7	0. 47
8	0 32	8	0. 53
9	0 36	9	0. 60
10	0 40	10	0. 67
11	0 44	11	0. 73
12	0 48	12	0. 80
13	0 52	13	0. 87
14	0 56	14	0. 93
15	1 0	15	1. 00
16	1 4	16	1. 07
17	1 8	17	1. 13
18	1 12	18	1. 20
19	1 16	19	1. 27
20	1 20	20	1. 33
21	1 24	21	1. 40
22	1 28	22	1. 47
23	1 32	23	1. 53
24	1 36	24	1. 60
25	1 40	25	1. 67
26	1 44	26	1. 73
27	1 48	27	1. 80
28	1 52	28	1. 87
29	1 56	29	1. 93
30	2 0	30	2. 00
31	2 4	31	2. 07
32	2 8	32	2. 13
33	2 12	33	2. 20
34	2 16	34	2. 27
35	2 20	35	2. 33
36	2 24	36	2. 40
37	2 28	37	2. 47
38	2 32	38	2. 53
39	2 36	39	2. 60
40	2 40	40	2. 67
41	2 44	41	2. 73
42	2 48	42	2. 80
43	2 52	43	2. 87
44	2 56	44	2. 93
45	3 0	45	3. 00
46	3 4	46	3. 07
47	3 8	47	3. 13
48	3 12	48	3. 20
49	3 16	49	3. 27
50	3 20	50	3. 33
51	3 24	51	3. 40
52	3 28	52	3. 47
53	3 32	53	3. 53
54	3 36	54	3. 60
55	3 40	55	3. 67
56	3 44	56	3. 73
57	3 48	57	3. 80
58	3 52	58	3. 87
59	3 56	59	3. 93
60	4 0	60	4. 00

TABLE 43.

For conversion of Local civil time to Greenwich civil time

Long. W. / L. C. T.	180°	165°	150°	135°	120°	105°	90°	75°	60°	45°	30°	15°	0°
	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.
00 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00	03 00	02 00	01 00	00 00
01 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00	03 00	02 00	01 00
02 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00	03 00	02 00
03 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00	03 00
04 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00
05 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00
06 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00
07 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00
08 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00
09 00	21 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00
10 00	22 00	21 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00
11 00	23 00	22 00	21 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00
12 00	24 00	23 00	22 00	21 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00
13 00	*01 00*	24 00	23 00	22 00	21 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00
14 00	*02 00*	*01 00*	24 00	23 00	22 00	21 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00
15 00	*03 00*	*02 00*	*01 00*	24 00	23 00	22 00	21 00	20 00	19 00	18 00	17 00	16 00	15 00
16 00	*04 00*	*03 00*	*02 00*	*01 00*	24 00	23 00	22 00	21 00	20 00	19 00	18 00	17 00	16 00
17 00	*05 00*	*04 00*	*03 00*	*02 00*	*01 00*	24 00	23 00	22 00	21 00	20 00	19 00	18 00	17 00
18 00	*06 00*	*05 00*	*04 00*	*03 00*	*02 00*	*01 00*	24 00	23 00	22 00	21 00	20 00	19 00	18 00
19 00	*07 00*	*06 00*	*05 00*	*04 00*	*03 00*	*02 00*	*01 00*	24 00	23 00	22 00	21 00	20 00	19 00
20 00	*08 00*	*07 00*	*06 00*	*05 00*	*04 00*	*03 00*	*02 00*	*01 00*	24 00	23 00	22 00	21 00	20 00
21 00	*09 00*	*08 00*	*07 00*	*06 00*	*05 00*	*04 00*	*03 00*	*02 00*	*01 00*	24 00	23 00	22 00	21 00
22 00	*10 00*	*09 00*	*08 00*	*07 00*	*06 00*	*05 00*	*04 00*	*03 00*	*02 00*	*01 00*	24 00	23 00	22 00
23 00	*11 00*	*10 00*	*09 00*	*08 00*	*07 00*	*06 00*	*05 00*	*04 00*	*03 00*	*02 00*	*01 00*	24 00	23 00
24 00	*12 00*	*11 00*	*10 00*	*09 00*	*08 00*	*07 00*	*06 00*	*05 00*	*04 00*	*03 00*	*02 00*	*01 00*	24 00
Zone	**+12**	**+11**	**+10**	**+9**	**+8**	**+7**	**+6**	**+5**	**+4**	**+3**	**+2**	**+1**	**0**

When G. C. T. is found in italic type, the Greenwich date is one day ahead of the local date in west longitude

0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°	Long. E. / L. C. T.
G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	G.C.T.	
00 00	*23 00*	*22 00*	*21 00*	*20 00*	*19 00*	*18 00*	*17 00*	*16 00*	*15 00*	*14 00*	*13 00*	*12 00*	**00 00**
01 00	24 00	*23 00*	*22 00*	*21 00*	*20 00*	*19 00*	*18 00*	*17 00*	*16 00*	*15 00*	*14 00*	*13 00*	**01 00**
02 00	01 00	24 00	*23 00*	*22 00*	*21 00*	*20 00*	*19 00*	*18 00*	*17 00*	*16 00*	*15 00*	*14 00*	**02 00**
03 00	02 00	01 00	24 00	*23 00*	*22 00*	*21 00*	*20 00*	*19 00*	*18 00*	*17 00*	*16 00*	*15 00*	**03 00**
04 00	03 00	02 00	01 00	24 00	*23 00*	*22 00*	*21 00*	*20 00*	*19 00*	*18 00*	*17 00*	*16 00*	**04 00**
05 00	04 00	03 00	02 00	01 00	24 00	*23 00*	*22 00*	*21 00*	*20 00*	*19 00*	*18 00*	*17 00*	**05 00**
06 00	05 00	04 00	03 00	02 00	01 00	24 00	*23 00*	*22 00*	*21 00*	*20 00*	*19 00*	*18 00*	**06 00**
07 00	06 00	05 00	04 00	03 00	02 00	01 00	24 00	*23 00*	*22 00*	*21 00*	*20 00*	*19 00*	**07 00**
08 00	07 00	06 00	05 00	04 00	03 00	02 00	01 00	24 00	*23 00*	*22 00*	*21 00*	*20 00*	**08 00**
09 00	08 00	07 00	06 00	05 00	04 00	03 00	02 00	01 00	24 00	*23 00*	*22 00*	*21 00*	**09 00**
10 00	09 00	08 00	07 00	06 00	05 00	04 00	03 00	02 00	01 00	24 00	*23 00*	*22 00*	**10 00**
11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00	03 00	02 00	01 00	24 00	*23 00*	**11 00**
12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00	03 00	02 00	01 00	24 00	**12 00**
13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00	03 00	02 00	01 00	**13 00**
14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00	03 00	02 00	**14 00**
15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00	03 00	**15 00**
16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	04 00	**16 00**
17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	05 00	**17 00**
18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	06 00	**18 00**
19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	07 00	**19 00**
20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	08 00	**20 00**
21 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	09 00	**21 00**
22 00	21 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	10 00	**22 00**
23 00	22 00	21 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	11 00	**23 00**
24 00	23 00	22 00	21 00	20 00	19 00	18 00	17 00	16 00	15 00	14 00	13 00	12 00	**24 00**
0	**−1**	**−2**	**−3**	**−4**	**−5**	**−6**	**−7**	**−8**	**−9**	**−10**	**−11**	**−12**	**Zone**

When G. C. T. is found in italic type, the Greenwich date is one day before the local date in east longitude