ABC
FIVE-FIGURE
LOGARITHMS.

C. J. WOODWARD

3/= NET

INDEX TO FIND PAGE ON WHICH A GIVEN LOGARITHM OF AN ARC FUNCTION WILL BE FOUND.

For explanation, see page 47.

Note.—A dash under the first figure of an index mantissa indicates that the characteristic is 8. A dash above the first figure of an index mantissa indicates that the characteristic is 10. When there is no dash the characteristic is 9, and when (as in a few cases) there is a dash both above and below, the index is 11. See example, p. 47.

Sines and Cosines.

Char. 8	p.	Char. 9	p.	Char. 9	p.	Char. 9	p.	Char. 9	p.
,24	53	,46	88	,753	123	,896	129	,971	94
,36	54	,47	89	,758	124	,899	128	,972	93
,45	55	,48	90	,763	125	,902	127	,974	92
,54	56	,50	91	,769	126	,905	126	,975	91
,60	57	,51	92	,774	127	,907	125	,976	90
,66	58	,52	93	,779	128	,910	124	,978	89
,71	59	,53	94	,784	129	,913	123	,979	88
,76	60	,54	95	,789	130	,915	122	,980	87
,80	61	,55	96	,793	131	,918	121	,981	86
,84	62	,56	97	,798	132	,921	120	,982	85
,89	63	,57	98	,803	133	,923	119	,983	84
,94	64	,58	99	,808	134	,926	118	,984	83
,98	65	,59	100	,812	135	,928	117	,985	82
Char. 9	66	,60	101	,816	136	,930	116	,986	81
,05	67	,609	102	,821	137	,933	115	,987	80
,08	68	,617	103	,825	138	,935	114	,988	79
,11	69	,625	104	,829	139	,937	113	,989	78
,14	70	,633	105	,833	140	,939	112	,990	77
,16	71	,641	106	,837	141	,941	111	,991	76
,19	72	,649	107	,841	142	,943	110	,991	75
,21	73	,656	108	,845	143	,945	109	,992	74
,23	74	,664	109	,849	143	,947	108	,993	73
,25	75	,671	110	,853	142	,949	107	,994	72
,28	76	,678	111	,856	141	,951	106	,994	71
,29	77	,685	112	,860	140	,953	105	,995	70
,31	78	,692	113	,864	139	,955	104	,995	69
,33	79	,698	114	,867	138	,957	103	,996	68
,35	80	,705	115	,871	137	,959	102	,996	67
,36	81	,711	116	,874	136	,960	101	,997	66
,38	82	,717	117	,877	135	,962	100	,997	65
,39	83	,724	118	,881	134	,964	99	,998	64
,41	84	,730	119	,884	133	,965	98	,998	63
,42	85	,735	120	,887	132	,967	97	,998	62
,44	86	,741	121	,890	131	,968	96	,998	61
,45	87	,747	122	,893	130	,970	95	,999	60
,46		,752		,896		,971		,999	

100	·000
150	·176
210	·322
270	·431
330	·518
390	·591
450	·653
510	·707
570	·755
630	·799
690	·838
750	·875
810	·908
870	·939
930	·968

A B C
FIVE-FIGURE
LOGARITHMS

FOR

GENERAL USE

BY

C. J. WOODWARD, B.Sc.

Containing
Mantissæ of Numbers direct to 10,000.
With Supplementary Tables to 100,000.
Log. Sines, Tangents, Cotangents, and Cosines to 10″ *of Arc.*
Natural Sines, Tangents, Cotangents, and Cosines to Four Places of Decimals for Each Minute of Arc.
Together with Full Explanations and Simple Exercises Showing Use of the Tables.
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1917.

PREFACE.

THE use of logarithms for ordinary calculations is rapidly extending, and within the last few years there have appeared many excellent tables.

Logarithm tables should be of as few figures as possible, provided that when used they give a result within the limits of allowable error; they should also be so arranged that a logarithm corresponding to a given number, or a number corresponding to a given logarithm, may be found quickly and with the least expenditure of mental effort.

Guided by the above principles, the author introduced a few years ago his "A B C Five-Figure Logarithms," containing mantissæ of numbers only. Immediately after its publication it was suggested that it would be a convenience to have logarithms of arc functions arranged according to the same or a similar method, and the present work is the outcome of many trial schemes to effect this object.

In this work the tables of mantissæ of numbers remain as in the book just referred to, but in applying the A B C system to logarithms of arc functions some little difference of method has been adopted. As with the numbers, so here a lateral index is provided, enabling the user of the book to turn up the particular degree of the quadrant he requires, at any rate within two or three leaves, and when the degree is found there is a principal table with side letters, and a supplementary table from which the true value of the five-figure mantissa of the required log. function is found directly to 10″ of arc, and indirectly to 1″ or 2″, by following the directions which will be found in the explanatory introduction to these tables.

The preparation of the supplementary tables has involved great labour. In the large tables of Vega and of Schrön the logarithms to seven-figure mantissæ are supplied for successive 10″ of arc, and it is from these fine tables that the required differences were obtained by subtracting the five-figure logarithm of the arc function of each minute from the successive logarithms of the required seconds. Having obtained the differences these were set out, and with the help of friends, to whom I am greatly indebted, they have been tested throughout as to their accuracy.

As stated on the title page, these logarithms are intended for general use. When calculations have to be made which require long sequences of figures to be multiplied and divided out to many decimals, unless a calculating machine is used, seven-figure mantissæ will always be required; but in the daily calculations, on board ship, in the observatory, the physics laboratory, the surveying office, the college class room, and elsewhere, five-figure mantissæ give results with all the needful accuracy, while the tables are far more compact and more easily used than the larger tables. Compact and convenient as are the usual tables, the author ventures to hope that the arrangement he now submits may do something yet to lighten the labours of the thousands of workers who use logarithms in their daily routine of calculation.

C. J. WOODWARD.

Municipal Technical School,
Birmingham,
September, 1893.

PREFACE TO SECOND EDITION.

In this edition, in accordance with the argument of the second paragraph of the preface to the first edition, an index is given on the inside pages of the cover, by means of which the arc corresponding to a given logarithm may be found quickly.

It has been suggested that a table of antilogarithms for numbers might, with advantage, be introduced. Such a table, however, is scarcely requisite, seeing that the lateral index enables a computer to find readily the folio on which a given mantissa will be found.

A table of natural arc functions to each minute of arc to four places of decimals has been added, the arrangement being on the A B C system. This method not only enables one to obtain the required function quickly, but is such a saving of space that the four-figure mantissa for each minute of arc is compressed into twelve pages.

It is now, I think, conceded that five-figure mantissæ are sufficiently accurate for all general purposes in which logarithms are used. It may be worth while noting that in an Austrian Ministerial decree of 1865, it is stated that " In the matter of mathematical instruction, tables of logarithms do not require special approbation, but no body of teachers is permitted to demand more than five figures."

C. J. WOODWARD.

Birmingham, 1909

ANALYTICAL TABLE OF CONTENTS.

INTRODUCTION
TO
LOGARITHMS OF NUMBERS.

If the student is not familiar with logarithms, he should give close attention to the remarks which follow, and work the simple exercises given. He will then be able to use the tables in his ordinary work with every confidence.

By means of logarithms extended series of multiplications, divisions, extractions of roots, and other arithmetical operations, are reduced to mere additions, subtractions, or other very simple operations, on a series of numbers found in the following tables (pages 8 to 38).

A logarithm consists of two parts—one which may be 0, 1, 2, 3, or any positive integer, or 0, $\bar{1}$, $\bar{2}$, $\bar{3}$, or any negative integer; and another part always positive, and expressed as a decimal. Thus 2·57347 and $\bar{2}$·57347 are logarithms; the two parts being 2 and ·57347, and $\bar{2}$ and ·57347 respectively. The integral part (2 or $\bar{2}$) is called *the characteristic*. The decimal part (·57347) is called *the mantissa*.

Given a number to find its logarithm. This operation resolves itself into two parts—one to find the characteristic, the other to find the mantissa.

To find the characteristic. When the given number contains more than one positive integer count the digits to the left of the unit's figure; the number so obtained is the characteristic, and is reckoned positive. Thus the characteristic of 365·43 is 2, of 36·543 it is 1, and of 3·6543 it is 0. When the number is less than unity count still from the unit's place, but to the right, until and including the first significant figure; the number so obtained is the characteristic, and *is reckoned negative*. Thus the characteristic of 0·587 is $\bar{1}$, of 0·0857 it is $\bar{2}$, and of 0·00004 it is $\bar{5}$.

To find the mantissa. The mantissæ of all *sequences* from 1 to 9999 are given at once in the main tables. Mantissæ for sequences as high as 999999 may approximately be found from the main tables together with the supplementary tables at the foot of each main table. A few examples will show the mode of finding the mantissa corresponding to a given sequence.

A.—Find the mantissa for 12·7 (see p. 9).

Look down the column marked N until 127 is found; then immediately to the right of it, in the first column headed 0, will be found ·10380, which is the required mantissa.

B.—Find the mantissa for 2 (see p. 11).

Look down the column N until 200 is met with; against this, on the right, is ·30103, which is the required mantissa.

Note.—The mantissa of a number is the same, no matter where the decimal point may be. Thus the mantissa of 2, of 0·2, of 200, of 0·002, is in each case ·30103.

C.—Find the mantissa for the sequence 32·57 (see p. 15).

Look down the column marked N until 325 is found; next look to the top of the page for the number 7, and carry the eye down this column until you come to the three figures 282, to the right of 325. Place 51 implied as prefixed to 282, and we have ·51282, the required mantissa.

D.—Find the mantissa for 3·314 (see p. 16).

Proceed as in the last example, and at meeting of the horizontal line 331, and the vertical column headed 4 will be found *035. The asterisk implies that instead of 51 we are to place 52 in front of 035; so the required mantissa is ·52035.

E.—Find the mantissa for 12·238 (see p. 8).

Find by previous methods the mantissa for 12·23 (which is ·08743). Notice that at right-hand of this, in the last column, is the letter *k*. Look now to the line *k* at foot of page, and run the eye to the right until it meets the column headed 8. Here will be found the number 28, which must be added to the last two figures of ·08743, making ·08771, the required mantissa.

F.—Find the mantissa for 122386 (see p. 8).

By previous methods find the mantissa for 12238, which is ·08771; then in table at foot of page look in line *k* for number under 6, where we find 21. Make this into 2·1, and neglecting what follows the decimal point, add it to the last figure of the mantissa already found, and we have ·08773, the required mantissa.

G.—Find the mantissa for 11647 (see p. 8).

By previous methods find mantissa for 1164, which is ·06595. It will be noticed that a dash is above the figure 5; and this means that the number to be added to the mantissa

will be found in the line *f* at foot of page, instead of in line *g*. Under 7 in line *f* is 27, and this added to ·06595 gives ·06622, the required mantissa.

Note.—When the dash is below the figure the letter below must be taken, instead of the letter above. Thus the mantissa for 16745 is ·22376+12, instead of ·22376+13.

EXERCISE 1.

1. Find the characteristic of each of the following numbers :—

a. 25	*b*. 327	*c*. 32·7	*d*. 3·27
e. 0·327	*f*. 0·00327	*g*. 0·0003	*h*. 2

2. Find the logarithm—that is, find both characteristic and mantissa—of each of the following numbers :—

a. 27	*b*. 3	*c*. 0·1	*d*. 0·00001
e. 5254·3	*f*. 338·9	*g*. 77669	*h*. 0·0543

ANSWERS.

Ex. 1. *a*. 1. *b*. 2. *c*. 1. *d*. 0. *e*. $\bar{1}$. *f*. $\bar{3}$. *g*. $\bar{4}$. *h*. 0.

Ex. 2. *a*. 1·43136 *b*. 0·47712 *c*. $\bar{1}$·00000 *d*. $\bar{5}$·00000
e. 3·72051 *f*. 2·53007 *g*. 4·89025 *h*. $\bar{2}$·73480

To find the number corresponding to a given logarithm.

H.—Find the number corresponding to the logarithm 2·07445.

Referring to the tables (p. 8) we find the mantissa ·07445, and the sequence is evidently 1187. To determine the position of the decimal point we look at the characteristic; and as the characteristic, when positive, is one less than the number of integers, the number of integers is one more than the characteristic. Hence the number of integers will be three, and the required number is 118·7. If the characteristic be $\bar{2}$, the number of ciphers must be one; so that the number corresponding to the logarithm $\bar{2}$·07445 is 0·01187.

K.—Find the number corresponding to the logarithm 2·07385.

The next *lower* mantissa we can find is ·07372, corresponding to the sequence 1185 (p. 8). Subtract ·07372 from ·07385, and we have 13. Look now in line *h* at foot of page for the nearest number to 13, viz., 14; and above 14 at top is found 4; so that the sequence is 11854, and the number is 118·54.

EXERCISE 2.

Find the numbers corresponding to the following logarithms :—

a. 3·88093	*b*. 5·88093	*c*. 0·88096
d. $\bar{2}$·95019	*e*. 0·00000	*f*. $\bar{1}$·00000

ANSWERS.

Ex. 2.	*a*. 7602	*b*. 760200	*c*. 7·6026*
	d. 0·089164	*e*. 1	*f*. 0·1

The student knowing now in what way to find the logarithm of a given number, and the number corresponding to a given logarithm, may at once use the tables to solve problems. He has simply to bear in mind that by adding two or more logarithms of given numbers he will obtain the logarithm of the product of these numbers; or if he subtract from the logarithm of one number the logarithm of a second number, he will obtain the logarithm of the quotient obtained by dividing the first number by the second number.

Note.—When adding logarithms, if the several characteristics are positive, proceed as in ordinary addition. Thus 2·54378 + 1·84673 will be 4·39051. But where negative characteristics occur they must be subtracted; thus 2·54378 + $\bar{1}$·84673 is the same thing as 2·54378 − 1 + ·84673, or 2·39051; while $\bar{2}$·54378 + $\bar{1}$·84673 = $\bar{2}$·39051.

When subtracting, if the characteristics are positive, proceed in the ordinary way. If the characteristic of the logarithm to be subtracted is negative, make it positive, and add it. Thus 2·54378 − 1·84673 = 0·69705; but 2·54378 − $\bar{1}$·84673 = 2·69705; and $\bar{2}$·54378 − 1·84673 is $\bar{2}$·69705.

* It may also, by the tables, be 7·6027, but a slight difference in the fourth decimal figure is unimportant in experimental work, for which these tables are intended.

As addition is a simpler process than subtraction, it is often convenient to *add* the "co-log." of a given logarithm rather than *subtract* the logarithm itself.

To find the co-log. of a given logarithm :

For the new characteristic. Add +1 to the given characteristic and change its sign.

Thus if the characteristic is 4 add 1 making it 5, change the sign and it becomes $\bar{5}$ the required characteristic. If the given characteristic is $\bar{4}$ add 1 making it $\bar{3}$, change its sign making it 3, and we have the required characteristic.

Note.—If the mantissa is 0 as 2·00000 or $\bar{2}$·00000 simply change the sign. Thus the co-log. of 2·00000 is $\bar{2}$ that of $\bar{2}$·00000 is 2.

For the new mantissa. Put down a sequence of figures which with successive figures of the given mantissa will make up in each case a sum of 9 except with the last (to the right) *significant* figure of the mantissa when the sum must be 10 instead of 9.

Thus if the given mantissa is ·87436 the new mantissa will be ·12564 for (1+8)=9, (2+7)=9, (5+4)=9, (6+3)=9, and 4+6=10. If the given mantissa is ·53470 the co-log. will be ·46530.

EXERCISE 3.

Find co-log. of each of the following logarithms.

(a) 3·87 437	*(c)* 0·47 256	*(e)* 6·43 260
(b) $\bar{3}$·87 437	*(d)* $\bar{1}$·00 000	*(f)* 6·03 260

ANSWERS.

(a) $\bar{4}$·12 563	*(c)* $\bar{1}$·52 744	*(e)* $\bar{7}$·56 740
(b) 2·12 563	*(d)* 1·00 000	*(f)* 5·96 740

Examples.

L.—51 c.cms. of a gas were measured at 20° C. and 70 cms. mercurial pressure. Required volume at 0°C. and 76 cms. pressure.

$$\text{Required vol.} = 51 \times \frac{70}{76} \times \frac{273}{293}$$

Logarithm 51	= 1·70757	Log. 76	= 1·88081
Logarithm 70	= 1·84510	Log. 293	= 2·46687
Logarithm 273	= 2·43616		
		Together	= 4·34768
Together	= 5·98883		
Subtract	4·34768		
Log. of required volume	1·64115		

But number corresponding to 1·64115 is 43·768 ; so required volume should be put as 43·77, as two places of decimals are quite sufficient.

Note.—Using co-logs for the above example we have:

Logarithm	51	$=1\cdot70757$
,,	70	$=1\cdot84510$
,,	273	$=2\cdot43616$
Co-log.	76	$=\bar{2}\cdot11919$
,,	293	$=\bar{3}\cdot53313$
Log. required volume		$=1\cdot64115$ same as before.

M.—Find the eighth power of 2.

To find squares, cubes and powers generally, we multiply log. of the number by the given power; so that the log. of the eighth power of 2 is 8 times log. 2, that is $8\times\cdot30103$, or 2·40824, the number corresponding to which is 256.

N.—Find the cube root of 35783.

Log. $35783=4\cdot55368$. Divide this by 3, and we have 1·51789, which is the log. of the cube root required, the number corresponding to which is 32·952, the required cube root.

EXERCISE 3.

1. Find logarithms of the following:—

a. 100 *b.* 0·001 *c.* $\sqrt{100}$ *d.* $\sqrt{49}$ *e.* $\sqrt{13574}$
f. $\sqrt{0\cdot384^*}$ *g.* $\sqrt[3]{3\cdot8768}$

2. Perform the following arithmetical operations by logarithms in examples *d* and *e*, using co-logs.:—

a. 2×2 *b.* $387\cdot6\times58\cdot43\times0\cdot0087$ *c.* $8347\times\sqrt{3}$

d. $\sqrt{\dfrac{1357\times2483}{5874}}$ *e.* $\dfrac{24837\times5\cdot436\times1\cdot43}{2\cdot36\times12\cdot346}$

ANSWERS.

Ex. 3. (1) *a.* 2·00000 *b.* $\bar{3}\cdot00000$ *c.* $\frac{1}{2}$ of 2·00000, or 1·00000 *d.* $\frac{1}{2}$ of 1·69020, or 0·84510
e. 2·06635 *g.* 0·19616

(2) *a.* Log. = 0·60206 N = 4
b. Log. = 2·29454 N = 197·03
c. Log. = 4·16009 N = 14457
d. Log. = 2·75863 N = 573·63
e. Log. = 3·83620 N = 6858

M.—Find the value of (*a*) $1{\cdot}27^3$. (*b*) $\sqrt[3]{348}$. (*c*) $\sqrt[4]{0{\cdot}3456}$.

a. Log. $1{\cdot}27 \times 3 = 0{\cdot}10380 \times 3 = 0{\cdot}31140 =$ log. of $2{\cdot}0483$.
Ans. $2{\cdot}0483$.

b. $\dfrac{\text{Log. } 348}{3} = \dfrac{2{\cdot}54158}{3} = 0{\cdot}84719 =$ log. of $7{\cdot}0338$.
Ans. $7{\cdot}0338$.

c. $\dfrac{\text{Log. } 0{\cdot}3456}{2} = \dfrac{\bar{1}{\cdot}53857}{2} = \bar{1}{\cdot}76928 =$ log. of $0{\cdot}58787$.
Ans. $0{\cdot}58787$.

Note.—To divide $\bar{1}{\cdot}53857$ by 2 make the characteristic $\bar{2}$, that is, subtract 1, and then add 1 to the mantissa, which does not alter the value of the whole. We then have $\bar{2} + 1{\cdot}53857$, which gives when divided by 2 the expression $\bar{1}{\cdot}76928$. Similarly, to divide $\bar{3}{\cdot}34265$ by 8, make the characteristic $\bar{8}$ and add 5, making $\bar{8} + 5{\cdot}34265$, which divided by 8 gives $\bar{1}{\cdot}66783$.

N.—In how many years will £54 2s. 8d. put out at 5 per cent. compound interest amount to £76 3s. 5d.?

£54 2s. 8d. = £54·133 = P. log. P = $1{\cdot}73346$
£76 3s. 5d. = £76·171 = M. log. M = $1{\cdot}88179$

Principal and interest in one year on each pound invested = £1 1s. = £1·05 = R. log. R = $0{\cdot}02119$.

Now if n = number of years, we have by the usual formula—

$$\text{Log. } n = \frac{\text{log. M} - \text{log. P}}{\text{log. R}}$$

$$\text{Hence, log. } n = \frac{1{\cdot}88179 - 1{\cdot}73346}{0{\cdot}02119} = \frac{0{\cdot}14833}{0{\cdot}02119} = 7$$

Ans. 7 years.

Note.—To convert shillings, pence, and farthings to decimals of a pound sterling.

As regards shillings, since a shilling is 1/20th, or 0·05, multiply 0·05 by the number of shillings for the required decimal. For the pence and farthings, convert all into farthings; these will approximately be thousandths (really

960ths); so that number of farthings multiplied by 0·001 is the required decimal. It is, however, more exact to add 0·001 to this for every 24 farthings.

Thus, 14s. 7½d. = 0·7 of a £ + 7½d.

7½d. = 30 × 0·001 + 0·001, or 0·031 of a £.

So that 14s. 7½d. = 0·731 of a £.

EXERCISE 3.

1. Find logarithms of the following:—

a. 100 *b.* 0·001 *c.* $\sqrt{100}$ *d.* $\sqrt{49}$ *e.* $\sqrt{13574}$

f. $\sqrt{0\cdot384}$ *g.* $\sqrt[3]{3\cdot8768}$

2. Perform the following arithmetical operations by logarithms:—

a. 2 × 2 *b.* 387·6 × 58·43 × 0·0087 *c.* 8347 × $\sqrt{3}$

d. $\sqrt{\dfrac{1357 \times 2483}{5874}}$

ANSWERS.

Ex. 3. (1) *a.* 2·00000 *b.* $\bar{3}$·00000 *c.* ½ of 2·00000, or 1·00000 *d.* ½ of 1·69020, or 0·84510 *e.* 2·06635 *f.* 0·61967 *g.* 0·19616

(2) *a.* Log. = 0·60206 = log. 4
b. Log. = 2·29454 = log. 197·03
c. Log. = 4·16009 = log. 14457
d. Log. = 1·37931 = log. 23·95

Shillings and Pence into decimals of a £. (See table at end of book.) This table taken from F. G. Burkitt's tables is convenient.

Example. Convert £27 13s. 4¾d. to decimals of a pound.

By table	13s.	= 0·650
	4d.	= 0·017
By rule, p. 6	¾d.	= 0·003
		0·670

Result then is £27·670.

Principal and Interest Calculations.— Problems similar to Example N are much facilitated by making use of a Table that will be found at end of the book.

N.	L.	0	1	2	3	4	5	6	7	8	9	
100	00	000	043	087	130	173	217	260	303	346	389	*a*
1		432	475	518	561	604	647	689	732	775	817	*a*
2		860	903	945	988	*030	*072	*115	*157	*199	*242	*b*
3	01	284	326	368	410	452	494	536	578	620	662	
4		703	745	787	828	870	912	953	995	*036	*078	*b*
5	02	119	160	202	243	284	325	366	407	449	490	*c*
6		531	572	612	653	694	735	776	816	857	898	*c*
7		938	979	*019	*060	*100	*141	*181	*222	*262	*302	*d*
8	03	342	383	423	463	503	543	583	623	663	703	
9		743	782	822	862	902	941	981	*021	*060	*100	*d*
110	04	139	179	218	258	297	336	376	415	454	493	*e*
1		532	571	610	650	689	727	766	805	844	883	
2		922	961	999	*038	*077	*115	*154	*192	*231	*269	*e*
3	05	308	346	385	423	461	500	538	576	614	652	*f*
4		690	729	767	805	843	881	918	956	994	*032	
5	06	070	108	145	183	221	258	296	333	371	408	*f*
6		446	483	521	558	595	633	670	707	744	781	*g*
7		819	856	893	930	967	*004	*041	*078	*115	*151	
8	07	188	225	262	298	335	372	408	445	482	518	*g*
9		555	591	628	664	700	737	773	809	846	882	*h*
120		918	954	990	*027	*063	*099	*135	*171	*207	*243	
1	08	279	314	350	386	422	458	493	529	565	600	*h*
2		636	672	707	743	778	814	849	884	920	955	*k*
3		991	*026	*061	*096	*132	*167	*202	*237	*272	*307	
4	09	342	377	412	447	482	517	552	587	621	656	*k*

N.	L.	0	1	2	3	4	5	6	7	8	9	

a	4	9	13	17	21	26	30	34	39
b	4	8	13	17	21	25	29	34	38
c	4	8	12	16	20	25	29	33	37
d	4	8	12	16	20	24	28	32	36
e	4	8	12	16	19	23	27	31	35
f	4	8	11	15	19	23	27	30	34
g	4	7	11	15	18	22	26	30	33
h	4	7	11	14	18	22	25	29	32
k	4	7	11	14	17	21	24	28	31
l	3	7	10	14	17	20	24	27	31

N.	L. 0	1	2	3	4	5	6	7	8	9	
125	09 691	726	760	795	830	864	899	934	968	*003	*a*
6	10 037	072	106	140	175	209	243	278	312	346	*b*
7	380	415	449	483	517	551	585	619	653	687	
8	721	755	789	823	857	890	924	958	992	*025	
9	11 059	093	126	160	193	227	261	294	327	361	*b*
130	11 394	428	461	494	528	561	594	628	661	694	*c*
1	727	760	793	826	860	893	926	959	992	*024	
2	12 057	090	123	156	189	222	254	287	320	352	
3	385	418	450	483	516	548	581	613	646	678	*c*
4	710	743	775	808	840	872	905	937	969	*001	*d*
5	13 033	066	098	130	162	194	226	258	290	322	
6	354	386	418	450	481	513	545	577	609	640	
7	672	704	735	767	799	830	862	893	925	956	*d*
8	988	*019	*051	*082	*114	*145	*176	*208	*239	*270	*e*
9	14 301	333	364	395	426	457	489	520	551	582	
140	14 613	644	675	706	737	768	799	829	860	891	
1	922	953	983	*014	*045	*076	*106	*137	*168	*198	*e*
2	15 229	259	290	320	351	381	412	442	473	503	*f*
3	534	564	594	625	655	685	715	746	776	806	
4	836	866	897	927	957	987	*017	*047	*077	*107	
5	16 137	167	197	227	256	286	316	346	376	406	
6	435	465	495	524	554	584	613	643	673	702	*f*
7	732	761	791	820	850	879	909	938	967	997	*g*
8	17 026	056	085	114	143	173	202	231	260	289	
9	319	348	377	406	435	464	493	522	551	580	*g*

N.	L. 0	1	2	3	4	5	6	7	8	9	
	a	3	7	10	14	17	21	24	28	31	
	b	3	7	10	14	17	20	24	27	31	
	c	3	7	10	13	16	20	23	26	30	
	d	3	6	10	13	16	19	22	26	29	
	e	3	6	9	12	15	19	22	25	28	
	f	3	6	9	12	15	18	21	24	27	
	g	3	6	9	12	15	17	20	23	26	

N.	L. 0	1	2	3	4	5	6	7	8	9	
150	17 609	638	667	696	725	754	782	811	840	869	*a*
1	898	926	955	984	*013	*041	*070	*099	*127	*156	*a*
2	18 184	213	241	270	298	327	355	384	412	441	*b*
3	469	498	526	554	583	611	639	667	696	724	
4	752	780	808	837	865	893	921	949	977	*005	
5	19 033	061	089	117	145	173	201	229	257	285	
6	312	340	368	396	424	451	479	507	535	562	
7	590	618	645	673	700	728	756	783	811	838	*b*
8	866	893	921	948	976	*003	*030	*058	*085	*112	*c*
9	20 140	167	194	222	249	276	303	330	358	385	
160	20 412	439	466	493	520	548	575	602	629	656	
1	683	710	737	763	790	817	844	871	898	925	
2	952	978	*005	*032	*059	*085	*112	*139	*165	*192	
3	21 219	245	272	299	325	352	378	405	431	458	*c*
4	484	511	537	564	590	617	643	669	696	722	*d*
5	21 748	775	801	827	854	880	906	932	958	985	
6	22 011	037	063	089	115	141	167	194	220	246	
7	272	298	324	350	376	401	427	453	479	505	
8	531	557	583	608	634	660	686	712	737	763	
9	789	814	840	866	891	917	943	968	994	*019	
170	23 045	070	096	121	147	172	198	223	249	274	*d*
1	300	325	350	376	401	426	452	477	502	528	*e*
2	553	578	603	629	654	679	704	729	754	779	
3	805	830	855	880	905	930	955	980	*005	*030	
4	24 055	080	105	130	155	180	204	229	254	279	
5	24 304	329	353	378	403	428	452	477	502	527	
6	551	576	601	625	650	674	699	724	748	773	
7	797	822	846	871	895	920	944	969	993	*018	*e*
8	25 042	066	091	115	139	164	188	212	237	261	*f*
9	285	310	334	358	382	406	431	455	479	503	*f*

N.	L. 0	1	2	3	4	5	6	7	8	9	
	a	3	6	9	12	15	17	20	23	26	
	b	3	6	8	11	14	17	20	22	25	
	c	3	5	8	11	13	16	19	22	24	
	d	3	5	8	10	13	16	18	21	23	
	e	2	5	7	10	12	15	17	20	22	
	f	2	5	7	10	12	14	17	19	22	

N.	L. 0	1	2	3	4	5	6	7	8	9	
180	25 527	551	575	600	624	648	672	696	720	744	*a*
1	768	792	816	840	864	888	912	935	959	983	
2	26 007	031	055	079	102	126	150	174	198	221	
3	245	269	293	316	340	364	387	411	435	458	
4	482	505	529	553	576	600	623	647	670	694	*a*
5	26 717	741	764	788	811	834	858	881	905	928	*b*
6	951	975	998	*021	*045	*068	*091	*114	*138	*161	
7	27 184	207	231	254	277	300	323	346	370	393	
8	416	439	462	485	508	531	554	577	600	623	
9	646	669	692	715	738	761	784	807	830	852	
190	27 875	898	921	944	967	989	*012	*035	*058	*081	
1	28 103	126	149	171	194	217	240	262	285	307	
2	330	353	375	398	421	443	466	488	511	533	*b*
3	556	578	601	623	646	668	691	713	735	758	*c*
4	780	803	825	847	870	892	914	937	959	981	
5	29 003	026	048	070	092	115	137	159	181	203	
6	226	248	270	292	314	336	358	380	403	425	
7	447	469	491	513	535	557	579	601	623	645	
8	667	688	710	732	754	776	798	820	842	863	
9	885	907	929	951	973	994	*016	*038	*060	*081	
200	30 103	125	146	168	190	211	233	255	276	298	
1	320	341	363	384	406	428	449	471	492	514	
2	535	557	578	600	621	643	664	685	707	728	*c*
3	750	771	792	814	835	856	878	899	920	942	*d*
4	963	984	*006	*027	*048	*069	*091	*112	*133	*154	
5	31 175	197	218	239	260	281	302	323	345	366	
6	387	408	429	450	471	492	513	534	555	576	
7	597	618	639	660	681	702	723	744	765	785	
8	806	827	848	869	890	911	931	952	973	994	
9	32 015	035	056	077	098	118	139	160	181	201	*d*

N.	L. 0	1	2	3	4	5	6	7	8	9	
	a	2	5	7	10	12	14	17	20	22	
	b	2	5	7	9	11	14	16	18	21	
	c	2	4	7	9	11	13	15	18	20	
	d	2	4	6	8	10	13	15	17	19	
	e	2	4	6	8	10	12	14	16	18	

N.	L. 0	1	2	3	4	5	6	7	8	9	
210	32 222	243	263	284	305	325	346	366	387	408	*a*
1	428	449	469	490	510	531	552	572	593	613	*a*
2	634	654	675	695	715	736	756	777	797	818	*b*
3	838	858	879	899	919	940	960	980	*001	*021	
4	33 041	062	082	102	122	143	163	183	203	224	
5	244	264	284	304	325	345	365	385	405	425	
6	445	465	486	506	526	546	566	586	606	626	
7	646	666	686	706	726	746	766	786	806	826	
8	846	866	885	905	925	945	965	985	*005	*025	
9	34 044	064	084	104	124	143	163	183	203	223	
220	34 242	262	282	301	321	341	361	380	400	420	
1	439	459	479	498	518	537	557	577	596	616	
2	635	655	674	694	713	733	753	772	792	811	
3	830	850	869	889	908	928	947	967	986	*005	*b*
4	35 025	044	064	083	102	122	141	160	180	199	*c*
5	218	238	257	276	295	315	334	353	372	392	
6	411	430	449	468	488	507	526	545	564	583	
7	603	622	641	660	679	698	717	736	755	774	
8	793	813	832	851	870	889	908	927	946	965	
9	984	*003	*021	*040	*059	*078	*097	*116	*135	*154	
230	36 173	192	211	229	248	267	286	305	324	342	
1	361	380	399	418	436	455	474	493	511	530	
2	549	568	586	605	624	642	661	680	698	717	
3	736	754	773	791	810	829	847	866	884	903	
4	922	940	959	977	996	*014	*033	*051	*070	*088	*c*
5	37 107	125	144	162	181	199	218	236	254	273	*d*
6	291	310	328	346	365	383	401	420	438	457	
7	475	493	511	530	548	566	585	603	621	639	
8	658	676	694	712	731	749	767	785	803	822	
9	840	858	876	894	912	931	949	967	985	*003	*d*

N.	L. 0	1	2	3	4	5	6	7	8	9	
	a	2	4	6	8	10	13	15	17	19	
	b	2	4	6	8	10	12	14	16	18	
	c	2	4	6	8	9	11	13	15	17	
	d	2	4	5	7	9	11	13	14	16	

N.	L. 0	1	2	3	4	5	6	7	8	9	
240	38 021	039	057	075	093̄	112	130	148	166	184	*b*
1	202	220	238	256	274	292	310	328	346	364	
2	382̲	399	417	435	453	471	489	507	525	543	
3	561̲	578	596	614	632	650	668	686̲	703	721	
4	739	757	775̲	792	810	828	846̲	863	881	899	
5	38 917̲	934	952	970̲	987	*005	*023	*041̲	*058	*076	
6	39 094̲	111	129̲	146	164	182̲	199	217	235̲	252	
7	270̲	287	305̲	322	340	358̲	375	393̲	410	428̲	*b*
8	445̄	463	480̄	498	515̄	533	550̄	568	585	602̄	*c*
9	620	637̄	655	672̄	690	707	724̄	742	759̄	777	
250	39 794	811̄	829	846	863̄	881	898	915̄	933	950	
1	967̄	985	*002	*019̄	*037	*054	*071	*088̄	*106	*123	
2	40 140	157̄	175	192	209	226	243̄	261	278	295	
3	312	329	346̄	364	381	398	415	432	449	466	
4	483	500̄	518	535	552	569	586	603	620	637	
5	40 654	671	688	705	722	739	756	773	790	807	
6	824	841	858	875	892	909	926	943	960	976	
7	993	*010	*027	*044	*061	*078	*095̲	*111	*128	*145	
8	41 162	179	196̲	212	229	246	263	280	296	313	
9	330	347̲	363	380	397	414̲	430	447	464	481̲	
260	41 497	514	531̲	547	564	581̲	597	614	631̲	647	
1	664	681̲	697	714	731̲	747	764̲	780	797	814̲	
2	830	847̲	863	880	896	913̲	929	946	963̲	979	*c*
3	996	*012̄	*029	*045̄	*062	*078̄	*095	*111	*127̄	*144	*d*
4	42 160̄	177	193̄	210	226̄	243	259	275̄	292	308̄	
5	42 325	341	357̄	374	390	406̄	423	439	455̄	472	
6	488	504̄	521	537	553̄	570	586	602̄	619	635	
7	651	667̄	684	700	716	732̄	749	765	781	797	
8	813̄	830	846	862	878	894̄	911	927	943	959	
9	975	991̄	*008	*024	*040	*056	*072	*088	*104	*120	*d*
N.	L. 0	1	2	3	4	5	6	7	8	9	

	a	2	4	6	8	9	11	13	15	17
	b	2	4	5	7	9	11	13	14	16
	c	2	3	5	7	8	10	12	14	15
	d	2	3	5	6	8	10	11	13	14

N.	L. 0	1	2	3	4	5	6	7	8	9	
270	43 136	152	169	185	201	217	233	249	265	281	*b*
1	297	313	329	345	361	377	393	409	425	441	
2	457	473	489	505	521	537	553	569	584	600	
3	616	632	648	664	680	696	712	727	743	759	
4	775	791	807	823	838	854	870	886	902	917	
5	43 933	949	965	981	996	*012	*028	*044	*059	*075	
6	44 091	107	122	138	154	170	185	201	217	232	
7	248	264	279	295	311	326	342	358	373	389	
8	404	420	436	451	467	483	498	514	529	545	
9	560	576	592	607	623	638	654	669	685	700	
280	44 716	731	747	762	778	793	809	824	840	855	
1	871	886	902	917	932	948	963	979	994	*010	*b*
2	45 025	040	056	071	086	102	117	133	148	163	*c*
3	179	194	209	225	240	255	271	286	301	317	
4	332	347	362	378	393	408	423	439	454	469	
5	45 484	500	515	530	545	561	576	591	606	621	
6	637	652	667	682	697	712	728	743	758	773	
7	788	803	818	834	849	864	879	894	909	924	
8	939	954	969	984	*000	*015	*030	*045	*060	*075	
9	46 090	105	120	135	150	165	180	195	210	225	
290	46 240	255	270	285	300	315	330	345	359	374	
1	389	404	419	434	449	464	479	494	509	523	
2	538	553	568	583	598	613	627	642	657	672	
3	687	702	716	731	746	761	776	790	805	820	
4	835	850	864	879	894	909	923	938	953	967	
5	46 982	997	*012	*026	*041	*056	*070	*085	*100	*114	
6	47 129	144	159	173	188	202	217	232	246	261	
7	276	290	305	319	334	349	363	378	392	407	
8	422	436	451	465	480	494	509	524	538	553	*c*
9	567	582	596	611	625	640	654	669	683	698	*d*

N.	L. 0	1	2	3	4	5	6	7	8	9	

a	2	3	5	7	8	10	12	14	15
b	2	3	5	6	8	10	11	13	14
c	1	3	4	6	7	9	10	12	13
d	1	3	4	6	7	8	10	11	13

N.	L. 0	1	2	3	4	5	6	7	8	9	
300	47 712	727	741	756	770	784	799	813	828	842	*a*
1	857	871	885	900	914	929	943	958	972	986	*b*
2	48 001	015	029	044	058	073	087	101	116	130	
3	144	159	173	187	202	216	230	244	259	273	
4	287	302	316	330	344	359	373	387	401	416	
5	48 430	444	458	473	487	501	515	530	544	558	
6	572	586	601	615	629	643	657	671	686	700	
7	714	728	742	756	770	785	799	813	827	841	
8	855	869	883	897	911	926	940	954	968	982	
9	996	*010	*024	*038	*052	*066	*080	*094	*108	*122	
310	49 136	150	164	178	192	206	220	234	248	262	
1	276	290	304	318	332	346	360	374	388	402	
2	415	429	443	457	471	485	499	513	527	541	
3	554	568	582	596	610	624	638	651	665	679	
4	693	707	721	734	748	762	776	790	803	817	
5	49 831	845	859	872	886	900	914	927	941	955	
6	969	982	996	*010	*024	*037	*051	*065	*079	*092	
7	50 106	120	133	147	161	174	188	202	215	229	
8	243	256	270	284	297	311	325	338	352	365	
9	379	393	406	420	433	447	461	474	488	501	
320	50 515	529	542	556	569	583	596	610	623	637	
1	651	664	678	691	705	718	732	745	759	772	*b*
2	786	799	813	826	840	853	866	880	893	907	*c*
3	920	934	947	961	974	987	*001	*014	*028	*041	
4	51 055	068	081	095	108	121	135	148	162	175	
5	51 188	202	215	228	242	255	268	282	295	308	
6	322	335	348	362	375	388	402	415	428	441	
7	455	468	481	495	508	521	534	548	561	574	
8	587	601	614	627	640	654	667	680	693	706	
9	720	733	746	759	772	786	799	812	825	838	*c*

N.	L. 0	1	2	3	4	5	6	7	8	9	

a	1	3	4	6	7	9	10	12	13
b	1	3	4	6	7	8	10	11	13
c	1	3	4	5	6	8	9	10	12

N.	L.	0	1	2	3	4	5	6	7	8	9	
330	51	85$\bar{1}$	865	878	891	904	917	930	94$\bar{3}$	957	970	*b*
1		983	996	*009	*022	*035	*048	*06$\bar{1}$	*075	*088	*101	
2	52	114	127	140	153	166	179	192	205	218	231	
3		244	257	27$\bar{0}$	284	297	310	323	336	349	362	
4		375	388	401	414	427	440	453	466	479	49$\underline{2}$	
5	52	504	517	530	543	556	569	582	595	608	621	
6		634	647	660	673	686	69$\underline{9}$	711	724	737	750	
7		763	776	789	802	81$\underline{5}$	827	840	853	866	879	
8		892	90$\underline{5}$	917	930	943	956	969	98$\underline{2}$	994	*007	
9	53	020	033	04$\underline{6}$	058	071	084	097	11$\underline{0}$	122	135	
340	53	148	16$\underline{1}$	173	186	199	21$\underline{2}$	224	237	250	26$\underline{3}$	
1		275	288	301	31$\underline{4}$	326	339	35$\underline{2}$	364	377	390	
2		40$\underline{3}$	415	428	44$\underline{1}$	453	466	47$\underline{9}$	491	504	51$\underline{7}$	
3		529	542	55$\underline{5}$	567	580	59$\underline{3}$	60$\underline{5}$	618	63$\underline{1}$	643	
4		65$\underline{6}$	668	681	69$\underline{4}$	706	719	73$\underline{2}$	744	75$\underline{7}$	769	
5	53	782	794	807	82$\underline{0}$	832	84$\underline{5}$	857	87$\underline{0}$	882	895	
6		90$\underline{8}$	920	93$\underline{3}$	945	95$\underline{8}$	970	98$\underline{3}$	995	*00$\underline{8}$	*020	
7	54	03$\underline{3}$	045	05$\underline{8}$	070	08$\underline{3}$	095	10$\underline{8}$	120	13$\underline{3}$	145	
8		15$\underline{8}$	170	18$\underline{3}$	195	20$\underline{8}$	220	23$\underline{3}$	245	25$\underline{8}$	270	*b*
9		283	295	30$\bar{7}$	320	33$\bar{2}$	345	35$\bar{7}$	370	382	39$\bar{4}$	*c*
350	54	407	41$\bar{9}$	432	444	45$\bar{6}$	469	48$\bar{1}$	494	506	51$\bar{8}$	
1		531	543	55$\bar{5}$	568	58$\bar{0}$	593	605	61$\bar{7}$	630	642	
2		65$\bar{4}$	667	679	69$\bar{1}$	704	716	72$\bar{8}$	741	753	765	
3		77$\bar{7}$	790	802	81$\bar{4}$	827	839	85$\bar{1}$	864	876	888	
4		90$\bar{0}$	913	925	937	94$\bar{9}$	962	974	986	99$\bar{8}$	*011	
5	55	023	035	04$\bar{7}$	060	072	084	096	10$\bar{8}$	121	133	
6		145	157	16$\bar{9}$	182	194	206	218	230	24$\bar{2}$	255	
7		267	279	291	303	31$\bar{5}$	328	340	352	364	376	
8		388	40$\bar{0}$	413	425	437	449	461	473	485	497	
9		50$\bar{9}$	522	534	546	558	570	582	594	606	618	*c*

N.	L.	0	1	2	3	4	5	6	7	8	9	

a	1	3	4	6	7	8	10	11	13	
b	1	3	4	5	6	8	9	10	12	
c	1	2	4	5	6	7	8	10	11	
d	1	2	3	4	5	7	8	9	10	

N.	L. 0	1	2	3	4	5	6	7	8	9	
360	55 630	642	654	666	678	691	703	715	727	739	*b*
1	751	763	775	787	799	811	823	835	847	859	
2	871	883	895	907	919	931	943	955	967	979	
3	991	*003	*015	*027	*038	*050	*062	*074	*086	*098	
4	56 110	122	134	146	158	170	182	194	205	217	
5	56 229	241	253	265	277	289	301	312	324	336	
6	348	360	372	384	396	407	419	431	443	455	
7	467	478	490	502	514	526	538	549	561	573	
8	585	597	608	620	632	644	656	667	679	691	
9	703	714	726	738	750	761	773	785	797	808	
370	56 820	832	844	855	867	879	891	902	914	926	
1	937	949	961	972	984	996	*008	*019	*031	*043	
2	57 054	066	078	089	101	113	124	136	148	159	
3	171	183	194	206	217	229	241	252	264	276	
4	287	299	310	322	334	345	357	368	380	392	
5	57 403	415	426	438	449	461	473	484	496	507	*b*
6	519	530	542	553	565	576	588	600	611	623	*c*
7	634	646	657	669	680	692	703	715	726	738	
8	749	761	772	784	795	807	818	830	841	852	
9	864	875	887	898	910	921	933	944	955	967	
380	57 978	990	*001	*013	*024	*035	*047	*058	*070	*081	
1	58 092	104	115	127	138	149	161	172	184	195	
2	206	218	229	240	252	263	274	286	297	309	
3	320	331	343	354	365	377	388	399	410	422	
4	433	444	456	467	478	490	501	512	524	535	
5	58 546	557	569	580	591	602	614	625	636	647	
6	659	670	681	692	704	715	726	737	749	760	
7	771	782	794	805	816	827	838	850	861	872	
8	883	894	906	917	928	939	950	961	973	984	
9	995	*006	*017	*028	*040	*051	*062	*073	*084	*095	*c*

N.	L. 0	1	2	3	4	5	6	7	8	9	

a	1	3	4	5	6	8	9	10	12	
b	1	2	4	5	6	7	8	10	11	
c	1	2	3	4	5	7	8	9	10	
d	1	2	3	4	5	6	7	8	9	

N.	L.	0	1	2	3	4	5	6	7	8	9	
390	59	106	118	129	140	151	162	173	184	195	207	*b*
1		218	229	240	251	262	273	284	295	306	318	
2		329	340	351	362	373	384	395	406	417	428	
3		439	450	461	472	483	494	506	517	528	539	
4		550	561	572	583	594	605	616	627	638	649	
5	59	660	671	682	693	704	715	726	737	748	759	
6		770	780	791	802	813	824	835	846	857	868	
7		879	890	901	912	923	934	945	956	966	977	
8		988	999	*010	*021	*032	*043	*054	*065	*076	*086	
9	60	097	108	119	130	141	152	163	173	184	195	
400	60	206	217	228	239	249	260	271	282	293	304	
1		314	325	336	347	358	369	379	390	401	412	
2		423	433	444	455	466	477	487	498	509	520	
3		531	541	552	563	574	584	595	606	617	627	
4		638	649	660	670	681	692	703	713	724	735	
5	60	746	756	767	778	788	799	810	821	831	842	
6		853	863	874	885	895	906	917	927	938	949	
7		959	970	981	991	*002	*013	*023	*034	*045	*055	
8	61	066	077	087	098	109	119	130	140	151	162	
9		172	183	194	204	215	225	236	247	257	268	
410	61	278	289	300	310	321	331	342	352	363	374	
1		384	395	405	416	426	437	448	458	469	479	*b*
2		490	500	511	521	532	542	553	563	574	584	*c*
3		595	606	616	627	637	648	658	669	679	690	
4		700	711	721	731	742	752	763	773	784	794	
5	61	805	815	826	836	847	857	868	878	888	899	
6		909	920	930	941	951	962	972	982	993	*003	
7	62	014	024	034	045	055	066	076	086	097	107	
8		118	128	138	149	159	170	180	190	201	211	
9		221	232	242	252	263	273	284	294	304	315	*c*

N.	L.	0	1	2	3	4	5	6	7	8	9	
		a	1	2	4	5	6	8	9	10	12	
		b	1	2	3	4	5	7	8	9	10	
		c	1	2	3	4	5	6	7	8	9	

N.	L.	0	1	2	3	4	5	6	7	8	9	
420	62	325	335	346	356	366	377	387	397	408	418	*b*
1		428	439	449	459	469	480	490	500	511	521	
2		531	542	552	562	572	583	593	603	613	624	
3		634	644	655	665	675	685	696	706	716	726	
4		737	747	757	767	778	788	798	808	818	829	
5	62	839	849	859	870	880	890	900	910	921	931	
6		941	951	961	972	982	992	*002	*012	*022	*033	
7	63	043	053	063	073	083	094	104	114	124	134	
8		144	155	165	175	185	195	205	215	225	236	
9		246	256	266	276	286	296	306	317	327	337	
430	63	347	357	367	377	387	397	407	417	428	438	
1		448	458	468	478	488	498	508	518	528	538	
2		548	558	568	579	589	599	609	619	629	639	
3		649	659	669	679	689	699	709	719	729	739	
4		749	759	769	779	789	799	809	819	829	839	
5	63	849	859	869	879	889	899	909	919	929	939	
6		949	959	969	979	988	998	*008	*018	*028	*038	
7	64	048	058	068	078	088	098	108	118	128	137	
8		147	157	167	177	187	197	207	217	227	237	
9		246	256	266	276	286	296	306	316	326	335	
440	64	345	355	365	375	385	395	404	414	424	434	
1		444	454	464	473	483	493	503	513	523	532	
2		542	552	562	572	582	591	601	611	621	631	
3		640	650	660	670	680	689	699	709	719	729	
4		738	748	758	768	777	787	797	807	816	826	
5	64	836	846	856	865	875	885	895	904	914	924	
6		933	943	953	963	972	982	992	*002	*011	*021	
7	65	031	040	050	060	070	079	089	099	108	118	
8		128	137	147	157	167	176	186	196	205	215	
9		225	234	244	254	263	273	283	292	302	312	*b*

N.	L.	0	1	2	3	4	5	6	7	8	9	
		a	1	2	3	4	5	7	8	9	10	
		b	1	2	3	4	5	6	7	8	9	
		c	1	2	3	4	5	5	6	7	8	

N.	L. 0	1	2	3	4	5	6	7	8	9	
450	65 321	331	341	350	360	369	379	389	398	408	*a*
1	418	427	437	447	456	466	475	485	495	504	
2	514	523	533	543	552	562	571	581	591	600	
3	610	619	629	639	648	658	667	677	686	696	
4	706	715	725	734	744	753	763	772	782	792	
5	65 801	811	820	830	839	849	858	868	877	887	
6	896	906	916	925	935	944	954	963	973	982	*a*
7	992	*001	*011	*020	*030	*039	*049	*058	*068	*077	*b*
8	66 087	096	106	115	124	134	143	153	162	172	
9	181	191	200	210	219	229	238	247	257	266	
460	66 276	285	295	304	314	323	332	342	351	361	
1	370	380	389	398	408	417	427	436	445	455	
2	464	474	483	492	502	511	521	530	539	549	
3	558	567	577	586	596	605	614	624	633	642	
4	652	661	671	680	689	699	708	717	727	736	
5	66 745	755	764	773	783	792	801	811	820	829	
6	839	848	857	867	876	885	894	904	913	922	
7	932	941	950	960	969	978	987	997	*006	*015	
8	67 025	034	043	052	062	071	080	089	099	108	
9	117	127	136	145	154	164	173	182	191	201	
470	67 210	219	228	237	247	256	265	274	284	293	
1	302	311	321	330	339	348	357	367	376	385	
2	394	403	413	422	431	440	449	459	468	477	
3	486	495	504	514	523	532	541	550	560	569	
4	578	587	596	605	614	624	633	642	651	660	
5	67 669	679	688	697	706	715	724	733	742	752	
6	761	770	779	788	797	806	815	825	834	843	
7	852	861	870	879	888	897	906	916	925	934	
8	943	952	961	970	979	988	997	*006	*015	*024	
9	68 034	043	052	061	070	079	088	097	106	115	*b*

N.	L. 0	1	2	3	4	5	6	7	8	9
	a	1	2	3	4	5	6	7	8	9
	b	1	2	3	4	5	5	6	7	8
	c	1	2	2	3	4	5	6	6	7

N.	L. 0	1	2	3	4	5	6	7	8	9	
480	68 124	133	142	151	160	169	178	187	196	205	*b*
1	215	224	233	242	251	260	269	278	287	296	
2	305	314	323	332	341	350	359	368	377	386	
3	395	404	413	422	431	440	449	458	467	476	
4	485	494	502	511	520	529	538	547	556	565	
5	68 574	583	592	601	610	619	628	637	646	655	
6	664	673	681	690	699	708	717	726	735	744	
7	753	762	771	780	789	797	806	815	824	833	
8	842	851	860	869	878	886	895	904	913	922	
9	931	940	949	958	966	975	984	993	*002	*011	
490	69 020	028	037	046	055	064	073	082	090	099	
1	108	117	126	135	144	152	161	170	179	188	
2	197	205	214	223	232	241	249	258	267	276	
3	285	294	302	311	320	329	338	346	355	364	
4	373	381	390	399	408	417	425	434	443	452	
5	69 461	469	478	487	496	504	513	522	531	539	
6	548	557	566	574	583	592	601	609	618	627	
7	636	644	653	662	671	679	688	697	705	714	
8	723	732	740	749	758	767	775	784	793	801	
9	810	819	827	836	845	854	862	871	880	888	
500	69 897	906	914	923	932	940	949	958	966	975	
1	984	992	*001	*010	*018	*027	*036	*044	*053	*062	
2	70 070	079	088	096	105	114	122	131	140	148	
3	157	165	174	183	191	200	209	217	226	234	
4	243	252	260	269	278	286	295	303	312	321	
5	70 329	338	346	355	364	372	381	389	398	406	
6	415	424	432	441	449	458	467	475	484	492	
7	501	509	518	526	535	544	552	561	569	578	
8	586	595	603	612	621	629	638	646	655	663	
9	672	680	689	697	706	714	723	731	740	749	*b*

N.	L. 0	1	2	3	4	5	6	7	8	9	
	a	1	2	3	4	5	6	7	8	9	
	b	1	2	3	4	5	5	6	7	8	
	c	1	2	2	3	4	5	6	6	7	

N.	L.	0	1	2	3	4	5	6	7	8	9	
510	70	757̄	766	774̄	783	791̄	800	808̄	817	825̄	834	*b*
1		842̄	851	859̄	868	876̄	885	893̄	902	910̄	919	
2		927	935̄	944	952̄	961	969̄	978	986̄	995	*003̄	
3	71	012	020̄	029	037̄	046	054̄	063	071	079̄	088	
4		096̄	105	113̄	122	130̄	139	147	155̄	164	172̄	
5	71	181	189̄	198	206	214̄	223	231̄	240	248̄	257	
6		265	273̄	282	290̄	299	307	315̄	324	332̄	341	
7		349	357̄	366	374̄	383	391	399̄	408	416̄	425	
8		433	441̄	450	458	466̄	475	483̄	492	500	508̄	
9		517	525	533̄	542	550̄	559	567	575̄	584	592	
520	71	600̄	609	617	625̄	634	642	650̄	659	667	675̄	
1		684	692	700̄	709	717	725̄	734	742	750̄	759	
2		767	775̄	784	792	800̄	809	817	825̄	834	842	
3		850	858̄	867	875	883̄	892	900	908̄	917	925	
4		933	941̄	950	958	966̄	975	983	991	999̄	*008	
5	72	016	024	032̄	041	049	057̄	066	074	082	090̄	
6		099	107	115	123̄	132	140	148	156̄	165	173	
7		181	189̄	198	206	214	222	230̄	239	247	255	
8		263̄	272	280	288	296	304̄	313	321	329	337̄	
9		346	354	362	370	378̄	387	395	403	411	419̄	
530	72	428	436	444	452	460̄	469	477	485	493	501	
1		509̄	518	526	534	542	550	558̄	567	575	583	
2		591	599	607̄	616	624	632	640	648	656̄	665	
3		673	681	689	697	705	713̄	722	730	738	746	
4		754	762	770̄	779	787	795	803	811	819	827	
5	72	835	843̄	852	860	868	876	884	892	900	908	
6		916̄	925	933	941	949	957	965	973	981	989	
7		997̄	*006	*014	*022	*030	*038	*046	*054	*062	*070	
8	73	078	086	094	102̄	111	119	127	135	143	151	
9		159	167	175	183	191	199	207	215	223	231	*b*

N.	L.	0	1	2	3	4	5	6	7	8	9	
		a	1	2	3	4	5	5	6	7	8	
		b	1	2	2	3	4	5	6	6	7	
		c	1	1	2	3	3	4	5	6	6	

N.	L.	0	1	2	3	4	5	6	7	8	9	
540	73	239	247	255	263	272	280	288	296	304	312	*b*
1		320	328	336	344	352	360	368	376	384	392	
2		400	408	416	424	432	440	448	456	464	472	
3		480	488	496	504	512	520	528	536	544	552	
4		560	568	576	584	592	600	608	616	624	632	
5	73	640	648	656	664	672	679	687	695	703	711	
6		719	727	735	743	751	759	767	775	783	791	
7		799	807	815	823	830	838	846	854	862	870	
8		878	886	894	902	910	918	926	933	941	949	
9		957	965	973	981	989	997	*005	*013	*020	*028	
550	74	036	044	052	060	068	076	084	092	099	107	
1		115	123	131	139	147	155	162	170	178	186	
2		194	202	210	218	225	233	241	249	257	265	
3		273	280	288	296	304	312	320	327	335	343	
4		351	359	367	374	382	390	398	406	414	421	
5	74	429	437	445	453	461	468	476	484	492	500	
6		507	515	523	531	539	547	554	562	570	578	
7		586	593	601	609	617	624	632	640	648	656	
8		663	671	679	687	695	702	710	718	726	733	
9		741	749	757	764	772	780	788	796	803	811	
560	74	819	827	834	842	850	858	865	873	881	889	
1		896	904	912	920	927	935	943	950	958	966	
2		974	981	989	997	*005	*012	*020	*028	*035	*043	
3	75	051	059	066	074	082	089	097	105	113	120	
4		128	136	143	151	159	166	174	182	189	197	
5	75	205	213	220	228	236	243	251	259	266	274	
6		282	289	297	305	312	320	328	335	343	351	
7		358	366	374	381	389	397	404	412	420	427	
8		435	442	450	458	465	473	481	488	496	504	
9		511	519	526	534	542	549	557	565	572	580	*b*

N.	L.	0	1	2	3	4	5	6	7	8	9	
		a	1	2	3	4	5	5	6	7	8	
		b	1	2	2	3	4	5	6	6	7	
		c	1	1	2	3	3	4	5	6	6	

N.	L.	0	1	2	3	4	5	6	7	8	9	
570	75	587	595	603	610	618	626	633	641	648	656	*a*
1		664	671	679	686	694	702	709	717	724	732	
2		740	747	755	762	770	778	785	793	800	808	
3		815	823	831	838	846	853	861	868	876	884	
4		891	899	906	914	921	929	937	944	952	959	
5	75	967	974	982	989	997	*005	*012	*020	*027	*035	
6	76	042	050	057	065	072	080	087	095	103	110	
7		118	125	133	140	148	155	163	170	178	185	
8		193	200	208	215	223	230	238	245	253	260	
9		268	275	283	290	298	305	313	320	328	335	*a*
580	76	343	350	358	365	373	380	388	395	403	410	*b*
1		418	425	433	440	448	455	462	470	477	485	
2		492	500	507	515	522	530	537	545	552	559	
3		567	574	582	589	597	604	612	619	626	634	
4		641	649	656	664	671	678	686	693	701	708	
5	76	716	723	730	738	745	753	760	768	775	782	
6		790	797	805	812	819	827	834	842	849	856	
7		864	871	879	886	893	901	908	916	923	930	
8		938	945	953	960	967	975	982	989	997	*004	
9	77	012	019	026	034	041	048	056	063	070	078	
590	77	085	093	100	107	115	122	129	137	144	151	
1		159	166	173	181	188	195	203	210	217	225	
2		232	240	247	254	262	269	276	283	291	298	
3		305	313	320	327	335	342	349	357	364	371	
4		379	386	393	401	408	415	422	430	437	444	
5	77	452	459	466	474	481	488	495	503	510	517	
6		525	532	539	546	554	561	568	576	583	590	
7		597	605	612	619	627	634	641	648	656	663	
8		670	677	685	692	699	706	714	721	728	735	
9		743	750	757	764	772	779	786	793	801	808	*b*

N.	L.	0	1	2	3	4	5	6	7	8	9	
		a	1	2	2	3	4	5	6	6	7	
		b	1	1	2	3	3	4	5	6	6	

N.	L.	0	1	2	3	4	5	6	7	8	9	
600	77	815	822	830	837	844	851	859	866	873	880	*b*
1		887	895	902	909	916	924	931	938	945	952	
2		960	967	974	981	988	996	*003	*010	*017	*025	
3	78	032	039	046	053	061	068	075	082	089	097	
4		104	111	118	125	132	140	147	154	161	168	
5	78	176	183	190	197	204	211	219	226	233	240	
6		247	254	262	269	276	283	290	297	305	312	
7		319	326	333	340	347	355	362	369	376	383	
8		390	398	405	412	419	426	433	440	447	455	
9		462	469	476	483	490	497	504	512	519	526	
610	78	533	540	547	554	561	569	576	583	590	597	
1		604	611	618	625	633	640	647	654	661	668	
2		675	682	689	696	704	711	718	725	732	739	
3		746	753	760	767	774	781	789	796	803	810	
4		817	824	831	838	845	852	859	866	873	880	
5	78	888	895	902	909	916	923	930	937	944	951	
6		958	965	972	979	986	993	*000	*007	*014	*021	
7	79	029	036	043	050	057	064	071	078	085	092	
8		099	106	113	120	127	134	141	148	155	162	
9		169	176	183	190	197	204	211	218	225	232	
620	79	239	246	253	260	267	274	281	288	295	302	
1		309	316	323	330	337	344	351	358	365	372	
2		379	386	393	400	407	414	421	428	435	442	
3		449	456	463	470	477	484	491	498	505	511	
4		518	525	532	539	546	553	560	567	574	581	
5	79	588	595	602	609	616	623	630	637	644	650	
6		657	664	671	678	685	692	699	706	713	720	
7		727	734	741	748	754	761	768	775	782	789	
8		796	803	810	817	824	831	837	844	851	858	
9		865	872	879	886	893	900	906	913	920	927	*b*

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		b	1	1	2	3	3	4	5	6	6	
		c	1	1	2	2	3	4	4	5	5	

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630	79	934	941	948	955	962	969	975	982	989	996	*a*
1	80	003	010	017	024	030	037	044	051	058	065	
2		072	079	085	092	099	106	113	120	127	134	
3		140	147	154	161	168	175	182	188	195	202	
4		209	216	223	229	236	243	250	257	264	271	
5	80	277	284	291	298	305	312	318	325	332	339	
6		346	353	359	366	373	380	387	393	400	407	
7		414	421	428	434	441	448	455	462	468	475	
8		482	489	496	502	509	516	523	530	536	543	
9		550	557	564	570	577	584	591	598	604	611	
640	80	618	625	632	638	645	652	659	665	672	679	
1		686	693	699	706	713	720	726	733	740	747	
2		754	760	767	774	781	787	794	801	808	814	
3		821	828	835	841	848	855	862	868	875	882	
4		889	895	902	909	916	922	929	936	943	949	
5	80	956	963	969	976	983	990	996	*003	*010	*017	
6	81	023	030	037	043	050	057	064	070	077	084	
7		090	097	104	111	117	124	131	137	144	151	
8		158	164	171	178	184	191	198	204	211	218	
9		224	231	238	245	251	258	265	271	278	285	
650	81	291	298	305	311	318	325	331	338	345	351	
1		358	365	371	378	385	391	398	405	411	418	
2		425	431	438	445	451	458	465	471	478	485	
3		491	498	505	511	518	525	531	538	544	551	
4		558	564	571	578	584	591	598	604	611	617	
5	81	624	631	637	644	651	657	664	671	677	684	
6		690	697	704	710	717	723	730	737	743	750	
7		757	763	770	776	783	790	796	803	809	816	
8		823	829	836	842	849	856	862	869	875	882	
9		889	895	902	908	915	921	928	935	941	948	*a*

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660	81 954	961	968	974	981	987	994	*000	*007	*014	*a*
1	82 020	027	033	040	046	053	060	066	073	079	
2	086	092	099	105	112	119	125	132	138	145	
3	151	158	164	171	178	184	191	197	204	210	
4	217	223	230	236	243	249	256	263	269	276	*a*
5	82 282	289	295	302	308	315	321	328	334	341	*b*
6	347	354	360	367	373	380	387	393	400	406	
7	413	419	426	432	439	445	452	458	465	471	
8	478	484	491	497	504	510	517	523	530	536	
9	543	549	556	562	569	575	582	588	595	601	
670	82 607	614	620	627	633	640	646	653	659	666	
1	672	679	685	692	698	705	711	718	724	730	
2	737	743	750	756	763	769	776	782	789	795	
3	802	808	814	821	827	834	840	847	853	860	
4	866	872	879	885	892	898	905	911	918	924	
5	82 930	937	943	950	956	963	969	975	982	988	
6	995	*001	*008	*014	*020	*027	*033	*040	*046	*052	
7	83 059	065	072	078	085	091	097	104	110	117	
8	123	129	136	142	149	155	161	168	174	181	
9	187	193	200	206	213	219	225	232	238	245	
680	83 251	257	264	270	276	283	289	296	302	308	
1	315	321	327	334	340	347	353	359	366	372	
2	378	385	391	398	404	410	417	423	429	436	
3	442	448	455	461	467	474	480	487	493	499	
4	506	512	518	525	531	537	544	550	556	563	
5	83 569	575	582	588	594	601	607	613	620	626	
6	632	639	645	651	658	664	670	677	683	689	
7	696	702	708	715	721	727	734	740	746	753	
8	759	765	771	778	784	790	797	803	809	816	
9	822	828	835	841	847	853	860	866	872	879	*b*

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690	83	885	891	897̄	904	910	916̄	923	929	935̄	942	*b*
1		948	954	960̄	967	973	979	985̄	992	998	*004	
2	84	011	017	023	029̄	036	042	048̄	055	061	067	
3		073̄	080	086	092	098̄	105	111	117	123̄	130	
4		136	142	148̄	155	161	167	173̄	180	186	192	
5	84	198̄	205	211	217	223̄	230	236	242	248̄	255	
6		261	267	273̄	280	286	292	298̄	305	311	317	
7		323̄	330	336	342	348	354̄	361	367	373	379̄	
8		386	392	398	404	410̄	417	423	429	435̄	442	
9		448	454	460	466̄	473	479	485	491	497̄	504	
700	84	510	516	522	528̄	535	541	547	553	559̄	566	
1		572	578	584	590̄	597	603	609	615	621̄	628	
2		634	640	646	652	658̄	665	671	677	683	689̄	
3		696	702	708	714	720	726̄	733	739	745	751	
4		757	763̄	770	776	782	788	794	800̄	807	813	
5	84	819	825	831	837̄	844	850	856	862	868	874	
6		880̄	887	893	899	905	911	917̄	924	930	936	
7		942	948	954	960̄	967	973	979	985	991	997	
8	85	003	009̄	016	022	028	034	040	046	052	058̄	
9		065	071	077	083	089	095	101	107	114	120	
710	85	126	132	138	144	150	156̄	163	169	175	181	
1		187	193	199	205	211	217̄	224	230	236	242	
2		248	254	260	266	272	278̄	285	291	297	303	
3		309	315	321	327	333	339	345̄	352	358	364	
4		370	376	382	388	394	400	406	412	418̄	425	
5	85	431	437	443	449	455	461	467	473	479	485	
6		491	497	503	509̄	516	522	528	534	540	546	
7		552	558	564	570	576	582	588	594	600	606	
8		612	618̄	625	631	637	643	649	655	661	667	
9		673	679	685	691	697	703	709	715	721	727	*b*

N.	L.	0	1	2	3	4	5	6	7	8	9	
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		b	1	1	2	2	3	4	4	5	5	

N.	L. 0	1	2	3	4	5	6	7	8	9	
720	85 733	739	745	751	757	763	769	775	781	788	*b*
1	794	800	806	812	818	824	830	836	842	848	
2	854	860	866	872	878	884	890	896	902	908	
3	914	920	926	932	938	944	950	956	962	968	
4	974	980	986	992	998	*004	*010	*016	*022	*028	
5	86 034	040	046	052	058	064	070	076	082	088	
6	094	100	106	112	118	124	130	136	141	147	
7	153	159	165	171	177	183	189	195	201	207	
8	213	219	225	231	237	243	249	255	261	267	
9	273	279	285	291	297	303	308	314	320	326	
730	86 332	338	344	350	356	362	368	374	380	386	
1	392	398	404	410	415	421	427	433	439	445	
2	451	457	463	469	475	481	487	493	499	504	
3	510	516	522	528	534	540	546	552	558	564	
4	570	576	581	587	593	599	605	611	617	623	
5	86 629	635	641	646	652	658	664	670	676	682	
6	688	694	700	705	711	717	723	729	735	741	
7	747	753	759	764	770	776	782	788	794	800	
8	806	812	817	823	829	835	841	847	853	859	
9	864	870	876	882	888	894	900	906	911	917	
740	86 923	929	935	941	947	953	958	964	970	976	
1	982	988	994	999	*005	*011	*017	*023	*029	*035	
2	87 040	046	052	058	064	070	075	081	087	093	
3	099	105	111	116	122	128	134	140	146	151	
4	157	163	169	175	181	186	192	198	204	210	
5	87 216	221	227	233	239	245	251	256	262	268	
6	274	280	286	291	297	303	309	315	320	326	
7	332	338	344	349	355	361	367	373	379	384	
8	390	396	402	408	413	419	425	431	437	442	
9	448	454	460	466	471	477	483	489	495	500	*b*

N.	L. 0	1	2	3	4	5	6	7	8	9	
	a	1	1	2	3	3	4	5	6	6	
	b	1	1	2	2	3	4	4	5	5	
	c	1	1	1	2	2	3	3	4	4	

N.	L. 0	1	2	3	4	5	6	7	8	9	
750	87 506	512	518	523	529	535	541	547	552	558	*a*
1	564	570	576	581	587	593	599	604	610	616	
2	622	628	633	639	645	651	656	662	668	674	
3	679	685	691	697	703	708	714	720	726	731	
4	737	743	749	754	760	766	772	777	783	789	
5	87 795	800	806	812	818	823	829	835	841	846	
6	852	858	864	869	875	881	887	892	898	904	
7	910	915	921	927	933	938	944	950	955	961	
8	967	973	978	984	990	996	*001	*007	*013	*018	
9	88 024	030	036	041	047	053	058	064	070	076	
760	88 081	087	093	098	104	110	116	121	127	133	
1	138	144	150	156	161	167	173	178	184	190	
2	195	201	207	213	218	224	230	235	241	247	
3	252	258	264	270	275	281	287	292	298	304	
4	309	315	321	326	332	338	343	349	355	360	
5	88 366	372	377	383	389	395	400	406	412	417	
6	423	429	434	440	446	451	457	463	468	474	
7	480	485	491	497	502	508	513	519	525	530	
8	536	542	547	553	559	564	570	576	581	587	
9	593	598	604	610	615	621	627	632	638	643	
770	88 649	655	660	666	672	677	683	689	694	700	
1	705	711	717	722	728	734	739	745	750	756	
2	762	767	773	779	784	790	795	801	807	812	
3	818	824	829	835	840	846	852	857	863	868	
4	874	880	885	891	897	902	908	913	919	925	
5	88 930	936	941	947	953	958	964	969	975	981	
6	986	992	997	*003	*009	*014	*020	*025	*031	*037	
7	89 042	048	053	059	064	070	076	081	087	092	
8	098	104	109	115	120	126	131	137	143	148	
9	154	159	165	170	176	182	187	193	198	204	*a*

N.	L. 0	1	2	3	4	5	6	7	8	9	
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	b	1	1	1	2	2	3	3	4	5	

N.	L. 0	1	2	3	4	5	6	7	8	9	
780	89 209	215	221	226	232	237	243	248	254	260	*a*
1	265	271	276	282	287	293	298	304	310	315	
2	321	326	332	337	343	348	354	360	365	371	
3	376	382	387	393	398	404	409	415	421	426	
4	432	437	443	448	454	459	465	470	476	481	
5	89 487	492	498	504	509	515	520	526	531	537	
6	542	548	553	559	564	570	575	581	586	592	
7	597	603	609	614	620	625	631	636	642	647	
8	653	658	664	669	675	680	686	691	697	702	
9	708	713	719	724	730	735	741	746	752	757	
790	89 763	768	774	779	785	790	796	801	807	812	
1	818	823	829	834	840	845	851	856	862	867	
2	873	878	883	889	894	900	905	911	916	922	
3	927	933	938	944	949	955	960	966	971	977	
4	982	988	993	998	*004	*009	*015	*020	*026	*031	*a*
5	90 037	042	048	053	059	064	069	075	080	086	*b*
6	091	097	102	108	113	119	124	129	135	140	
7	146	151	157	162	168	173	179	184	189	195	
8	200	206	211	217	222	227	233	238	244	249	
9	255	260	266	271	276	282	287	293	298	304	
800	90 309	314	320	325	331	336	342	347	352	358	
1	363	369	374	380	385	390	396	401	407	412	
2	417	423	428	434	439	445	450	455	461	466	
3	472	477	482	488	493	499	504	509	515	520	
4	526	531	536	542	547	553	558	563	569	574	
5	90 580	585	590	596	601	607	612	617	623	628	
6	634	639	644	650	655	660	666	671	677	682	
7	687	693	698	703	709	714	720	725	730	736	
8	741	747	752	757	763	768	773	779	784	789	
9	795	800	806	811	816	822	827	832	838	843	*b*

N.	L. 0	1	2	3	4	5	6	7	8	9	
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	b	1	1	1	2	2	3	3	4	4	

N.	L.	0	1	2	3	4	5	6	7	8	9	
810	90	849	854	859	865	870	875	881	886	891	897	*b*
1		902	907	913	918	924	929	934	940	945	950	
2		956	961	966	972	977	982	988	993	998	*004	
3	91	009	014	020	025	030	036	041	046	052	057	
4		062	068	073	078	084	089	094	100	105	110	
5	91	116	121	126	132	137	142	148	153	158	164	
6		169	174	180	185	190	196	201	206	212	217	
7		222	228	233	238	243	249	254	259	265	270	
8		275	281	286	291	297	302	307	312	318	323	
9		328	334	339	344	350	355	360	365	371	376	
820	91	381	387	392	397	403	408	413	418	424	429	
1		434	440	445	450	455	461	466	471	477	482	
2		487	492	498	503	508	514	519	524	529	535	
3		540	545	551	556	561	566	572	577	582	587	
4		593	598	603	609	614	619	624	630	635	640	
5	91	645	651	656	661	666	672	677	682	687	693	
6		698	703	709	714	719	724	730	735	740	745	
7		751	756	761	766	772	777	782	787	793	798	
8		803	808	814	819	824	829	834	840	845	850	
9		855	861	866	871	876	882	887	892	897	903	
830	91	908	913	918	924	929	934	939	944	950	955	
1		960	965	971	976	981	986	991	997	*002	*007	
2	92	012	018	023	028	033	038	044	049	054	059	
3		065	070	075	080	085	091	096	101	106	111	
4		117	122	127	132	137	143	148	153	158	163	
5	92	169	174	179	184	189	195	200	205	210	215	
6		221	226	231	236	241	247	252	257	262	267	
7		273	278	283	288	293	298	304	309	314	319	
8		324	330	335	340	345	350	355	361	366	371	
9		376	381	387	392	397	402	407	412	418	423	*b*

N.	L.	0	1	2	3	4	5	6	7	8	9	
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		b	1	1	1	2	2	3	3	4	4	

N.	L.	0	1	2	3	4	5	6	7	8	9	
840	92	428	433	438	443̄	449	454	459	464	469	474̄	*b*
1		480	485	490	495	500	505̄	511	516	521	526	
2		531	536̄	542	547	552	557	562	567	572̄	578	
3		583	588	593	598	603̄	609	614	619	624	629	
4		634	639̄	645	650	655	660	665	670	675̄	681	
5	92	686	691	696	701	706	711	716̄	722	727	732	
6		737	742	747	752̄	758	763	768	773	778	783	
7		788	793̄	799	804	809	814	819	824	829	834̄	
8		840	845	850	855	860	865	870	875̄	881	886	
9		891	896	901	906	911	916	921̄	927	932	937	
850	92	942	947	952	957	962	967̄	973	978	983	988	
1		993	998	*003	*008	*013	*018̄	*024	*029	*034	*039	
2	93	044	049	054	059	064	069̄	075	080	085	090	
3		095	100	105	110	115	120	125̄	131	136	141	
4		146	151	156	161	166	171	176	181	186̄	192	
5	93	197	202	207	212	217	222	227	232	237	242	
6		247	252̄	258	263	268	273	278	283	288	293	
7		298	303	308	313	318	323	328̄	334	339	344	
8		349	354	359	364	369	374	379	384	389	394	
9		399	404	409	414̄	420	425	430	435	440	445	
860	93	450	455	460	465	470	475	480	485	490	495	
1		500	505	510	515	520̄	526	531	536	541	546	
2		551	556	561	566	571	576	581	586	591	596	
3		601	606	611	616	621	626	631	636	641	646	
4		651	656	661	666	671	676̄	682	687	692	697	
5	93	702	707	712	717	722	727	732	737	742	747	
6		752	757	762	767	772	777	782	787	792	797	
7		802	807	812	817	822	827	832	837	842	847	
8		852	857	862	867	872	877	882	887	892	897	
9		902	907	912	917	922	927	932	937	942	947	*b*

N.	L.	0	1	2	3	4	5	6	7	8	9	
		a	1	1	2	2	3	4	4	5	5	
		b	1	1	1	2	2	3	3	4	4	

N.	L.	0	1	2	3	4	5	6	7	8	9	
870	93	952	957	962	967	972	977	982	987	992	997	*a*
1	94	002	007	012	017	022	027	032	037	042	047	
2		052	057	062	067	072	077	082	086	091	096	
3		101	106	111	116	121	126	131	136	141	146	
4		151	156	161	166	171	176	181	186	191	196	
5	94	201	206	211	216	221	226	231	236	240	245	
6		250	255	260	265	270	275	280	285	290	295	
7		300	305	310	315	320	325	330	335	340	345	
8		349	354	359	364	369	374	379	384	389	394	
9		399	404	409	414	419	424	429	433	438	443	
880	94	448	453	458	463	468	473	478	483	488	493	
1		498	503	507	512	517	522	527	532	537	542	
2		547	552	557	562	567	571	576	581	586	591	
3		596	601	606	611	616	621	626	630	635	640	
4		645	650	655	660	665	670	675	680	685	689	
5	94	694	699	704	709	714	719	724	729	734	738	
6		743	748	753	758	763	768	773	778	783	787	
7		792	797	802	807	812	817	822	827	832	836	
8		841	846	851	856	861	866	871	876	880	885	
9		890	895	900	905	910	915	919	924	929	934	
890	94	939	944	949	954	959	963	968	973	978	983	
1		988	993	998	*002	*007	*012	*017	*022	*027	*032	
2	95	036	041	046	051	056	061	066	071	075	080	
3		085	090	095	100	105	109	114	119	124	129	
4		134	139	143	148	153	158	163	168	173	177	
5	95	182	187	192	197	202	207	211	216	221	226	
6		231	236	240	245	250	255	260	265	270	274	
7		279	284	289	294	299	303	308	313	318	323	
8		328	332	337	342	347	352	357	361	366	371	
9		376	381	386	390	395	400	405	410	415	419	*a*

N.	L.	0	1	2	3	4	5	6	7	8	9	
		a	0	1	1	2	2	3	3	4	4	
		b	0	1	1	2	2	2	3	3	4	

N.	L.	0	1	2	3	4	5	6	7	8	9	
900	95	424	429	434	439	444	448	453	458	463	468	*a*
1		472	477	482	487	492	497	501	506	511	516	
2		521	525	530	535	540	545	550	554	559	564	
3		569	574	578	583	588	593	598	602	607	612	
4		617	622	626	631	636	641	646	650	655	660	
5	95	665	670	674	679	684	689	694	698	703	708	
6		713	718	722	727	732	737	742	746	751	756	
7		761	766	770	775	780	785	789	794	799	804	
8		809	813	818	823	828	832	837	842	847	852	
9		856	861	866	871	875	880	885	890	895	899	
910	95	904	909	914	918	923	928	933	938	942	947	
1		952	957	961	966	971	976	980	985	990	995	
2		999	*004	*009	*014	*019	*023	*028	*033	*038	*042	
3	96	047	052	057	061	066	071	076	080	085	090	
4		095	099	104	109	114	118	123	128	133	137	
5	96	142	147	152	156	161	166	171	175	180	185	
6		190	194	199	204	209	213	218	223	227	232	
7		237	242	246	251	256	261	265	270	275	280	
8		284	289	294	298	303	308	313	317	322	327	
9		332	336	341	346	350	355	360	365	369	374	
920	96	379	384	388	393	398	402	407	412	417	421	
1		426	431	435	440	445	450	454	459	464	468	
2		473	478	483	487	492	497	501	506	511	515	
3		520	525	530	534	539	544	548	553	558	562	
4		567	572	577	581	586	591	595	600	605	609	
5	96	614	619	624	628	633	638	642	647	652	656	
6		661	666	670	675	680	685	689	694	699	703	
7		708	713	717	722	727	731	736	741	745	750	
8		755	759	764	769	774	778	783	788	792	797	
9		802	806	811	816	820	825	830	834	839	844	*a*

N.	L.	0	1	2	3	4	5	6	7	8	9	
	a	0	1	1	2	2	3	3	4	4		
	b	0	1	1	2	2	2	3	3	4		

N.	L.	0	1	2	3	4	5	6	7	8	9	
930	96	848	853	858	862	867	872	876	881	886	890	*a*
1		895	900	904	909	914	918	923	928	932	937	
2		942	946	951	956	960	965	970	974	979	984	
3		988	993	997	*002	*007	*011	*016	*021	*025	*030	
4	97	035	039	044	049	053	058	063	067	072	077	
5	97	081	086	090	095	100	104	109	114	118	123	
6		128	132	137	142	146	151	155	160	165	169	
7		174	179	183	188	192	197	202	206	211	216	
8		220	225	230	234	239	243	248	253	257	262	
9		267	271	276	280	285	290	294	299	304	308	
940	97	313	317	322	327	331	336	340	345	350	354	
1		359	364	368	373	377	382	387	391	396	400	
2		405	410	414	419	424	428	433	437	442	447	
3		451	456	460	465	470	474	479	483	488	493	
4		497	502	506	511	516	520	525	529	534	539	
5	97	543	548	552	557	562	566	571	575	580	585	
6		589	594	598	603	607	612	617	621	626	630	
7		635	640	644	649	653	658	663	667	672	676	
8		681	685	690	695	699	704	708	713	717	722	
9		727	731	736	740	745	749	754	759	763	768	*a* / *b*
950	97	772	777	782	786	791	795	800	804	809	813	
1		818	823	827	832	836	841	845	850	855	859	
2		864	868	873	877	882	886	891	896	900	905	
3		909	914	918	923	928	932	937	941	946	950	
4		955	959	964	968	973	978	982	987	991	996	
5	98	000	005	009	014	019	023	028	032	037	041	
6		046	050	055	059	064	068	073	078	082	087	
7		091	096	100	105	109	114	118	123	127	132	
8		137	141	146	150	155	159	164	168	173	177	
9		182	186	191	195	200	204	209	214	218	223	*b*

N.	L.	0	1	2	3	4	5	6	7	8	9	
		a	0	1	1	2	2	3	3	4	4	
		b	0	1	1	2	2	2	3	3	4	

N.	L. 0	1	2	3	4	5	6	7	8	9	
960	98 227̄	232	236̄	241	245̄	250	254̄	259	263̄	268	*b*
1	272̄	277	281̄	286	290̄	295	299̄	304	308̄	313̄	
2	318	322̄	327	331̄	336	340̄	345	349̄	354	358̄	
3	363	367̄	372	376̄	381	385̄	390	394̄	399	403̄	
4	408	412̄	417	421̄	426	430̄	435	439̄	444	448̄	
5	98 453	457̄	462	466̄	471	475̄	480	484̄	489	493̄	
6	498	502̄	507	511̄	516	520̄	525	529̄	534	538̄	
7	543	547̄	552	556̄	561	565̄	570	574̄	579	583̄	
8	588	592̄	597	601	605̄	610	614̄	619	623̄	628	
9	632̄	637	641̄	646	650̄	655	659̄	664	668̄	673	
970	98 677̄	682	686̄	691	695̄	700	704̄	709	713	717̄	
1	722	726̄	731	735̄	740	744̄	749	753̄	758	762̄	
2	767	771̄	776	780	784̄	789	793̄	798	802̄	807	
3	811̄	816	820̄	825	829̄	834	838̄	843	847	851̄	
4	856	860̄	865	869̄	874	878̄	883	887̄	892	896	
5	98 900̄	905	909̄	914	918̄	923	927̄	932	936̄	941	
6	945	949̄	954	958̄	963	967̄	972	976̄	981	985	
7	989̄	994	998̄	*003	*007	*012	*016̄	*021	*025	*029̄	
8	99 034	038̄	043	047̄	052	056̄	061	065	069̄	074	
9	078̄	083	087̄	092	096	100̄	105	109̄	114	118̄	
980	99 123	127	131̄	136	140̄	145	149̄	154	158	162̄	
1	167	171̄	176	180̄	185	189	193̄	198	202̄	207	
2	211̄	216	220	224̄	229	233̄	238	242̄	247	251	
3	255̄	260	264̄	269	273	277̄	282	286̄	291	295̄	
4	300	304	308̄	313	317̄	322	326	330̄	335	339̄	
5	99 344	348	352̄	357	361̄	366	370	374̄	379	383̄	
6	388	392	396̄	401	405̄	410	414̄	419	423	427̄	
7	432	436̄	441	445	449̄	454	458̄	463	467	471̄	
8	476	480	484̄	489	493̄	498	502	506̄	511	515̄	
9	520	524	528̄	533	537̄	542	546	550̄	555	559̄	*b*

N.	L. 0	1	2	3	4	5	6	7	8	9	
	a 0	1	1	2	2	3	3	4	4		
	b 0	1	1	2	2	2	3	3	4		

N.	L.	0	1	2	3	4	5	6	7	8	9	
990	99	564	568	572̄	577	581	585̄	590	594̄	599	603	*b*
1		607̄	612	616̄	621	625	629̄	634	638	642̄	647	
2		651̄	656	660	664̄	669	673	677̄	682	686̄	691	
3		695	699̄	704	708	712̄	717	721̄	726	730	734̄	
4		739	743	747̄	752	756	760̄	765	769̄	774	778	
5	99	782̄	787	791	795̄	800	804	808	813	817̄	822	
6		826	830̄	835	839	843̄	848	852	856̄	861	865̄	
7		870	874	878̄	883	887	891̄	896	900	904̄	909	
8		913	917̄	922	926	930̄	935	939̄	944	948	952̄	
9		957	961	965̄	970	974	978̄	983	987	991̄	996	*b*
N.	L.	0	1	2	3	4	5	6	7	8	9	
		a	0	1	1	2	2	3	3	4	4	
		b	0	1	1	2	2	2	3	3	4	

Square Roots

To nearest 3 places of decimals.

1	1	21	4·583	41	6·403	61	7·810	81	9
2	1·414	22	4·690	42	6·481	62	7·874	82	9·055
3	1·732	23	4·796	43	6·557	63	7·937	83	9·110
4	2	24	4·899	44	6.633	64	8	84	9·165
5	2·236	25	5	45	6·708	65	8·062	85	9·220
6	2·449	26	5·099	46	6·782	66	8·124	86	9·274
7	2·646	27	5·196	47	6·856	67	8·185	87	9·327
8	2·828	28	5·292	48	6·928	68	8·246	88	9·381
9	3	29	5·385	49	7	69	8·307	89	9·434
10	3·162	30	5·477	50	7·071	70	8·367	90	9·487
11	3·317	31	5·568	51	7·141	71	8·426	91	9·539
12	3·464	32	5·657	52	7·211	72	8·485	92	9·592
13	3·606	33	5·745	53	7·280	73	8·544	93	9·644
14	3·742	34	5·831	54	7·348	74	8·602	94	9·695
15	3·873	35	5·916	55	7·416	75	8·660	95	9·747
16	4	36	6	56	7·483	76	8·718	96	9·798
17	4·123	37	6·083	57	7·550	77	8·775	97	9·849
18	4·243	38	6·164	58	7·616	78	8·832	98	9·899
19	4·359	39	6·245	59	7·681	79	8·888	99	9·950
20	4·472	40	6·325	60	7·746	80	8·944	100	10

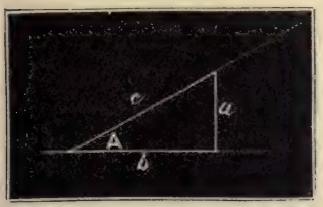
INTRODUCTION

TO

TABLES OF LOGARITHMS

OF ARC FUNCTIONS.

An angle is the opening between two straight lines which meet together. If from any point in one of these lines a perpendicular fall upon the other line, we have a right-angled triangle, as in figure. Now if A is the angle expressed in degrees, minutes, and seconds, enclosed by the straight lines, and a, b, c are the lengths in inches, centimetres, or other units of the lines indicated by these letters in the figure, then



$$\frac{a}{c}=\sin A. \qquad \frac{b}{c}=\cos A. \qquad \frac{a}{b}=\tan A.$$

$$\frac{c}{a}=\operatorname{cosec} A. \qquad \frac{c}{b}=\sec A. \qquad \frac{b}{a}=\cot A.$$

If we find out what is the value of each of the above ratios to several places of decimals for each degree of the quadrant, we have a series of numbers called the *Natural* Sines, *Natural* Cosines, &c., for each degree. Now in most problems in navigation, astronomy, crystallography, and other subjects into which spherical or plane trigonometry enters, these natural sines have to be multiplied together, or divided into each other; so that the calculations when made by ordinary arithmetic occupy a great deal of time. Indeed, as mentioned in the article "Logarithms," in *Chambers' Encyclopædia*, Vol. VI., 1890:—"By the end of the sixteenth century trigonometrical operations had become so complicated that the wits of several mathematicians were at work to devise means of shortening them;" and

ultimately John Napier invented logarithms which make these complex calculations mere child's play in comparison with former methods.

Characteristic. As in the logarithms of numbers, so in the logarithms of arc functions the natural function may be a decimal, or a whole number and decimal; but it is customary not to give the characteristic in the same manner as for numbers. The value of sin 0° 10′ is 0·0029089 . . . and the logarithm of this should, according to the usual rule, be $\bar{3}$·46373. On turning to the table, page 49, it will be seen to be 7·46373; in fact, it is considered simpler to add ten always to the usual characteristic, and by this means negative indices are avoided.

EXERCISE 1.

Find the *characteristic* of the logarithm for each of the following numbers according to the principle just explained:—

a. 1·357348	*b.* 0·236	*c.* 0·00047
d. 5·3462	*e.* 343·7737	*f.* 57·290

Answers. *a.* 10 *b.* 9 *c.* 6 *d.* 10 *e.* 12 *f.* 11

Given an arc to find the logarithm of its sine, cosine, or other function by means of the tables.

A.—Main Tables. Note that to find any arc so far as the degrees are concerned, we must look either to the top or the bottom of each of the *main* tables. The degrees, in fact, are consecutive, commencing with 0° on page 49, and following on until we come to 44° on page 143, then at the bottom of the table is 45°; and now running backwards along the foot of each table we meet with 46°, 47°, &c., until we come to 89° at the foot of the main table on page 49, the one from which we started. By means of the lateral index, any required degree is quickly found; but it must be remembered that degrees up to 44° are at the tops of the tables, while degrees above 44° are at the bottoms of the tables.

At the sides of each table are indicated minutes of arc, the minutes on the left-hand side referring to the degree at top of table, while those on the right-hand side refer to the degree at bottom of table. Thus, to find log. sin 44° 50′, since 44° is at the *top* of table, we read down the column headed "Sin +" on the *left-hand* side till we come to 50, against which we find 9·84822, the required logarithm.

If, however, we want log. sine 45° 50′, since we find 45° at *bottom* of table, we read upward on the *right-hand* side in the column which has "Sin +" at foot until we come to 50, where we find 9·85571, the required logarithm.

EXERCISE 2.

Find logarithms for each of the following arc functions :—

a. sin 0° 15′	*b.* tan 1° 30′	*c.* cot 1° 30′
d. cos 4° 50′	*e.* sin 50° 10′	*f.* tan 80° 20′
g. sin 90°	*h.* cos 90°	*k.* tan 45°
l. cot 45°	*m.* cot 30°	*n.* tan 60°

ANSWERS.

a. 7·63982	*b.* 8·41807	*c.* 11·58193	*d.* 9·99845	
e. 9 88531	*f.* 10·76870	*g.* 10	*h.* 10	*k.* 10
l. 10	*m.* 10·23856	*n.* 10·23856		

B.—Supplementary Tables at foot of each page. These tables enable us to find a five-figure mantissa for an arc accurately to 10″, and approximately to 2″, or even 1″.

The figures in these tables consist of the differences for 10″, 20″, 30″, 40″, and 50″ for successive minutes of the main tables, index letters at the sides indicating which line of differences is to be used for a particular minute. Hence, these differences are added or subtracted as required.

In order to bring these supplementary tables within small compass, and yet preserve an accurate mantissa for every 10″, advantage is taken of the *dash over* and *dash under* system, introduced by the author in a previous work. Thus, when there is no numeral above or below an index letter, as, for example, with the *g* against sin 15° 48′, page 85; then for 10″, 20″, 30″, 40″, 50″, we take the numbers 7, 14, 22, 29, 37, just as they stand, disregarding the dashes above and below.

When the index letter has a numeral above, as g^1 against sin 15° 50′, then the line *g* at foot is read as 7, 15, 22, 29, 37, the dash over the $\overline{14}$ implying that 1 is to be added, making 15 instead of 14.

When the index letter has a numeral below, as g_1 against sin 15° 59′, then the line *g* is read as 7, 14, 22, 29, 36, the dash under the $\underline{37}$ implying that we are to subtract 1 from this number, making 36 instead of 37.

Differences are *added* in the case of sines and tangents, and *subtracted* in the case of cosines and cotangents; the series for sines and tangents being an increasing one, while for cosines and cotangents it is a decreasing one. In order to remind the computer of this, the columns are headed "Sin +," "Tan +," "Cos −," "Cot −," the plus and minus signs showing whether the differences are to be added or subtracted.

After these explanations, the following rules will be intelligible.

Rule for using the tables in finding log. functions when the arc is given.

1. If the arc is in degrees and minutes only, the required logarithm is found in the *main* tables by inspection only.

2. If the arc is in degrees, minutes, and any multiple of 10″, the logarithm is found by inspection of the main table for the degrees and minutes, and to this logarithm is added (or subtracted) the number found under the 10″, 20″, 30″, 40″, or 50″, in the line corresponding to the index letter.

3. If the arc is not a multiple of 10″, find the logarithm to the greatest multiple of 10″ contained in the given number of seconds, and as regards the remaining seconds multiply these by the number under 10″ in the table, cut off one place of decimals, and add this product to the logarithm already found.

The above rules apply *strictly* only to degrees under 45°, but they *may* be used without sensible error for degrees above 45°. The five-figure mantissa is, however, accurately obtained for any multiple of 10″, when the given arc is above 45°, by the following rule.

Rule that may be used when finding the logarithm of an arc function for any degree above 45° *when the arc is expressed in degrees, minutes, and any multiple of* 10″.

Take from the tables the logarithm of the arc to the *minute above that which is given;* subtract the given number of seconds from 60″, and proceed as in rules 2 and 3 above, only reversing the operation of addition or subtraction as indicated by the expressions Sin+, Tan+, Cot−, Tan−. See Example *f*.

Those familiar with trigonometry will note that the above rule is simply one for changing the function of an arc above 45° to the complementary function under 45°, for which, of course, rules 2 and 3 apply.

EXAMPLES.

(a) Required the log. of sin 30° 36′ 40″.

By method already indicated, we find log. of 30° 36′ to be 9·70675, and against this we have the letter *a*. Looking now to *a* in the table at bottom of page, we find underneath 40″ the number 15, and since the column is headed "Sin+," we *add* 15 to 9·70675, making 9·70690 the required logarithm.

(b) Required the log. of cos 30° 36′ 40″.

We first find log. cos 30° 36′ as 9·93487, against which is the letter y, and at foot of page in line y under 40″ is the number 5. Since, however, the column is headed "Cos−," we *subtract* 5 from 9·93487, thus giving 9·93482 as the logarithm of cos 30° 36′ 40″

(c) Required the logarithm of tan 30° 33′ 50″.

As before, log. of tan 30° 33′ is found as 9·77101, against this is d^1; we look then in line d at foot of page, and underneath 50″ is $2\overline{4}$. Since there is a figure *above* the index letter, and a stroke above the number, we add 1 to 24, making it 25, and then 25 added to 9·77101 gives 9·77126 as the required logarithm.

(d) Required the logarithm of tan 4° 16′ 40″.

Here there is a figure below the index letter, thus f_1, and also a stroke under the 4 of 114 in line f and under 40″; hence, instead of adding 114 to 8·87277 we add 113, making the required logarithm 8·87390.

(e) Required the logarithm of tan 10° 15′ 47″.

We find by methods already described the log. of tan 10° 15′ 40″ as 9·25727+48, or 9·25775, and for the remaining 7″ multiply the number under 10″ by 7, and cut off one place, when we have 8; thus, $12 \times 7 = 84$, and cutting off the 4, we have 8. This 8 must be added to 9·25775, and we obtain 9·25783 as the required logarithm.

(f) Required the logarithm of sin 51° 10′ 20″. Since the required arc is more than 45°, look for sin 51° 11′ instead of 51° 10′. Also note "Sin+" at bottom of column.

Log. of sin 51° 11′ (index letter w)	9·89162
60″ − 20″ = 40″. Number underneath 40″ in line w is 6. This is to be subtracted instead of added	−6
Required logarithm	9·89156

Note.—If rule 2 is used, we have log. sin 51° 10′ 20″ = 9·89152+3 = 9·89155, instead of the more accurate number 9·89156.

(g) Required log. cot 51° 12′ 14″.

As in Example *f*, find log. cot 51° 13′ (index letter h), also find the number 60 − 14, or 46″, the value for which is 17+2, or 19. Note, too, that we have "Cot−" as indicating subtraction if rule 2 is used; but by the rule we are now using the sign is reversed.

Log. cot 51° 13′	9·90501
Add	19
Required logarithm	9·90520

EXERCISE 3.

Find logarithms of the following arc functions:—

Sin.	Cos.	Tan.	Cot.
a. 0° 5′ 20″	*g.* 4° 52′ 20″	*o.* 4° 50′ 10″	*u.* 13° 40′ 30″
b. 1° 18′ 10″	*h.* 9° 4′ 50″	*p.* 22° 1′ 30″	*v.* 24° 38′ 16″
c. 85° 32′ 50″	*k.* 13° 1′ 40″	*q.* 32° 36′ 26″	*w.* 44° 55′ 27″
d. 80° 18′ 10″	*l.* 40° 22′ 40″	*r.* 60° 10′ 13″	*x.* 49° 0′ 50″
e. 21° 45′ 38″	*m.* 50° 33′ 40″	*s.* 63° 11′ 52″	*y.* 57° 40′ 40″
f. 67° 17′ 30″	*n.* 57° 10′ 43″	*t.* 85° 26′ 44″	*z.* 88° 5′ 44″

ANSWERS.

a. 7·19072	*g.* 9·99843	*o.* 8·92741	*u.* 10·61384
b. 8·35671	*h.* 9·99452	*p.* 9·60695	*v.* 10·33854
c. 9·99869	*k.* 9·98868	*q.* 9·80598	*w.* 10·00115
d. 9·99375	*l.* 9·88184	*r.* 10·24155	*x.* 9·93895
e. 9·56905	*m.* 9·80295	*s.* 10·29655	*y.* 9·80121
f. 9·96496	*n.* 9·73401	*t.* 11·09877	*z.* 8·52181

Given the logarithm of an arc function to find by means of the tables the arc to which it refers.

If the given logarithm is found in the main table, the arc is known at once. Thus, if log. tan. = 9·43308 is given to find the arc, we have only to look out this number under tan on page 84, and we see that the arc is 15° 10′. Similarly, if the given logarithm is log. tan. = 9·43358, the arc must be 15° 11′; but if the logarithm is a number intermediate between these two, the arc must also be intermediate, and would be expressed as 15° 10′ x″, where x has to be found.

For quickly finding the page on which a required logarithm will be found see page 47.

Rule for using the tables to find the arc from a given logarithm of an arc function.

If the given logarithm is found in the main tables, the corresponding arc is found by noting to what arc the logarithm in the main tables refers.

When the given logarithm is not found in the main tables, look out in the main tables the logarithm next below it in value; this next lower logarithm refers to a certain arc expressed in degrees and minutes; write this down as $A°\ B'$.

To find the seconds. Subtract the logarithm of $A°\ B'$ from the given logarithm, when a certain difference d is found. Note the index letter n, say, against the logarithm of $A°\ B'$, and see if in the line n the number d is present; if so, add (or subtract) the number of seconds to which d refers, and we have the required arc.

Note.—Addition or subtraction is indicated by the expressions Sin+, Tan+, Cot−, Cos−.

If the number d is not present in the line n, we may generally estimate without calculation the number of seconds d represents, or we may proceed thus :—

Add a cypher to the difference d, and divide by the number underneath 10″ in the line to which the index letter refers.

EXAMPLES.

(h) Required the arc corresponding to log. tan = 9·43425

The given log. tan = 9·43425
Log. of tan 15° 12′ = 9·43408 Index letter c.

17 = Diff. . . d.

On looking along line c in table at foot, we find 17 underneath 20″. The number of seconds to be added is then 20, so the required arc is 15° 12′ 20″.

(k) Required the arc corresponding to log. tan = 9·43438

The given log. tan = 9·43438
Log. of tan 15° 12′ = 9·43408 Index letter c.

30 = Diff. . . d.

This is near 33, the number under 40″ in line c; hence we may estimate the number of seconds to be added as something under 40, about 37″, say; so that the required arc would be 15° 12′ 37″. Or, add a cypher to the difference 30, giving 300, and divide by 8 the number under 10″, when we have 37.

(l). Find the arc, having given log. cot = 8·94988

The given log. cot = 8·94988
Log. of cot 84° 55′ = 8·94917 Index letter h^1.

71 = Diff. . . d.

On looking along line h we find 71 under 30″, and Cot – at bottom of column reminds us we are to subtract instead of add; hence required arc = 84° 55′, *less* 30″, or 84° 54′ 30″.

EXERCISE 4.

Find the arcs to which the following logarithms refer :—

a. sin = 9·47073	e. cos = 8·71758
b. sin = 9·40037	f. cos = 9·85810
c. tan = 10·35153	g. cot = 8·75320
d. tan = 11·28135	h. cot = 10·38250

ANSWERS.

a. 17° 11′ 40″	e. 87° 0′ 30″
b. 14° 33′ 38″	f. 43° 50′ 25″
c. 66° 0′ 19″	g. 86° 45′ 27″
d. 87° 0′ 19″	h. 22° 30′ 47″

Cosecants and Secants. These functions are not included in the tables, and if we do not mind substituting subtraction for addition, there is no necessity for them. No doubt addition is an easier operation than subtraction, but on the other hand the necessary introduction of two additional rows to the tables makes the page much more complex, and, hence, renders the finding of a particular function more uncertain.

If in any problem we are to *add* the logarithm of a cosecant, we simply *subtract* the logarithm of the sine of the corresponding arc. Or, if we are to *subtract* the logarithm of a cosecant, we *add* the logarithm of the sine of the corresponding arc. Similarly, when the secant is given, we treat the logarithm of the cosine of the given arc after the same manner. Lest the reader should forget this point, a reminder is put at the foot of each page of the tables where there is room for it.

Note.—The conversion of the mantissæ of sin. and cos. into corresponding mantissæ of cosec and sec may easily be effected by making up to 9 all figures of the sin. or cos. mantissæ excepting the last, which is made up to 10. Thus, mantissa of sin. 14° 30′ 0″ = ·39 860; so for 3 put 6, for 9 put 0, for 8 put 1, for 6 put 3, and for 0 put 10, and we have ·60 140 as mantissa of cosec 14° 30′ 0″. Similarly the mantissa of sec. 14° 30′ 0″ is by same method = ·01 406.

Treatment of the characteristic when using logarithms of arc functions in calculations.

Since 10 has been added to each logarithm of an arc function, we obtain on adding several logarithms together an accumulation of tens, but this accumulation is disregarded. Suppose, for example, we add up each of the following:—

9·87346	9·47234
10·32120	8·36359
12·35436	12·21026
8·37260	9·10263
40·92162	39·14882

The result in the first case is considered as 10·92162, and in the second as 9·14882.

Again, if we have to divide a logarithm, then if the characteristic is 10, or less than 10, we add 10 before making the division. Thus, to divide 9·84736 by 2 we add 10, making 19·84736, which when divided by 2 gives 9·92368, the required quotient. Again, to divide 10·03786 by 2 we add 10, making 20·03786, which divided by 2 gives 10·01893, the required quotient. It will be noticed in the Examples the way in which the characteristics are treated in other cases than those mentioned here.

INDEX TO FIND PAGE ON WHICH LOGARITHM OF AN ARC FUNCTION WILL BE FOUND.

See pp. 2 *and* 3 *of cover.*

Suppose that after a calculation has been made we have to find the arc corresponding to a given logarithm as in the example on p. 48*a*, where the arc corresponding to a sine of which the log. is 9·77 869 is wanted. The usual plan is to search through the log. sines until we drop upon the right page. With the index, however, the right page is found at once, for at a glance it is seen that log. sines between 9·774 and 9·779 occur on p. 127 of the tables. Turning to this page we find the arc to be 36° 55′ 23″.

CONTRACTED MULTIPLICATION OF DECIMALS.

The product of two decimal numbers contains as many decimal places as both the factors. Thus the product of 34·6587 and 26·439 contains seven decimal places. The last four or five of these figures may be altogether useless, and the object of contracted multiplication is to find the product correct to any required number of decimal places without the trouble of finding the rest.

EXAMPLE.

1. Multiply 27·4697 by 43·506, retaining two decimal places in the product.

27·4697
60·534
———
109 879
8 241
1 373
16
———
1195·09

Explanation.—Place the unit's figure of the multiplier under the second figure of the multiplicand, and reverse the multiplier. First multiply by 4; 4 sevens 28, do not set this down, but carry 3, its *nearest* ten; then 4 nines, 36+3, 39; set down 9 under the multiplying figure and carry 3; then 4 sixes 24+3, 27; set down 7 and carry 3, and so on in the usual way. Now multiply by 3; 3 nines 27, do not set it down but carry 3, its *nearest* ten; then 3 sixes 18+3, 21; set down 1 under the first multiplying figure and carry 2 and so on. Proceed in the same manner with the next multiplying figure, and then with the 6. Add together and mark off two decimal places. The product to two decimal places is 1195·09, the complete product being 1195·0967682.

Note.—If the *nearest* product to the actual product were required in the above example it would be necessary to work the result to 3 places of decimals instead of two, and then alter the second decimal if required. Working to three places we obtain 1195·096 so nearest product to two places would be 1195·10.

GENERAL EXAMPLES.

PLANE TRIGONOMETRY.

In an oblique-angled triangle $A\,B\,C$, $A\,B$ has a length 536, and $B\,C$ a length 385; while the angle at C is 49° 13′. Find the angle A.

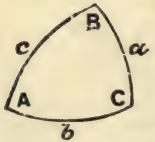
By trigonometrical formulæ—

$$\sin A = \frac{385}{536} \sin 49° 13'$$

Log. 385	= 2·58546
,, sin 49° 13′	= 9·87920
	12·46466
Less log. 536 .	2·72916
	9·73550 = log. sin 32° 56′ 50″

SPHERICAL TRIGONOMETRY.

Napier's Rules of circular parts. If a, b, c are the three sides of a *right-angled* spherical triangle, the side c being opposite the right angle, while A, B are the angles opposite the sides a and b respectively. Then if we arrange these parts as represented in the second of following figures—



The sine of the middle part = product of tangents of adjacent parts.
= product of cosines of opposite parts.

Thus $\sin a = \tan b \tan (90 - B) = \cos (90 - c) \cos (90 - A)$
$\sin 90 - A = \tan b \tan (90 - c) = \cos a \cos (90 - B)$
&c. = &c. = &c.

Example.—In a right-angled spherical triangle the side a is 56° 11′, the side c opposite the right angle is 81° 30′. Required the length of the side b.

Here a and c are given, required b, and by Napier's rule—

$$\sin (90 - c) = \cos a \cos b.$$

$$\text{or } \cos b = \frac{\cos c}{\cos a} = \frac{\cos 81^\circ\ 30'}{\cos 56^\circ\ 11'}$$

Log. cos 81° 30′ = 9·16970
„ cos 56° 11′ = 9·74549

9·42421 = log. cos 74° 35′ 53″

Hence the length of b is 74° 35′ 53″.

NAVIGATION AND NAUTICAL ASTRONOMY.

In daily work at sea the time of apparent noon is found by the following rule:—Add together the logarithms of the secant of the latitude, the cosecant of the polar distance, the cosine of the "half sum," and the sine of "the remainder;" and take half this sum, which gives the log. sine of half the time from apparent noon in degrees, minutes, and seconds.

Thus let it be required to find the log. sine of half the time from apparent noon when the true altitude is 21° 55′ 37″, the given latitude 43° 17′ 0″, and the polar distance 74° 58′ 6″.

Note in the first place that subtracting cosine and sine is the same as adding secant and cosecant.

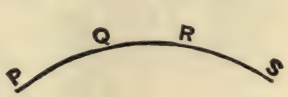
True altitude ...	21° 55′ 37″	
Given latitude ...	43° 17′ 0″	log. cos = 9·86211
Polar distance ...	74° 58′ 6″	„ sin = 9·98488
2)	140° 10′ 43″	9·84699 . . a
½ sum	70° 5′ 21″	log. cos 9·53219
½ sum − alt. ...	48° 9′ 44″	„ sin 9·87218
		9·40437
Subtract a		9·84699
Divide by 2		2) 19·55738
		9·77869

Hence 9·77869 is log sine of half the time from apparent noon, and arc of half the time from apparent noon = 36° 55′ 23″.

Note.—Those who use 6 or 7 figure tables will note that the result only differs by half a second from that obtained with such tables.

CRYSTALLOGRAPHY. FOUR POLES IN A ZONE.

If P, Q, R, S represent the four poles, we have—



$$\frac{\sin PQ}{\sin PR} : \frac{\sin SQ}{\sin SR} = \frac{PQ}{PR} : \frac{SQ}{SR} = \frac{m}{n}$$

$$\text{or} \quad \frac{\sin PQ \sin SR}{\sin PR \sin SQ} = \frac{m}{n}.$$

Thus, if $PQ = 17° 43'$, $SR = 9° 30'$, $PR = 23° 5'$, and $SQ = 14° 52'$, then we have—

$$\frac{m}{n} = \frac{\sin 17° 43' \sin 9° 30'}{\sin 23° 5' \sin 14° 52'}$$

Log. sin $17° 43' = 9{\cdot}48332$ Log. sin $23° 5' = 9{\cdot}59336$
,, ,, $9° 30' = 9{\cdot}21761$,, ,, $14° 52' = 9{\cdot}40921$

$8{\cdot}70093$ $9{\cdot}00257$
$9{\cdot}00257$

$9{\cdot}69836 = \text{log. } 0{\cdot}4993$

But $0{\cdot}4993$ may be assumed $= 0{\cdot}5$; hence, $m/n = \frac{1}{2}$.

0°

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	− ∞	*a*	− ∞	*a*	+ ∞	*a*	10		60
1	6,46 373	*b*	6,46 373	*b*	13,53 627	*b*	10,00 000	Differences exceedingly small.	59
2	76 476	*c*	76 476	*c*	23 524	*c*	000		58
3	6,94 085	*d*	6,94 085	*d*	13,05 915	*d*	000		57
4	7,06 579	e^1	7,06 579	*e*	12,93 421	*e*	10,00 000		56
5	7,16 270	*f*	7,16 270	f^1	12,83 730	f^1	10,00 000		55
6	24 188	g_1	24 188	*g*	75 812	*g*	000		54
7	30 882	*h*	30 882	*h*	69 118	*h*	000		53
8	36 682	*k*	36 682	k^1	63 318	k^1	000		52
9	7,41 797	*l*	7,41 797	*l*	12,58 203	*l*	10,00 000		51
10	7,46 373	m_1	7,46 373	*m*	12,53 627	*m*	10,00 000		50
11	50 512	*n*	50 512	n^1	49 488	n^1	000		49
12	54 291	o_1	54 291	*o*	45 709	*o*	000		48
13	57 767	*p*	57 767	p^1	42 233	p^1	000		47
14	7,60 985	*q*	7,60 986	*q*	12,39 014	*q*	10,00 000		46
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

89°

	10″	20″	30″	40″	50″
a	5·68 557	5·98 660	6·16 270	6·28 763	6·38 454
b	6694	12493	17609	22184	26324
c	3476	6694	9691	12493	15126
d	2348	4575	6694	8715	10645
e	1772̄	3476	5115	6694	8218
f	1424	2802̄	4139	5435	6694
g	1190	2348	3476	4576̄	5648
h	1022	2021	2997	3951	4885
k	895	1772	2632̄	3476	4303
l	797	1579	2348	3103	3846
m	718̲	1424	2119̲	2802	3476
n	653	1296̄	1930̄	2555	3171
o	599	1190	1773	2348	2916̲
p	553	1099̄	1639	2172	2698̄
q	514	1022	1524	2020	2511

Sin +, Tan +, add diff. Log. cosec = − log. sin.
Cos −, Cot −, subtract diff. ,, sec = − log. cos.

Log. cot 0° 0′ 10″, 20″, &c. = 10·00 000 *minus* figures in line *a*.
Thus: Log. cot 20″ = 10 − 5·98 660 = 4·01 340.

0°

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
15	7,63 982	a	7,63 982	a^1	12,36 018	a^1	10,00 000	Differences exceedingly small.	45
16	66 784	b^1	66 785	b	33 215	b	10,00 000		44
17	69 417	c^1	69 418	c	30 582	c	9,99 999		43
18	71 900	d	71 900	d^1	28 100	d^1	999		42
19	7,74 248	e	7,74 248	e^1	12,25 752	e^1	9,99 999		41
20	7,76 475	f	7,76 476	f	12,23 524	f	9,99 999		40
21	78 594	g^1	78 595	g	21 405	g	999		39
22	80 615	h	80 615	h^1	19 385	h^1	999		38
23	82 545	k	82 546	k	17 454	k	999		37
24	7,84 393	l	7,84 394	l	12,15 606	l	9,99 999		36
25	7,86 166	m	7,86 167	m^1	12,13 833	m^1	9,99 999		35
26	87 870	n	87 871	n	12 129	n	999		34
27	89 509	o	89 510	o^1	10 490	o^1	999		33
28	91 088	p	91 089	p	08 911	p	999		32
29	7,92 612	q	7,92 613	q^1	12,07 387	q^1	9,99 998		31
30	7,94 084	r^1	7,94 086	r	12,05 914	r	9,99 998		30
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

89°

	10″	20″	30″	40″	50″
a	47$\overline{9}$	95$\overline{4}$	1424	188$\overline{8}$	2348
b	450	89$\overline{5}$	133$\overline{6}$	1773	2205
c	424	84$\overline{3}$	1259	167$\overline{0}$	207$\overline{8}$
d	400	797	1190	157$\overline{9}$	196$\overline{5}$
e	37$\overline{9}$	75$\overline{5}$	112$\overline{8}$	149$\overline{7}$	186$\overline{4}$
f	361	718	1073	1424	1773
g	34$\overline{3}$	684	1022	135$\overline{7}$	1690
h	32$\overline{7}$	65$\overline{3}$	976	129$\overline{6}$	161$\overline{4}$
k	314	625	934	1241	1546
l	301	599	896	1190	1483
m	289	57$\overline{5}$	860	1143	1424
n	277	553	827	1099	1370
o	267	53$\overline{2}$	79$\overline{6}$	1059	1320
p	258	514	769	1022	1274
q	249	49$\overline{6}$	74$\overline{2}$	98$\overline{7}$	123$\overline{0}$
r	24$\overline{0}$	480	718	95$\overline{4}$	1190

Sin +, Tan +, add diff. Log. cosec = − log. sin.
Cos −, Cot −, subtract diff. ,, sec = − log. cos.

0°

′	Sin+	″	Tan+	″	Cot−	″	Cos−	″	′
30	7,94 084	a^1	7,94 086	a	12,05 914	a	9,99 998		**30**
31	95 508	b^1	95 510	b	04 490	b	998		29
32	96 887	c^1	96 889	c	03 111	c	998		28
33	98 223	d	98 225	d	01 775	d	998		27
34	7,99 520	e	7,99 522	e^1	12,00 478	e^1	9,99 998		26
35	8,00 779	f	8,00 781	f^1	11,99 219	f^1	9,99 998	Differences very small.	25
36	02 002	g	02 004	g^1	97 996	g^1	998		24
37	03 192	h	03 194	h^1	96 806	h^1	997		23
38	04 350	k	04 353	k	95 647	k	997		22
39	8,05 478	l	8,05 481	l	11,94 519	l	9,99 997		21
40	8,06 578	m	8,06 581	m	11,93 419	m	9,99 997		**20**
41	07 650	n	07 653	n^1	92 347	n^1	997		19
42	08 696	o^1	08 700	o	91 300	o	997		18
43	09 718	p^1	09 722	p	90 278	p	997		17
44	8,10 717	q	8,10 720	q^1	11,89 280	q^1	9,99 996		16
′	Cos−	″	Cot−	″	Tan+	″	Sin+	″	′

89°

	10″	20″	30″	40″	50″
a	24$\bar{0}$	480	718	95$\bar{4}$	1190
b	233	46$\bar{4}$	695	924	1152
c	22$\bar{5}$	450	673	895	1116
d	219	437	653	869	1083
e	212	42$\bar{3}$	634	843	105$\bar{1}$
f	206	41$\bar{1}$	616	819	1022
g	201	40$\bar{0}$	59$\bar{9}$	797	994
h	19$\bar{5}$	38$\bar{9}$	583	77$\bar{5}$	96$\bar{7}$
k	190	379	568	755	942
l	185	370	553	736	918
m	180	360	539	717	895
n	176	352	52$\bar{6}$	70$\bar{0}$	874
o	172	34$\bar{3}$	514	684	85$\bar{3}$
p	168	33$\bar{5}$	502	668	83$\bar{3}$
q	164	32$\bar{7}$	49$\bar{0}$	653	81$\bar{4}$

Sin+, Tan+, add diff. Log. cosec = − log. sin.
Cos−, Cot−, subtract diff. ,, sec = − log. cos.

0°

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
45	8,11 693	*a*	8,11 696	a^1	11,88 304	a^1	9,99 996	Differences very small.	15
46	12 647	*b*	12 651	*b*	87 349	*b*	996		14
47	13 581	*c*	13 585	*c*	86 415	*c*	996		13
48	14 495	d^1	14 500	*d*	85 500	*d*	996		12
49	8,15 391	*e*	8,15 395	e^1	11,84 605	e^1	9,99 996		11
50	8,16 268	f^1	8,16 273	*f*	11,83 727	*f*	9,99 995		**10**
51	17 128	*g*	17 133	*g*	82 867	*g*	995		9
52	17 971	*h*	17 976	h^1	82 024	h^1	995		8
53	18 798	k^1	18 804	*k*	81 196	*k*	995		7
54	8,19 610	l^1	8,19 616	*l*	11,80 384	*l*	9,99 995		6
55	8,20 407	*m*	8,20 413	*m*	11,79 587	*m*	9,99 994		5
56	21 189	n^1	21 195	*n*	78 805	*n*	994		4
57	21 958	*o*	21 964	o^1	78 036	o^1	994		3
58	22 713	p^1	22 720	*p*	77 280	*p*	994		2
59	8,23 456	*q*	8,23 462	q^1	11,76 538	q^1	9,99 994		1
60	8,24 186	*r*	8,24 192	r^1	11,75 808	r^1	9,99 993		**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

89°

″	10″	20″	30″	40″	50″
a	16$\bar{0}$	32$\bar{0}$	47$\bar{9}$	63$\bar{8}$	79$\bar{6}$
b	157	314	470	625	780
c	154	307	460	612	763
d	15$\bar{0}$	30$\bar{0}$	450	599	74$\bar{7}$
e	14$\bar{7}$	29$\bar{4}$	441	587	73$\bar{2}$
f	14$\bar{4}$	28$\bar{8}$	432	575	718
g	142	283	424	564	704
h	139	278	416	55$\bar{3}$	691
k	13$\bar{6}$	27$\bar{2}$	40$\bar{7}$	543	67$\bar{7}$
l	13$\bar{3}$	267	400	533	665
m	131	262	393	523	653
n	12$\bar{9}$	258	38$\bar{6}$	514	642
o	127	253	379	505	63$\bar{0}$
p	12$\bar{4}$	24$\bar{8}$	37$\bar{2}$	49$\bar{6}$	61$\bar{9}$
q	12$\bar{2}$	24$\bar{4}$	36$\bar{6}$	488	609
r	12$\bar{0}$	24$\bar{0}$	36$\bar{0}$	47$\bar{9}$	599

Sin +, Tan +. add diff. Log. cosec = − log. sin.
Cos −. Cot −. subtract diff. „ sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	8,24 186	*a*	8,24 192	a^1	11,75 808	a^1	9,99 993		**60**
1	24 903	*b*	24 910	*b*	75 090	*b*	993		59
2	25 609	*c*	25 616	*c*	74 384	*c*	993		58
3	26 304	d^1	26 312	*d*	73 688	*d*	993		57
4	8,26 988	f^1	8,26 996	*f*	11,73 004	*f*	9,99 992		56
5	8,27 661	g^1	8,27 669	*g*	11,72 331	*g*	9,99 992		55
6	28 324	*h*	28 332	*h*	71 668	*h*	992		54
7	28 977	k^1	28 986	*k*	71 014	*k*	992		53
8	29 621	*l*	29 629	l^1	70 371	l^1	992		52
9	8,30 255	*m*	8,30 263	m^1	11,69 737	m^1	9,99 991		51
10	8,30 879	*n*	8,30 888	n^1	11,69 112	n^1	9,99 991		**50**
11	31 495	o^1	31 505	*o*	68 495	*o*	991		49
12	32 103	*p*	32 112	p^1	67 888	p^1	990		48
13	32 702	*q*	32 711	*r*	67 289	*r*	990		47
14	8,33 292	*s*	8,33 302	*s*	11,66 698	*s*	9,99 990		46
15	8,33 875	u^1	8,33 886	*u*	11,66 114	*u*	9,99 990		45
16	34 450	v^1	34 461	*v*	65 539	*v*	989		44
17	35 018	*w*	35 029	w^1	64 971	w^1	989		43
18	35 578	x^1	35 590	*x*	64 410	*x*	989		42
19	8,36 131	*y*	8,36 143	*y*	11,63 857	*y*	9,99 989		41
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

Differences very small.

″	10″	20″	30″	40″	50″	**88°**	″	10″	20″	30″	40″	50″
a	12$\bar{0}$	24$\bar{0}$	36$\bar{0}$	47$\bar{9}$	599		*n*	104	207	30$\bar{9}$	412	51$\bar{4}$
b	119	237	355	472	590		*o*	10$\bar{1}$	20$\bar{3}$	30$\bar{4}$	406	507
c	117	233	349	465	580		*p*	10$\bar{0}$	20$\bar{0}$	30$\bar{0}$	40$\bar{0}$	49$\bar{9}$
d	11$\bar{4}$	229	34$\bar{3}$	457	57$\bar{0}$		*q*	99	197	296	394	493
f	113	22$\bar{5}$	338	450	562		*r*	99	198	297	395	494
g	11$\bar{1}$	222	333	443	554		*s*	98	196	293	390	487
h	110	219	328	437	545		*u*	9$\bar{6}$	19$\bar{2}$	28$\bar{8}$	38$\bar{4}$	480
k	108	21$\bar{5}$	323	430	537		*v*	9$\bar{5}$	190	285	37$\bar{9}$	474
l	10$\bar{6}$	21$\bar{2}$	318	42$\bar{3}$	529		*w*	94	188	281	374	46$\bar{7}$
m	10$\bar{4}$	20$\bar{9}$	31$\bar{3}$	41$\bar{7}$	52$\bar{1}$		*x*	9$\bar{2}$	18$\bar{5}$	27$\bar{7}$	36$\bar{9}$	46$\bar{1}$
							y	92	183	274	365	456

Sin +, Tan +, add diff.
Cos −, Cot −, subtract diff.

Log. cosec = − log. sin.
„ sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
20	8,36 678	*a*	8,36 689	a^1	11,63 311	a^1	9,99 988		**40**
21	37 217	*b*	37 229	b^1	62 771	b^1	988		39
22	37 750	*c*	37 762	c^1	62 238	c^1	988		38
23	38 276	d^1	38 289	*d*	61 711	*d*	987		37
24	8,38 796	*e*	8,38 809	e^1	11,61 191	e^1	9,99 987		36
25	8,39 310	*f*	8,39 323	f^1	11,60 677	f^1	9,99 987		35
26	39 818	g^1	39 832	*g*	60 168	*g*	986		34
27	40 320	*h*	40 334	*h*	59 666	*h*	986		33
28	40 816	*k*	40 830	*l*	59 170	*l*	986		32
29	8,41 307	*m*	8,41 321	m^1	11,58 679	m^1	9,99 985		31
30	8,41 792	*n*	8,41 807	*n*	11,58 193	*n*	9,99 985		**30**
31	42 272	*o*	42 287	o^1	57 713	o^1	985		29
32	42 746	p^1	42 762	*p*	57 238	*p*	984		28
33	43 216	*q*	43 232	*q*	56 768	*q*	984		27
34	8,43 680	*r*	8,43 696	r^1	11,56 304	r^1	9,99 984		26
35	8,44 139	s^1	8,44 156	*s*	11,55 844	*s*	9,99 983		25
36	44 594	*t*	44 611	*t*	55 389	*t*	983		24
37	45 044	*u*	45 061	u^1	54 939	u^1	983		23
38	45 489	*v*	45 507	*v*	54 493	*v*	982		22
39	8,45 930	*y*	8,45 948	*y*	11,54 052	*y*	9,99 982		21
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

Differences small.

″	10″	20″	30″	40″	50″	**88°**	″	10″	20″	30″	40″	50″
a	90	180	270	360	450		*m*	81	162	243	324	404
b	89	178	267	356	445		*n*	80	160	240	320	400
c	88	176	264	351	439		*o*	79	158	238	317	395
d	87	174	261	347	434		*p*	78	157	235	313	392
e	86	172	258	343	429		*q*	77	155	232	310	387
f	85	170	255	339	424		*r*	77	154	230	307	383
g	84	168	251	335	418		*s*	76	152	228	304	380
h	83	166	249	331	414		*t*	75	151	226	301	376
k	82	164	246	328	409		*u*	75	149	223	297	371
l	83	165	247	328	410		*v*	74	148	221	295	368
							y	73	146	219	292	364

Sin +, Tan +, add diff.
Cos −, Cot −, subtract diff.

Log. cosec = − log. sin.
„ sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
40	8,46 366	*a*	8,46 385	*b*	11,53 615	*b*	9,99 982		**20**
41	46 799	*c*	46 817	c^1	53 183	c^1	981		19
42	47 226	*d*	47 245	*d*	52 755	*d*	981		18
43	47 650	*e*	47 669	e^1	52 331	e^1	981		17
44	8,48 069	*f*	8,48 089	*f*	11,51 911	*f*	9,99 980		16
45	8,48 485	*g*	8,48 505	g^1	11,51 495	g^1	9,99 980		15
46	48 896	h^1	48 917	*h*	51 083	*h*	979		14
47	49 304	*k*	49 325	k^1	50 675	k^1	979		13
48	49 708	*l*	49 729	l^1	50 271	l^1	979		12
49	8,50 108	*m*	8,50 130	*m*	11,49 870	*m*	9,99 978		11
50	8,50 504	n^1	8,50 527	*n*	11,49 473	*n*	9,99 978		**10**
51	50 897	o^1	50 920	*o*	49 080	*o*	977		9
52	51 287	*p*	51 310	p^1	48 690	p^1	977		8
53	51 673	*q*	51 696	q^1	48 304	q^1	977		7
54	8,52 055	*r*	8,52 079	r^1	11,47 921	r^1	9,99 976		6
55	8,52 434	*s*	8,52 459	*t*	11,47 541	*t*	9,99 976		5
56	52 810	*u*	52 835	*u*	47 165	*u*	975		4
57	53 183	*v*	53 208	v^1	46 792	v^1	975		3
58	53 552	w^1	53 578	*w*	46 422	*w*	974		2
59	8,53 919	*x*	8,53 945	*x*	11,46 055	*x*	9,99 974		1
60	8,54 282	*y*	8,54 308	y^1	11,45 692	y^1	9,99 974		**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

Differences small.

″	10″	20″	30″	40″	50″	**88°**	″	10″	20″	30″	40″	50″
a	73	145	217	289	361		*n*	65	131	197	262	328
b	72	144	217	289	360		*o*	65	130	195	260	325
c	71	143	214	285	356		*p*	64	129	193	257	322
d	71	142	213	283	354		*q*	64	128	191	255	319
e	70	140	210	280	350		*r*	64	127	190	253	316
f	70	139	209	278	347		*s*	63	126	189	251	314
g	69	137	206	275	343		*t*	63	125	188	251	313
h	68	136	204	272	340		*u*	62	125	187	249	311
k	68	135	202	270	337		*v*	62	123	185	246	308
l	67	134	200	267	334		*w*	61	122	184	245	306
m	66	133	199	265	331		*x*	60	121	182	242	303
							y	60	120	180	240	300

Sin +, Tan +, add diff.
Cos −, Cot −, subtract diff.

Log. cosec = − log. sin.
„ sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	8,54 282	*a*	8,54 308	a^1	11,45 692	a^1	9,99 974		**60**
1	54 642	*b*	54 669	*b*	45 331	*b*	973		59
2	54 999	*c*	55 027	*c*	44 973	*c*	973		58
3	55 354	*e*	55 382	*e*	44 618	*e*	972		57
4	8,55 705	g^1	8,55 734	*g*	11,44 266	*g*	9,99 972		56
5	8,56 054	*h*	8,56 083	h^1	11,43 917	h^1	9,99 971		55
6	56 400	*l*	56 429	l^1	43 571	l^1	971		54
7	56 743	*m*	56 773	*m*	43 227	*m*	970		53
8	57 084	*n*	57 114	n^1	42 886	n^1	970		52
9	8,57 421	*o*	8,57 452	*o*	11,42 548	*o*	9,99 969		51
10	8,57 757	*p*	8,57 788	p^1	11,42 212	p^1	9,99 969		**50**
11	58 089	*q*	58 121	*q*	41 879	*q*	968		49
12	58 419	*r*	58 451	r^1	41 549	r^1	968		48
13	58 747	*s*	58 779	s^1	41 221	s^1	967		47
14	8,59 072	*t*	8,59 105	*u*	11,40 895	*u*	9,99 967		46
15	8,59 395	*v*	8,59 428	v^1	11,40 572	v^1	9,99 967		45
16	59 715	*w*	59 749	w^1	40 251	w^1	966		44
17	60 033	x^1	60 068	*x*	39 932	*x*	966		43
18	60 349	*y*	60 384	y^1	39 616	y^1	965		42
19	8,60 662	*z*	8,60 698	*z*	11,39 302	*z*	9,99 964		41
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

Differences small.

″	10″	20″	30″	40″	50″	**87°**	″	10″	20″	30″	40″	50″
a	60	120	180	240	300		*p*	55	111	166	222	277
b	60	120	179	239	298		*q*	55	110	165	220	275
c	59	118	178	237	296		*r*	55	110	164	219	274
e	59	117	176	235	293		*s*	54	109	163	217	271
g	58	116	175	233	291		*t*	54	108	162	216	269
h	58	116	173	231	288		*u*	54	108	162	216	270
l	57	115	172	229	286		*v*	53	107	160	214	267
m	57	114	171	227	284		*w*	53	106	159	212	265
n	56	112	169	225	281		*x*	53	105	158	211	263
o	56	112	168	224	280		*y*	52	105	157	209	261
							z	52	104	156	208	260

Sin +, Tan +, add diff.
Cos −, Cot −, subtract diff.

Log. cosec = − log. sin.
„ sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
20	8,60 973	*a*	8,61 009	*a*	11,38 991	*a*	9,99 964		**40**
21	61 282	b^1	61 319	*b*	38 681	*b*	963		39
22	61 589	*c*	61 626	c^1	38 374	c^1	963		38
23	61 894	*d*	61 931	d^1	38 069	d^1	962		37
24	8,62 196	*e*	8,62 234	e^1	11,37 766	e^1	9,99 962		36
25	8,62 497	*g*	8,62 535	*h*	11,37 465	*h*	9,99 961		35
26	62 795	*k*	62 834	k^1	37 166	k^1	961		34
27	63 091	*l*	63 131	l^1	36 869	l^1	960		33
28	63 385	n^1	63 426	*n*	36 574	*n*	960		32
29	8,63 678	*o*	8,63 718	*m*	11,36 282	*m*	9,99 959		31
30	8,63 968	*p*	8,64 009	*q*	11,35 991	*q*	9,99 959		**30**
31	64 256	*r*	64 298	r^1	35 702	r^1	958		29
32	64 543	*s*	64 585	s^1	35 415	s^1	958		28
33	64 827	*t*	64 870	t^1	35 130	t^1	957		27
34	8,65 110	*u*	8,65 154	*u*	11,34 846	*u*	9,99 956		26
35	8,65 391	*v*	8,65 435	v^1	11,34 565	v^1	9,99 956		25
36	65 670	*w*	65 715	w^1	34 285	w^1	955		24
37	65 947	x^1	65 993	*x*	34 007	*x*	955		23
38	66 223	*y*	66 269	y^1	33 731	y^1	954		22
39	8,66 497	*z*	8,66 543	z^1	11,33 457	z^1	9,99 954		21
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

Differences small.

″	10″	20″	30″	40″	50″	**87°**	″	10″	20″	30″	40″	50″
a	52	104	155	207	258		*p*	48	96	144	192	240
b	51̄	103	154	205	256		*q*	49	97	145	193	241
c	51	102	153	203̄	254̄		*r*	48	96	144	192	239̄
d	50̄	101̄	151̄	202̄	252̄		*s*	47̄	95̄	142̄	190̄	237̄
e	50̄	101	151	201	251		*t*	48	95	142	189̄	236̄
g	49	99	149	199	248		*u*	47	94	141	188	234
h	50	100	150	200	249		*v*	47	93̄	140	186̄	233̄
k	49̄	99	148̄	198	247		*w*	47	93	139	185	231
l	49	98	147	196̄	245̄		w^1	46	93	139	185	232
m	49	98	146	195	243		*x*	46̄	92̄	138	184	230
n	49	97̄	146̄	195	244		*y*	46	91̄	137	183	228̄
o	48	97	145	193	242		*z*	45̄	91	136̄	181̄	227̄

Sin +, Tan +, add diff.
Cos −, Cot −, subtract diff.

Log. cosec = − log. sin.
,, sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
40	8,66 769	*a*	8,66 816	*b*	11,33 184	*b*	9,99 953		**20**
41	67 039	*c*	67 087	c^1	32 913	c^1	952		19
42	67 308	*d*	67 356	d^1	32 644	d^1	952		18
43	67 575	*e*	67 624	e^1	32 376	e^1	951		17
44	8,67 841	*f*	8,67 890	f^1	11,32 110	f^1	9,99 951		16
45	8,68 104	*g*	8,68 154	g^1	11,31 846	g^1	9,99 950		15
46	68 367	*h*	68 417	h^1	31 583	h^1	949		14
47	68 627	*k*	68 678	k^1	31 322	k^1	949		13
48	68 886	*l*	68 938	*l*	31 062	*l*	948		12
49	8,69 144	*m*	8,69 196	m^1	11,30 804	m^1	9,99 948		11
50	8,69 400	*n*	8,69 453	*o*	11,30 547	*o*	9,99 947		**10**
51	69 654	*p*	69 708	p^1	30 292	p^1	946		9
52	69 907	*q*	69 962	*q*	30 038	*q*	946		8
53	70 159	*r*	70 214	r^1	29 786	r^1	945		7
54	8,70 409	s^1	8,70 465	*s*	11,29 535	*s*	9,99 944		6
55	8,70 658	*t*	8,70 714	t^1	11,29 286	t^1	9,99 944		5
56	70 905	*u*	70 962	*u*	29 038	*u*	943		4
57	71 151	*v*	71 208	*u*	28 792	*u*	942		3
58	71 395	*w*	71 453	w^1	28 547	w^1	942		2
59	8,71 638	*y*	8,71 697	y^1	11,28 303	y^1	9,99 941		1
60	8,71 880	*x*	8,71 940	x^1	11,28 060	x^1	9,99 940		**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

Differences small.

″	10″	20″	30″	40″	50″	**87°**	″	10″	20″	30″	40″	50″
a	45	90	135	180	22$\bar{5}$		*n*	42	85	127	170	212
b	45	90	136	181	226		*o*	43	85	128	170	213
c	45	90	135	180	22$\bar{4}$		*p*	43	85	127	169	211
d	45	8$\bar{9}$	134	17$\bar{8}$	223		p^1	42	85	127	169	212
e	44	89	133	177	22$\bar{1}$		*q*	42	84	126	168	210
f	44	88	132	176	21$\bar{9}$		*r*	42	8$\bar{3}$	125	167	20$\bar{8}$
g	44	88	132	17$\bar{5}$	219		*s*	4$\bar{1}$	83	124	166	207
h	43	87	130	173	217		*t*	41	8$\bar{2}$	12$\bar{3}$	165	20$\bar{6}$
h^1	44	87	131	175	218		*u*	41	82	123	164	205
k	4$\bar{3}$	87	130	17$\bar{3}$	21$\bar{6}$		*v*	41	81	122	163	204
l	43	86	129	172	215		*w*	41	8$\bar{1}$	122	16$\bar{2}$	20$\bar{3}$
m	43	85	128	171	21$\bar{3}$		*x*	40	80	120	160	20$\bar{0}$
m^1	43	86	129	172	214		*y*	41	81	12$\bar{1}$	162	202

Sin +, Tan +, add diff. Log. cosec = − log. sin.
Cos −, Cot −, subtract diff. „ sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	8,71 880	*a*	8,71 940	a^1	11,28 060	a^1	9,99 940		60
1	72 120	*a*	72 181	*c*	27 819	*c*	940		59
2	72 359	*d*	72 420	d^1	27 580	d^1	939		58
3	72 597	*e*	72 659	*f*	27 341	*f*	938		57
4	8,72 834	*g*	8,72 896	g^1	11,27 104	g^1	9,99 938		56
5	8,73 069	*h*	8,73 132	*h*	11,26 868	*h*	9,99 937		55
6	73 303	*k*	73 366	*l*	26 634	*l*	936		54
7	73 535	m^1	73 600	*m*	26 400	*m*	936		53
8	73 767	*n*	73 832	n^1	26 168	n^1	935		52
9	8,73 997	*o*	8,74 063	*o*	11,25 937	*o*	9,99 934		51
10	8,74 226	*p*	8,74 292	p^1	11,25 708	p^1	9,99 934		50
11	74 454	*q*	74 521	q^1	25 479	q^1	933		49
12	74 680	*r*	74 748	*r*	25 252	*r*	932		48
13	74 906	*s*	74 974	s^1	25 026	s^1	932		47
14	8,75 130	*t*	8,75 199	t^1	11,24 801	t^1	9,99 931		46
15	8,75 353	*u*	8,75 423	*u*	11,24 577	*u*	9,99 930		45
16	75 575	*v*	75 645	v^1	24 355	v^1	929		44
17	75 795	w^1	75 867	*w*	24 133	*w*	929		43
18	76 015	*x*	76 087	x^1	23 913	x^1	928		42
19	8,76 234	*z*	8,76 306	z^1	11,23 694	z^1	9,99 927		41
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

Max. diff. = 0·0000073.

″	10″	20″	30″	40″	50″	**86°**	″	10″	20″	30″	40″	50″
a	40	80	120	160	20$\bar{0}$		*o*	38	76	115	153	191
b	40	80	120	161	199		*p*	38	76	11$\bar{4}$	15$\bar{2}$	19$\bar{0}$
c	40	80	120	160	199		*q*	3$\bar{7}$	7$\bar{5}$	113	151	18$\bar{8}$
d	40	80	11$\bar{9}$	159	199		*r*	38	75	113	151	188
e	40	79	119	158	197		*s*	37	74	112	149	186
f	39	79	118	158	197		s^1	38	75	113	150	188
g	39	7$\bar{8}$	11$\bar{7}$	157	19$\bar{6}$		*t*	37	7$\bar{4}$	11$\bar{1}$	149	186
h	39	78	117	156	195		*u*	37	74	111	148	185
k	39	77	116	155	194		*v*	37	7$\bar{3}$	11$\bar{0}$	14$\bar{7}$	18$\bar{4}$
l	39	78	117	156	195		*w*	37	7$\bar{3}$	110	147	184
m	3$\bar{8}$	7$\bar{7}$	116	15$\bar{4}$	193		*x*	37	73	110	146	18$\bar{2}$
n	38	77	115	15$\bar{3}$	192		*z*	3$\bar{6}$	7$\bar{2}$	10$\bar{9}$	14$\bar{5}$	18$\bar{1}$

Sin +, Tan +, add diff.
Cos −, Cot −, subtract diff.

Log. cosec = − log. sin.
„ sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
20	8,76 451	*a*	8,76 525	a^1	11,23 475	a^1	9,99 926		**40**
21	76 667	*a*	76 742	*a*	23 258	*a*	926		39
22	76 883	*d*	76 958	d^1	23 042	d^1	925		38
23	77 097	e^1	77 173	*e*	22 827	*e*	924		37
24	8,77 310	f^1	8,77 387	*f*	11,22 613	*f*	9,99 923		36
25	8,77 522	g^1	8,77 600	*g*	11,22 400	*g*	9,99 923		35
26	77 733	*h*	77 811	*k*	22 189	*k*	922		34
27	77 943	*h*	78 022	*h*	21 978	*h*	921		33
28	78 152	*l*	78 232	*l*	21 768	*l*	920		32
29	8,78 360	p^1	8,78 441	*p*	11,21 559	*p*	9,99 920		31
30	8,78 568	*r*	8,78 649	*q*	11,21 351	*q*	9,99 919		**30**
31	78 774	r^1	78 855	q^1	21 145	q^1	918		29
32	78 979	*s*	79 061	s^1	20 939	s^1	917		28
33	79 183	*t*	79 266	t^1	20 734	t^1	917		27
34	8,79 386	*u*	8,79 470	u^1	11,20 530	u^1	9,99 916		26
35	8,79 588	*v*	8,79 673	v^1	11,20 327	v^1	9,99 915		25
36	79 789	*w*	79 875	w^1	20 125	w^1	914		24
37	79 990	*x*	80 076	*w*	19 924	*w*	913		23
38	80 189	*x*	80 277	*y*	19 723	*y*	913		22
39	8,80 388	*z*	8,80 476	z^1	11,19 524	z^1	9,99 912		21
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

Max. diff. = 0·0000080.

″	10″	20″	30″	40″	50″	**86°**	″	10″	20″	30″	40″	50″
a	36	72	108	144	18$\bar{0}$		*r*	34	68	103	137	171
d	36	7$\bar{1}$	107	143	17$\bar{8}$		r^1	34	68	102	136	171
e	3$\bar{5}$	71	107	142	178		*s*	3$\bar{4}$	6$\bar{8}$	10$\bar{2}$	13$\bar{6}$	17$\bar{0}$
f	3$\bar{5}$	71	106	142	177		*t*	34	68	10$\bar{1}$	13$\bar{5}$	16$\bar{9}$
g	3$\bar{5}$	7$\bar{0}$	106	141	176		*u*	34	6$\bar{7}$	10$\bar{1}$	13$\bar{5}$	169
h	35	70	105	140	175		*v*	34	6$\bar{7}$	101	13$\bar{4}$	16$\bar{8}$
k	36	71	106	141	176		*w*	34	67	101	134	16$\bar{7}$
l	35	70	105	139	174		*x*	33	66	100	133	166
p	3$\bar{4}$	6$\bar{9}$	104	13$\bar{8}$	173		*y*	33	66	99	132	166
q	3$\bar{4}$	69	103	138	172		*z*	33	66	99	13$\bar{1}$	16$\bar{4}$

Sin +, Tan +, add diff. Log. cosec = − log. sin.
Cos −, Cot −, subtract diff. ,, sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
40	8,80 585	*a*	8,80 674	a^1	11,19 326	a^1	9,99 911		**20**
41	80 782	*b*	80 872	b^1	19 128	b^1	910		19
42	80 978	c^1	81 068	d^1	18 932	d^1	909		18
43	81 173	*c*	81 264	*d*	18 736	*d*	909		17
44	8,81 367	e^1	8,81 459	*f*	11,18 541	*f*	9,99 908		16
45	8,81 560	*e*	8,81 653	*e*	11,18 347	*e*	9,99 907		15
46	81 752	*e*	81 846	*e*	18 154	*e*	906		14
47	81 944	*g*	82 038	*e*	17 962	*e*	905		13
48	82 134	*z*	82 230	g^1	17 770	g^1	904		12
49	8,82 324	*h*	8,82 420	h^1	11,17 580	h^1	9,99 904		11
50	8,82 513	*k*	8,82 610	k^1	11,17 390	k^1	9,99 903		**10**
51	82 701	*l*	82 799	l^1	17 201	l^1	902		9
52	82 888	*m*	82 987	m^1	17 013	m^1	901		8
53	83 075	*n*	83 175	*n*	16 825	*n*	900		7
54	8,83 261	*o*	8,83 361	o^1	11,16 639	o^1	9,99 899		6
55	8,83 446	*p*	8,83 547	*u*	11,16 453	*u*	9,99 898		5
56	83 630	*q*	83 732	*v*	16 268	*v*	898		4
57	83 813	*r*	83 916	*w*	16 084	*w*	897		3
58	83 996	*s*	84 100	*x*	15 900	*x*	896		2
59	8,84 177	*t*	8,84 282	*y*	11,15 718	*y*	9,99 895		1
60	8,84 358	*t*	8,84 464	*t*	11,15 536	*t*	9,99 894		**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

Max. diff. = 0·0000088.

″	10″	20″	30″	40″	50″	**86°**	″	10″	20″	30″	40″	50″
a	33	66	99	13$\bar{1}$	16$\bar{4}$		*o*	31	6$\bar{1}$	9$\bar{2}$	12$\bar{3}$	15$\bar{4}$
b	33	65	98	131	16$\bar{3}$		*p*	30	61	92	122	153
c	32	6$\bar{4}$	97	12$\bar{9}$	16$\bar{1}$		*q*	30	61	91	122	153
d	33	6$\bar{5}$	98	13$\bar{0}$	16$\bar{3}$		*r*	31	61	91	122	152
e	32	64	96	12$\bar{8}$	16$\bar{0}$		*s*	30	60	91	121	151
f	32	65	97	129	162		*t*	31	61	91	121	151
g	3$\bar{1}$	63	95	127	159		*u*	31	62	93	124	154
h	32	6$\bar{3}$	95	12$\bar{6}$	15$\bar{8}$		*v*	31	62	92	123	154
k	3$\bar{1}$	63	9$\bar{4}$	126	15$\bar{7}$		*w*	31	62	92	123	153
l	3$\bar{1}$	63	94	12$\bar{5}$	15$\bar{6}$		*x*	30	61	91	122	152
m	32	63	94	125	15$\bar{6}$		*y*	31	61	92	122	152
n	31	62	93	124	155		*z*	32	64	95	127	158

Sin +, Tan +, add diff.
Cos −, Cot −, subtract diff.

Log. cosec = − log. sin.
„ sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	8,84 358	a^1	8,84 464	a^1	11,15 536	a^1	9,99 894	y^1	60
1	539	a_1	646	a	354	a	893	y	59
2	718	a_1	84 826	a	15 174	a	892	y	58
3	84 897	b	85 006	b^1	14 994	b^1	891	y_1	57
4	8,85 075	b_1	8,85 185	c^1	11,14 815	c^1	9,99 891	z^1	56
5	8,85 252	b_1	8,85 363	c	11,14 637	c	9,99 890	z^1	55
6	429	d	540	b_1	460	b_1	889	z	54
7	605	e	717	d^1	283	d^1	888	z_1	53
8	780	d_1	85 893	e^1	14 107	e^1	887	z_1	52
9	8,85 955	f^1	8,86 069	e_1	11,13 931	e_1	9,99 886	y^1	51
10	8,86 128	e_1	8,86 243	e_1	11,13 757	e_1	9,99 885	y^1	50
11	301	f^1	417	e_1	583	e_1	884	y	49
12	474	g_1	591	g	409	g	883	y	48
13	645	g^1	763	g^1	237	g^1	882	y_1	47
14	8,86 816	h^1	8,86 935	f	11,13 065	f	9,99 881	y_1	46
15	8,86 987	h_1	8,87 106	f	11,12 894	f	9,99 880	y_1	45
16	87 156	h	277	f_1	723	f_1	879	y_1	44
17	325	k^1	447	h_1	553	h_1	879	z^1	43
18	494	k_1	616	k	384	k	878	z^1	42
19	8,87 661	k_1	8,87 785	k_1	11,12 215	k_1	9,99 877	z^1	41
20	8,87 829	l	8,87 953	m^1	11,12 047	m^1	9,99 876	z	40
21	87 995	l^1	88 120	m^1	11 880	m^1	875		39
22	88 161	n_1	287	l^1	713	l^1	874		38
23	326	n_1	453	m_1	547	m_1	873		37
24	8,88 490	n	8,88 618	m	11,11 382	m	9 99 872		36
25	8,88 654	o^1	8,88 783	n^1	11,11 217	n^1	9,99 871	z_1	35
26	817	o^1	8,88 948	o	11 052	o	870	z_1	34
27	88 980	p^1	8,89 111	o^1	10 889	o^1	869	z_1	33
28	8,89 142	p^1	8,89 274	o	11,10 726	o	9,99 868	z_1	32
29	(Cos) 304	p_1	(Cot) 437	p	(Tan) 563	p	(Sin) 867	y^1	31

	10″	20″	30″	40″	50″	85°		10″	20″	30″	40″	50″
a	30	60	90	120	150		k	28	57	85	113	141
b	30	59	89	119	148		l	27	55	83	111	138
c	29	59	89	118	148		m	28	56	83	110	138
d	29	59	88	117	147		n	28	55	82	110	137
e	29	58	88	117	146		o	27	54	81	109	136
f	29	57	86	114	143		p	27	54	81	107	134
g	28	57	86	115	143		y	0	0	0	0	1
h	29	57	85	114	141		z	0	1	1	1	1

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	8,89 464	a^1	8,89 598	k^1	11,10 402	k^1	9,99 866	y^1	30
31	625	a_1	760	k_1	240	k_1	865	y^1	29
32	784	a	89 920	k	10 080	k	864	y^1	28
33	89 943	b^1	90 080	q^1	09 920	q^1	863	y^1	27
34	8,90 102	b	8,90 240	l^1	11,09 760	l^1	9,99 862	y^1	26
35	8,90 260	b_1	8,90 399	q_1	11,09 601	q_1	9,99 861	y^1	25
36	417	b_1	557	l	443	l	860	y^1	24
37	574	b_1	715	l_1	285	l_1	859	y^1	23
38	730	b_1	90 872	b_1	09 128	b_1	858	y^1	22
39	8,90 885	b_1	8,91 029	b_1	11,08 971	b_1	9,99 857	z	21
40	8,91 040	c^1	8,91 185	n	11,08 815	n	9,99 856	z	20
41	195	c	340	c^1	660	c^1	855	z	19
42	349	c_1	495	n	505	n	854	z	18
43	502	o^1	650	o_1	350	o_1	853	z^1	17
44	8,91 655	d	8,91 803	n_1	11,08 197	n_1	9,99 852	z^1	16
45	8,91 807	d^1	8,91 957	d	11,08 043	d	9,99 851	z^1	15
46	91 959	d_1	92 110	o_1	07 890	o_1	850	z^1	14
47	92 110	e^1	262	d_1	738	d_1	848	y_1	13
48	261	e_1	414	e	586	e	847	y_1	12
49	8,92 411	e_1	8,92 565	e_1	11,07 435	e_1	9,99 846	y	11
50	8,92 561	p^1	8,92 716	e_1	11,07 284	e_1	9,99 845	y	10
51	710	f^1	92 866	e_1	07 134	e_1	844	y	9
52	92 859	f_1	93 016	p_1	06 984	p_1	843	z_1	8
53	93 007	f_1	165	p	835	p	842	z_1	7
54	8,93 154	f	8,93 313	p^1	11,06 687	p^1	9,99 841	y^1	6
55	8,93 301	g^1	8,93 462	f_1	11,06 538	f_1	9,99 840	y^1	5
56	448	g_1	609	g^1	391	g^1	839	z	4
57	594	h^1	756	g^1	244	g^1	838	z	3
58	740	h	93 903	g	06 097	g	837	z^1	2
59	8,93 885	h_1	8,94 049	g	11,05 951	g	9,99 836	z^1	1
60	8,94 030	h_1	8,94 195	g	11,05 805	g	9,99 834	y_1	0

″	10″	20″	30″	40″	50″
a	2$\overline{7}$	5$\overline{3}$	8$\overline{0}$	10$\overline{6}$	13$\overline{3}$
b	2$\overline{6}$	5$\overline{2}$	7$\overline{9}$	10$\overline{5}$	13$\overline{1}$
c	2$\underline{6}$	5$\overline{1}$	7$\overline{7}$	10$\underline{3}$	12$\overline{8}$
d	2$\overline{5}$	51	76	10$\underline{2}$	127
e	2$\overline{5}$	5$\overline{0}$	7$\overline{5}$	10$\underline{1}$	12$\underline{6}$
f	2$\underline{5}$	4$\overline{9}$	74	9$\underline{9}$	12$\overline{3}$
g	2$\underline{5}$	49	7$\overline{3}$	98	12$\overline{2}$
h	2$\overline{4}$	4$\overline{8}$	7$\overline{2}$	97	12$\overline{1}$

85°

″	10″	20″	30″	40″	50″
k	2$\underline{7}$	5$\underline{4}$	8$\overline{0}$	10$\overline{7}$	13$\overline{4}$
l	26	5$\overline{3}$	7$\underline{9}$	10$\overline{5}$	13$\overline{1}$
n	26	52	77	103	12$\underline{9}$
o	2$\overline{5}$	5$\underline{1}$	77	10$\underline{2}$	12$\underline{8}$
p	2$\underline{5}$	4$\overline{9}$	7$\overline{4}$	99	124
q	2$\underline{7}$	5$\overline{3}$	7$\overline{9}$	10$\overline{6}$	13$\overline{2}$
y	0	0	$\overline{0}$	0	$\underline{1}$
z	$\overline{0}$	$\underline{1}$	$\underline{1}$	1	1

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	8,94 030	a^1	8,94 195	g	11,05 805	g	9,99 834	y_1	60
1	174	a^1	340	g^1	660	g^1	833	z_1	59
2	317	a^1	485	g_1	515	g_1	832	y	58
3	461	a	630	k	370	k	831	y	57
4	8,94 603	k	8,94 773	a^1	11,05 227	a^1	9,99 830	y^1	56
5	8,94 746	a_1	8,94 917	h^1	11,05 083	h^1	9,99 829	z	55
6	94 887	b^1	95 060	k_1	04 940	k_1	828	z	54
7	95 029	b	202	h	798	h	827	z^1	53
8	170	b_1	344	h	656	h	825	y_1	52
9	8,95 310	c^1	8,95 486	b	11,04 514	b	9,99 824	z_1	51
10	8,95 450	c	8,95 627	b	11,04 373	b	9,99 823	y	50
11	589	l^1	767	h_1	233	h_1	822	y^1	49
12	728	l^1	95 908	l	04 092	l	821	y^1	48
13	95 867	c_1	96 047	l^1	03 953	l^1	820	z	47
14	8,96 005	c_1	8,96 187	l_1	11,03 813	l_1	9,99 819	z^1	46
15	8,96 143	d^1	8,96 325	l^1	11,03 675	l^1	9,99 817	z_1	45
16	280	d^1	464	c_1	536	c_1	816	y	44
17	417	m^1	602	c_1	398	c_1	815	y	43
18	553	d	739	c_1	261	c_1	814	y^1	42
19	8,96 689	d_1	8,96 877	m	11,03 123	m	9,99 813	z	41
20	8,96 825	e^1	8,97 013	d	11,02 987	d	9,99 812	z^1	40
21	96 960	e^1	150	m_1	850	m_1	810	z_1	39
22	97 095	e_1	285	d_1	715	d_1	809	y	38
23	229	e	421	e^1	579	e^1	808	y^1	37
24	8,97 363	f^1	8,97 556	e^1	11,02 444	e^1	9,99 807	z	36
25	8,97 496	n^1	8,97 691	f^1	11,02 309	f^1	9,99 806	z^1	35
26	629	n^1	825	f^1	175	f^1	804	z_1	34
27	762	f	97 959	n	02 041	n	803	y	33
28	97 894	f	98 092	f^1	01 908	f^1	802	y^1	32
29	8,98 026	f_1	8,98 225	n	11,01 775	n	9,99 801	z	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	2$\bar{3}$	4$\bar{7}$	7$\bar{1}$	9$\bar{5}$	11$\bar{9}$
b	2$\bar{3}$	4$\bar{7}$	7$\bar{0}$	9$\bar{4}$	11$\bar{7}$
c	23	4$\bar{6}$	7$\underline{0}$	9$\underline{3}$	11$\bar{6}$
d	23	46	6$\bar{8}$	91	11$\underline{4}$
e	22	4$\underline{5}$	67	8$\bar{9}$	112
f	22	44	6$\bar{6}$	8$\bar{8}$	11$\underline{0}$
g	2$\bar{4}$	4$\underline{9}$	7$\underline{3}$	97	121

84°

″	10″	20″	30″	40″	50″
h	24	47	71	9$\underline{5}$	11$\underline{8}$
k	2$\underline{4}$	4$\underline{8}$	7$\underline{2}$	95	11$\underline{9}$
l	2$\bar{3}$	4$\bar{6}$	6$\bar{9}$	9$\underline{3}$	11$\underline{6}$
m	2$\bar{2}$	45	68	9$\underline{1}$	11$\underline{4}$
n	22	4$\bar{4}$	6$\bar{6}$	89	111
y	0	0	$\bar{0}$	$\underline{1}$	$\underline{1}$
z	$\bar{0}$	$\underline{1}$	$\underline{1}$	$\underline{1}$	1

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	8,98 157	a^1	8,98 358	h^1	11,01 642	h^1	9,99 800	y^1	**30**
31	288	a	490	h^1	510	h^1	798	y_1	29
32	419	a_1	622	h	378	h	797	y	28
33	549	a_1	753	a^1	247	a^1	796	z_1	27
34	8,98 679	b^1	8,98 884	a	11,01 116	a	9,99 795	y^1	26
35	8,98 808	b^1	8,99 015	a_1	11,00 985	a_1	9,99 793	y_1	25
36	98 937	b^1	145	a_1	855	a_1	792	y	24
37	99 066	b	275	b^1	725	b^1	791	z_1	23
38	194	g	405	b	595	b	790	z	22
39	8,99 322	k_1	8,99 534	b	11,00 466	b	9,99 788	y_1	21
40	8,99 450	c^1	8,99 662	k^1	11,00 338	k^1	9,99 787	y	**20**
41	577	c	791	k	209	k	786	z_1	19
42	704	c	8,99 919	b_1	11,00 081	b_1	785	z	18
43	830	c	9,00 046	k^1	10,99 954	k^1	783	y_1	17
44	8,99 956	c	9,00 174	c^1	10,99 826	c^1	9,99 782	y	16
45	9,00 082	c_1	9,00 301	c	10,99 699	c	9,99 781	z_1	15
46	207	d^1	427	c	573	c	780	y^1	14
47	332	d	553	c	447	c	778	y_1	13
48	456	d^1	679	c	321	c	777	z_1	12
49	9,00 581	d_1	9,00 805	c_1	10,99 195	c_1	9,99 776	z	11
50	9,00 704	e^1	9,00 930	c_1	10,99 070	c_1	9,99 775	z^1	**10**
51	828	e	01 055	l	98 945	l	773	y	9
52	00 951	e	179	l^1	821	l^1	772	z_1	8
53	01 074	e_1	303	l^1	697	l^1	771	y^1	7
54	9,01 196	f^1	9,01 427	m	10,98 573	m	9,99 769	y	6
55	9,01 318	f	9,01 550	m^1	10,98 450	m^1	9,99 768	z_1	5
56	440	f_1	673	m^1	327	m^1	767	y^1	4
57	561	n	796	m_1	204	m_1	765	y_1	3
58	682	n	01 918	f^1	98 082	f^1	764	z_1	2
59	9,01 803	n_1	9,02 040	n^1	10,97 960	n^1	9,99 763	z	1
60	9,01 923	n	9,02 162	n	10,97 838	n	9,99 761	y	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

84°

″	10″	20″	30″	40″	50″	″	10″	20″	30″	40″	50″
a	22	44	66	87	109	h	22	44	65	87	109
b	21	43	64	86	107	k	21	43	64	85	107
c	21	42	63	84	105	l	20	41	62	83	103
d	21	41	62	83	104	m	20	41	62	82	103
e	20	41	61	82	102	n	21	41	61	81	101
f	21	41	61	81	102	y	0	0	0	1	1
g	22	43	64	86	107	z	0	1	1	1	1

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,01 923	h	9,02 162	h	10,97 838	h	9,99 761	y_1	**60**
1	02 043	a	283	h^1	717	h^1	760	y	59
2	163	a	404	h^1	596	h^1	759	y^1	58
3	283	b	525	a	475	a	757	y_1	57
4	9,02 402	b	9,02 645	h^1	10,97 355	h^1	9,99 756	y	56
5	9,02 520	b^1	9,02 766	b	10,97 234	b	9,99 755	y^1	55
6	639	b_1	02 885	a	97 115	a	753	y_1	54
7	757	b_1	03 005	k	96 995	k	752	y	53
8	874	c^1	124	k	876	k	751	z	52
9	9,02 992	c_1	9,03 242	k^1	10,96 758	k^1	9,99 749	z_1	51
10	9,03 109	c_1	9,03 361	k_1	10,96 639	k_1	9,99 748	y	50
11	226	d	479	k_1	521	k_1	747	z^1	49
12	342	c_1	597	b_1	403	b_1	745	z_1	48
13	458	d^1	714	k_1	286	k_1	744	y^1	47
14	9,03 574	d_1	9,03 832	c_1	10,96 168	c_1	9,99 742	y_1	46
15	9,03 690	e^1	9,03 948	l^1	10,96 052	l^1	9,99 741	y	45
16	805	e^1	04 065	c_1	95 935	c_1	740	z	44
17	03 920	e	181	l	819	l	738	z_1	43
18	04 034	e	297	l	703	l	737	y^1	42
19	9,04 149	e	9,04 413	l_1	10,95 587	l_1	9,99 736	z^1	41
20	9,04 262	e	9,04 528	m^1	10,95 472	m^1	9,99 734	y	**40**
21	376	e	643	m^1	357	m^1	733	z	39
22	490	f	758	m	242	m	731	z_1	38
23	603	f	873	e	127	e	730	y^1	37
24	9,04 715	f_1	9,04 987	e	10,95 013	e	9,99 728	y_1	36
25	9,04 828	g^1	9,05 101	n^1	10,94 899	n^1	9,99 727	y	35
26	04 940	g^1	214	e	786	e	726	z^1	34
27	05 052	g	328	n	672	n	724	z_1	33
28	164	g_1	441	n	559	n	723	y^1	32
29	9,05 275	g_1	9,05 553	f_1	10,94 447	f_1	9,99 721	z_1	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**83°**	″	10″	20″	30″	40″	50″
a	20	40	60	80	100		h	20	41	61	81	101
b	19	39	59	79	99		k	20	39	59	79	99
c	19	39	58	79	97		l	20	39	58	77	97
d	19	39	58	77	97		m	19	38	57	77	96
e	19	38	57	76	95		n	19	37	56	75	94
f	18	37	56	75	94		y	0	0	1	1	1
g	19	37	56	74	93		z	1	1	1	1	1

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,05 386	a	9,05 666	h^1	10,94 334	h^1	9,99 720	y^1	**30**
31	497	a_1	778	h^1	222	h^1	718	y_1	29
32	607	a	05 890	h	94 110	h	717	y	28
33	717	a^1	06 002	h_1	93 998	h_1	716	z^1	27
34	9,05 827	b^1	9,06 113	h	10,93 887	h	9,99 714	y	26
35	9,05 937	b_1	9,06 224	a^1	10,93 776	a^1	9,99 713	z^1	25
36	06 046	b	335	h_1	665	h_1	711	y	24
37	155	b	445	a^1	555	a^1	710	y^1	23
38	264	c	556	b	444	b	708	z_1	22
39	9,06 372	b_1	9,06 666	b_1	10,93 334	b_1	9,99 707	y^1	21
40	9,06 481	c	9,06 775	k^1	10,93 225	k^1	9,99 705	z_1	**20**
41	589	d	885	k	115	k	704	y^1	19
42	696	c	06 994	k	93 006	k	702	z_1	18
43	804	d	07 103	c	92 897	c	701	y^1	17
44	9,06 911	d	9,07 211	b	10,92 789	b	9,99 699	z_1	16
45	9,07 018	d_1	9,07 320	c	10,92 680	c	9,99 698	y^1	15
46	124	d^1	428	c	572	c	696	z_1	14
47	231	e_1	536	d^1	464	d^1	695	y^1	13
48	337	e_1	643	c	357	c	693	z_1	12
49	9,07 442	e^1	9,07 751	d	10,92 249	d	9,99 692	y^1	11
50	9,07 548	e	9,07 858	d	10,92 142	d	9,99 690	z_1	**10**
51	653	e	9,07 964	l^1	92 036	l^1	689	y^1	9
52	758	e	9,08 071	l	91 929	l	687	z_1	8
53	863	f^1	177	d^1	823	d^1	686	y^1	7
54	9,07 968	f_1	9,08 283	e^1	10,91 717	e^1	9,99 684	z_1	6
55	9,08 072	f	9,08 389	m^1	10,91 611	m^1	9,99 683	y^1	5
56	176	g	495	m	505	m	681	y	4
57	280	g_1	600	e_1	400	e_1	680	z^1	3
58	383	g	705	m	295	m	678	y	2
59	9,08 486	g^1	9,08 810	m	10,91 190	u	9,99 677	z^1	1
60	9,08 589	g^1	9,08 914	n	10,91 086	n	9,99 675	y	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	1$\bar{8}$	3$\bar{7}$	55	7$\underline{4}$	92
b	18	3$\bar{6}$	5$\underline{5}$	73	91
c	18	3$\underline{6}$	5$\bar{4}$	7$\underline{2}$	9$\underline{0}$
d	1$\bar{7}$	3$\underline{5}$	53	71	8$\underline{9}$
e	1$\underline{8}$	3$\underline{5}$	53	7$\bar{0}$	88
f	1$\bar{7}$	3$\underline{5}$	52	6$\bar{9}$	87
g	1$\bar{7}$	3$\underline{5}$	5$\underline{2}$	69	86

83°

″	10″	20″	30″	40″	50″
h	1$\underline{9}$	37	5$\underline{6}$	7$\bar{4}$	9$\underline{3}$
k	18	3$\bar{6}$	5$\bar{4}$	7$\bar{2}$	91
l	18	3$\bar{5}$	5$\bar{3}$	71	89
m	1$\bar{7}$	35	5$\bar{2}$	7$\bar{0}$	8$\bar{7}$
n	18	35	53	70	87
y	0	$\bar{0}$	$\underline{1}$	$\underline{1}$	1
z	$\bar{0}$	$\underline{1}$	$\underline{1}$	1	$\underline{2}$

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,08 589	a^1	9,08 914	h^1	10,91 086	h^1	9,99 675	x_1	**60**
1	692	a	09 019	a	90 981	a	674	x^1	59
2	795	a_1	123	a	877	a	672	x	58
3	897	a_1	227	h_1	773	h_1	670	y_1	57
4	9,08 999	a_1	9,09 330	h	10,90 670	h	9,99 669	x	56
5	9,09 101	b^1	9,09 434	a_1	10,90 566	a_1	9,99 667	x_1	55
6	202	a_1	537	a_1	463	a_1	666	y	54
7	304	b	640	a_1	360	a_1	664	x_1	53
8	405	b	742	k	258	k	663	y^1	52
9	9,09 506	b_1	9,09 845	a_1	10,90 155	a_1	9,99 661	x	51
10	9,09 606	l	9,09 947	a_1	10,90 053	a_1	9,99 659	y_1	**50**
11	707	c	10 049	b^1	89 951	b^1	658	x^1	49
12	807	c	150	a_1	850	a_1	656	x_1	48
13	09 907	c_1	252	l^1	748	l^1	655	y	47
14	9,10 006	d^1	9,10 353	b^1	10,89 647	b^1	9,99 653	x	46
15	9,10 106	d	9,10 454	l^1	10,89 546	l^1	9,99 651	y_1	45
16	205	d	555	l	445	l	650	z^1	44
17	304	d	656	l_1	344	l_1	648	x_1	43
18	402	e^1	756	b_1	244	b_1	647	y^1	42
19	9,10 501	d	9,10 856	m^1	10,89 144	m^1	9,99 645	x	41
20	9,10 599	e	9,10 956	e^1	10,89 044	e^1	9,99 643	x_1	**40**
21	697	e	11 056	c_1	88 944	c_1	642	y	39
22	795	f^1	155	e^1	845	e^1	640	x	38
23	893	f	254	e^1	746	e^1	638	y_1	37
24	9,10 990	f^1	9,11 353	e^1	10,88 647	e^1	9,99 637	y	36
25	9,11 087	f^1	9,11 452	m	10,88 548	m	9,99 635	x_1	35
26	184	g^1	551	m_1	449	m_1	633	y_1	34
27	281	g	649	d	351	d	632	z^1	33
28	377	f^1	747	m	253	m	630	x_1	32
29	9,11 474	g	9,11 845	m_1	10,88 155	m_1	9,99 629	y^1	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**82°**	″	10″	20″	30″	40″	50″
a	1$\bar{7}$	3$\bar{4}$	5$\underline{2}$	6$\underline{9}$	8$\underline{6}$		h	1$\bar{7}$	3$\underline{5}$	5$\underline{2}$	6$\underline{9}$	8$\bar{6}$
b	17	3$\bar{3}$	5$\bar{0}$	6$\bar{7}$	8$\underline{4}$		k	17	34	51	68	86
c	16	3$\bar{3}$	5$\underline{0}$	6$\bar{6}$	8$\bar{3}$		l	1$\underline{7}$	3$\underline{4}$	5$\bar{0}$	6$\underline{7}$	8$\underline{4}$
d	1$\bar{6}$	3$\bar{3}$	4$\bar{9}$	66	8$\bar{2}$		m	1$\underline{7}$	33	4$\bar{9}$	6$\bar{6}$	8$\bar{2}$
e	17	33	4$\bar{9}$	66	8$\bar{2}$		x	0	$\underline{1}$	1	$\bar{1}$	$\bar{1}$
f	16	3$\bar{2}$	4$\bar{8}$	65	81		y	$\underline{1}$	$\underline{1}$	$\underline{1}$	$\bar{1}$	$\underline{2}$
g	16	32	4$\bar{8}$	6$\bar{4}$	8$\bar{0}$		z	0	1	1	1	2

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,11 570	a^1	9,11 943	g	10,88 057	g	9,99 627	x_1	30
31	666	a	12 040	y^1	87 960	g^1	625	y^1	29
32	761	a^1	138	g_1	862	g_1	624	x^1	28
33	857	a_1	235	g_1	765	g_1	622	x_1	27
34	9,11 952	a	9,12 332	a^1	10,87 668	a^1	9,99 620	y^1	26
35	9,12 047	a_1	9,12 428	h	10,87 572	h	9,99 618	y	25
36	142	b^1	525	a^1	475	a^1	617	z^1	24
37	236	a	621	a^1	379	a^1	615	y^1	23
38	331	b	717	a^1	283	a^1	613	y	22
39	9,12 425	b	9,12 813	a^1	10,87 187	a^1	9,99 612	x	21
40	9,12 519	b	9,12 909	a	10,87 091	a	9,99 610	z	20
41	612	c^1	13 004	a^1	86 996	a^1	608	y^1	19
42	706	l^1	099	a^1	901	a^1	607	x^1	18
43	799	l^1	194	k^1	806	k^1	605	z^1	17
44	9,12 892	l^1	9,13 289	k	10,86 711	k	9,99 603	y^1	16
45	9,12 985	l^1	9,13 384	k_1	10,86 616	k_1	9,99 601	y	15
46	13 078	c	478	k	522	k	600	x	14
47	171	d	573	b	427	b	598	z	13
48	263	d^1	667	b	333	b	596	y^1	12
49	9,13 355	d^1	9,13 761	b_1	10,86 239	b_1	9,99 595	x^1	11
50	9,13 447	e	9,13 854	m^1	10,86 146	m^1	9,99 593	x_1	10
51	539	d_1	13 948	l	86 052	l	591	y^1	9
52	630	e^1	14 041	l	85 959	l	589	y^1	8
53	722	e_1	134	l	866	l	588	x^1	7
54	9,13 813	e_1	9,14 227	l	10,85 773	l	9,99 586	z^1	6
55	9,13 904	f	9,14 320	d	10,85 680	d	9,99 584	y^1	5
56	13 994	e^1	412	l	588	l	582	y^1	4
57	14 085	f	504	m	496	m	581	x^1	3
58	175	f^1	597	d_1	403	d_1	579	z^1	2
59	9,14 266	f	9,14 688	m	10,85 312	m	9,99 577	z	1
60	9,14 356	f_1	9,14 780	l_1	10,85 220	l_1	9,99 575	y^1	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	16	32	47	63	79
b	15	31	47	62	78
c	16	31	46	62	77
d	15	30	46	61	77
e	15	31	46	61	76
f	15	30	45	60	75
g	16	32	49	65	81

82°

″	10″	20″	30″	40″	50″
h	16	33	49	65	81
k	16	32	48	63	79
l	15	31	46	62	77
m	16	31	47	62	77
x	1	1	1	1	2
y	0	0	0	1	1
z	0	1	1	1	1

8°

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,14 356	*a*	9,14 780	k^1	10,85 220	k^1	9,99 575	x^1	**60**
1	445	b^1	872	k_1	128	k_1	574	y^1	59
2	535	*b*	14 963	*k*	85 037	*k*	572	*y*	58
3	624	b^1	15 054	*k*	84 946	*k*	570	z^1	57
4	9,14 714	*c*	9,15 145	*k*	10,84 855	*k*	9,99 568	x^1	56
5	9,14 803	*c*	9,15 236	*k*	10,84 764	*k*	9,99 566	x^1	55
6	891	*b*	327	b^1	673	b^1	565	y^1	54
7	14 980	c^1	417	*k*	583	*k*	563	*y*	53
8	15 069	*d*	508	b^1	492	b^1	561	z^1	52
9	9,15 157	d^1	9,15 598	b^1	10,84 402	b^1	9,99 559	x^1	51
10	9,15 245	d^1	9,15 688	b^1	10,84 312	b^1	9,99 557	x^1	**50**
11	333	d^1	777	b^1	223	b^1	556	y^1	49
12	421	d_1	867	b^1	133	b^1	554	y^1	48
13	508	d^1	15 956	b^1	84 044	b^1	552	z^1	47
14	9,15 596	*e*	9,16 046	*a*	10,83 954	*a*	9,99 550	*z*	46
15	9,15 683	d_1	9,16 135	*a*	10,83 865	*a*	9,99 548	x^1	45
16	770	*e*	224	*c*	776	*c*	546	x^1	44
17	857	*e*	312	*l*	688	*l*	545	y^1	43
18	15 944	e_1	401	d^1	599	d^1	543	y^1	42
19	9,16 030	*e*	9,16 489	c^1	10,83 511	c^1	9,99 541	z^1	41
20	9,16 116	f^1	9,16 577	c^1	10,83 423	c^1	9,99 539	z^1	**40**
21	203	*f*	665	c^1	335	c^1	537	x^1	39
22	289	f_1	753	d^1	247	d^1	535	x^1	38
23	374	*g*	841	d_1	159	d_1	533	*x*	37
24	9,16 460	*f*	9,16 928	l_1	10,83 072	l_1	9,99 532	y^1	36
25	9,16 545	*g*	9,17 016	*e*	10,82 984	*e*	9,99 530	y^1	35
26	631	f_1	103	*e*	897	*e*	528	z^1	34
27	716	f_1	190	*e*	810	*e*	526	z^1	33
28	801	*h*	277	*e*	723	*e*	524	*z*	32
29	9,16 886	*h*	9,17 363	m^1	10,82 637	m^1	9,99 522	x^1	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**81°**	″	10″	20″	30″	40″	50″
a	15	29	44	59	74		*h*	14	28	42	56	70
b	15	30	45	60	$7\bar{4}$		*k*	15	$3\underline{1}$	46	61	$7\bar{6}$
c	$1\bar{4}$	$2\bar{9}$	44	59	74		*l*	15	30	$4\underline{5}$	59	$7\underline{4}$
d	$1\bar{4}$	29	44	$5\underline{9}$	73		*m*	$1\bar{4}$	$2\bar{8}$	$4\bar{3}$	58	72
e	14	$2\underline{9}$	43	$5\bar{8}$	$7\bar{2}$		*x*	0	0	$\bar{0}$	1	1
f	$1\bar{4}$	$2\bar{8}$	$4\underline{3}$	$5\bar{7}$	71		*y*	1	1	1	$\bar{1}$	2
g	$1\underline{5}$	29	43	57	72		*z*	0	1	1	1	$\bar{1}$

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,16 970	a^1	9,17 450	h	10,82 550	h	9,99 520	x	30
31	17 055	a	536	h^1	464	h^1	518	x	29
32	139	a	622	h^1	378	h^1	517	y	28
33	223	a	708	h^1	292	h^1	515	y	27
34	9,17 307	a	9,17 794	k^1	10,82 206	k^1	9,99 513	y	26
35	9,17 391	b^1	9,17 880	k	10,82 120	k	9,99 511	x^1	25
36	474	a	17 965	k^1	82 035	k^1	509	x^1	24
37	558	b	18 051	a^1	81 949	a^1	507	x^1	23
38	641	b^1	136	k	864	k	505	x^1	22
39	9,17 724	b^1	9,18 221	k	10,81 779	k	9,99 503	x	21
40	9,17 807	c^1	9,18 306	l	10,81 694	l	9,99 501	x	20
41	890	b	391	a	609	a	499	x	19
42	17 973	c	475	a^1	525	a^1	497	x	18
43	18 055	b	560	a	440	a	495	x	17
44	9,18 137	c^1	9,18 644	a	10,81 356	a	9,99 494	y	16
45	9,18 220	d	9,18 728	a	10,81 272	a	9,99 492	y	15
46	302	d	812	a	188	a	490	y	14
47	383	b	896	b^1	104	b^1	488	y	13
48	465	d^1	18 979	a	81 021	a	486	y	12
49	9,18 547	e	9,19 063	c^1	10,80 937	c^1	9,99 484	y	11
50	9,18 628	d^1	9,19 146	a	10,80 854	a	9,99 482	z^1	10
51	709	d^1	229	a	771	a	480	x^1	9
52	790	d^1	312	b^1	688	b^1	478	x^1	8
53	871	d^1	395	c^1	605	c^1	476	x^1	7
54	9,18 952	e	9,19 478	b	10,80 522	b	9,99 474	x^1	6
55	9,19 033	f	9,19 561	c	10,80 439	c	9,99 472	x^1	5
56	113	f^1	643	m^1	357	m^1	470	x^1	4
57	193	g^1	725	b	275	b	468	x^1	3
58	273	g^1	807	b	193	b	466	x^1	2
59	9,19 353	g^1	9,19 889	b	10,80 111	b	9,99 464	x^1	1
60	9,19 433	g	9,19 971	m	10,80 029	m	9,99 462	x^1	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	14	28	42	56	70
b	14	28	41	55	69
c	13	27	41	55	68
d	13	27	41	54	68
e	13	27	40	54	67
f	13	26	40	53	67
g	14	27	40	53	67

81°

″	10″	20″	30″	40″	50″
h	14	29	43	57	72
k	14	28	43	57	71
l	14	28	42	56	71
m	14	27	41	55	68
x	0	0	1	1	1
y	1	1	1	2	2
z	1	1	1	1	1

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,19 433	a^1	9,19 971	g^1	10,80 029	g^1	9,99 462	w^1	60
1	513	b^1	20 053	g	79 947	g	460	w^1	59
2	592	a^1	134	h^1	866	h^1	458	w^1	58
3	672	b	216	h	784	h	456	w^1	57
4	9,19 751	b^1	9,20 297	g	10,79 703	g	9,99 454	w^1	56
5	9,19 830	a	9,20 378	g	10,79 622	g	9,99 452	w^1	55
6	909	b^1	459	g	541	g	450	w^1	54
7	19 988	c	540	k	460	k	448	w^1	53
8	20 067	c	621	k_1	379	k_1	446	w^1	52
9	9,20 145	c	9,20 701	k^1	10,79 299	k^1	9,99 444	x	51
10	9,20 223	a	9,20 782	k_1	10,79 218	k_1	9,99 442	x	50
11	302	c	862	k_1	138	k_1	440	x	49
12	380	c	20 942	k_1	79 058	k_1	438	x	48
13	458	e^1	21 022	k_1	78 978	k_1	436	x	47
14	9,20 535	c	9,21 102	b^1	10,78 898	b^1	9,99 434	x	46
15	9,20 613	c	9,21 182	b	10,78 818	b	9,99 432	x	45
16	691	d^1	261	a	739	a	429	w	44
17	768	e	341	l^1	659	l^1	427	w	43
18	845	e^1	420	b	580	b	425	w	42
19	9,20 922	e^1	9,21 499	b	10,78 501	b	9,99 423	w	41
20	9,20 999	e	9,21 578	b	10,78 422	b	9,99 421	z_1	40
21	21 076	e_1	657	l	343	l	419	y	39
22	153	d	736	l	264	l	417	y	38
23	229	e_1	814	l^1	186	l^1	415	y	37
24	9,21 306	d_1	9,21 893	l	10,78 107	l	9,99 413	y^1	36
25	9,21 382	d	9,21 971	l	10,78 029	l	9,99 411	x	35
26	458	d	22 049	l	77 951	l	409	x	34
27	534	d_1	127	l	873	l	407	x^1	33
28	610	d_1	205	l	795	l	404	w	32
29	9,21 685	f^1	9,22 283	l	10,77 717	l	9,99 402	w	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	13	27	40	53	66
b	13	26	39	53	66
c	13	26	39	52	65
d	12	25	38	51	63
e	13	26	39	51	64
f	13	25	38	50	63
g	14	27	41	54	68

80°

″	10″	20″	30″	40″	50″
h	13	27	41	54	68
k	13	27	40	54	67
l	13	26	39	52	65
w	0	0	1	1	1
x	1	1	1	2	2
y	0	1	1	1	2
z	0	0	1	2	2

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,21 761	a	9,22 361	g	10,77 639	g	9,99 400	w	30
31	836	a^1	438	g^1	562	g^1	398	w^1	29
32	912	b	516	g_1	484	g_1	396	w^1	28
33	21 987	b	593	g	407	g	394	x	27
34	9,22 062	b	9,22 670	h^1	10,77 330	h^1	9,99 392	x^1	26
35	9,22 137	b	9,22 747	h^1	10,77 253	h^1	9,99 390	x^1	25
36	211	a	824	g	176	g	388	y	24
37	286	b^1	901	g_1	099	g_1	385	w	23
38	361	c	22 977	h^1	77 023	h^1	383	z	22
39	9,22 435	c^1	9,23 054	l^1	10,76 946	l^1	9,99 381	w^1	21
40	9,22 509	b^1	9,23 130	g	10,76 870	g	9,99 379	x	20
41	583	b^1	206	h^1	794	h^1	377	x^1	19
42	657	d^1	283	k^1	717	k^1	375	x^1	18
43	731	c^1	359	k^1	641	k^1	372	w	17
44	9,22 805	d_1	9,23 435	k	10,76 565	k	9,99 370	z	16
45	9,22 878	d^1	9,23 510	a^1	10,76 490	a^1	9,99 368	w^1	15
46	22 952	d_1	586	k^1	414	k^1	366	w^1	14
47	23 025	d	661	h	339	h	364	x^1	13
48	098	e	737	b	263	b	362	x^1	12
49	9,23 171	e	9,23 812	a	10,76 188	a	9,99 359	w	11
50	9,23 244	e	9,23 887	a	10,76 113	a	9,99 357	z	10
51	317	d_1	23 962	a	76 038	a	355	w^1	9
52	390	f	24 037	b^1	75 963	b^1	353	x^1	8
53	462	e	112	b	888	b	351	x^1	7
54	9,23 535	f	9,24 186	a	10,75 814	a	9,99 348	w	6
55	9,23 607	f	9,24 261	b	10,75 739	b	9,99 346	w^1	5
56	679	d_1	335	l	665	l	344	w^1	4
57	752	f	410	c	590	c	342	x^1	3
58	823	f	484	c^1	516	c^1	340	y	2
59	9,23 895	f	9,24 558	c^1	10,75 442	c^1	9,99 337	w	1
60	9,23 967	f	9,24 632	d_1	10,75 368	d_1	9,99 335	w^1	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	13	25	38	50̄	63
b	12̄	25	37	50	62
c	12	24̄	37	49	62
d	12̄	25̲	37	49	61̄
e	13	25	37	49	61
f	12	24	36	48	60
g	13̲	26̲	38̄	51̄	64̄

80°

″	10″	20″	30″	40″	50″
h	13	26	38̄	51	63̄
k	12	25	37̄	50	63
l	13	25	38	50̄	62̄
w	0	0̄	1	1	1̄
x	0̄	1	1	2	2
y	1	1	2	2	2
z	0	0	1	1	2

10°

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,23 967	a^1	9,24 632	f^1	10,75 368	f^1	9,99 335	w_1	60
1	24 039	b^1	706	f^1	294	f^1	333	w	59
2	110	a^1	779	g^1	221	g^1	331	w^1	58
3	181	a^1	853	f^1	147	f^1	328	x	57
4	9,24 253	b	9,24 926	g^1	10,75 074	g^1	9,99 326	w_1	56
5	9,24 324	b^1	9,25 000	f	10,75 000	f	9,99 324	w	55
6	395	b^1	073	f^1	74 927	f^1	322	w^1	54
7	466	b	146	f^1	854	f^1	319	x	53
8	536	a	219	f^1	781	f^1	317	y	52
9	9.24 607	b^1	9,25 292	f	10,74 708	f	9,99 315	w	51
10	9,24 677	a	9,25 365	a^1	10,74 635	a^1	9,99 313	w^1	50
11	748	c^1	437	g	563	g	310	x	49
12	818	h	510	a^1	490	a^1	308	w_1	48
13	888	h	582	g_1	418	g_1	306	w^1	47
14	9,24 958	h	9,25 655	a^1	10,74 345	a^1	9,99 304	z	46
15	9,25 028	h	9,25 727	a^1	10,74 273	a^1	9,99 301	x^1	45
16	098	c	799	a^1	201	a^1	299	w	44
17	168	c_1	871	a^1	129	a^1	297	w^1	43
18	237	c^1	25 943	a^1	74 057	a^1	294	x	42
19	9,25 307	e^1	9,26 015	h	10,73 985	h	9,99 292	y	41
20	9,25 376	c	9,26 086	a^1	10,73 914	a^1	9,99 290	w^1	40
21	445	c	158	a	842	a	288	z	39
22	514	c	229	a^1	771	a^1	285	y	38
23	583	c	301	b	699	b	283	w	37
24	9,25 652	c	9,26 372	b^1	10,73 628	b^1	9,99 281	z	36
25	9,25 721	d	9,26 443	h	10,73 557	h	9,99 278	y	35
26	790	d_1	514	b^1	486	b^1	276	y	34
27	858	d^1	585	b^1	415	b^1	274	z	33
28	927	d_1	655	l^1	345	l^1	271	x^1	32
29	9,25 995	e	9,26 726	h	10,73 274	h	9,99 269	w	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

79°

″	10″	20″	30″	40″	50″	″	10″	20″	30″	40″	50″
a	12	24	36	47	59	h	12	24	35	47	59
b	11	23	35	47	59	k	11	23	34	46	59
c	12	23	35	46	58	l	11	23	35	47	58
d	12	23	34	46	57	w	0	1	1	2	2
e	11	23	34	46	57	x	0	0	1	1	1
f	12	24	36	49	61	y	0	1	1	1	2
g	13	25	37	49	61	z	1	1	2	2	2

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,26 063	a^1	9,26 797	e	10,73 203	e	9,99 267	w^1	30
31	131	a^1	867	f	133	f	264	x	29
32	199	a^1	26 937	f^1	73 063	f^1	262	w_1	28
33	267	a	27 008	e_1	72 992	e_1	260	w^1	27
34	9,26 335	b^1	9,27 078	e^1	10,72 922	e^1	9,99 257	x	26
35	9,26 403	b	9,27 148	e^1	10,72 852	e^1	9,99 255	w	25
36	470	a	218	e_1	782	e_1	252	x_1	24
37	538	b_1	288	g_1	712	g_1	250	x	23
38	605	b^1	357	g^1	643	g^1	248	w	22
39	9,26 672	a_1	9,27 427	g	10,72 573	g	9,99 245	y	21
40	9,26 739	a_1	9,27 496	g^1	10,72 504	g^1	9,99 243	w_1	20
41	806	a_1	566	e_1	434	e_1	241	w^1	19
42	873	a_1	635	g	365	g	238	x	18
43	26 940	b	704	g	296	g	236	w	17
44	9,27 007	c_1	9,27 773	g	10,72 227	g	9,99 233	y	16
45	9,27 073	a_1	9,27 842	g	10,72 158	g	9,99 231	w_1	15
46	140	c	911	g	089	g	229	w^1	14
47	206	b	27 980	a^1	72 020	a^1	226	x	13
48	273	c	28 049	h	71 951	h	224	w	12
49	9,27 339	c	9,28 117	l^1	10,71 883	l^1	9,99 221	y	11
50	9,27 405	c	9,28 186	l	10,71 814	l	9,99 219	w_1	10
51	471	c	254	a^1	746	a^1	217	w^1	9
52	537	c	323	b	677	b	214	x	8
53	602	c	391	b	609	b	212	w	7
54	9,27 668	c	9,28 459	b	10,71 541	b	9,99 209	y	6
55	9,27 734	d	9,28 527	b	10,71 473	b	9,99 207	w	5
56	799	c	595	b	405	b	204	y	4
57	864	c	662	a^1	338	a^1	202	x	3
58	930	d	730	b^1	270	b^1	200	w^1	2
59	9,27 995	d^1	9,28 798	k	10,71 202	k	9,99 197	w_1	1
60	9,28 060	d^1	9,28 865	b^1	10,71 135	b^1	9,99 195	w^1	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	12	23	34	45	57
b	11	22	34	45	56
c	11	22	33	44	55
d	11	21	32	43	54
e	11	23	35	47	58
f	12	24	35	47	59
g	12	23	35	46	58

79°

″	10″	20″	30″	40″	50″
h	11	23	34	46	57
k	11	22	33	45	56
l	11	23	34	45	57
w	1	1	1	2	2
x	0	1	1	1	2
y	0	0	1	1	2
z	0	0	0	1	2

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,28 060	a^1	9,28 865	f^1	10,71 135	f^1	9,99 195	x^1	60
1	125	a	28 933	f_1	067	f_1	192	x_1	59
2	190	a_1	29 000	f	71 000	f	190	x	58
3	254	b^1	067	f^1	70 933	f^1	187	x_1	57
4	9,28 319	a^1	9,29 134	f^1	10,70 866	f^1	9,99 185	x	56
5	9,28 384	b_1	9,29 201	f^1	10,70 799	f^1	9,99 182	y	55
6	448	a	268	f	732	f	180	x	54
7	512	a^1	335	g^1	665	g^1	177	y	53
8	577	d	402	g	598	g	175	x	52
9	9,28 641	d	9,29 468	f^1	10,70 532	f^1	9,99 172	y	51
10	9,28 705	d	9,29 535	g	10,70 465	g	9,99 170	x	50
11	769	d	601	f	399	f	167	y	49
12	833	c^1	668	g	332	g	165	x	48
13	896	b	734	g	266	g	162	y	47
14	9,28 960	d^1	9,29 800	g	10,70 200	g	9,99 160	x	46
15	9,29 024	c^1	9,29 866	g	10,70 134	g	9,99 157	y	45
16	087	d^1	932	g	068	g	155	x	44
17	150	b	29 998	g	70 002	g	152	y	43
18	214	c^1	30 064	g	69 936	g	150	x	42
19	9,29 277	c^1	9,30 130	a_1	10,69 870	a_1	9,99 147	x_1	41
20	9,29 340	c^1	9,30 195	g	10,69 805	g	9,99 145	x	40
21	403	c^1	261	a	739	a	142	x_1	39
22	466	c^1	326	g	674	g	140	x^1	38
23	529	c	391	g	609	g	137	y^1	37
24	9,29 591	e^1	9,30 457	a	10,69 543	a	9,99 135	z	36
25	9,29 654	c^1	9,30 522	a^1	10,69 478	a^1	9,99 132	y^1	35
26	716	e^1	587	a^1	413	a^1	130	z	34
27	779	c	652	a^1	348	a^1	127	y^1	33
28	841	e	717	a	283	a	124	y	32
29	9,29 903	e	9,30 782	b_1	10,69 218	b_1	9,99 122	x	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	1 1	2 2	32	43	54
b	1 1	2 2	3 2	4 3	5 3
c	10	21	31	4 1	52
d	1 0	21	32	42	53
e	11	21	3 1	42	52
f	11	2 2	34	45	56

78°

″	10″	20″	30″	40″	50″
g	11	22	33	44	5 5
h	10	20	31	41	51
x	1	1	1	2	2
y	0	0	1	1	2
z	1	1	2	2	3

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,29 966	a^1	9,30 846	f^1	10,69 154	f^1	9,99 119	x	30
31	30 028	a^1	911	f	089	f	117	y	29
32	090	a	30 975	f^1	69 025	f^1	114	x^1	28
33	151	k_1	31 040	f_1	68 960	f_1	112	y^1	27
34	9,30 213	b_1	9,31 104	g^1	10,68 896	g^1	9,99 109	x^1	26
35	9,30 275	a^1	9,31 168	f^1	10,68 832	f^1	9,99 106	z_1	25
36	336	b	233	g	767	g	104	y	24
37	398	a^1	297	g	703	g	101	x^1	23
38	459	c^1	361	g	639	g	099	y^1	22
39	9,30 521	c	9,31 425	g	10,68 575	g	9,99 096	x^1	21
40	9,30 582	a	9,31 489	h_1	10,68 511	h_1	9,99 093	z_1	20
41	643	a^1	552	f_1	448	f_1	091	y	19
42	704	a^1	616	h	384	h	088	x^1	18
43	765	a	679	h^1	321	h^1	086	y^1	17
44	9,30 826	c	9,31 743	h	10,68 257	h	9,99 083	y_1	16
45	9,30 887	c_1	9,31 806	h^1	10,68 194	h^1	9,99 080	x	15
46	30 947	d	870	d^1	130	d^1	078	y^1	14
47	31 008	c_1	933	g	067	g	075	x^1	13
48	068	c^1	31 996	h	68 004	h	072	z_1	12
49	9,31 129	c_1	9,32 059	h	10,67 941	h	9,99 070	v	11
50	9,31 189	c_1	9,32 122	h	10,67 878	h	9,99 067	x^1	10
51	250	c_1	185	k_1	815	k_1	064	z_1	9
52	310	c_1	248	d^1	752	d^1	062	y	8
53	370	c_1	311	b_1	689	b_1	059	x^1	7
54	9,31 430	c_1	9,32 373	k	10,67 627	k	9,99 056	z_1	6
55	9,31 490	c_1	9,32 436	d^1	10,67 564	d^1	9,99 054	y	5
56	549	c_1	498	k	502	k	051	x^1	4
57	609	c_1	561	b_1	439	b_1	048	z_1	3
58	669	e^1	623	d^1	377	d^1	046	y	2
59	9,31 728	c_1	9,32 685	k_1	10,67 315	k_1	9,99 043	x^1	1
60	9,31 788	e	9,32 747	k	10,67 253	k	9,99 040	z_1	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	10	20	3$\bar{0}$	41	51
b	1$\underline{1}$	21	31	41	52
c	1$\bar{0}$	2$\bar{0}$	3$\bar{0}$	4$\bar{0}$	5$\underline{1}$
d	10	21	31	4$\bar{1}$	5$\bar{1}$
e	10	20	30	3$\bar{9}$	49
f	11	2$\bar{1}$	3$\bar{2}$	43	5$\underline{4}$

78°

″	10″	20″	30″	40″	50″
g	1$\bar{0}$	2$\bar{1}$	32	4$\bar{2}$	5$\bar{3}$
h	1$\underline{1}$	2$\bar{1}$	3$\underline{2}$	4$\bar{2}$	53
k	11	2$\bar{1}$	3$\underline{2}$	42	5$\bar{2}$
x	0	1	1	$\bar{1}$	2
y	1	1	$\underline{2}$	2	$\bar{2}$
z	0	$\bar{0}$	$\bar{1}$	$\underline{2}$	2

Sin+, Tan+ add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,31 788	a	9,32 747	g^1	10,67 253	g^1	9,99 040	x_1	60
1	847	a^1	810	g_1	190	g_1	038	x^1	59
2	907	b	872	l^1	128	l^1	035	x	58
3	31 966	a_1	933	g	067	g	032	y	57
4	9,32 025	a	9,32 995	h^1	10,67 005	h^1	9,99 030	y^1	56
5	9,32 084	a_1	9,33 057	k	10,66 943	k	9,99 027	x	55
6	143	a_1	119	g_1	881	g_1	024	x	54
7	202	b^1	180	h^1	820	h^1	022	y^1	53
8	261	b	242	g_1	758	g_1	019	x^1	52
9	9,32 319	a	9,33 303	h	10,66 697	h	9,99 016	x	51
10	9,32 378	a_1	9,33 365	l	10,66 635	l	9,99 013	y	50
11	437	d	426	g_1	574	g_1	011	y^1	49
12	495	a_1	487	g_1	513	g_1	008	z	48
13	553	a	548	k	452	k	005	x	47
14	9,32 612	d	9,33 609	k	10,66 391	k	9,99 002	x_1	46
15	9,32 670	d^1	9,33 670	k	10,66 330	k	9,99 000	y^1	45
16	728	b^1	731	g_1	269	g_1	98 997	x	44
17	786	e^1	792	l	208	l	994	x	43
18	844	d^1	853	a^1	147	a^1	991	x_1	42
19	9,32 902	d^1	9,33 913	k	10,66 087	k	9,98 989	y^1	41
20	9,32 960	e	9,33 974	a^1	10,66 026	a^1	9,98 986	x	40
21	33 018	f	34 034	k	65 966	k	983	x	39
22	075	d^1	095	a^1	905	a^1	980	x_1	38
23	133	f^1	155	a^1	845	a^1	978	y^1	37
24	9,33 190	e^1	9,34 215	h	10,65 785	h	9,98 975	x^1	36
25	9,33 248	f	9,34 276	a^1	10,65 724	a^1	9,98 972	x	35
26	305	e	336	a^1	664	a^1	969	x	34
27	362	e	396	a^1	604	a^1	967	y^1	33
28	420	f_1	456	a^1	544	a^1	964	y^1	32
29	9,33 477	f_1	9,34 516	a^1	10,65 484	a^1	9,98 961	z	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	77°	″	10″	20″	30″	40″	50″
a	10	20	30	39	49		h	11	21	31	41	51
b	9	19	29	39	49		k	10	21	31	41	51
d	9	19	29	39	48		l	10	20	30	40	51
e	10	19	29	38	48		x	0	1	1	2	2
f	9	19	28	38	48		y	0	1	1	1	2
g	11	21	31	42	52		z	1	1	1	2	2

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,33 534	*a*	9,34 576	*f*	10,65 424	*f*	9,98 958	*x*	30
31	591	*a*	635	g^1	365	g^1	955	*x*	29
32	647	a^1	695	g^1	305	g^1	953	x^1	28
33	704	a^1	755	*f*	245	*f*	950	x^1	27
34	9,33 761	*a*	9,34 814	g^1	10,65 186	g^1	9,98 947	z_1	26
35	9,33 818	a_1	9,34 874	*f*	10,65 126	*f*	9,98 944	*x*	25
36	874	*b*	933	*g*	067	*g*	941	*x*	24
37	931	a_1	34 992	g^1	65 008	g^1	938	*y*	23
38	33 987	*a*	35 051	g^1	64 949	g^1	936	x^1	22
39	9,34 043	b^1	9,35 111	*f*	10,64 889	*f*	9,98 933	x^1	21
40	9,34 100	*c*	9,35 170	f^1	10,64 830	f^1	9,98 930	z_1	20
41	156	c^1	229	f^1	771	f^1	927	*x*	19
42	212	c^1	288	*f*	712	*f*	924	*x*	18
43	268	c^1	347	*f*	653	*f*	921	y^1	17
44	9,34 324	*c*	9,35 405	*g*	10,64 595	*g*	9,98 919	x^1	16
45	9,34 380	*c*	9,35 464	h^1	10,64 536	h^1	9,98 916	x^1	15
46	436	c_1	523	*f*	477	*f*	913	x^1	14
47	491	d^1	581	*g*	419	*g*	910	*x*	13
48	547	*c*	640	h_1	360	h_1	907	*x*	12
49	9,34 602	d^1	9,35 698	h^1	10,64 302	h^1	9,98 904	*x*	11
50	9,34 658	*c*	9,35 757	h_1	10,64 243	h_1	9,98 901	*x*	10
51	713	*d*	815	f^1	185	f^1	898	*y*	9
52	769	c_1	873	f^1	127	f^1	896	x^1	8
53	824	*c*	931	h^1	069	h^1	893	x^1	7
54	9,34 879	*k*	9,35 989	h^1	10,64 011	h^1	9,98 890	x^1	6
55	9,34 934	*k*	9,36 047	h^1	10,63 953	h^1	9,98 887	*z*	5
56	34 989	*d*	105	h^1	895	h^1	884	*x*	4
57	35 044	*k*	163	h_1	837	h_1	881	*x*	3
58	099	*k*	221	h_1	779	h_1	878	*x*	2
59	9,35 154	c_1	9,36 279	f_1	10,63 721	f_1	9,98 875	*x*	1
60	9,35 209	*e*	9,36 336	*h*	10,63 664	*h*	9,98 872	*x*	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	77°	″	10″	20″	30″	40″	50″
a	$\bar{9}$	19	28̄	38	47̄		*g*	10	20	30	39̄	49̄
b	10	19	28̄	38	47		*h*	10	20̲	29	39	48̄
c	9	18̄	28̲	37	46̄		*k*	9	19	28	37	46
d	10	19	28	37	46̄		*x*	$\bar{0}$	1	$\bar{1}$	2	$\bar{2}$
e	9	18	27	36	45		*y*	0	$\bar{0}$	1	1	2
f	$\bar{9}$	19	29	39̲	49̲		*z*	1	1	2̲	$\bar{2}$	$\bar{2}$

Sin+, Tan+ add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,35 209	*b*	9,36 336	f^1	10,63 664	f^1	9,98 872	*x*	**60**
1	263	*c*	394	*f*	606	*f*	869	y_1	59
2	318	b^1	452	*g*	548	*g*	867	*z*	58
3	373	*b*	509	*f*	491	*f*	864	*z*	57
4	9,35 427	*b*	9,36 566	f^1	10,63 434	f^1	9,98 861	*z*	56
5	9,35 481	*c*	9,36 624	*g*	10,63 376	*g*	9,98 858	*z*	55
6	536	*b*	681	*f*	319	*f*	855	*z*	54
7	590	*b*	738	*f*	262	*f*	852	*z*	53
8	644	*b*	795	*f*	205	*f*	849	*z*	52
9	9,35 698	*b*	9,36 852	*f*	10,63 148	*f*	9,98 846	x^1	51
10	9,35 752	*b*	9,36 909	*f*	10,63 091	*f*	9,98 843	*x*	**50**
11	806	*b*	36 966	*f*	63 034	*f*	840	*x*	49
12	860	*b*	37 023	g^1	62 977	g^1	837	*x*	48
13	914	*b*	080	*g*	920	*g*	834	*x*	47
14	9,35 968	*b*	9,37 137	h^1	10,62 863	h^1	9,98 831	*x*	46
15	9,36 022	d_1	9,37 193	g^1	10,62 807	g^1	9,98 828	*x*	45
16	075	*b*	250	*g*	750	*g*	825	*x*	44
17	129	*d*	306	*f*	694	*f*	822	*x*	43
18	182	*b*	363	*g*	637	*g*	819	*x*	42
19	9,36 236	d_1	9,37 419	c^1	10,62 581	c^1	9,98 816	*x*	41
20	9,36 289	*a*	9,37 476	*h*	10,62 524	*h*	9,98 813	*x*	**40**
21	342	*b*	532	h^1	468	h^1	810	*x*	39
22	395	*b*	588	*g*	412	*g*	807	*x*	38
23	449	d_1	644	c^1	356	c^1	804	*x*	37
24	9,36 502	d_1	9,37 700	c^1	10,62 300	c^1	9,98 801	*x*	36
25	9,36 555	d_1	9,37 756	c^1	10,62 244	c^1	9,98 798	*x*	35
26	608	d_1	812	c^1	188	c^1	795	*x*	34
27	660	a^1	868	h^1	132	h^1	792	*x*	33
28	713	*a*	924	*k*	076	*k*	789	*x*	32
29	9,36 766	e^1	9,37 980	k_1	10,62 020	k_1	9,98 786	*x*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	9	18	27	35	44
b	9	18	27	36	45
c	10	19	28	37	46
d	9	18	26	35	44
e	8	17	26	35	43
f	10	19	29	38	48

76°

″	10″	20″	30″	40″	50″
g	9	19	28	38	47
h	9	18	28	37	47
k	9	19	28	37	46
x	0	1	1	2	2
y	0	0	1	2	2
z	1	1	2	2	3

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,36 819	g^1	9,38 035	a^1	10,61 965	a^1	9,98 783	x	30
31	871	d^1	091	a_1	909	a_1	780	x	29
32	924	g^1	147	c	853	c	777	x	28
33	36 976	d^1	202	a_1	798	a_1	774	x^1	27
34	9,37 028	k	9,38 257	a^1	10,61 743	a^1	9,98 771	y^1	26
35	9,37 081	e	9,38 313	c^1	10,61 687	c^1	9,98 768	y^1	25
36	133	e^1	368	a_1	632	a_1	765	y^1	24
37	185	d^1	423	a	577	a	762	y^1	23
38	237	d^1	479	c_1	521	c_1	759	y^1	22
39	9,37 289	d^1	9,38 534	c_1	10,61 466	c_1	9,98 756	y^1	21
40	9,37 341	d^1	9,38 589	c_1	10,61 411	c_1	9,98 753	y^1	20
41	393	d^1	644	c_1	356	c_1	750	y^1	19
42	445	e	699	b	301	b	746	x	18
43	497	e_1	754	b	246	b	743	x	17
44	9,37 549	e_1	9,38 808	a	10,61 192	a	9,98 740	x	16
45	9,37 600	k_1	9,38 863	c	10,61 137	c	9,98 737	x	15
46	652	e_1	918	b	082	b	734	x	14
47	703	k_1	38 972	a	61 028	a	731	y	13
48	755	e_1	39 027	b	60 973	b	728	y^1	12
49	9,37 806	e	9,39 082	b	10,60 918	b	9,98 725	y^1	11
50	9 37 858	h^1	9,39 136	b	10,60 864	b	9,98 722	y^1	10
51	909	g	190	c^1	810	c^1	719	y^1	9
52	37 960	e_1	245	b	755	b	715	x	8
53	38 011	e_1	299	b	701	b	712	x	7
54	9,38 062	e_1	9,39 353	b	10,60 647	b	9,98 709	x	6
55	9,38 113	e_1	9,39 407	b	10,60 593	b	9,98 706	x	5
56	164	e_1	461	b	539	b	703	y^1	4
57	215	e_1	515	b	485	b	700	y^1	3
58	266	f	569	b	431	b	697	y^1	2
59	9,38 317	h^1	9,39 623	b	10,60 377	b	9,98 694	z	1
60	9,38 368	h	9,39 677	b	10,60 323	b	9,98 690	x	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	10	19	28	37	46
b	9	18	27	36	45
c	9	18	27	37	46
d	9	18	25	35	44
e	9	17	26	35	43
f	9	17	25	34	42

76°

″	10″	20″	30″	40″	50″
g	8	17	26	34	43
h	8	16	25	33	42
k	9	18	27	35	44
x	0	1	1	2	2
y	0	1	2	2	3
z	1	1	2	3	3

Sin+, Tan+, add. diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,38 368	g^1	9,39 677	k	10,60 323	k	9,98 690	x	60
1	418	c	731	k	269	k	687	x	59
2	469	f	785	b^1	215	b^1	684	x^1	58
3	519	c	838	k	162	k	681	y^1	57
4	9,38 570	g^1	9,39 892	k	10,60 108	k	9,98 678	y^1	56
5	9,38 620	f^1	9,39 945	k	10,60 055	k	9,98 675	y^1	55
6	670	c^1	39 999	a	60 001	a	671	x	54
7	721	g^1	40 052	k	59 948	k	668	x	53
8	771	f	106	b^1	894	b^1	665	y	52
9	9,38 821	f	9,40 159	k	10,59 841	k	9,98 662	y	51
10	9,38 871	f	9,40 212	k	10,59 788	k	9,98 659	y	50
11	921	f	266	e^1	734	e^1	656	z	49
12	38 971	f	319	b	681	b	652	x	48
13	39 021	f_1	372	b^1	628	b^1	649	x^1	47
14	9,39 071	g	9,40 425	b^1	10,59 575	b^1	9,98 646	y^1	46
15	9,39 121	h^1	9,40 478	b	10,59 522	b	9,98 643	y^1	45
16	170	d^1	531	b	469	b	640	z	44
17	220	g	584	b	416	b	636	x	43
18	270	h^1	636	a	364	a	633	y	42
19	9,39 319	f_1	9,40 689	a_1	10,59 311	a_1	9,98 630	y^1	41
20	9,39 369	h	9,40 742	b	10,59 258	b	9,98 627	y^1	40
21	418	g	795	e	205	e	623	x	39
22	467	d	847	b^1	153	b^1	620	x^1	38
23	517	h	900	e	100	e	617	y^1	37
24	9,39 566	h^1	9,40 952	b^1	10,59 048	b^1	9,98 614	y^1	36
25	9,39 615	g	9,41 005	e_1	10,58 995	e_1	9,98 610	x	35
26	664	g	057	b	943	b	607	x^1	34
27	713	g	109	b^1	891	b^1	604	y^1	33
28	762	g	161	a_1	839	a_1	601	y^1	32
29	9,39 811	g	9,41 214	e_1	10,58 786	e_1	9,98 597	x	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	75°	″	10″	20″	30″	40″	50″
a	9	18	27	36	44		g	8	16	25	33	41
b	9	17	26	35	44		h	8	16	24	32	41
c	9	17	25	34	42		k	9	18	27	36	45
d	9	17	25	33	41		x	0	1	1	2	2
e	8	17	26	35	43		y	0	1	2	2	3
f	8	17	25	33	42		z	1	2	2	3	3

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,39 860	*f*	9,41 266	d^1	10,58 734	d^1	9,98 594	x^1	**30**
31	909	*g*	318	*a*	682	*a*	591	*y*	29
32	39 958	*g*	370	*a*	630	*a*	588	y^1	28
33	40 006	f^1	422	*a*	578	*a*	584	*x*	27
34	9,40 055	*g*	9,41 474	*d*	10,58 526	*d*	9,98 581	*z*	26
35	9,40 103	*c*	9,41 526	*d*	10,58 474	*d*	9,98 578	*y*	25
36	152	*g*	578	d_1	422	d_1	574	*x*	24
37	200	*c*	629	a^1	371	a^1	571	x^1	23
38	249	*g*	681	b^1	319	b^1	568	*y*	22
39	9,40 297	*g*	9,41 733	d_1	10,58 267	d_1	9,98 565	z^1	21
40	9,40 346	*g*	9,41 784	*a*	10,58 216	*a*	9,98 561	*x*	**20**
41	394	*g*	836	*d*	164	*d*	558	*y*	19
42	442	*g*	887	*a*	113	*a*	555	y^1	18
43	490	*g*	939	d_1	061	d_1	551	*x*	17
44	9,40 538	*g*	9,41 990	b^1	10,58 010	b^1	9,98 548	*y*	16
45	9,40 586	*g*	9,42 041	a^1	10,57 959	a^1	9,98 545	y^1	15
46	634	*g*	093	e^1	907	e^1	541	*x*	14
47	682	*g*	144	b^1	856	b^1	538	*y*	13
48	730	*g*	195	b^1	805	b^1	535	y^1	12
49	9,40 778	h^1	9,42 246	b^1	10,57 754	b^1	9,98 531	*x*	11
50	9,40 825	*g*	9,42 297	b^1	10,57 703	b^1	9,98 528	*y*	**10**
51	873	*g*	348	b^1	652	b^1	525	y^1	9
52	921	*h*	399	b^1	601	b^1	521	*x*	8
53	40 968	*g*	450	b^1	550	b^1	518	*y*	7
54	9,41 016	*h*	9,42 501	*b*	10,57 499	*b*	9,98 515	z^1	6
55	9,41 063	*g*	9,42 552	e^1	10,57 448	e^1	9,98 511	x^1	5
56	111	*k*	603	e^1	397	e^1	508	*y*	4
57	158	h^1	653	b^1	347	b^1	505	z^1	3
58	205	*g*	704	c^1	296	c^1	501	*z*	2
59	9,41 252	*g*	9,42 755	*e*	10,57 245	*e*	9,98 498	*y*	1
60	9,41 300	*k*	9,42 805	*b*	10,57 195	*b*	9,98 494	*x*	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**75°**	″	10″	20″	30″	40″	50″
a	9	17	26	35	43		*g*	8	16	24	32	40
b	9	17	26	34	42		*h*	8	16	23	31	39
c	9	17	25	33	41		*k*	7	15	23	31	39
d	8	17	26	34	43		*x*	0	1	1	2	2
e	8	17	25	33	42		*y*	1	1	2	2	3
f	8	16	24	33	41		*z*	0	1	2	2	3

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,41 300	h^1	9,42 805	a^1	10,57 195	a^1	9,98 494	x	**60**
1	347	g	856	c	144	c	491	y	59
2	394	g	906	a	094	a	488	z^1	58
3	441	g	42 957	d^1	57 043	d^1	484	x^1	57
4	9,41 488	g	9,43 007	c^1	10,56 993	c^1	9,98 481	y	56
5	9,41 535	h^1	9,43 057	a	10,56 943	a	9,98 477	x	55
6	582	h^1	108	d	892	d	474	y	54
7	628	f^1	158	d^1	842	d^1	471	z^1	53
8	675	f	208	c	792	c	467	z	52
9	9,41 722	g	9,43 258	c	10,56 742	c	9,98 464	y^1	51
10	9,41 768	f^1	9,43 308	c	10,56 692	c	9,98 460	x^1	**50**
11	815	g	358	c	642	c	457	y	49
12	861	f^1	408	c	592	c	453	x	48
13	908	g	458	c	542	c	450	y	47
14	9,41 954	f^1	9,43 508	d	10,56 492	d	9,98 447	z^1	46
15	9,42 001	h	9,43 558	d_1	10,56 442	d_1	9,98 443	z	45
16	047	g	607	a_1	393	a_1	440	y^1	44
17	093	f	657	c_1	343	c_1	436	x^1	43
18	140	k	707	d	293	d	433	y	42
19	9,42 186	k	9,43 756	a_1	10,56 244	a_1	9,98 429	x^1	41
20	9,42 232	k	9,43 806	d	10,56 194	d	9,98 426	y	**40**
21	278	k	855	a_1	145	a_1	422	x	39
22	324	k	905	d	095	d	419	y	38
23	370	k	43 954	c_1	56 046	c_1	415	x	37
24	9,42 416	k	9,44 004	d_1	10,55 996	d_1	9,98 412	y	36
25	9,42 461	f	9,44 053	d	10,55 947	d	9,98 409	z^1	35
26	507	f_1	102	c_1	898	c_1	405	y	34
27	553	g_1	151	b	849	b	402	z^1	33
28	599	k^1	201	e	799	e	398	y	32
29	9,42 644	f_1	9,44 250	e	10,55 750	e	9,98 395	z^1	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

74°

″	10″	20″	30″	40″	50″	″	10″	20″	30″	40″	50″
a	9	17	25	34	42	g	8	15	23	31	39
b	9	17	25	33	41	h	7	15	23	31	38
c	8	17	25	33	42	k	7	15	23	30	38
d	8	16	25	33	41	x	0	1	1	−2	2
e	8	16	24	32	41	y	1	1	2	2	3
f	8	16	23	31	39	z	0	1	2	2	3

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,42 690	f^1	9,44 299	c^1	10,55 701	c^1	9,98 391	w	30
31	735	d	348	c^1	652	c^1	388	x	29
32	781	f^1	397	c	603	c	384	w	28
33	826	d_1	446	c	554	c	381	x	27
34	9,42 872	f	9,44 495	h	10,55 505	h	9,98 377	w	26
35	9,42 917	e^1	9,44 544	h	10,55 456	h	9,98 373	y	25
36	42 962	e^1	592	a	408	a	370	w	24
37	43 008	f	641	c^1	359	c^1	366	y^1	23
38	053	f	690	h	310	h	363	w	22
39	9,43 098	f	9,44 738	a^1	10,55 262	a^1	9,98 359	y^1	21
40	9,43 143	f	9,44 787	c	10,55 213	c	9,98 356	w^1	20
41	188	f	836	h	164	h	352	z	19
42	233	f	884	c	116	c	349	w^1	18
43	278	f	933	h	067	h	345	z	17
44	9,43 323	f	9,44 981	h	10,55 019	h	9,98 342	x	16
45	9,43 367	e^1	9,45 029	a	10,54 971	a	9,98 338	w	15
46	412	e	078	h	922	h	334	y	14
47	457	f	126	h	874	h	331	w	13
48	502	g	174	h	826	h	327	y^1	12
49	9,43 546	e	9,45 222	a	10,54 778	a	9,98 324	w^1	11
50	9,43 591	g^1	9,45 271	h	10,54 729	h	9,98 320	z	10
51	635	e	319	h	681	h	317	x	9
52	680	g^1	367	h	633	h	313	w	8
53	724	e_1	415	h	585	h	309	y^1	7
54	9,43 769	g	9,45 463	h	10,54 537	h	9,98 306	w^1	6
55	9,43 813	g^1	9,45 511	h	10,54 489	h	9,98 302	z	5
56	857	e_1	559	d^1	441	d^1	299	x	4
57	901	e	606	b	394	b	295	w	3
58	946	g	654	h	346	h	291	y^1	2
59	9,43 990	g_1	9,45 702	h	10,54 298	h	9,98 288	w^1	1
60	9,44 034	g_1	9,45 750	d	10,54 250	d	9,98 284	z	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	8	17	25	33	41
b	8	16	24	32	40
c	8	16	24	32	41
d	8	16	23	31	38
e	8	15	23	30	37
f	7	15	22	30	37

74°

″	10″	20″	30″	40″	50″
g	7	14	22	29	37
h	8	16	24	32	40
w	1	1	2	2	3
x	1	2	2	3	3
y	0	1	1	2	2
z	0	1	2	2	3

Sin+, Tan+, add. diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,44 034	h^1	9,45 750	b	10,54 250	b	9,98 284	z	60
1	078	f^1	797	a	203	a	281	y	59
2	122	h	845	a	155	a	277	y_1	58
3	166	h	892	a	108	a	273	z	57
4	9,44 210	h	9,45 940	a	10,54 060	a	9,98 270	y	56
5	9,44 253	c^1	9,45 987	a	10,54 013	a	9,98 266	z^1	55
6	297	c	46 035	a_1	53 965	a_1	262	z_1	54
7	341	f	082	a	918	a	259	y	53
8	385	h	130	g	870	g	255	z^1	52
9	9,44 428	c	9,46 177	b^1	10,53 823	b^1	9,98 251	z_1	51
10	9,44 472	h	9,46 224	a	10,53 776	a	9,98 248	y_1	50
11	516	k^1	271	a	729	a	244	z^1	49
12	559	f	319	e^1	681	e^1	240	z_1	48
13	602	c	366	g	634	g	237	y_1	47
14	9,44 646	h	9,46 413	b	10,53 587	b	9,98 233	z^1	46
15	9,44 689	d	9,46 460	b	10,53 540	b	9,98 229	z_1	45
16	733	k	507	b	493	b	226	y	44
17	776	k^1	554	b	446	b	222	z^1	43
18	819	h	601	g	399	g	218	z	42
19	9,44 862	f	9,46 648	g	10,53 352	g	9,98 215	y	41
20	9,44 905	d	9,46 694	a_1	10,53 306	a_1	9,98 211	y_1	40
21	948	d	741	b^1	259	b^1	207	z	39
22	44 992	l	788	b	212	b	204	y^1	38
23	45 035	l	835	g	165	g	200	y_1	37
24	9,45 077	d	9,46 881	b^1	10,53 119	b^1	9,98 196	z^1	36
25	9,45 120	d	9,46 928	b	10,53 072	b	9,98 192	z	35
26	163	h	46 975	e	53 025	e	189	y	34
27	206	k^1	47 021	b	52 979	b	185	y_1	33
28	249	l	068	e	932	e	181	z	32
29	9,45 292	l	9,47 114	b	10,52 886	b	9,98 177	z_1	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	73°	″	10″	20″	30″	40″	50″
a	8	16	24	32	40		g	8	15	23	31	39
b	8	16	23	31	39		h	7	14	22	29	36
c	8	15	22	29	37		k	7	14	21	28	36
d	8	15	22	29	36		l	7	14	21	28	35
e	7	15	23	31	38		y	1	2	2	3	3
f	7	15	22	29	36		z	0	1	2	2	3

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,45 334	c^1	9,47 160	e^1	10,52 840	e^1	9,98 174	x	30
31	377	c	207	f	793	f	170	x_1	29
32	419	a^1	253	e	747	e	166	z^1	28
33	462	c	299	e^1	701	e^1	162	z	27
34	9,45 504	a^1	9,47 346	g	10,52 654	g	9,98 159	x	26
35	9,45 547	c	9,47 392	f	10,52 608	f	9,98 155	x_1	25
36	589	c^1	438	f^1	562	f^1	151	z^1	24
37	632	c	484	e	516	e	147	z	23
38	674	c	530	e	470	e	144	x^1	22
39	9,45 716	c	9,47 576	e	10,52 424	e	9,98 140	x_1	21
40	9,45 758	a	9,47 622	e	10,52 378	e	9,98 136	y	20
41	801	c	668	e	332	e	132	z^1	19
42	843	c	714	g^1	286	g^1	129	x^1	18
43	885	c	760	f	240	f	125	x	17
44	9,45 927	c	9,47 806	h^1	10,52 194	h^1	9,98 121	x_1	16
45	9,45 969	c	9,47 852	h	10,52 148	h	9,98 117	x_1	15
46	46 011	c	897	e	103	e	113	z^1	14
47	053	c	943	f	057	f	110	x^1	13
48	095	b^1	47 989	h	52 011	h	106	x	12
49	9,46 136	c	9,48 035	k^1	10,51 965	k^1	9,98 102	x_1	11
50	9,46 178	c	9,48 080	h^1	10,51 920	h^1	9,98 098	y	10
51	220	c	126	k^1	874	k^1	094	z^1	9
52	262	b	171	g	829	g	090	z^1	8
53	303	c	217	k^1	783	k^1	087	x^1	7
54	9,46 345	d^1	9,48 262	h^1	10,51 738	h^1	9,98 083	x	6
55	9,46 386	c	9,48 307	g^1	10,51 693	g^1	9,98 079	x_1	5
56	428	d^1	353	h	647	h	075	x_1	4
57	469	c	398	h^1	602	h^1	071	z^1	3
58	511	d	443	g^1	557	g^1	067	z^1	2
59	9,46 552	c	9,48 489	k	10,51 511	k	9,98 063	z	1
60	9,46 594	b_1	9,48 534	h	10,51 466	h	9,98 060	x_1	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

73°

″	10″	20″	30″	40″	50″
a	7	1$\bar{4}$	22	29	36
b	$\underline{7}$	1$\bar{3}$	20	27	34
c	7	14	21	2$\bar{8}$	3$\bar{5}$
d	7	14	21	2$\bar{7}$	34
e	8	16	2$\bar{3}$	31	39
f	8	15	23	31	3$\bar{8}$

″	10″	20″	30″	40″	50″
g	$\bar{7}$	1$\bar{5}$	23	31	38
h	$\bar{7}$	15	23	30	38
k	7	15	22	30	3$\bar{7}$
x	1	$\underline{2}$	2	3	$\bar{3}$
y	1	1	2	2	3
z	0	1	$\bar{1}$	2	3

Sin+, Tan+, add. diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,46 594	b^1	9,48 534	h^1	10,51 466	h^1	9,98 060	x^1	60
1	635	d^1	579	g	421	g	056	x	59
2	676	a	624	g	376	g	052	x_1	58
3	717	a^1	669	g	331	g	048	x_1	57
4	9,46 758	a^1	9,48 714	g	10,51 286	g	9,98 044	y^1	56
5	9,46 800	b^1	9,48 759	g	10,51 241	g	9,98 040	y^1	55
6	841	d	804	g	196	g	036	y^1	54
7	882	d	849	g	151	g	032	y	53
8	923	d	894	g	106	g	029	x^1	52
9	9,46 964	d	9,48 939	h	10,51 061	h	9,98 025	x^1	51
10	9,47 005	b^1	9,48 984	h	10,51 016	h	9,98 021	x_1	50
11	045	a^1	49 029	l	50 971	l	017	x_1	49
12	086	a	073	g	927	g	013	x_1	48
13	127	d^1	118	h	882	h	009	x_1	47
14	9,47 168	d	9,49 163	l	10,50 837	l	9,98 005	y^1	46
15	9,47 209	b	9,49 207	g_1	10,50 793	g_1	9,98 001	y^1	45
16	249	f	252	h	748	h	97 997	y^1	44
17	290	d	296	g	704	g	993	y^1	43
18	330	f	341	h	659	h	989	y^1	42
19	9,47 371	d	9,49 385	g_1	10,50 615	g_1	9,97 986	x^1	41
20	9,47 411	f	9,49 430	l	10,50 570	l	9,97 982	x^1	40
21	452	d	474	l^1	526	l^1	978	x^1	39
22	492	f	519	k^1	481	k^1	974	x^1	38
23	533	b	563	h	437	h	970	x^1	37
24	9,47 573	d	9,49 607	l^1	10,50 393	l^1	9,97 966	x^1	36
25	9,47 613	d^1	9,49 652	k	10,50 348	k	9,97 962	x	35
26	654	c	696	k^1	304	k^1	958	x_1	34
27	694	b	740	l	260	l	954	x_1	33
28	734	e	784	l	216	l	950	x_1	32
29	9,47 774	d	9,49 828	l^1	10,50 172	l^1	9,97 946	x_1	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	7	14	21	28	34
b	6	13	20	27	33
c	6	13	20	26	33
d	7	13	20	27	34
e	7	13	20	27	33
f	7	14	21	27	34

72°

″	10″	20″	30″	40″	50″
g	8	15	23	30	38
h	7	15	22	30	37
k	7	14	22	29	36
l	7	15	22	29	37
x	1	2	2	3	3
y	0	1	1	2	3

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,47 814	a^1	9,49 872	e	10,50 128	e	9,97 942	y	30
31	854	a^1	916	e	084	e	938	y	29
32	894	a^1	49 960	e	50 040	e	934	y	28
33	934	a	50 004	e	49 996	e	930	y	27
34	9,47 974	b^1	9,50 048	f	10,49 952	f	9,97 926	y	26
35	9,48 014	b^1	9,50 092	f	10,49 908	f	9,97 922	y	25
36	054	d	136	h	864	h	918	y	24
37	094	d	180	h	820	h	914	y	23
38	133	a^1	223	e	777	e	910	y	22
39	9,48 173	b^1	9,50 267	f	10,49 733	f	9,97 906	y	21
40	9,48 213	d	9,50 311	h	10,49 689	h	9,97 902	y	20
41	252	a	355	h_1	645	h_1	898	y	19
42	292	b	398	f	602	f	894	y	18
43	332	c^1	442	h	558	h	890	x	17
44	9,48 371	b^1	9,50 485	k^1	10,49 515	k^1	9,97 886	x	16
45	9,48 411	c^1	9,50 529	h	10,49 471	h	9,97 882	x	15
46	450	b	572	k^1	428	k^1	878	x_1	14
47	490	c	616	h	384	h	874	x	13
48	529	d	659	k	341	k	870	x	12
49	9,48 568	b	9,50 703	h_1	10,49 297	h_1	9,97 866	x	11
50	9,48 607	a	9,50 746	h	10,49 254	h	9,97 861	z	10
51	647	c	789	k	211	k	857	z	9
52	686	d	833	g	167	g	853	z	8
53	725	b	876	h_1	124	h_1	849	z	7
54	9,48 764	b	9,50 919	h	10,49 081	h	9,97 845	z^1	6
55	9,48 803	b	9,50 962	f_1	10,49 038	f_1	9,97 841	y	5
56	842	b	51 005	k	48 995	k	837	y	4
57	881	b	048	k	952	k	833	y	3
58	920	b	092	g	908	g	829	x	2
59	9,48 959	b	9,51 135	g	10,48 865	g	9,97 825	x	1
60	9,48 998	b	9,51 178	g	10,48 822	a	9,97 821	x	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	72°	″	10″	20″	30″	40″	50″
a	7	14	20	27	33		g	7	14	21	28	35
b	7	13	20	26	33		h	7	14	22	29	36
c	6	13	19	26	32		k	8	15	22	29	36
d	6	13	20	26	33		x	1	2	2	3	4
e	8	15	22	30	37		y	1	1	2	3	3
f	7	15	22	29	37		z	0	1	2	2	3

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,48 998	a^1	9,51 178	g	10,48 822	g	9,97 821	w	**60**
1	49 037	a	221	g	779	g	817	w^1	59
2	076	b^1	264	g	736	g	812	z	58
3	115	b^1	306	h	694	h	808	z	57
4	9,49 153	a^1	9,51 349	f	10,48 651	f	9,97 804	x	56
5	9,49 192	a	9,51 392	e^1	10,48 608	e^1	9,97 800	x	55
6	231	b^1	435	g^1	565	g^1	796	x^1	54
7	269	a^1	478	g	522	g	792	w	53
8	308	b^1	520	h	480	h	788	w	52
9	9,49 347	c^1	9,51 563	e	10,48 437	e	9,97 784	w^1	51
10	9,49 385	d	9,51 606	g	10,48 394	g	9,97 779	z	**50**
11	424	c^1	648	f	352	f	775	y	49
12	462	b^1	691	g	309	g	771	x	48
13	500	a	734	g	266	g	767	x^1	47
14	9,49 539	b	9,51 776	g	10,48 224	g	9,97 763	w	46
15	9,49 577	d	9,51 819	g	10,48 181	g	9,97 759	w	45
16	615	a	861	g	139	g	754	z	44
17	654	c^1	903	h	097	h	750	y	43
18	692	b	946	g	054	g	746	x	42
19	9,49 730	b^1	9,51 988	g	10,48 012	g	9,97 742	x^1	41
20	9,49 768	d	9,52 031	g	10,47 969	g	9,97 738	w	**40**
21	806	d	073	g	927	g	734	w^1	39
22	844	d	115	g	885	g	729	z	38
23	882	d	157	g	843	g	725	x	37
24	9,49 920	d	9,52 200	g	10,47 800	g	9,97 721	x^1	36
25	9,49 958	d	9,52 242	g	10,47 758	g	9,97 717	w	35
26	49 996	d	284	g	716	g	713	w^1	34
27	50 034	d_1	326	g	674	g	708	z	33
28	072	b	368	g	632	g	704	x	32
29	9,50 110	c	9,52 410	g	10,47 590	g	9,97 700	w	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

71°

″	10″	20″	30″	40″	50″	″	10″	20″	30″	40″	50″
a	7	13	20	26	32	g	7	14	21	28	35
b	6	13	19	25	32	h	8	15	22	29	36
c	6	12	19	25	31	w	1	2	2	3	4
d	7	13	19	26	32	x	1	1	2	3	3
e	7	14	21	29	36	y	0	1	2	3	3
f	7	15	22	29	36	z	0	1	2	2	3

Sin+, Tan+, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,50 148	*f*	9,52 452	*a*	10,47 548	*a*	9,97 696	y^1	**30**
31	185	e^1	494	*a*	506	*a*	691	*z*	29
32	223	f^1	536	*a*	464	*a*	687	*y*	28
33	261	*f*	578	*a*	422	*a*	683	*x*	27
34	9,50 298	*e*	9,52 620	*a*	10,47 380	*a*	9,97 679	y^1	26
35	9,50 336	*f*	9,52 661	*a*	10,47 339	*a*	9,97 674	*z*	25
36	374	*g*	703	*a*	297	*a*	670	z^1	24
37	411	f^1	745	*a*	255	*a*	666	*x*	23
38	449	*g*	787	*a*	213	*a*	662	y^1	22
39	9,50 486	*f*	9,52 829	*b*	10,47 171	*b*	9,97 657	*z*	21
40	9,50 523	*e*	9,52 870	*a*	10,47 130	*a*	9,97 653	*y*	**20**
41	561	*g*	912	*a*	088	*a*	649	y^1	19
42	598	f^1	953	*a*	047	*a*	645	y^1	18
43	635	*h*	52 995	*a*	47 005	*a*	640	*z*	17
44	9,50 673	*g*	9,53 037	b^1	10,46 963	b^1	9,97 636	*y*	16
45	9,50 710	*f*	9,53 078	*a*	10,46 922	*a*	9,97 632	y^1	15
46	747	f^1	120	b^1	880	b^1	628	x^1	14
47	784	f^1	161	*a*	839	*a*	623	*y*	13
48	821	*h*	202	*a*	798	*a*	619	y^1	12
49	9,50 858	*h*	9,53 244	*d*	10,46 756	*d*	9,97 615	x^1	11
50	9,50 896	*k*	9,53 285	*a*	10,46 715	*a*	9,97 610	z^1	**10**
51	933	*k*	327	*b*	673	*b*	606	*x*	9
52	50 970	*k*	368	*d*	632	*d*	602	y^1	8
53	51 007	*k*	409	*a*	591	*a*	597	z^1	7
54	9,51 043	*h*	9,53 450	*a*	10,46 550	*a*	9,97 593	*x*	6
55	9,51 080	f^1	9,53 492	*b*	10,46 508	*b*	9,97 589	y^1	5
56	117	*f*	533	b^1	467	b^1	584	z^1	4
57	154	k^1	574	b^1	426	b^1	580	*x*	3
58	191	*k*	615	*d*	385	*d*	576	y^1	2
59	9,51 227	*h*	9,53 656	a_1	10,46 344	a_1	9,97 571	z^1	1
60	9,51 264	*f*	9,53 697	a_1	10,46 303	a_1	9,97 567	*x*	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**71°**	″	10″	20″	30″	40″	50″
a	7	14	21	28	35		*g*	6	12	18	25	31
b	6	13	20	27	34		*h*	7	13	19	25	31
c	6	14	21	28	35		*k*	6	12	18	24	30
d	7	14	21	27	34		*x*	1	1	2	3	4
e	7	13	19	25	32		*y*	1	1	2	3	3
f	6	12	19	25	31		*z*	0	1	2	2	3

Sin+, Tan+, add. diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,51 264	*a*	9,53 697	e^1	10,46 303	e^1	9,97 567	*w*	**60**
1	301	*b*	738	e^1	262	e^1	563	*x*	59
2	338	*b*	779	e^1	221	e^1	558	y^1	58
3	374	b^1	820	*e*	180	*e*	554	w^1	57
4	9,51 411	*b*	9,53 861	*e*	10,46 139	*e*	9,97 550	*x*	56
5	9,51 447	*c*	9,53 902	f^1	10,46 098	f^1	9,97 545	*z*	55
6	484	*b*	943	*f*	057	*f*	541	w^1	54
7	520	b^1	53 984	*f*	46 016	*f*	536	*y*	53
8	557	*b*	54 025	g^1	45 975	g^1	532	*w*	52
9	9,51 593	*b*	9,54 065	*e*	10,45 935	*e*	9,97 528	w^1	51
10	9,51 629	*a*	9,54 106	f^1	10,45 894	f^1	9,97 523	y^1	**50**
11	666	*b*	147	*f*	853	*f*	519	w^1	49
12	702	*b*	187	e^1	813	e^1	515	*x*	48
13	738	*b*	228	f^1	772	f^1	510	*w*	47
14	9,51 774	a^1	9,54 269	*f*	10,45 731	*f*	9,97 506	w^1	46
15	9,51 811	*b*	9,54 309	*e*	10,45 691	*e*	9,97 501	y^1	45
16	847	*b*	350	*f*	650	*f*	497	w^1	44
17	883	*b*	390	*e*	610	*e*	492	*y*	43
18	919	*b*	431	*f*	569	*f*	488	*w*	42
19	9,51 955	*b*	9,54 471	*e*	10,45 529	*e*	9,97 484	*x*	41
20	9,51 991	*b*	9,54 512	*f*	10,45 488	*f*	9,97 479	*w*	**40**
21	52 027	*b*	552	*e*	448	*e*	475	w^1	39
22	063	*b*	593	*g*	407	*g*	470	y^1	38
23	099	*b*	633	f^1	367	f^1	466	w^1	37
24	9,52 135	*b*	9,54 673	*e*	10,45 327	*e*	9,97 461	y^1	36
25	9,52 171	*b*	9,54 714	*g*	10,45 286	*g*	9,97 457	w^1	35
26	207	*d*	754	*f*	246	*f*	453	*x*	34
27	242	*b*	794	f^1	206	f^1	448	*w*	33
28	278	*b*	835	*h*	165	*h*	444	*x*	32
29	9,52 314	*b*	9,54 875	*h*	10,45 125	*h*	9,97 439	*w*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**70°**	″	10″	20″	30″	40″	50″
a	6	12	19	25	31		*g*	6	13	20	27	33
b	6	12	18	24	30		*h*	6	13	20	26	33
c	6	12	18	25	31		*w*	1	1	2	3	4
d	6	11	17	23	29		*x*	1	2	3	3	4
e	7	14	21	27	34		*y*	0	1	2	2	3
f	7	13	20	27	34		*z*	1	1	2	3	3

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,52 350	*a*	9,54 915	*e*	10,45 085	*e*	9,97 435	x^1	30
31	385	*c*	955	*e*	045	*e*	430	*w*	29
32	421	b^1	54 995	e^1	45 005	e^1	426	x^1	28
33	456	*c*	55 035	*f*	44 965	*f*	421	w^1	27
34	9,52 492	*c*	9,55 075	*f*	10,44 925	*f*	9,97 417	x^1	26
35	9,52 527	*c*	9,55 115	*f*	10,44 885	*f*	9,97 412	*w*	25
36	563	*c*	155	*f*	845	*f*	408	x^1	24
37	598	*c*	195	f_1	805	f_1	403	*w*	23
38	634	*b*	235	*e*	765	*e*	399	x^1	22
39	9,52 669	*c*	9,55 275	*e*	10,44 725	*e*	9,97 394	*w*	21
40	9,52 705	*a*	9,55 315	g^1	10,44 685	g^1	9,97 390	x^1	20
41	740	b^1	355	*g*	645	*g*	385	*w*	19
42	775	*c*	395	h^1	605	h^1	381	x^1	18
43	811	*a*	434	*f*	566	*f*	376	*w*	17
44	9,52 846	*d*	9,55 474	*e*	10,44 526	*e*	9,97 372	x^1	16
45	9,52 881	*b*	9,55 514	g^1	10,44 486	g^1	9,97 367	*w*	15
46	916	b^1	554	h^1	446	h^1	363	x^1	14
47	951	*c*	593	*e*	407	*e*	358	*x*	13
48	52 986	*c*	633	g^1	367	g^1	353	*z*	12
49	9,53 021	*c*	9,55 673	h^1	10,44 327	h^1	9,97 349	*x*	11
50	9 53 056	*c*	9,55 712	*e*	10,44 288	*e*	9,97 344	*z*	10
51	092	*a*	752	h^1	248	h^1	340	*x*	9
52	126	*c*	791	*e*	209	*e*	335	*w*	8
53	161	*c*	831	*g*	169	*g*	331	x^1	7
54	9,53 196	b^1	9,55 870	*e*	10,44 130	*e*	9,97 326	*w*	6
55	9,53 231	*b*	9,55 910	h^1	10,44 090	h^1	9,97 322	*y*	5
56	266	*d*	949	g^1	051	g^1	317	*x*	4
57	301	*d*	55 989	*h*	44 011	*h*	312	*z*	3
58	336	*a*	56 028	*g*	43 972	*g*	308	x^1	2
59	9,53 370	b^1	9,56 067	g^1	10,43 933	g^1	9,97 303	*w*	1
60	9,53 405	*b*	9 56 107	*h*	10,43 893	*h*	9,97 299	x^1	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	70°	″	10″	20″	30″	40″	50″
a	6	11̄	17	23	29		*g*	6̄	13	20	26	33
b	6	12	18	23̄	29		*h*	6	13	19	26	32̄
c	6	12	18	24	30		*w*	1	1	2	3	4
d	6	12	17	23	29		*x*	1	2	2̄	3	4
e	7	13	20	27	33̄		*y*	1	2	3	4	4
f	7	14	20	27	34̄		*z*	0	1	2	3	3

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,53 405	a^1	9,56 107	f	10,43 893	f	9,97 299	x^1	**60**
1	440	c^1	146	g_1	854	g_1	294	x	59
2	475	c	185	g	815	g	289	y	58
3	509	a	224	h^1	776	h^1	285	x^1	57
4	9,53 544	c^1	9,56 264	f	10,43 736	f	9,97 280	z	56
5	9,53 578	a^1	9,56 303	f	10,43 697	f	9,97 276	z^1	55
6	613	c^1	342	g_1	658	g_1	271	x	54
7	647	a^1	381	g	619	g	266	y^1	53
8	682	c^1	420	g	580	g	262	x^1	52
9	9,53 716	a	9,56 459	g	10,43 541	g	9,97 257	x	51
10	9,53 751	c	9,56 498	g	10,43 502	g	9,97 252	y	**50**
11	785	a	537	g	463	g	248	x^1	49
12	819	a^1	576	g	424	g	243	z	48
13	854	c	615	g	385	g	238	y	47
14	9,53 888	c^1	9,56 654	g	10,43 346	g	9,97 234	x^1	46
15	9,53 922	a	9,56 693	g	10,43 307	g	9,97 229	z	45
16	957	d	732	k^1	268	k^1	224	y	44
17	53 991	d^1	771	f	229	f	220	x^1	43
18	54 025	e	810	f	190	f	215	z	42
19	9,54 059	e	9,56 849	k	10,43 151	k	9,97 210	y	41
20	9,54 093	c^1	9,56 887	g	10,43 113	g	9,97 206	x^1	**40**
21	127	a	926	k^1	074	k^1	201	z	39
22	161	a	56 965	f	43 035	f	196	y	38
23	195	a	57 004	k	42 996	k	192	x^1	37
24	9,54 229	a	9,57 042	h	10,42 958	h	9,97 187	x	36
25	9,54 263	b^1	9,57 081	f	10,42 919	f	9,97 182	y^1	35
26	297	e	120	k	880	k	178	z^1	34
27	331	e	158	k^1	842	k^1	173	x	33
28	365	b	197	f_1	803	f_1	168	z	32
29	9,54 399	d	9,57 235	h	10,42 765	h	9,97 163	y	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	6	12	17	23	29
b	6	11	17	22	28
c	5	11	17	23	28
d	5	11	17	22	28
e	6	11	17	23	28
f	6	13	19	26	32

69°

″	10″	20″	30″	40″	50″
g	7	13	20	26	33
h	7	13	20	26	32
k	6	12	19	25	32
x	1	2	2	3	4
y	0	1	2	3	3
z	1	1	2	3	4

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,54 433	a^1	9,57 274	d	10,42 726	d	9,97 159	v	30
31	466	b^1	312	g^1	688	g^1	154	w	29
32	500	b	351	d	649	d	149	x	28
33	534	c	389	g	611	g	145	y	27
34	9,54 567	b^1	9,57 428	e^1	10,42 572	e^1	9,97 140	v	26
35	9,54 601	b	9,57 466	d^1	10,42 534	d^1	9,97 135	z	25
36	635	c	504	g^1	496	g^1	130	x	24
37	668	b^1	543	e^1	457	e^1	126	y	23
38	702	c	581	d^1	419	d^1	121	v	22
39	9,54 735	b^1	9,57 619	g	10,42 381	g	9,97 116	w	21
40	9,54 769	c^1	9,57 658	e	10,42 342	e	9,97 111	x	20
41	802	b^1	696	d	304	d	107	y	19
42	836	c	734	d^1	266	d^1	102	v	18
43	869	b	772	g	228	g	097	w	17
44	9,54 903	a	9,57 810	g^1	10,42 190	g^1	9,97 092	z	16
45	9,54 936	c^1	9,57 849	e	10,42 151	e	9,97 087	x	15
46	54 969	b	887	e	113	e	083	y	14
47	55 003	a	925	e^1	075	e^1	078	v	13
48	036	c	57 963	d	42 037	d	073	z	12
49	9,55 069	c^1	9,58 001	d	10,41 999	d	9,97 068	z	11
50	9,55 102	b	9,58 039	d	10,41 961	d	9,97 063	x	10
51	136	a	077	d	923	d	059	y	9
52	169	a	115	d	885	d	054	v	8
53	202	a	153	e	847	e	049	w	7
54	9,55 235	a	9,58 191	e	10,41 809	e	9,97 044	z	6
55	9,55 268	c^1	9,58 229	e	10,41 771	e	9,97 039	x	5
56	301	c^1	267	f	733	f	035	y	4
57	334	c^1	304	g	696	g	030	y	3
58	367	c^1	342	d	658	d	025	y	2
59	9,55 400	a	9,58 380	f^1	10,41 620	f^1	9,97 020	w	1
60	9,55 433	a	9,58 418	e	10,41 582	e	9,97 015	z	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	5	11	16	22	27
b	6	11	17	23	28
c	5	11	17	22	28
d	6	13	19	25	32
e	6	12	19	25	31
f	6	12	18	25	31

69°

″	10″	20″	30″	40″	50″
g	7	13	19	26	32
v	1	2	3	3	4
w	1	2	2	3	4
x	0	1	2	3	4
y	1	2	3	4	4
z	1	1	2	3	4

Sin+, Tan+, add. diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,55 433	*a*	9,58 418	e^1	10,41 582	e^1	9,97 015	x^1	**60**
1	466	a_1	455	f^1	545	f^1	010	*x*	59
2	499	*a*	493	g^1	507	g^1	005	*x*	58
3	532	*b*	531	e^1	469	e^1	97 001	y^1	57
4	9,55 564	c^1	9,58 569	*e*	10,41 431	*e*	9,96 996	y^1	56
5	9,55 597	*c*	9,58 606	*f*	10,41 394	*f*	9,96 991	*z*	55
6	630	*a*	644	e^1	356	e^1	986	*y*	54
7	663	*b*	681	f^1	319	f^1	981	*y*	53
8	695	c^1	719	*g*	281	*g*	976	x^1	52
9	9,55 728	*a*	9,58 757	*e*	10,41 243	*e*	9,96 971	*x*	51
10	9,55 761	*b*	9,58 794	*g*	10,41 206	*g*	9,96 966	*x*	**50**
11	793	*d*	832	*e*	168	*e*	962	z^1	49
12	826	*a*	869	*g*	131	*g*	957	y^1	48
13	858	*d*	907	*e*	093	*e*	952	*z*	47
14	9,55 891	*a*	9,58 944	e^1	10,41 056	e^1	9,96 947	*z*	46
15	9,55 923	*d*	9,58 981	*f*	10,41 019	*f*	9,96 942	*y*	45
16	956	b^1	59 019	*e*	40 981	*e*	937	*y*	44
17	55 988	*d*	056	*g*	944	*g*	932	*y*	43
18	56 021	b^1	094	h^1	906	h^1	927	x^1	42
19	9,56 053	*a*	9,59 131	*e*	10,40 869	*e*	9,96 922	x^1	41
20	9,56 085	*d*	9,59 168	*g*	10,40 832	*g*	9,96 917	*x*	**40**
21	118	b^1	205	*k*	795	*k*	912	*x*	39
22	150	*a*	243	h^1	757	h^1	907	*x*	38
23	182	*d*	280	*e*	720	*e*	903	z^1	37
24	9,56 215	b_1	9,59 317	e^1	10,40 683	e^1	9,96 898	z^1	36
25	9,56 247	b^1	9,59 354	*g*	10,40 646	*g*	9,96 893	z^1	35
26	279	b^1	391	*k*	609	*k*	888	y^1	34
27	311	*c*	429	*h*	571	*h*	883	y^1	33
28	343	*c*	466	h^1	534	h^1	878	y^1	32
29	9,56 375	*d*	9,59 503	h^1	10,40 497	h^1	9,96 873	y^1	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	5	11	16	22	27
b	5	10	16	21	27
c	6	11	16	22	27
d	6	11	17	22	27
e	6	12	18	25	31
f	7	13	19	25	32

68°

″	10″	20″	30″	40″	50″
g	6	13	19	25	31
h	6	12	18	24	30
k	7	13	19	25	31
x	0	1	2	3	4
y	1	2	2	3	4
z	1	2	3	3	4

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,56 408	a^1	9,59 540	e^1	10,40 460	e^1	9,96 868	v^1	**30**
31	440	a^1	577	e^1	423	e^1	863	v^1	29
32	472	a^1	614	e^1	386	e^1	858	v	28
33	504	a^1	651	e^1	349	e^1	853	v	27
34	9,56 536	a^1	9,59 688	e^1	10,40 312	e^1	9,96 848	v	26
35	9,56 568	a^1	9,59 725	e	10,40 275	e	9,96 843	v	25
36	599	b^1	762	e	238	e	838	v	24
37	631	b^1	799	e	201	e	833	v	23
38	663	b	835	f^1	165	f^1	828	v	22
39	9,56 695	c^1	9,59 872	f	10,40 128	f	9,96 823	v^1	21
40	9,56 727	a^1	9,59 909	g	10,40 091	g	9,96 818	v^1	**20**
41	759	a^1	946	e^1	054	e^1	813	v^1	19
42	790	b^1	59 983	e	40 017	e	808	v^1	18
43	822	c^1	60 019	f^1	39 981	f^1	803	v^1	17
44	9,56 854	a^1	9,60 056	g^1	10,39 944	g^1	9,96 798	v^1	16
45	9,56 886	a	9,60 093	e	10,39 907	e	9,96 793	z	15
46	917	c^1	130	e	870	e	788	z	14
47	949	a^1	166	g^1	834	g^1	783	z	13
48	56 980	b	203	e	797	e	778	z	12
49	9,57 012	c	9,60 240	e	10,39 760	e	9,96 772	y	11
50	9,57 044	a	9,60 276	g	10,39 724	g	9,96 767	y	**10**
51	075	c	313	e	687	e	762	x	9
52	107	a	349	g^1	651	g^1	757	w	8
53	138	c	386	e	614	e	752	w_1	7
54	9,57 169	b	9,60 422	g^1	10,39 578	g^1	9,96 747	w	6
55	9,57 201	a^1	9,60 459	e	10,39 541	e	9,96 742	w	5
56	232	c	495	g^1	505	g^1	737	v	4
57	264	a	532	e	468	e	732	v^1	3
58	295	a^1	568	e^1	432	e^1	727	v^1	2
59	9,57 326	e	9,60 605	e	10,39 395	e	9,96 722	z	1
60	9,57 358	d	9,60 641	e	10,39 359	e	9,96 717	z	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**68°**	″	10″	20″	30″	40″	50″
a	5	10	15	21	26		g	6	12	18	25	31
b	6	11	16	21	27		v	1	2	3	3	4
c	5	11	16	21	26		w	1	2	2	3	4
d	5	10	15	20	26		x	0	1	3	4	4
e	6	12	18	24	30		y	0	1	2	3	4
f	6	13	19	25	31		z	1	2	3	4	5

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,57 358	c^1	9,60 641	e	10,39 359	e	9,96 717	x	**60**
1	389	a	677	d	323	d	711	y	59
2	420	a^1	714	e	286	e	706	y	58
3	451	b	750	e	250	e	701	y^1	57
4	9,57 482	b^1	9,60 786	e	10,39 214	e	9,96 696	v	56
5	9,57 514	c	9,60 823	e	10,39 177	e	9,96 691	x_1	55
6	545	c^1	859	e	141	e	686	x	54
7	576	c^1	895	e	105	e	681	x	53
8	607	a	931	e	069	e	676	x	52
9	9,57 638	a	9,60 967	d^1	10,39 033	d^1	9,96 670	y	51
10	9,57 669	a	9,61 004	e	10,38 996	e	9,96 665	y^1	**50**
11	700	a	040	e	960	e	660	v	49
12	731	a	076	e	924	e	655	z	48
13	762	c^1	112	e	888	e	650	x_1	47
14	9,57 793	c	9,61 148	e	10,38 852	e	9,96 645	x	46
15	9,57 824	c	9,61 184	e	10,38 816	e	9,96 640	x	45
16	855	c	220	e	780	e	634	y	44
17	885	b	256	e	744	e	629	v	43
18	916	a^1	292	e	708	e	624	z	42
19	9,57 947	c^1	9,61 328	e	10,38 672	e	9,96 619	x_1	41
20	9,57 978	c	9,61 364	e	10,38 636	e	9,96 614	x	**40**
21	58 008	b^1	400	e	600	e	608	y	39
22	039	a^1	436	e	564	e	603	y^1	38
23	070	c	472	e	528	e	598	z	37
24	9,58 101	c	9,61 508	e	10,38 492	e	9,96 593	x_1	36
25	9,58 131	a	9,61 544	f	10,38 456	f	9,96 588	x	35
26	162	c	579	e	421	e	582	y	34
27	192	b	615	e	385	e	577	v	33
28	223	c	651	e	349	e	572	z	32
29	9,58 253	b^1	9,61 687	g	10,38 313	g	9,96 567	x	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**67°**	″	10″	20″	30″	40″	50″
a	5	10	15	21	26		g	6	12	18	24	29
b	5	11	16	21	26		v	1	2	2	3	4
c	5	10	15	20	25		w	0	2	2	3	4
d	6	12	18	25	31		x	1	2	3	4	5
e	6	12	18	24	30		y	0	1	2	3	4
f	5	11	17	23	29		z	1	2	3	3	4

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin+	″	Tan+	″	Cot−	″	Cos−	″	′
30	9,58 284	*a*	9,61 722	*e*	10,38 278	*e*	9,96 562	w^1	30
31	314	*h*	758	*e*	242	*e*	556	*v*	29
32	345	*a*	794	*e*	206	*e*	551	v^1	28
33	375	*b*	830	*c*	170	*c*	546	w^1	27
34	9,58 406	*a*	9,61 865	*e*	10,38 135	*e*	9,96 541	w^1	26
35	9,58 436	*a*	9,61 901	*e*	10,38 099	*e*	9,96 535	*v*	25
36	467	*a*	936	*e*	064	*e*	530	v^1	24
37	497	*a*	61 972	*e*	38 028	*e*	525	w^1	23
38	527	*a*	62 008	c^1	37 992	c^1	520	w^1	22
39	9,58 557	*h*	9,62 043	*e*	10,37 957	*e*	9,96 514	*v*	21
40	9,58 588	*a*	9,62 079	*f*	10,37 921	*f*	9,96 509	*w*	20
41	618	*a*	114	*e*	886	*e*	504	w^1	19
42	648	*a*	150	*f*	850	*f*	498	*x*	18
43	678	*a*	185	*e*	815	*e*	493	v^1	17
44	9,58 709	*a*	9,62 221	c^1	10,37 779	c^1	9,96 488	w^1	16
45	9,58 739	*a*	9,62 256	*e*	10,37 744	*e*	9,96 483	w^1	15
46	769	*a*	292	*c*	708	*c*	477	x^1	14
47	799	*a*	327	*d*	673	*d*	472	*w*	13
48	829	*a*	362	*e*	638	*e*	467	w^1	12
49	9,58 859	*a*	9,62 398	c^1	10,37 602	c^1	9,96 461	*v*	11
50	9,58 889	*a*	9,62 433	d^1	10,37 567	d^1	9,96 456	*w*	10
51	919	*a*	468	*e*	532	*e*	451	w^1	9
52	949	*a*	504	*c*	496	*c*	445	*v*	8
53	58 979	*a*	539	*f*	461	*f*	440	*w*	7
54	9,59 009	*a*	9,62 574	d^1	10,37 426	d^1	9,96 435	w^1	6
55	9,59 039	*a*	9,62 609	*e*	10,37 391	*e*	9,96 429	*v*	5
56	069	*g*	645	*c*	355	*c*	424	*w*	4
57	098	*a*	680	c^1	320	c^1	419	w^1	3
58	128	*a*	715	*f*	285	*f*	413	*v*	2
59	9,59 158	*a*	9,62 750	*d*	10,37 250	*d*	9,96 408	*w*	1
60	9,59 188	*a*	9,62 785	d^1	10,37 215	d^1	9,96 403	w^1	0
′	Cos−	″	Cot−	″	Tan+	″	Sin+	″	′

″	10″	20″	30″	40″	50″
a	5	10	15	20	25
b	5	10	16	21	26
c	5	11	17	23	29
d	6	12	18	23	29
e	6	12	18	24	30
f	6	12	17	23	29

67°

″	10″	20″	30″	40″	50″
g	5	10	14	19	24
h	6	11	16	21	26
u	1	2	3	3	5
v	1	1	2	3	4
w	1	2	3	4	4
x	0	1	2	3	4

Sin+, Tan+, add. diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,59 188	*a*	9,62 785	*d*	10,37 215	*d*	9,96 403	*v*	**60**
1	218	b^1	820	d^1	180	d^1	397	*w*	59
2	247	*a*	855	d^1	145	d^1	392	*v*	58
3	277	*a*	890	d^1	110	d^1	387	*v*	57
4	9,59 307	*c*	9,62 926	e^1	10,37 074	e^1	9,96 381	*y*	56
5	9,59 336	*a*	9,62 961	e^1	10,37 039	e^1	9,96 376	*v*	55
6	366	*a*	62 996	e^1	37 004	e^1	370	*z*	54
7	396	*b*	63 031	e^1	36 969	e^1	365	*v*	53
8	425	*a*	066	e^1	934	e^1	360	*v*	52
9	9,59 455	*c*	9,63 101	e^1	10,36 899	e^1	9,96 354	*y*	51
10	9,59 484	*a*	9,63 135	d^1	10,36 865	d^1	9,96 349	*v*	**50**
11	514	*c*	170	*d*	830	*d*	343	*z*	49
12	543	*a*	205	*d*	795	*d*	338	*v*	48
13	573	b^1	240	f^1	760	f^1	333	*v*	47
14	9,59 602	*a*	9,63 275	*f*	10,36 725	*f*	9,96 327	v_1	46
15	9,59 632	*b*	9,63 310	*g*	10,36 690	*g*	9,96 322	*v*	45
16	661	a_1	345	e^1	655	e^1	316	*w*	44
17	690	*a*	379	*d*	621	*d*	311	*v*	43
18	720	b^1	414	f^1	586	f^1	305	*z*	42
19	9,59 749	a_1	9,63 449	*f*	10,36 551	*f*	9,96 300	*v*	41
20	9,59 778	*a*	9,63 484	*g*	10,36 516	*g*	9,96 294	*x*	**40**
21	808	*b*	519	*e*	481	*e*	289	*v*	39
22	837	*c*	553	f^1	447	f^1	284	*v*	38
23	866	c^1	588	*g*	412	*g*	278	v_1	37
24	9,59 895	*a*	9,63 623	*e*	10,36 377	*e*	9,96 273	*v*	36
25	9,59 924	*a*	9,63 657	f^1	10,36 343	f^1	9,96 267	*y*	35
26	954	*b*	692	*g*	308	*g*	262	*v*	34
27	59 983	b^1	726	*d*	274	*d*	256	*y*	33
28	60 012	*c*	761	*f*	239	*f*	251	*v*	32
29	9,60 041	*c*	9,63 796	*e*	10,36 204	*e*	9,96 245	*w*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**66°**	″	10″	20″	30″	40″	50″
a	5	10	15	20	25		*g*	6	11	17	23	29
b	4	9	14	19	24		*v*	1	2	3	4	5
c	5	10	14	19	24		*w*	1	2	2	3	4
d	6	12	18	24	29		*x*	0	1	2	3	4
e	5	11	17	23	28		*y*	1	2	3	3	4
f	6	12	17	23	29		*z*	1	1	2	3	4

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,60 070	*a*	9,63 830	*e*	10,36 170	*e*	9,96 240	*w*	30
31	099	a^1	865	*g*	135	*g*	234	*x*	29
32	128	a^1	899	*e*	101	*e*	229	*w*	28
33	157	a^1	934	*f*	066	*f*	223	*x*	27
34	9,60 186	*a*	9,63 968	*e*	10,36 032	*e*	9,96 218	*w*	26
35	9,60 215	*a*	9,64 003	*f*	10,35 997	*f*	9,96 212	*x*	25
36	244	*a*	037	*e*	963	*e*	207	*w*	24
37	273	b^1	072	*f*	928	*f*	201	*y*	23
38	302	*b*	106	e_1	894	e_1	196	*w*	22
39	9,60 331	*b*	9,64 140	*h*	10,35 860	*h*	9,96 190	y^1	21
40	9,60 359	*d*	9,64 175	*f*	10,35 825	*f*	9,96 185	*w*	20
41	388	a^1	209	*e*	791	*e*	179	*w*	19
42	417	*a*	243	*h*	757	*h*	174	*w*	18
43	446	b^1	278	*f*	722	*f*	168	*w*	17
44	9,60 474	*d*	9,64 312	e_1	10,35 688	e_1	9,96 162	*z*	16
45	9,60 503	a^1	9,64 346	*e*	10,35 654	*e*	9,96 157	*w*	15
46	532	b^1	381	*f*	619	*f*	151	*x*	14
47	561	c^1	415	*g*	585	*g*	146	*w*	13
48	589	a^1	449	e_1	551	e_1	140	y^1	12
49	9,60 618	b^1	9,64 483	*e*	10,35 517	*e*	9,96 135	*w*	11
50	9,60 646	*d*	9,64 517	*h*	10,35 483	*h*	9,96 129	*w*	10
51	675	*a*	552	f_1	448	f_1	123	*z*	9
52	704	c^1	586	*f*	414	*f*	118	*w*	8
53	732	*a*	620	*g*	380	*g*	112	*y*	7
54	9,60 761	c^1	9,64 654	*g*	10,35 346	*g*	9,96 107	*w*	6
55	9,60 789	*a*	9,64 688	*g*	10,35 312	*g*	9,96 101	*w*	5
56	818	c^1	722	*e*	278	*e*	095	*z*	4
57	846	*a*	756	*e*	244	*e*	090	*w*	3
58	875	*c*	790	*e*	210	*e*	084	*y*	2
59	9,60 903	b^1	9,64 824	*e*	10,35 176	*e*	9,96 079	*w*	1
60	9,60 931	a^1	9,64 858	*e*	10,35 142	*e*	9,96 073	*w*	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	66°	″	10″	20″	30″	40″	50″
a	5	10	14	19	24		*g*	6	11	17	23	28
b	4	9	14	19	24		*h*	6	12	18	23	29
c	4	9	14	18	23		*w*	1	2	3	4	5
d	5	10	15	20	24		*x*	1	2	2	3	4
e	5	12	17	23	29		*y*	1	2	3	3	4
f	5	11	17	23	28		*z*	0	1	2	3	4

Sin + Tan +, ädd. diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,60 931	a^1	9,64 858	f^1	10,35 142	f^1	9,96 073	x	**60**
1	960	b^1	892	f^1	108	f^1	067	y	59
2	60 988	c^1	926	f^1	074	f^1	062	x	58
3	61 016	a^1	960	f^1	040	f^1	056	x	57
4	9,61 045	b^1	9,64 994	g	10,35 006	g	9,96 050	z	56
5	9,61 073	c	9,65 028	g	10,34 972	g	9,96 045	x	55
6	101	a	062	g	938	g	039	x	54
7	129	a^1	096	g_1	904	g_1	034	x	53
8	158	b	130	h	870	h	028	x	52
9	9,61 186	b^1	9,65 164	h	10,34 836	h	9,96 022	x	51
10	9,61 214	c	9,65 197	f^1	10,34 803	f^1	9,96 017	x	**50**
11	242	c^1	231	g	769	g	011	x	49
12	270	a	265	g	735	g	005	x	48
13	298	a	299	h	701	h	96 000	x	47
14	9,61 326	a	9,65 333	k	10,34 667	k	9,95 994	x	46
15	9,61 354	a	9,65 366	f	10,34 634	f	9,95 988	x	45
16	382	a^1	400	g	600	g	982	z	44
17	411	b	434	h	566	h	977	x	43
18	438	a	467	f^1	533	f^1	971	x	42
19	9,61 466	a	9,65 501	g	10,34 499	g	9,95 965	y^1	41
20	9,61 494	a	9,65 535	h	10,34 465	h	9,95 960	x	**40**
21	522	a	568	f	432	f	954	x	39
22	550	d	602	g_1	398	g_1	948	x	38
23	578	c	636	k	364	k	942	z	37
24	9,61 606	c	9,65 669	g	10,34 331	g	9,95 937	x	36
25	9,61 634	b	9,65 703	h	10,34 297	h	9,95 931	x	35
26	662	b	736	f	264	f	925	x	34
27	689	a	770	h	230	h	920	x	33
28	717	c	803	f	197	f	914	x	32
29	9,61 745	e	9,65 837	h	10,34 163	h	9,95 908	x	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**65°**	″	10″	20″	30″	40″	50″
a	5	10	14̄	19	24		g	6	11	17	23̄	28
b	4	9	14	18̄	23		h	5	11	17	22̄	28
c	5̄	9	14	19	23̄		k	5	11	16	22	28
d	5	10	14	19	23		x	1	2	3	4	5
e	5	9	14	18	23		y	1	1̄	2̄	3	4
f	6	12	17	23	28̄		z	0	1	2	3	4

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,61 773	*a*	9,65 870	f^1	10,34 130	f^1	9,95 902	*w*	30
31	800	b^1	904	g^1	096	g^1	897	*w*	29
32	828	*b*	937	*f*	063	*f*	891	*w*	28
33	856	a^1	65 971	*g*	34 029	*g*	885	*w*	27
34	9,61 883	b^1	9,66 004	*k*	10,33 996	*k*	9,95 879	*w*	26
35	9,61 911	*d*	9,66 038	*h*	10,33 962	*h*	9,95 873	*y*	25
36	939	c^1	071	*k*	929	*k*	868	*w*	24
37	966	*b*	104	*f*	896	*f*	862	*w*	23
38	61 994	*a*	138	*h*	862	*h*	856	*w*	22
39	9,62 021	*b*	9,66 171	*k*	10,33 829	*k*	9,95 850	*w*	21
40	9,62 049	*a*	9,66 204	*f*	10,33 796	*f*	9,95 844	*z*	20
41	076	*b*	238	*h*	762	*h*	839	*w*	19
42	104	*a*	271	g^1	729	g^1	833	*w*	18
43	131	*b*	304	*k*	696	*k*	827	*w*	17
44	9,62 159	c^1	9,66 337	f^1	10,33 663	f^1	9,95 821	*w*	16
45	9,62 186	*d*	9,66 371	*h*	10,33 629	*h*	9,95 815	*x*	15
46	214	*c*	404	g^1	596	g^1	810	*w*	14
47	241	*a*	437	*k*	563	*k*	804	*w*	13
48	268	*d*	470	*k*	530	*k*	798	*w*	12
49	9,62 296	*c*	9,66 503	f^1	10,33 497	f^1	9,95 792	*w*	11
50	9,62 323	*a*	9,66 537	*h*	10,33 463	*h*	9,95 786	*w*	10
51	350	*d*	570	*h*	430	*h*	780	x^1	9
52	377	b^1	603	*h*	397	*h*	775	*w*	8
53	405	*c*	636	g^1	364	g^1	769	*w*	7
54	9,62 432	*a*	9,66 669	*k*	10,33 331	*k*	9,95 763	*w*	6
55	9,62 459	*d*	9,66 702	*k*	10,33 298	*k*	9,95 757	*w*	5
56	486	*d*	735	*k*	265	*k*	751	*w*	4
57	513	b^1	768	*k*	232	*k*	745	*w*	3
58	541	*c*	801	*k*	199	*k*	739	*w*	2
59	9,62 568	*c*	9,66 834	*k*	10,33 166	*k*	9,95 733	x_1	1
60	9,62 595	*c*	9,66 867	*k*	10,33 133	*k*	9,95 728	*w*	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40′	50′	65°	″	10″	20″	30″	40″	50″
a	4	9	14	18	23		*h*	5	11	16	22	27
b	5	9	14	19	23		*k*	6	11	17	22	28
c	4	9	13	18	22		*w*	1	2	3	4	5
d	5	9	14	18	23		*x*	1	2	2	3	4
f	6	11	17	23	28		*y*	1	1	2	3	4
g	5	11	16	22	28		*z*	0	1	2	3	4

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

25°

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,62 595	*a*	9,66 867	*f*	10,33 133	*f*	9,95 728	*y*	**60**
1	622	*a*	900	*f*	100	*f*	722	*y*	59
2	649	b^1	933	*f*	067	*f*	716	*y*	58
3	676	*c*	966	*f*	034	*f*	710	*y*	57
4	9,62 703	*c*	9,66 999	*l*	10,33 001	*l*	9,95 704	*y*	56
5	9,62 730	*c*	9,67 032	*g*	10,32 968	*g*	9,95 698	*y*	55
6	757	a^1	065	*g*	935	*g*	692	*y*	54
7	784	*a*	098	*g*	902	*g*	686	*y*	53
8	811	*a*	131	*g*	869	*g*	680	*y*	52
9	9,62 838	*a*	9,67 163	*f*	10,32 837	*f*	9,95 674	*y*	51
10	9,62 865	*a*	9,67 196	*f*	10,32 804	*f*	9,95 668	*y*	**50**
11	892	*a*	229	*m*	771	*m*	663	*y*	49
12	918	*c*	262	*g*	738	*g*	657	*y*	48
13	945	*c*	295	*g*	705	*g*	651	*y*	47
14	9,62 972	*e*	9,67 327	*f*	10,32 673	*f*	9,95 645	*y*	46
15	9,62 999	*a*	9,67 360	*l*	10,32 640	*l*	9,95 639	*y*	45
16	63 026	*a*	393	*g*	607	*g*	633	*y*	44
17	052	*c*	426	*h*	574	*h*	627	*y*	43
18	079	*e*	458	*f*	542	*f*	621	*y*	42
19	9,63 106	*a*	9,67 491	*g*	10,32 509	*g*	9,95 615	*y*	41
20	9,63 133	*d*	9,67 524	*h*	10,32 476	*h*	9,95 609	*y*	**40**
21	159	*e*	556	*f*	444	*f*	603	*y*	39
22	186	*a*	589	*g*	411	*g*	597	*y*	38
23	213	*d*	622	*h*	378	*h*	591	*y*	37
24	9,63 239	a^1	9,67 654	*l*	10,32 346	*l*	9,95 585	*y*	36
25	9,63 266	*b*	9,67 687	*g*	10,32 313	*g*	9,95 579	*y*	35
26	292	*e*	719	*f*	281	*f*	573	*y*	34
27	319	*a*	752	*g*	248	*g*	567	*y*	33
28	345	*c*	785	*k*	215	*k*	561	*y*	32
29	9,63 372	*a*	9,67 817	*m*	10,32 183	*m*	9,95 555	*y*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	$\bar{4}$	9	13	18	22
b	4	9	13	$1\bar{7}$	$2\bar{2}$
c	5	9	14	18	23
d	4	8	13	17	22
e	5	9	14	18	22
f	6	11	17	22	$2\underline{8}$

64°

″	10″	20″	30″	40″	50″
g	5	11	16	22	27
h	$\bar{5}$	11	16	$2\bar{1}$	27
k	5	10	16	21	27
l	6	11	17	22	27
m	6	11	16	22	27
y	1	2	3	4	5

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,63 398	*a*	9,67 850	*f*	10,32 150	*f*	9,95 549	*x*	**30**
31	425	*b*	882	*g*	118	*g*	543	*x*	29
32	451	*a*	915	*f*	085	*f*	537	*x*	28
33	478	*c*	947	*h*	053	*h*	531	*x*	27
34	9,63 504	*d*	9,67 980	*f*	10,32 020	*f*	9,95 525	*x*	26
35	9,63 531	e^1	9,68 012	*h*	10,31 988	*h*	9,95 519	*x*	25
36	557	*b*	044	g^1	956	g^1	513	*x*	24
37	583	*a*	077	*k*	923	*k*	507	*z*	23
38	610	e^1	109	*g*	891	*g*	500	*x*	22
39	9,63 636	*b*	9,68 142	*f*	10,31 858	*f*	9,95 494	*x*	21
40	9,63 662	*d*	9,68 174	*h*	10,31 826	*h*	9,95 488	*x*	**20**
41	689	*e*	206	*g*	794	*g*	482	*x*	19
42	715	*c*	239	*f*	761	*f*	476	*x*	18
43	741	*b*	271	*h*	729	*h*	470	*x*	17
44	9,63 767	*d*	9,68 303	*g*	10,31 697	*g*	9,95 464	*x*	16
45	9,63 794	*e*	9,68 336	*l*	10,31 664	*l*	9,95 458	*x*	15
46	820	*e*	368	*k*	632	*k*	452	*x*	14
47	846	*c*	400	*h*	600	*h*	446	*x*	13
48	872	*c*	432	*g*	568	*g*	440	*x*	12
49	9,63 898	*b*	9,68 465	*l*	10,31 535	*l*	9,95 434	z^1	11
50	9,63 924	*d*	9,68 497	*k*	10,31 503	*k*	9,95 427	*x*	**10**
51	950	*d*	529	*k*	471	*k*	421	*x*	9
52	63 976	*d*	561	*g*	439	*g*	415	*x*	8
53	64 002	*d*	593	*g*	407	*g*	409	*x*	7
54	9,64 028	*d*	9,68 626	*l*	10,31 374	*l*	9,95 403	*x*	6
55	9,64 054	*d*	9,68 658	*l*	10,31 342	*l*	9,95 397	*x*	5
56	080	*d*	690	*k*	310	*k*	391	*x*	4
57	106	*d*	722	*k*	278	*k*	384	*x*	3
58	132	*d*	754	*k*	246	*k*	378	*x*	2
59	9,64 158	*d*	9,68 786	*k*	10,31 214	*k*	9,95 372	*x*	1
60	9,64 184	c^1	9,68 818	*g*	10,31 182	*g*	9,95 366	*x*	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**64°**	″	10″	20″	30″	40″	50″
a	5	9	14	18	2̄2̄		*g*	6	11	1̄6̄	22	27
b	4	9	13	18	22		*h*	5	11	16	22	27
c	4̄	9	13	17	22		*k*	5	11	16	21	27
d	5	9	13	18	22		*l*	5	10	16	21	26
e	4	8	13	17	2̄1̄		*x*	1	2	3	4	5
f	5	10	16	21	27		*z*	1	2̄	3̄	4̄	6

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,64 184	*a*	9,68 818	*f*	10,31 182	*f*	9,95 366	*y*	**60**
1	210	*b*	850	*f*	150	*f*	360	*y*	59
2	236	*b*	882	*f*	118	*f*	354	*y*	58
3	262	*c*	914	*f*	086	*f*	348	z^1	57
4	9,64 288	*c*	9,68 946	*f*	10,31 054	*f*	9,95 341	*y*	56
5	9,64 313	b^1	9,68 978	*f*	10,31 022	*f*	9,95 335	*y*	55
6	339	*a*	69 010	*f*	30 990	*f*	329	*y*	54
7	365	*b*	042	*f*	958	*f*	323	*y*	53
8	391	*c*	074	*f*	926	*f*	317	*z*	52
9	9,64 417	*d*	9,69 106	g^1	10,30 894	g^1	9,95 310	*y*	51
10	9,64 442	*a*	9,69 138	g^1	10,30 862	g^1	9,95 304	*y*	**50**
11	468	*e*	170	g^1	830	g^1	298	*y*	49
12	494	*d*	202	*g*	798	*g*	292	*y*	48
13	519	*a*	234	h^1	766	h^1	286	z^1	47
14	9,64 545	*e*	9,69 266	h^1	10,30 734	h^1	9,95 279	*y*	46
15	9,64 571	*d*	9,69 298	*h*	10,30 702	*h*	9,95 273	*y*	45
16	596	*b*	329	*f*	671	*f*	267	*y*	44
17	622	*c*	361	g^1	639	g^1	261	*z*	43
18	647	*a*	393	*g*	607	*g*	254	*y*	42
19	9,64 673	*c*	9,69 425	h^1	10,30 575	h^1	9,95 248	*y*	41
20	9,64 698	*a*	9,69 457	*h*	10,30 543	*h*	9,95 242	*y*	**40**
21	724	*c*	488	l^1	512	l^1	236	*z*	39
22	749	*a*	520	g^1	480	g^1	229	*y*	38
23	775	*c*	552	h^1	448	h^1	223	*y*	37
24	9,64 800	*a*	9,69 584	*h*	10,30 416	*h*	9,95 217	*y*	36
25	9,64 826	*c*	9,69 615	*l*	10,30 385	*l*	9,95 211	z^1	35
26	851	*e*	647	*g*	353	*g*	204	*y*	34
27	877	*d*	679	*h*	321	*h*	198	*y*	33
28	902	*c*	710	*l*	290	*l*	192	*y*	32
29	9,64 927	*a*	9,69 742	*g*	10,30 258	*g*	9,95 185	*y*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	5	9	13	17	22
b	4	9	13	17	22
c	4	8	13	17	21
d	4	8	12	17	21
e	4	9	13	17	21
f	6	11	16	22	27

63°

″	10″	20″	30″	40″	50″
g	5	11	16	21	26
h	5	10	15	21	26
k	6	10	16	22	27
l	6	11	16	21	27
y	1	2	3	4	5
z	1	2	4	5	6

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,64 953	*b*	9,69 774	*k*	10,30 226	*k*	9,95 179	*x*	**30**
31	64 978	a_1	805	*e*	195	*e*	173	*x*	29
32	65 003	*a*	837	*f*	163	*f*	167	y^1	28
33	029	*b*	868	g^1	132	g^1	160	*x*	27
34	9,65 054	b^1	9,69 900	*h*	10,30 100	*h*	9,95 154	*x*	26
35	9,65 079	a_1	9,69 932	*k*	10,30 068	*k*	9,95 148	*y*	25
36	104	*a*	963	*h*	037	*h*	141	*x*	24
37	130	*c*	69 995	*f*	30 005	*f*	135	*x*	23
38	155	*b*	70 026	*e*	29 974	*e*	129	*y*	22
39	9,65 180	b^1	9,70 058	*f*	10,29 942	*f*	9,95 122	*x*	21
40	9,65 205	a_1	9,70 089	*e*	10,29 911	*e*	9,95 116	*x*	**20**
41	230	*a*	121	*f*	879	*f*	110	*y*	19
42	255	*a*	152	*g*	848	*g*	103	*x*	18
43	281	*d*	184	*k*	816	*k*	097	*x*	17
44	9,65 306	*c*	9,70 215	*h*	10,29 785	*h*	9,95 090	*x*	16
45	9,65 331	*c*	9,70 247	*k*	10,29 753	*k*	9,95 084	*x*	15
46	356	*c*	278	*h*	722	*h*	078	*z*	14
47	381	*b*	309	f^1	691	f^1	071	*x*	13
48	406	*b*	341	*f*	659	*f*	065	*x*	12
49	9,65 431	*b*	9,70 372	h^1	10,29 628	*h*	9,95 059	*y*	11
50	9,65 456	*c*	9,70 404	*k*	10,29 596	*k*	9,95 052	*x*	**10**
51	481	*c*	435	*f*	565	*f*	046	*x*	9
52	506	*c*	466	*g*	534	*g*	039	*x*	8
53	531	*d*	498	*k*	502	*k*	033	*x*	7
54	9,65 556	*d*	9,70 529	*f*	10,29 471	*f*	9,95 027	*y*	6
55	9,65 580	*a*	9,70 560	*h*	10,29 440	*h*	9,95 020	*x*	5
56	605	*a*	592	k_1	408	k_1	014	*z*	4
57	630	b^1	623	*k*	377	*k*	007	*x*	3
58	655	*b*	654	*h*	346	*h*	9,95 001	*x*	2
59	9,65 680	*c*	9,70 685	*g*	10,29 315	*g*	9,94 995	*y*	1
60	9,65 705	*d*	9,70 717	k_1	10,29 283	k_1	9,94 988	*x*	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**63°**	″	10″	20″	30″	40″	50″
a	5	9	13	17	21		*g*	6	11	16	21	26
b	4	8	12	17	21		*h*	5	11	16	21	26
c	4	8	12	16	21		*k*	5	10	15	21	26
d	4	8	12	16	20		*x*	1	2	3	4	5
e	6	11	16	21	27		*y*	1	3	4	5	6
f	5	10	16	21	26		*z*	1	2	3	4	6

Sin+, Tan+, add. diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,65 705	*d*	9,70 717	*h*	10,29 283	*h*	9,94 988	*w*	60
1	729	*a*	748	h^1	252	h^1	982	v^1	59
2	754	b^1	779	*e*	221	*e*	975	*w*	58
3	779	*c*	810	*f*	190	*f*	969	*v*	57
4	9,65 804	*d*	9,70 841	f^1	10,29 159	f^1	9,94 962	*w*	56
5	9,65 828	*a*	9,70 873	*h*	10,29 127	*h*	9,94 956	*x*	55
6	853	*b*	904	h^1	096	h^1	949	*w*	54
7	878	*d*	935	h^1	065	h^1	943	*w*	53
8	902	*a*	966	*e*	034	*e*	936	*w*	52
9	9,65 927	*b*	9,70 997	*f*	10,29 003	*f*	9,94 930	*w*	51
10	9,65 952	*d*	9,71 028	*f*	10,28 972	*f*	9,94 923	*w*	50
11	65 976	a_1	059	f^1	941	f^1	917	*w*	49
12	66 001	*d*	090	f^1	910	f^1	911	y^1	48
13	025	*a*	121	f^1	879	f^1	904	*w*	47
14	9,66 050	*c*	9,71 153	*q*	10,28 847	*g*	9,94 898	y^1	46
15	9,66 075	*d*	9,71 184	*g*	10,28 816	*g*	9,94 891	*w*	45
16	099	*c*	215	*g*	785	*g*	885	y^1	44
17	124	*d*	246	*g*	754	*g*	878	*w*	43
18	148	*d*	277	*g*	723	*g*	871	*w*	42
19	9,66 173	*d*	9,71 308	*g*	10,28 692	*g*	9,94 865	*w*	41
20	9,66 197	*d*	9,71 339	*g*	10,28 661	*g*	9,94 858	*w*	40
21	221	*a*	370	*g*	630	*g*	852	*x*	39
22	246	*d*	401	*g*	599	*g*	845	*w*	38
23	270	*b*	431	f^1	569	f^1	839	*v*	37
24	9,66 295	*d*	9,71 462	f^1	10,28 538	f^1	9,94 832	*w*	36
25	9,66 319	*d*	9,71 493	*f*	10,28 507	*f*	9,94 826	v^1	35
26	343	b^1	524	*e*	476	*e*	819	*w*	34
27	368	*d*	555	*e*	445	*e*	813	*y*	33
28	392	*d*	586	h^1	414	h^1	806	*w*	32
29	9,66 416	*c*	9,71 617	*h*	10,28 383	*h*	9,94 799	*w*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	5	9	13	17	21
b	4	8	12	17	21
c	4	8	12	16	21
d	4	8	12	16	20
e	5	10	16	21	26
f	5	11	16	21	26

62°

″	10″	20″	30″	40″	50″
g	5	10	15	20	25
h	5	10	15	20	26
v	1	2	3	5	6
w	1	2	3	4	5
x	1	2	3	4	6
y	1	3	4	5	6

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,66 441	*a*	9,71 648	*e*	10,28 352	*e*	9,94 793	*z*	**30**
31	465	*a*	679	*e*	321	*e*	786	*w*	29
32	489	*a*	709	f^1	291	f^1	780	*x*	28
33	513	*a*	740	*f*	260	*f*	773	*w*	27
34	9,66 537	b^1	9,71 771	*h*	10,28 229	*h*	9,94 767	y^1	26
35	9,66 562	*a*	9,71 802	*e*	10,28 198	*e*	9,94 760	*z*	25
36	586	*a*	833	*e*	167	*e*	753	*w*	24
37	610	*a*	863	f^1	137	f^1	747	*x*	23
38	634	*a*	894	h^1	106	h^1	740	*w*	22
39	9,66 658	*a*	9,71 925	*e*	10,28 075	*e*	9,94 734	y^1	21
40	9,66 682	*a*	9,71 955	*g*	10,28 045	*g*	9,94 727	z^1	**20**
41	706	*b*	71 986	*f*	28 014	*f*	720	*w*	19
42	731	*a*	72 017	*e*	27 983	*e*	714	*y*	18
43	755	*a*	048	*e*	952	*e*	707	*z*	17
44	9,66 779	*a*	9,72 078	*f*	10,27 922	*f*	9,94 700	*w*	16
45	9,66 803	*a*	9,72 109	*e*	10,27 891	*e*	9,94 694	*x*	15
46	827	*a*	140	*e*	860	*e*	687	*w*	14
47	851	*a*	170	*f*	830	*f*	680	*w*	13
48	875	*a*	201	*e*	799	*e*	674	*x*	12
49	9,66 899	*a*	9,72 231	*g*	10,27 769	*g*	9,94 667	*w*	11
50	9,66 922	*a*	9,72 262	*h*	10,27 738	*h*	9,94 660	*w*	**10**
51	946	*a*	293	*e*	707	*e*	654	*x*	9
52	970	*a*	323	*f*	677	*f*	647	*w*	8
53	66 994	*a*	354	*e*	646	*e*	640	*w*	7
54	9,67 018	*a*	9,72 384	f^1	10,27 616	f^1	9,94 634	*y*	6
55	9,67 042	*a*	9,72 415	*e*	10,27 585	*e*	9,94 627	*z*	5
56	066	*a*	445	*g*	555	*g*	620	*w*	4
57	090	*d*	476	*e*	524	*e*	614	*y*	3
58	113	*a*	506	*g*	494	*g*	607	z^1	2
59	9,67 137	*a*	9,72 537	*e*	10,27 463	*e*	9,94 600	*w*	**1**
60	9,67 161	*a*	9,72 567	*g*	10,27 433	*g*	9,94 593	*w*	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**62°**	″	10″	20″	30″	40″	50″
a	4	8	12	16	20		*g*	6	11	16	21	26
b	$\bar{4}$	$\bar{8}$	13	17	21		*h*	5	10	15	$2\bar{0}$	26
c	3	7	11	15	20		*w*	1	2	3	4	5
d	4	8	11	15	20		*x*	1	2	4	5	6
e	5	10	15	20	25		*y*	$\bar{1}$	3	4	5	6
f	5	$1\bar{0}$	16	21	26		*z*	1	2	3	$\bar{4}$	6

Sin +, Tan +, add diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,67 161	*b*	9,72 567	*f*	10,27 433	*f*	9,94 593	*y*	60
1	185	*a*	598	*e*	402	*e*	587	*w*	59
2	208	*b*	628	f_1	372	f_1	580	*x*	58
3	232	*b*	659	*e*	341	*e*	573	*y*	57
4	9,67 256	*b*	9,72 689	*g*	10,27 311	*g*	9,94 567	*z*	56
5	9,67 280	*c*	9,72 720	*e*	10,27 280	*e*	9,94 560	*w*	55
6	303	*b*	750	*e*	250	*e*	553	*x*	54
7	327	*b*	780	*f*	220	*f*	546	*y*	53
8	350	*b*	811	*e*	189	*e*	540	*z*	52
9	9,67 374	*b*	9,72 841	*h*	10,27 159	*h*	9,94 533	*w*	51
10	9,67 398	*d*	9,72 872	*e*	10,27 128	*e*	9,94 526	*x*	50
11	421	*b*	902	*e*	098	*e*	519	*y*	49
12	445	*a*	932	*g*	068	*g*	513	*z*	48
13	468	*b*	963	*e*	037	*e*	506	*w*	47
14	9,67 492	*b*	9,72 993	*e*	10,27 007	*e*	9,94 499	x^1	46
15	9,67 515	*b*	9,73 023	*e*	10,26 977	*e*	9,94 492	*y*	45
16	539	*b*	054	*e*	946	*e*	485	*y*	44
17	562	*b*	084	*e*	916	*e*	479	*z*	43
18	586	*a*	114	*e*	886	*e*	472	*w*	42
19	9,67 609	*b*	9,73 144	*g*	10,26 856	*g*	9,94 465	x^1	41
20	9,67 633	a_1	9,73 175	*e*	10,26 825	*e*	9,94 458	*y*	40
21	656	*b*	205	*e*	795	*e*	451	*y*	39
22	680	*c*	235	*e*	765	*e*	445	*z*	38
23	703	*b*	265	*e*	735	*e*	438	w^1	37
24	9,67 726	*b*	9,73 295	*f*	10,26 705	*f*	9,94 431	x^1	36
25	9,67 750	*d*	9,73 326	*e*	10,26 674	*e*	9,94 424	*x*	35
26	773	*b*	356	*e*	644	*e*	417	*y*	34
27	796	*b*	386	*e*	614	*e*	410	*y*	33
28	820	c^1	416	*e*	584	*e*	404	*z*	32
29	9,67 843	*a*	9,73 446	*e*	10,26 554	*e*	9,94 397	w^1	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	4	8	12	16	19
b	4	8	12	16	20
c	3	7	11	15	19
d	4	8	11	15	19
e	5	10	15	20	25
f	6	11	16	21	26

61°

″	10″	20″	30″	40″	50″
g	5	10	15	21	26
h	5	10	15	20	26
w	1	2	4	5	6
x	1	2	3	4	6
y	1	2	3	4	5
z	2	3	4	5	6

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,67 866	d	9,73 476	g	10,26 524	g	9,94 390	z	30
31	890	a	507	f	493	f	383	w^1	29
32	913	b	537	f	463	f	376	w	28
33	936	e	567	f	433	f	369	x	27
34	9,67 959	d	9,73 597	f	10,26 403	f	9,94 362	x	26
35	9,67 982	d	9,73 627	f	10,26 373	f	9,94 355	x	25
36	68 006	a	657	f	343	f	349	y	24
37	029	c	687	f	313	f	342	z^1	23
38	052	b	717	f	283	f	335	z	22
39	9,68 075	e	9,73 747	f	10,26 253	f	9,94 328	z	21
40	9,68 098	e^1	9,73 777	f	10,26 223	f	9,94 321	w^1	20
41	121	e^1	807	f	193	f	314	w	19
42	144	d	837	f	163	f	307	w	18
43	167	d	867	f	133	f	300	x	17
44	9,68 190	d	9,73 897	f	10,26 103	f	9,94 293	x	16
45	9,68 213	d	9,73 927	f	10,26 073	f	9,94 286	x	15
46	237	a	957	f	043	f	279	x	14
47	260	a	73 987	f	26 013	f	273	y	13
48	283	a	74 017	f	25 983	f	266	y	12
49	9,68 305	d	9,74 047	f	10,25 953	f	9,94 259	z^1	11
50	9,68 328	d	9,74 077	f	10,25 923	f	9,94 252	z^1	10
51	351	e^1	107	f	893	f	245	z^1	9
52	374	e^1	137	h_1	863	h_1	238	z^1	8
53	397	e	166	f	834	f	231	z	7
54	9,68 420	e	9,74 196	f	10,25 804	f	9,94 224	z	6
55	9,68 443	b	9,74 226	f	10,25 774	f	9,94 217	z	5
56	466	c	256	f	744	f	210	z	4
57	489	a	286	f	714	f	203	z	3
58	512	a	316	h	684	h	196	z	2
59	9,68 534	e^1	9,74 345	f	10,25 655	f	9,94 189	z	1
60	9,68 557	e	9,74 375	f	10,25 625	f	9,94 182	z	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	3	7	11	15	19
b	4	8	11	15	19
c	4	7	11	15	19
d	4	8	12	16	20
e	4	8	12	15	19
f	5	10	15	20	25

61°

″	10″	20″	30″	40″	50″
g	5	10	16	21	26
h	5	10	14	19	24
w	1	2	3	4	6
x	1	2	3	4	5
y	2	3	4	5	6
z	1	2	4	5	6

Sin +, Tan +, add. diff. Cos −, Cot −, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,68 557	*a*	9,74 375	*f*	10,25 625	*f*	9,94 182	*w*	**60**
1	580	b^1	405	*f*	595	*f*	175	*w*	59
2	603	c^1	435	*f*	565	*f*	168	*w*	58
3	625	a^1	465	*g*	535	*g*	161	*w*	57
4	9,68 648	*a*	9,74 494	*f*	10,25 506	*f*	9.94 154	*w*	56
5	9,68 671	b^1	9,74 524	*f*	10,25 476	*f*	9,94 147	*w*	55
6	694	*c*	554	*f*	446	*f*	140	*x*	54
7	716	*a*	583	*f*	417	*f*	133	*x*	53
8	739	*d*	613	*f*	387	*f*	126	*x*	52
9	9,68 762	*c*	9,74 643	*f*	10,25 357	*f*	9,94 119	*x*	51
10	9,68 784	*a*	9,74 673	g^1	10,25 327	g^1	9,94 112	x^1	**50**
11	807	b^1	702	*f*	298	*f*	105	x^1	49
12	829	a^1	732	*f*	268	*f*	098	x^1	48
13	852	*d*	762	g^1	238	g^1	090	*y*	47
14	9,68 875	*c*	9,74 791	*f*	10,25 209	*f*	9.94 083	*y*	46
15	9,68 897	*a*	9,74 821	*f*	10,25 179	*f*	9,94 076	y^1	45
16	920	b^1	851	*g*	149	*g*	069	y^1	44
17	942	*a*	880	*f*	120	*f*	062	*z*	43
18	965	b^1	910	f_1	090	f_1	055	*z*	42
19	9,68 987	*a*	9,74 939	*f*	10,25 061	*f*	9.94 048	*w*	41
20	9,69 010	b^1	9,74 969	*f*	10,25 031	*f*	9,94 041	*w*	**40**
21	032	*a*	74 998	*f*	25 002	*f*	034	*x*	39
22	055	*b*	75 028	*f*	24 972	*f*	027	*x*	38
23	077	*d*	058	g^1	942	g^1	020	x^1	37
24	9.69 100	*c*	9,75 087	*f*	10,24 913	*f*	9.94 012	*y*	36
25	9,69 122	*d*	9,75 117	*h*	10,24 883	*h*	9,94 005	y^1	35
26	144	*a*	146	*f*	854	*f*	93 998	*z*	34
27	167	*b*	176	*h*	824	*h*	991	*z*	33
28	189	*d*	205	*f*	795	*f*	984	*w*	32
29	9,69 212	*e*	9,75 235	*h*	10,24 765	*h*	9,93 977	*x*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	4	8	12	15	19
b	4	7	11	15	18
c	3	7	11	15	18
d	4	8	11	15	19
e	3	7	11	14	18
f	5	10	15	20	25

60°

″	10″	20″	30″	40″	50″
g	4	9	14	19	24
h	5	10	14	19	24
w	1	2	4	5	6
x	1	3	4	5	6
y	1	2	3	4	5
z	1	2	3	5	6

Sin+, Tan+, add diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,69 234	*c*	9,75 264	*f*	10,24 736	*f*	9,93 970	*v*	**30**
31	256	*a*	294	e^1	706	e^1	963	*v*	29
32	279	*b*	323	*f*	677	*f*	955	*w*	28
33	301	*c*	353	*e*	647	*e*	948	*x*	27
34	9,69 323	c^1	9,75 382	*f*	10,24 618	*f*	9,93 941	*z*	26
35	9,69 345	*a*	9,75 411	*f*	10,24 589	*f*	9,93 934	z^1	25
36	368	*b*	441	f_1	559	f_1	927	z^1	24
37	390	*c*	470	*f*	530	*f*	920	*v*	23
38	412	c^1	500	h_1	500	h_1	912	*w*	22
39	9,69 434	*a*	9,75 529	*f*	10,24 471	*f*	9,93 905	*x*	21
40	9,69 456	a^1	9,75 558	*f*	10,24 442	*f*	9,93 898	*z*	**20**
41	479	*b*	588	f_1	412	f_1	891	z^1	19
42	501	b^1	617	*f*	383	*f*	884	*v*	18
43	523	*c*	647	*e*	353	*e*	876	*w*	17
44	9,69 545	*c*	9,75 676	f_1	10,24 324	f_1	9,93 869	*x*	16
45	9,69 567	c^1	9,75 705	*f*	10,24 295	*f*	9,93 862	*z*	15
46	589	*a*	735	*e*	265	*e*	855	*v*	14
47	611	*a*	764	*h*	236	*h*	847	*w*	13
48	633	*a*	793	*f*	207	*f*	840	*x*	12
49	9,69 655	*a*	9,75 822	*f*	10,24 178	*f*	9,93 833	*z*	11
50	9,69 677	*a*	9,75 852	e^1	10,24 148	e^1	9,93 826	z^1	**10**
51	699	*a*	881	f_1	119	f_1	819	v^1	9
52	721	*a*	910	*f*	090	*f*	811	*x*	8
53	743	*a*	939	*f*	061	*f*	804	*z*	7
54	9,69 765	*a*	9,75 969	e^1	10,24 031	e^1	9,93 797	z^1	6
55	9,69 787	*a*	9,75 998	f_1	10,24 002	f_1	9,93 789	*w*	5
56	809	*a*	76 027	*f*	23 973	*f*	782	*x*	4
57	831	*a*	056	*f*	944	*f*	775	z^1	3
58	853	*d*	086	*e*	914	*e*	768	*v*	2
59	9,69 875	*c*	9,76 115	e^1	10,23 885	e^1	9,93 760	*x*	1
60	9,69 897	*c*	9,76 144	*h*	10,23 856	*h*	9,93 753	*z*	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**60°**	″	10″	20″	30″	40″	50″
a	4	8	11	15	19		*g*	5	9	15	19	24
b	3	7	11	14	18		*h*	5	10	14	19	24
c	4	7	11	15	18		*v*	2	3	4	5	6
d	4	8	11	15	18		*w*	1	2	3	4	6
e	4	9	14	19	24		*x*	1	2	3	5	6
f	5	10	15	20	25		*z*	1	2	4	5	6

Sin+, Tan+, add. diff. Cos−, Cot−, subtract diff.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,69 897	a^1	9,76 144	e^1	10,23 856	e^1	9,93 753	y	**60**
1	919	a	173	d	827	d	746	w^1	59
2	941	c^1	202	d^1	798	d^1	738	w	58
3	963	c	231	d^1	769	d^1	731	y^1	57
4	9,69 984	b^1	9,76 261	f	10,23 739	f	9,93 724	w^1	56
5	9,70 006	a^1	9,76 290	f^1	10,23 710	f^1	9,93 717	x	55
6	028	a^1	319	e	681	e	709	y^1	54
7	050	c^1	348	e	652	e	702	w^1	53
8	072	c	377	e^1	623	e^1	695	x	52
9	9,70 093	b	9,76 406	d	10,23 594	d	9,93 687	y^1	51
10	9,70 115	a^1	9,76 435	d	10,23 565	d	9,93 680	w	**50**
11	137	c^1	464	d	536	d	673	x	49
12	159	c	493	d^1	507	d^1	665	y^1	48
13	180	a^1	522	d^1	478	d^1	658	w^1	47
14	9,70 202	a	9,76 551	d^1	10,23 449	d^1	9,93 650	y	46
15	9,70 224	c	9,76 580	d^1	10,23 420	d^1	9,93 643	w	45
16	245	a^1	609	d^1	391	d^1	636	w^1	44
17	267	c^1	639	f	361	f	628	y^1	43
18	288	b^1	668	f	332	f	621	w	42
19	9,70 310	a^1	9,76 697	f	10,23 303	f	9,93 614	x	41
20	9,70 332	c	9,76 725	d^1	10,23 275	d^1	9,93 606	y^1	**40**
21	353	a^1	754	d^1	246	d^1	599	w^1	39
22	375	c^1	783	d^1	217	d^1	591	y^1	38
23	396	b	812	d^1	188	d^1	584	w	37
24	9,70 418	a	9,76 841	d	10,23 159	d	9,93 577	x	36
25	9,70 439	b	9,76 870	d	10,23 130	d	9,93 569	w	35
26	461	a	899	e^1	101	e^1	562	w^1	34
27	482	b	928	e^1	072	e^1	554	y^1	33
28	504	a	957	e^1	043	e^1	547	w^1	32
29	9,70 525	b	9,76 986	e	10,23 014	e	9,93 539	y	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	4	7	11	$1\overline{4}$	18
b	4	8	11	15	$1\overline{8}$
c	3	7	$1\overline{0}$	14	18
d	5	10	15	20	$2\overline{4}$
e	5	10	$1\overline{4}$	19	24

59°

″	10″	20″	30″	40″	50″
f	$\overline{4}$	9	14	19	24
w	1	$\overline{2}$	4	5	6
x	2	3	4	5	7
y	1	2	3	$\overline{4}$	6
z	1	2	5	6	6

Sin+, Tan+, add dif.
Cos−, Cot−, subtract diff.

Log. cosec = − log. sin.
,, sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,70 547	b_1	9,77 015	f	10,22 985	f	9,93 532	y^1	30
31	568	a	044	f	956	f	525	w	29
32	590	c^1	073	f_1	927	f_1	517	y^1	28
33	611	b	101	d^1	899	d^1	510	w	27
34	9,70 633	c	9,77 130	d	10,22 870	d	9,93 502	y	26
35	9,70 654	b	9,77 159	e^1	10,22 841	e^1	9,93 495	x	25
36	675	a	188	e	812	e	487	y	24
37	697	c	217	f	783	f	480	x	23
38	718	b	246	f_1	754	f_1	472	y	22
39	9,70 739	b	9,77 274	d	10,22 726	d	9,93 465	x	21
40	9,70 761	c	9,77 303	e^1	10,22 697	e^1	9,93 457	y	20
41	782	b_1	332	e	668	e	450	x	19
42	803	b	361	f	639	f	442	y	18
43	824	a^1	390	f_1	610	f_1	435	x	17
44	9,70 846	c	9,77 418	d	10,22 582	d	9,93 427	y	16
45	9,70 867	b	9,77 447	e^1	10,22 553	e^1	9,93 420	x	15
46	888	b	476	f	524	f	412	y	14
47	909	a^1	505	f_1	495	f_1	405	x	13
48	931	c	533	e^1	467	e^1	397	y	12
49	9,70 952	c	9,77 562	e	10,22 438	e	9,93 390	w	11
50	9,70 973	b	9,77 591	f	10,22 409	f	9,93 382	y^1	10
51	70 994	b	619	d	381	d	375	w	9
52	71 015	b	648	e^1	352	e^1	367	y^1	8
53	036	b	677	f	323	f	360	w	7
54	9,71 058	c	9,77 706	g	10,22 294	g	9,93 352	x	6
55	9,71 079	c	9,77 734	e^1	10,22 266	e^1	9,93 344	y	5
56	100	c	763	f	237	f	337	x	4
57	121	c	791	d	209	d	329	y	3
58	142	c	820	e	180	e	322	w	2
59	9,71 163	c	9,77 849	f	10,22 151	f	9,93 314	y^1	1
60	9,71 184	c	9,77 877	e^1	10,22 123	e^1	9,93 307	w	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	4	$\overline{7}$	11	15	18
b	4	7	11	14	18
c	3	7	10	14	$1\overline{7}$
d	5	10	15	20	$2\overline{4}$
e	5	10	14	19	24

59°

″	10″	20″	30″	40″	50″
f	$\underline{5}$	9	14	19	24
g	4	9	14	19	23
w	2	3	4	5	7
x	1	3	4	5	6
y	1	2	$\overline{3}$	5	6

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,71 184	*a*	9,77 877	*d*	10,22 123	*d*	9,93 307	w^1	**60**
1	205	*a*	906	*d*	094	*d*	299	*w*	59
2	226	*a*	935	*e*	065	*e*	291	*x*	58
3	247	*a*	963	f^1	037	f^1	284	*y*	57
4	9,71 268	*a*	9,77 992	*f*	10,22 008	*f*	9,93 276	x^1	56
5	9,71 289	*a*	9,78 020	*d*	10,21 980	*d*	9,93 269	y^1	55
6	310	*a*	049	*f*	951	*f*	261	*w*	54
7	331	*a*	077	d^1	923	d^1	253	x^1	53
8	352	*a*	106	f^1	894	f^1	246	w^1	52
9	9,71 373	*a*	9,78 135	*e*	10,21 865	*e*	9,93 238	*w*	51
10	9,71 393	b^1	9,78 163	f^1	10,21 837	f^1	9,93 230	*x*	**50**
11	414	b^1	192	*e*	808	*e*	223	w^1	49
12	435	b^1	220	f^1	780	f^1	215	x^1	48
13	456	*b*	249	*e*	751	*e*	207	*x*	47
14	9,71 477	*a*	9,78 277	f^1	10,21 723	f^1	9,93 200	*y*	46
15	9,71 498	*a*	9,78 306	*e*	10,21 694	*e*	9,93 192	x^1	45
16	519	c^1	334	f^1	666	f^1	184	*x*	44
17	539	b^1	363	*e*	637	*e*	177	*y*	43
18	560	*b*	391	f^1	609	f^1	169	x^1	42
19	9,71 581	*a*	9,78 419	*d*	10,21 581	*d*	9,93 161	*x*	41
20	9,71 602	*a*	9,78 448	*f*	10,21 552	*f*	9,93 154	w^1	**40**
21	622	b^1	476	*d*	524	*d*	146	*w*	39
22	643	*b*	505	h^1	495	h^1	138	*x*	38
23	664	*a*	533	f^1	467	f^1	131	w^1	37
24	9,71 685	*c*	9,78 562	*e*	10,21 438	*e*	9,93 123	*w*	36
25	9,71 705	*b*	9,78 590	f^1	10,21 410	f^1	9,93 115	x^1	35
26	726	*a*	618	*d*	382	*d*	108	y^1	34
27	747	*c*	647	h^1	353	h^1	100	w^1	33
28	767	*b*	675	f^1	325	f^1	092	*w*	32
29	9,71 788	*a*	9,78 704	*h*	10,21 296	*h*	9,93 084	x^1	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	3	7	10	14	17
b	4	7	11	14	17̄
c	3	6̄	10	13	17
d	5	10	15	19̄	24
e	4	9	14	19	23

58°

″	10″	20″	30″	40″	50″
f	5̄	9̄	14	19	24
h	4̄	9	14	18̄	23
w	1̄	3	4	5	6̄
x	1	2	3̄	5	6
y	1̄	3	4	5̄	7

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff.

Log. cosec = −log. sin.
,, sec = −log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,71 809	a^1	9,78 732	e^1	10,21 268	e^1	9,93 077	y^1	30
31	829	c_1	760	f	240	f	069	x	29
32	850	b	789	e	211	e	061	w	28
33	870	c	817	e^1	183	e^1	053	w	27
34	9,71 891	b^1	9,78 845	f	10,21 155	f	9,93 046	y^1	26
35	9,71 911	c^1	9,78 874	g	10,21 126	g	9,93 038	x	25
36	932	b^1	902	e^1	098	e^1	030	w^1	24
37	952	c^1	930	f	070	f	022	w	23
38	973	b^1	959	g	041	g	014	z	22
39	9,71 994	a^1	9,78 987	g^1	10,21 013	g^1	9,93 007	y	21
40	9,72 014	b^1	9,79 015	f	10,20 985	f	9,92 999	x	20
41	034	c^1	043	f	957	f	991	w	19
42	055	b^1	072	g	928	g	983	w	18
43	075	c	100	g^1	900	g^1	976	y^1	17
44	9,72 096	b	9,79 128	f	10,20 872	f	9,92 968	y^1	16
45	9,72 116	c_1	9,79 156	f	10,20 844	f	9,92 960	x	15
46	137	a^1	185	g	815	g	952	w^1	14
47	157	b^1	213	e	787	e	944	w	13
48	177	c	241	e^1	759	e^1	936	w	12
49	9,72 198	b	9,79 269	f	10,20 731	f	9,92 929	y^1	11
50	9,72 218	c_1	9,79 297	f^1	10,20 703	f^1	9,92 921	y	10
51	238	c	326	g	674	g	913	x	9
52	259	b	354	e	646	e	905	x	8
53	279	c_1	382	g^1	618	g^1	897	w	7
54	9,72 299	c	9,79 410	f	10,20 590	f	9,92 889	w	6
55	9,72 320	a^1	9,79 438	f	10,20 562	f	9,92 881	z^1	5
56	340	b^1	466	f	534	f	874	y^1	4
57	360	c_1	495	g	505	g	866	y^1	3
58	381	a	523	g	477	g	858	x	2
59	9,72 401	a^1	9,79 551	e	10,20 449	e	9,92 850	x	1
60	9,72 421	b	9,79 579	g	10,20 421	g	9,92 842	x	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**58°**	″	10″	20″	30″	40″	50″
a	3	6	10	13	16		g	4	9	14	18	23
b	3	7	10	13	17		w	1	2	4	5	6
c	4	7	11	14	17		x	1	3	4	5	7
e	4	9	14	19	23		y	2	3	4	5	7
f	5	10	14	19	24		z	1	2	3	5	6

Sin+, Tan+, add. diff. Log. cosec = −log. sin.
Cos−, Cot−, subtract diff. ,, sec = −log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,72 421	*a*	9,79 579	f^1	10,20 421	f^1	9,92 842	*x*	**60**
1	441	*b*	607	f^1	393	f^1	834	*y*	59
2	461	*b*	635	g^1	365	g^1	826	*y*	58
3	482	*d*	663	*h*	337	*h*	818	*y*	57
4	9,72 502	c^1	9,79 691	*h*	10,20 309	*h*	9,92 810	*y*	56
5	9,72 522	*a*	9,79 719	*h*	10,20 281	*h*	9,92 803	z^1	55
6	542	*a*	747	*h*	253	*h*	795	z^1	54
7	562	*b*	776	*f*	224	*f*	787	z^1	53
8	582	*b*	804	*f*	196	*f*	779	z^1	52
9	9,72 602	*b*	9,79 832	*f*	10,20 168	*f*	9,92 771	*z*	51
10	9,72 622	b^1	9,79 860	*f*	10,20 140	*f*	9,92 763	*x*	**50**
11	643	*c*	888	*f*	112	*f*	755	*x*	49
12	663	*c*	916	*f*	084	*f*	747	*x*	48
13	683	*c*	944	*f*	056	*f*	739	*x*	47
14	9,72 703	*c*	9,79 972	*f*	10,20 028	*f*	9,92 731	*x*	46
15	9,72 723	*c*	9,80 000	*f*	10,20 000	*f*	9,92 723	*x*	45
16	743	*c*	028	*f*	19 972	*f*	715	*x*	44
17	763	*c*	056	*f*	944	*f*	707	*x*	43
18	783	*c*	084	*f*	916	*f*	699	*x*	42
19	9,72 803	*c*	9,80 112	*f*	10,19 888	*f*	9,92 691	*x*	41
20	9,72 823	*c*	9,80 140	*f*	10,19 860	*f*	9,92 683	*x*	**40**
21	843	*c*	168	*g*	832	*g*	675	*x*	39
22	863	*c*	195	*h*	805	*h*	667	*x*	38
23	883	c_1	223	*h*	777	*h*	659	*x*	37
24	9,72 902	*b*	9,80 251	*h*	10,19 749	*h*	9,92 651	*x*	36
25	9,72 922	*b*	9,80 279	*h*	10,19 721	*h*	9,92 643	*x*	35
26	942	a^1	307	f^1	693	f^1	635	*x*	34
27	962	*a*	335	f^1	665	f^1	627	*x*	33
28	72 982	*a*	363	f^1	637	f^1	619	*x*	32
29	9,73 002	*e*	9,80 391	*f*	10,19 609	*f*	9,92 611	*x*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**57°**	″	10″	20″	30″	40″	50″
a	3	7	10	13	17		*g*	$\bar{4}$	9	13	18	23
b	4	7	10	14	17		*h*	5	10	14	19	24
c	3	6	10	13	16		*x*	1	3	4	5	7
d	3	6	10	13	16		*y*	1	2	4	5	6
f	$\bar{4}$	9	14	18	23		*z*	2	3	4	$\bar{5}$	7

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff.

Log. cosec = −log. sin.
,, sec = −log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,73 022	*a*	9,80 419	*e*	10,19 581	*e*	9,92 603	*x*	**30**
31	041	b^1	447	*e*	553	*e*	595	x^1	29
32	061	*b*	474	g^1	526	g^1	587	*y*	28
33	081	c^1	502	g^1	498	g^1	579	*y*	27
34	9,73 101	*a*	9,80 530	*g*	10,19 470	*g*	9,92 571	*y*	26
35	9,73 121	*a*	9,80 558	*g*	10,19 442	*g*	9,92 563	*y*	25
36	140	b^1	586	*f*	414	*f*	555	y^1	24
37	160	c^1	614	*e*	386	*e*	546	*z*	23
38	180	*a*	642	*k*	358	*k*	538	*z*	22
39	9,73 200	a_1	9,80 669	g^1	10,19 331	g^1	9,92 530	*z*	21
40	9,73 219	*b*	9,80 697	*g*	10,19 303	*g*	9,92 522	*x*	**20**
41	239	*c*	725	*f*	275	*f*	514	*x*	19
42	259	*a*	753	*e*	247	*e*	506	*x*	18
43	278	*b*	781	*k*	219	*k*	498	x^1	17
44	9,73 298	*c*	9,80 808	f^1	10,19 192	f^1	9,92 490	*y*	16
45	9,73 318	a_1	9,80 836	*g*	10,19 164	*g*	9,92 482	*y*	15
46	337	*b*	864	*e*	136	*e*	473	*z*	14
47	357	*a*	892	*k*	108	*k*	465	*z*	13
48	377	a_1	919	f^1	081	f^1	457	*x*	12
49	9,73 396	*c*	9,80 947	*g*	10,19 053	*g*	9,92 449	*x*	11
50	9,73 416	*a*	9,80 975	*e*	10,19 025	*e*	9,92 441	x^1	**10**
51	435	*b*	81 003	*k*	18 997	*k*	433	*y*	9
52	455	*a*	030	*g*	970	*g*	425	*y*	8
53	474	*b*	058	*f*	942	*f*	416	*z*	7
54	9,73 494	*a*	9,81 086	*e*	10,18 914	*e*	9,92 408	z^1	6
55	9,73 513	*b*	9,81 113	f^1	10,18 887	f^1	9,92 400	*x*	5
56	533	*a*	141	*g*	859	*g*	392	x^1	4
57	552	*b*	169	*e*	831	*e*	384	*y*	3
58	572	*a*	196	f^1	804	f^1	376	y^1	2
59	9,73 591	*b*	9,81 224	*g*	10,18 776	*g*	9,92 367	*z*	1
60	9,73 611	*a*	9,81 252	*e*	10,18 748	*e*	9,92 359	*x*	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**57°**	″	10″	20″	30″	40″	50″
a	3	6	10	13	16		*g*	5	9	14	19	23
b	4	7	10	13	17		*k*	4	9	13	18	23
c	3	7	10	13	16		*x*	1	3	4	5	7
e	4	9	14	18	23		*y*	2	3	4	6	7
f	5	9	14	18	23		*z*	1	2	4	5	6

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff.

Log. cosec = −log. sin.
,, sec = −log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,73 611	a^1	9,81 252	e	10,18 748	e	9,92 359	w	**60**
1	630	d	279	f	721	f	351	w^1	59
2	650	a	307	e^1	693	e^1	343	x	58
3	669	b	335	g	665	g	335	x^1	57
4	9,73 689	a	9,81 362	f	10,18 638	f	9,92 326	z	56
5	9,73 708	a^1	9,81 390	e^1	10,18 610	e^1	9,92 318	w	55
6	727	d	418	g	582	g	310	x	54
7	747	a	445	f_1	555	f_1	302	x^1	53
8	766	b	473	e	527	e	293	z	52
9	9,73 785	d	9,81 500	f	10,18 500	f	9,92 285	w	51
10	9,73 805	a	9,81 528	e^1	10,18 472	e^1	9,92 277	x	**50**
11	824	b	556	g	444	g	269	x^1	49
12	843	d	583	e^1	417	e^1	260	z	48
13	863	a	611	g	389	g	252	w	47
14	9,73 882	a^1	9,81 638	f_1	10,18 362	f_1	9,92 244	x	46
15	9,73 901	b	9,81 666	e	10,18 334	e	9,92 235	z_1	45
16	921	c^1	693	f	307	f	227	w	44
17	940	a	721	e	279	e	219	w^1	43
18	959	a^1	748	f	252	f	211	x^1	42
19	9,73 978	b	9,81 776	e^1	10,18 224	e^1	9,92 202	z	41
20	9,73 997	b^1	9,81 803	f	10,18 197	f	9,92 194	w^1	**40**
21	74 017	c^1	831	e^1	169	e^1	186	x	39
22	036	a	858	f	142	f	177	z	38
23	055	a^1	886	e^1	114	e^1	169	w	37
24	9,74 074	b	9,81 913	f	10,18 087	f	9,92 161	x	36
25	9,74 093	b^1	9,81 941	e^1	10,18 059	e^1	9,92 152	z	35
26	113	c	968	f	032	f	144	w	34
27	132	c^1	81 996	e	18 004	e	136	x	33
28	151	c	82 023	f	17 977	f	127	z	32
29	9,74 170	a	9,82 051	e	10,17 949	e	9,92 119	w^1	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	3	6	9	13	16
b	3	7	10	13	16
c	3	6	9	12	15
d	4	7	10	13	17
e	4	9	14	18	23

56°

″	10″	20″	30″	40″	50″
f	5	10	14	19	23
g	4	9	13	18	23
w	1	3	4	5	7
x	2	3	4	6	7
z	1	2	4	5	7

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff.

Log. cosec = − log. sin.
,, sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,74 189	*a*	9,82 078	e^1	10,17 922	e^1	9,92 111	*z*	**30**
31	208	a^1	106	*f*	894	*f*	102	y_1	29
32	227	a^1	133	f^1	867	f^1	094	y^1	28
33	246	*b*	161	*g*	839	*g*	086	*z*	27
34	9,74 265	*b*	9,82 188	*e*	10,17 812	*e*	9,92 077	*y*	26
35	9,74 284	*b*	9,82 215	h^1	10,17 785	h^1	9,92 069	z_1	25
36	303	*b*	243	*h*	757	*h*	060	y_1	24
37	322	*b*	270	e^1	730	e^1	052	y^1	23
38	341	*b*	298	*g*	702	*g*	044	*z*	22
39	9,74 360	*b*	9,82 325	f^1	10,17 675	f^1	9,92 035	*y*	21
40	9,74 379	*b*	9,82 352	h^1	10,17 648	h^1	9,92 027	z_1	**20**
41	398	a^1	380	*h*	620	*h*	018	y_1	19
42	417	a^1	407	*e*	593	*e*	010	*y*	18
43	436	*b*	435	*g*	565	*g*	92 002	z^1	17
44	9,74 455	*a*	9,82 462	*h*	10,17 538	*h*	9,91 993	y^1	16
45	9,74 474	c^1	9,82 489	*e*	10,17 511	*e*	9,91 985	*z*	15
46	493	c^1	517	*g*	483	*g*	976	*y*	14
47	512	*c*	544	*h*	456	*h*	968	z_1	13
48	531	*c*	571	*e*	429	*e*	959	*y*	12
49	9,74 549	*d*	9,82 599	*g*	10,17 401	*g*	9,91 951	*z*	11
50	9,74 568	*b*	9,82 626	*h*	10,17 374	*h*	9,91 942	y_1	**10**
51	587	a^1	653	*e*	347	*e*	934	z_1	9
52	606	c^1	681	*g*	319	*g*	925	y_1	8
53	625	*c*	708	*f*	292	*f*	917	y^1	7
54	9,74 644	*c*	9,82 735	f^1	10,17 265	f^1	9,91 908	y_1	6
55	9,74 662	*d*	9,82 762	h^1	10,17 238	h^1	9,91 900	y^1	5
56	681	a^1	790	*g*	210	*g*	891	y_1	4
57	700	c^1	817	f^1	183	f^1	883	y^1	3
58	719	*c*	844	f^1	156	f^1	874	y_1	2
59	9,74 737	*d*	9,82 871	h^1	10,17 129	h^1	9,91 866	y^1	1
60	9,74 756	a^1	9,82 899	*g*	10,17 101	*g*	9,91 857	y_1	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**56°**	″	10″	20″	30″	40″	50″
a	3	6	9	13	16		*f*	4	9	13	18	23
b	3	7	10	13	16		*g*	4	9	13	18	22
c	3	6	9	12	15		*h*	4	9	14	18	23
d	4	7	10	13	16		*y*	1	3	4	5	7
e	5	9	14	18	23		*z*	2	3	5	6	7

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff

Log. cosec = −log. sin.
„ sec = −log cos.

34°

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,74 756	*a*	9,82 899	*d*	10,17 101	*d*	9,91 857	*v*	**60**
1	775	*b*	926	*e*	074	*e*	849	y^1	59
2	794	*b*	953	*e*	047	*e*	840	*v*	58
3	812	*c*	82 980	e^1	17 020	e^1	832	y^1	57
4	9,74 831	b^1	9,83 008	*d*	10,16 992	*d*	9,91 823	*x*	56
5	9,74 850	*b*	9,83 035	*g*	10,16 965	*g*	9,91 815	x^1	55
6	868	*c*	062	*e*	938	*e*	806	*y*	54
7	887	b^1	089	*e*	911	*e*	798	x^1	53
8	906	*b*	117	*d*	883	*d*	789	*y*	52
9	9,74 924	*a*	9,83 144	*d*	10,16 856	*d*	9,91 781	*z*	51
10	9,74 943	*b*	9,83 171	*g*	10,16 829	*g*	9,91 772	*y*	**50**
11	961	c^1	198	*e*	802	*e*	763	*v*	49
12	980	b^1	225	*e*	775	*e*	755	x^1	48
13	74 999	*b*	252	e^1	748	e^1	746	*y*	47
14	9,75 017	*a*	9,83 280	*d*	10,16 720	*d*	9,91 738	*z*	46
15	9,75 036	*b*	9,83 307	*d*	10,16 693	*d*	9,91 729	*y*	45
16	054	*c*	334	*g*	666	*g*	720	*v*	44
17	073	*b*	361	*e*	639	*e*	712	x^1	43
18	091	*c*	388	*e*	612	*e*	703	*y*	42
19	9,75 110	*b*	9,83 415	*e*	10,16 585	*e*	9,91 695	*z*	41
20	9,75 128	*c*	9,83 442	e^1	10,16 558	e^1	9,91 686	y^1	**40**
21	147	*b*	470	*d*	530	*d*	677	*x*	39
22	165	*c*	497	*d*	503	*d*	669	*z*	38
23	184	*b*	524	*d*	476	*d*	660	*y*	37
24	9,75 202	*a*	9,83 551	d^1	10,16 449	d^1	9,91 651	*x*	36
25	9,75 221	*b*	9,83 578	*e*	10,16 422	*e*	9,91 643	x^1	35
26	239	b^1	605	*e*	395	*e*	634	*y*	34
27	258	*b*	632	*e*	368	*e*	625	*v*	33
28	276	*b*	659	*e*	341	*e*	617	*z*	32
29	9,75 294	*c*	9,83 686	*e*	10,16 314	*e*	9,91 608	*y*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	3	6	10	13	16
b	3	6	9	12	$1\bar{5}$
c	$\bar{3}$	7	10	13	16
d	4	9	13	18	$2\bar{2}$
e	5	$\bar{9}$	14	$1\bar{8}$	23

55°

″	10″	20″	30″	40″	50″
g	4	9	14	18	23
v	1	2	4	5	7
x	$\bar{1}$	3	$\bar{4}$	$\bar{5}$	7
y	$\bar{1}$	3	4	6	7
z	2	3	5	6	8

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff.

Log. cosec = − log. sin.
,, sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,75 313	*a*	9,83 713	*e*	10,16 287	*e*	9,91 599	w_1	**30**
31	331	*a*	740	e^1	260	e^1	591	*x*	29
32	350	*a*	768	*g*	232	*g*	582	*w*	28
33	368	*a*	795	*g*	205	*g*	573	*w*	27
34	9,75 386	a^1	9,83 822	*g*	10,16 178	*g*	9,91 565	*x*	26
35	9,75 405	*a*	9,83 849	*g*	10,16 151	*g*	9,91 556	*y*	25
36	423	*a*	876	*g*	124	*g*	547	*w*	24
37	441	*a*	903	*g*	097	*g*	538	*z*	23
38	459	b^1	930	*g*	070	*g*	530	*x*	22
39	9,75 478	*a*	9,83 957	*g*	10,16 043	*g*	9,91 521	*w*	21
40	9,75 496	*a*	9,83 984	*g*	10,16 016	*g*	9,91 512	*w*	**20**
41	514	a^1	84 011	*g*	15 989	*g*	504	*x*	19
42	533	*a*	038	*g*	962	*g*	495	*x*	18
43	551	*a*	065	*g*	935	*g*	486	*w*	17
44	9,75 569	*a*	9,84 092	*g*	10,15 908	*g*	9,91 477	*w*	16
45	9,75 587	*a*	9,84 119	*g*	10,15 881	*g*	9,91 469	*x*	15
46	605	*b*	146	*g*	854	*g*	460	*x*	14
47	624	*a*	173	*g*	827	*g*	451	*w*	13
48	642	*a*	200	*g*	800	*g*	442	*w*	12
49	9,75 660	*a*	9,84 227	*g*	10,15 773	*g*	9,91 433	w_1	11
50	9,75 678	*a*	9,84 254	*h*	10,15 746	*h*	9,91 425	*x*	**10**
51	696	*a*	280	*e*	720	*e*	416	x_1	9
52	714	b_1	307	*e*	693	*e*	407	*w*	8
53	733	*a*	334	*e*	666	*e*	398	*w*	7
54	9,75 751	*a*	9,84 361	*e*	10,15 639	*e*	9,91 389	w_1	6
55	9,75 769	*a*	9,84 388	*e*	10,15 612	*e*	9,91 381	*x*	5
56	787	*a*	415	*e*	585	*e*	372	*x*	4
57	805	*a*	442	*g*	558	*g*	363	*y*	3
58	823	*a*	469	*g*	531	*g*	354	*w*	2
59	9,75 841	*a*	9,84 496	*g*	10,15 504	*g*	9,91 345	*w*	**1**
60	9,75 859	*a*	9,84 523	*g*	10,15 477	*g*	9,91 336	*z*	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**55°**	″	10″	20″	30″	40″	50″
a	3	6	9	12	15		*h*	4	8	13	17	22
b	3	7	10	13	16		*w*	1	3	4	6	7
d	4	7	9	12	15		*x*	2	3	5	6	8
e	5	9	14	18	23		*y*	2	3	4	6	7
g	4	9	13	18	22		*z*	1	2	4	5	7

Sin+, Tan+, add. diff.
Cos−, Cot−, subtract diff.

Log. cosec = −log. sin.
,, sec = −log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,75 859	*a*	9,84 523	*e*	10,15 477	*e*	9,91 336	*v*	**60**
1	877	*a*	550	d^1	450	d^1	328	*w*	59
2	895	*a*	576	*f*	424	*f*	319	*w*	58
3	913	*a*	603	*f*	397	*f*	310	*x*	57
4	9,75 931	*a*	9,84 630	*f*	10,15 370	*f*	9,91 301	*y*	56
5	9,75 949	*a*	9,84 657	*g*	10,15 343	*g*	9,91 292	*y*	55
6	967	*a*	684	*e*	316	*e*	283	*y*	54
7	75 985	*a*	711	*e*	289	*e*	274	*y*	53
8	76 003	*a*	738	d^1	262	d^1	266	*w*	52
9	9,76 021	*a*	9,84 764	*f*	10,15 236	*f*	9,91 257	*w*	51
10	9,76 039	*a*	9,84 791	*f*	10,15 209	*f*	9,91 248	*w*	**50**
11	057	*a*	818	g^1	182	g^1	239	*w*	49
12	075	*a*	845	*e*	155	*e*	230	*w*	48
13	093	*a*	872	*e*	128	*e*	221	*y*	47
14	9,76 111	*a*	9,84 899	*d*	10,15 101	*d*	9,91 212	*y*	46
15	9,76 129	*a*	9,84 925	*f*	10,15 075	*f*	9,91 203	v^1	45
16	146	*a*	952	g^1	048	g^1	194	*y*	44
17	164	*a*	84 979	*e*	15 021	*e*	185	*y*	43
18	182	*a*	85 006	*e*	14 994	*e*	176	*y*	42
19	9,76 200	*a*	9,85 033	*d*	10,14 967	*d*	9,91 167	*y*	41
20	9,76 218	*a*	9,85 059	*f*	10,14 941	*f*	9,91 158	*y*	**40**
21	236	*b*	086	*g*	914	*g*	149	y_1	39
22	253	*a*	113	*e*	887	*e*	141	*w*	38
23	271	*a*	140	d^1	860	d^1	132	*w*	37
24	9,76 289	*a*	9,85 166	*f*	10,14 834	*f*	9,91 123	*w*	36
25	9,76 307	*a*	9,85 193	*g*	10,14 807	*g*	9,91 114	*w*	35
26	324	*a*	220	*e*	780	*e*	105	*w*	34
27	342	*a*	247	d^1	753	d^1	096	*w*	33
28	360	*a*	273	*f*	727	*f*	087	*w*	32
29	9,76 378	a_1	9,85 300	*g*	10,14 700	*g*	9,91 078	*w*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	3	6	9	12	15
b	3	5	8	11	14
d	4	8	13	17	22
e	4	9	13	18	22
f	5	9	14	18	23

54°

″	10″	20″	30″	40″	50″
g	5	9	13	18	22
v	1	2	4	5	7
w	2	3	5	6	8
x	2	3	5	6	7
y	1	3	4	6	7

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff.

Log. cosec = − log. sin.
,, sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,76 395	*a*	9,85 327	*e*	10,14 673	*e*	9,91 069	*w*	**30**
31	413	*a*	354	*f*	646	*f*	060	*w*	29
32	431	*a*	380	*g*	620	*g*	051	*w*	28
33	448	*a*	407	*e*	593	*e*	042	*w*	27
34	9,76 466	*a*	9,85 434	f^1	10,14 566	f^1	9,91 033	w^1	26
35	9,76 484	*a*	9,85 460	g^1	10,14 540	g^1	9,91 023	*x*	25
36	501	*a*	487	*e*	513	*e*	014	*x*	24
37	519	*a*	514	*e*	486	*e*	91 005	*x*	23
38	537	*b*	540	g^1	460	g^1	90 996	*x*	22
39	9,76 554	*a*	9,85 567	*h*	10,14 433	*h*	9,90 987	*x*	21
40	9,76 572	b^1	9,85 594	*e*	10,14 406	*e*	9,90 978	*x*	**20**
41	590	*d*	620	g^1	380	g^1	969	*x*	19
42	607	*a*	647	*h*	353	*h*	960	*x*	18
43	625	*b*	674	*e*	326	*e*	951	*w*	17
44	9,76 642	*a*	9,85 700	g^1	10,14 300	g^1	9,90 942	*w*	16
45	9,76 660	b^1	9,85 727	*e*	10,14 273	*e*	9,90 933	*w*	15
46	677	*a*	754	f^1	246	f^1	924	*w*	14
47	695	*a*	780	g^1	220	g^1	915	*w*	13
48	712	*a*	807	*e*	193	*e*	906	*y*	12
49	9,76 730	*a*	9,85 834	*f*	10,14 166	*f*	9,90 896	*x*	11
50	9,76 747	*a*	9,85 860	*h*	10,14 140	*h*	9,90 887	*x*	**10**
51	765	*a*	887	*e*	113	*e*	878	*x*	9
52	782	*a*	913	g^1	087	g^1	869	*w*	8
53	800	b^1	940	*e*	060	*e*	860	*w*	7
54	9,76 817	*a*	9,85 967	*f*	10,14 033	*f*	9,90 851	*w*	6
55	9,76 835	*b*	9,85 993	*g*	10,14 007	*g*	9,90 842	w^1	5
56	852	*a*	86 020	*e*	13 980	*e*	832	*x*	4
57	870	d^1	046	g^1	954	g^1	823	*x*	3
58	887	*a*	073	*e*	927	*e*	814	x^1	2
59	9,76 904	*a*	9,86 100	*f*	10,13 900	*f*	9,90 805	*w*	1
60	9,76 922	*b*	9,86 126	*h*	10,13 874	*h*	9,90 796	*w*	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**54°**	″	10″	20″	30″	40″	50″
a	3	6	9	12	15		*g*	5	9	14	18	22̄
b	3	6	9	11̄	14		*h*	5	9	13	18	22
d	2̄	5	8	11	14		*w*	2	3	5	6̄	8
e	4	9	13	18	22		*x*	1	3	4	6	7̄
f	4	8̄	13	17	22		*y*	2	4	5	7	8

Sin+, Tan+, add. diff. Log. cosec = −log. sin.
Cos−, Cot−, subtract diff. ,, sec = −log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,76 922	*a*	9,86 126	g_1	10,13 874	g_1	9,90 796	*w*	**60**
1	939	*b*	153	f^1	847	f^1	787	*x*	59
2	957	*c*	179	*g*	821	*g*	777	*y*	58
3	974	a^1	206	f^1	794	f^1	768	*y*	57
4	9,76 991	*b*	9,86 232	*g*	10,13 768	*g*	9,90 759	*w*	56
5	9,77 009	*c*	9,86 259	*h*	10,13 741	*h*	9,90 750	*w*	55
6	026	*b*	285	g^1	715	g^1	741	*x*	54
7	043	*b*	312	*h*	688	*h*	731	*y*	53
8	061	*c*	338	g^1	662	g^1	722	*z*	52
9	9,77 078	*a*	9,86 365	*h*	10,13 635	*h*	9,90 713	*w*	51
10	9,77 095	*b*	9,86 392	*f*	10,13 608	*f*	9,90 704	*w*	**50**
11	112	*b*	418	*h*	582	*h*	694	*y*	49
12	130	c^1	445	*f*	555	*f*	685	*y*	48
13	147	a^1	471	*h*	529	*h*	676	*w*	47
14	9,77 164	*b*	9,86 498	*f*	10,13 502	*f*	9,90 667	*w*	46
15	9,77 181	*b*	9,86 524	*h*	10,13 476	*h*	9,90 657	*y*	45
16	199	*c*	551	*f*	449	*f*	648	*z*	44
17	216	*a*	577	*h*	423	*h*	639	*w*	43
18	233	a^1	603	g^1	397	g^1	630	*x*	42
19	9,77 250	*b*	9,86 630	*h*	10,13 370	*h*	9,90 620	*y*	41
20	9,77 268	c_1	9,86 656	*g*	10,13 344	*g*	9,90 611	z^1	**40**
21	285	*c*	683	*h*	317	*h*	602	*w*	39
22	302	a_1	709	*g*	291	*g*	592	*y*	38
23	319	*a*	736	f^1	264	f^1	583	*z*	37
24	9,77 336	a^1	9,86 762	*g*	10,13 238	*g*	9,90 574	*w*	36
25	9,77 353	*b*	9,86 789	f^1	10,13 211	f^1	9,90 565	*x*	35
26	370	*b*	815	g_1	185	g_1	555	*z*	34
27	387	*b*	842	*f*	158	*f*	546	*w*	33
28	405	c_1	868	*h*	132	*h*	537	*x*	32
29	9,77 422	*c*	9,86 894	*g*	10,13 106	*g*	9,90 527	*z*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**53°**	″	10″	20″	30″	40″	50″
a	3	6	9	11	14		*h*	4	9	13	18	22
b	3	6	9	12	15		*w*	2	3	5	6	8
c	3	5	8	11	14		*x*	2	3	5	7	8
f	4	8	13	17	22		*y*	1	3	4	6	7
g	5	9	14	18	22		*z*	1	3	4	6	8

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff.

Log. cosec = − log. sin.
,, sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,77 439	*a*	9,86 921	*d*	10,13 079	*d*	9,90 518	*u*	**30**
31	456	a^1	947	d^1	053	d^1	509	v^1	29
32	473	a^1	86 974	e^1	026	e^1	499	*w*	28
33	490	a^1	87 000	*f*	13 000	*f*	490	*u*	27
34	9,77 507	a^1	9,87 027	*e*	10,12 973	*e*	9,90 480	*x*	26
35	9,77 524	*b*	9,87 053	*d*	10,12 947	*d*	9,90 471	*w*	25
36	541	*b*	079	d^1	921	d^1	462	u^1	24
37	558	*b*	106	e^1	894	e^1	452	*y*	23
38	575	*b*	132	*f*	868	*f*	443	*u*	22
39	9,77 592	a^1	9,87 158	d^1	10,12 842	d^1	9,90 434	v^1	21
40	9,77 609	a^1	9,87 185	e^1	10,12 815	e^1	9,90 424	*w*	**20**
41	626	a^1	211	*f*	789	*f*	415	u^1	19
42	643	a^1	238	*e*	762	*e*	405	*y*	18
43	660	*a*	264	*d*	736	*d*	396	*v*	17
44	9,77 677	*a*	9,87 290	*f*	10,12 710	*f*	9,90 386	*x*	16
45	9,77 694	*a*	9,87 317	*e*	10,12 683	*e*	9,90 377	*u*	15
46	711	a_1	343	*d*	657	*d*	368	v^1	14
47	728	a_1	369	d^1	631	d^1	358	*w*	13
48	744	b^1	396	*e*	604	*e*	349	u^1	12
49	9,77 761	b^1	9,87 422	*d*	10,12 578	*d*	9,90 339	*y*	11
50	9,77 778	*b*	9,87 448	d^1	10,12 552	d^1	9,90 330	u^1	**10**
51	795	a^1	475	*e*	525	*e*	320	*y*	9
52	812	*a*	501	*d*	499	*d*	311	*u*	8
53	829	*a*	527	*f*	473	*f*	301	*y*	7
54	9,77 846	a_1	9,87 554	*e*	10,12 446	*e*	9,90 292	*u*	6
55	9,77 862	b^1	9,87 580	*d*	10,12 420	*d*	9,90 282	*y*	5
56	879	*b*	606	*f*	394	*f*	273	*u*	4
57	896	a^1	633	e_1	367	e_1	263	*y*	3
58	913	*a*	659	e^1	341	e^1	254	*u*	2
59	9,77 930	a_1	9,87 685	*f*	10,12 315	*f*	9,90 244	*y*	1
60	9,77 946	*b*	9,87 711	f^1	10,12 289	f^1	9,90 235	*u*	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**53°**	″	10″	20″	30″	40″	50″
a	3	5	8	11	14		*u*	2	3	5	6	8
b	3	6	9	11	14		*v*	2	4	5	6	8
d	4	9	13	18	22		*w*	1	3	5	6	8
e	4	8	13	17	22		*x*	1	3	4	6	7
f	5	9	13	18	22		*y*	1	3	4	6	8

Log. cosec = −log. sin. Log. sec = −log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,77 946	a^1	9,87 711	e^1	10,12 289	e^1	9,90 235	v	60
1	963	a	738	f	262	f	225	w	59
2	980	b^1	764	f^1	236	f^1	216	x	58
3	77 997	c	790	e	210	e	206	w	57
4	9,78 013	a^1	9,87 817	g	10,12 183	g	9,90 197	x	56
5	9,78 030	a	9,87 843	g^1	10,12 157	g^1	9,90 187	w^1	55
6	047	c^1	869	f^1	131	f^1	178	x^1	54
7	063	d^1	895	e	105	e	168	v_1	53
8	080	a	922	g	078	g	159	x^1	52
9	9,78 097	b^1	9,87 948	g^1	10,12 052	g^1	9,90 149	v	51
10	9,78 113	d^1	9,87 974	f^1	10,12 026	f^1	9,90 139	w	50
11	130	a	88 000	e	12 000	e	130	x	49
12	147	b^1	027	g	11 973	g	120	w^1	48
13	163	a^1	053	g^1	947	g^1	111	x^1	47
14	9,78 180	a	9,88 079	g^1	10,11 921	g^1	9,90 101	v	46
15	9,78 197	c	9,88 105	e	10,11 895	e	9,90 091	w	45
16	213	a^1	131	e^1	869	e^1	082	x	44
17	230	b^1	158	g	842	g	072	w^1	43
18	246	a^1	184	g^1	816	g^1	063	x^1	42
19	9,78 263	a	9,88 210	f^1	10,11 790	f^1	9,90 053	v	41
20	9,78 280	c	9,88 236	e	10,11 764	e	9,90 043	w^1	40
21	296	a	262	e^1	738	e^1	034	x^1	39
22	313	c	289	g	711	g	024	v	38
23	329	a	315	g^1	685	g^1	014	w	37
24	9,78 346	b^1	9,88 341	g^1	10,11 659	g^1	9,90 005	x	36
25	9,78 362	a^1	9,88 367	e	10,11 633	e	9,89 995	v	35
26	379	b^1	393	e	607	e	985	w	34
27	395	a^1	420	g	580	g	976	x^1	33
28	412	b^1	446	f	554	f	966	v	32
29	9,78 428	a	9,88 472	g^1	10,11 528	g^1	9,89 956	w	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	3	6	8	11	14
b	3	5	8	11	13
c	2	5	8	11	13
d	2	6	9	12	14
e	5	9	13	18	22

52°

″	10″	20″	30″	40″	50″
f	4	8	13	17	22
g	4	8	13	17	21
v	2	3	5	6	8
w	1	3	4	6	8
x	2	3	5	7	8

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff.

Log. cosec = − log. sin.
„ sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,78 445	a^1	9,88 498	d	10,11 502	d	9,89 947	u	**30**
31	461	b	524	e	476	e	937	v	29
32	478	a^1	550	e	450	e	927	w	28
33	494	b	577	f	423	f	918	u^1	27
34	9,78 510	b^1	9,88 603	f	10,11 397	f	9,89 908	x	26
35	9,78 527	c^1	9,88 629	f^1	10,11 371	f^1	9,89 898	w	25
36	543	b^1	655	d	345	d	888	w_1	24
37	560	a^1	681	d	319	d	879	v^1	23
38	576	b	707	e	293	e	869	x	22
39	9,78 592	b^1	9,88 733	e	10,11 267	e	9,89 859	w	21
40	9,78 609	c	9,88 759	e	10,11 241	e	9,89 849	w_1	**20**
41	625	b	786	f	214	f	840	u	19
42	642	a	812	f	188	f	830	x	18
43	658	c^1	838	f^1	162	f^1	820	w	17
44	9,78 674	b	9,88 864	d	10,11 136	d	9,89 810	w	16
45	9,78 691	a	9,88 890	d	10,11 110	d	9,89 801	u^1	15
46	707	c	916	d	084	d	791	x	14
47	723	b	942	d^1	058	d^1	781	x	13
48	739	b^1	968	e	032	e	771	w	12
49	9,78 756	a^1	9,88 994	e	10,11 006	e	9,89 761	w_1	11
50	9,78 772	c^1	9,89 020	e	10,10 980	e	9,89 752	u^1	**10**
51	788	b	046	e^1	954	e^1	742	x	9
52	805	a	073	f	927	f	732	x	8
53	821	a^1	099	f	901	f	722	w	7
54	9,78 837	c^1	9,89 125	f	10,10 875	f	9,89 712	w	6
55	9,78 853	b	9,89 151	f	10,10 849	f	9,89 702	w_1	5
56	869	b^1	177	f^1	823	f^1	693	u^1	4
57	886	a	203	d	797	d	683	x	3
58	902	c	229	d	771	d	673	x	2
59	9,78 918	c^1	9,89 255	d	10,10 745	d	9,89 663	v	1
60	9,78 934	b	9,89 281	d	10,10 719	d	9,89 653	w	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**52°**	″	10″	20″	30″	40″	50″
a	2	5	8	10̄	13		f	4	8	13	17	21̄
b	3	6	8̄	11	14		u	2	4	5	7	8̄
c	3	5	8	11	13̄		v	2	3̄	5̄	6̄	8
d	4	9	13	17̄	22		w	1	3	5̲	6	8
e	5	9	13̄	18	22		x	2	3	5	7	8

Log. cosec = − log. sin. Log. sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,78 934	*a*	9,89 281	*d*	10,10 719	*d*	9,89 653	*v*	60
1	950	*a*	307	*d*	693	*d*	643	*v*	59
2	967	*b*	333	*d*	667	*d*	633	v_1	58
3	983	*b*	359	*d*	641	*d*	624	*x*	57
4	9,78 999	b^1	9,89 385	*d*	10,10 615	*d*	9,89 614	*x*	56
5	9,79 015	*c*	9,89 411	*d*	10,10 589	*d*	9,89 604	x_1	55
6	031	*c*	437	*d*	563	*d*	594	*z*	54
7	047	*a*	463	*e*	537	*e*	584	*z*	53
8	063	*a*	489	*e*	511	*e*	574	*z*	52
9	9,79 079	*a*	9,89 515	*e*	10,10 485	*e*	9,89 564	v^1	51
10	9,79 095	*a*	9,89 541	*e*	10,10 459	*e*	9,89 554	*v*	50
11	111	a^1	567	*e*	433	*e*	544	*v*	49
12	128	*b*	593	*e*	407	*e*	534	*v*	48
13	144	*b*	619	*e*	381	*e*	524	*v*	47
14	9,79 160	*b*	9,89 645	f^1	10,10 355	f^1	9,89 514	*v*	46
15	9,79 176	*b*	9,89 671	*d*	10,10 329	*d*	9,89 504	v_1	45
16	192	*b*	697	*d*	303	*d*	495	*x*	44
17	208	*b*	723	*d*	277	*d*	485	*x*	43
18	224	*b*	749	*d*	251	*d*	475	*x*	42
19	9,79 240	*b*	9,89 775	*d*	10,10 225	*d*	9,89 465	*x*	41
20	9,79 256	*b*	9,89 801	*d*	10,10 199	*d*	9,89 455	*x*	40
21	272	*b*	827	*d*	173	*d*	445	*x*	39
22	288	*b*	853	*d*	147	*d*	435	*x*	38
23	304	*b*	879	*d*	121	*d*	425	*x*	37
24	9,79 319	*a*	9,89 905	*f*	10,10 095	*f*	9,89 415	*x*	36
25	9,79 335	*a*	9,89 931	g^1	10,10 069	g^1	9,89 405	*x*	35
26	351	*a*	957	g^1	043	g^1	395	*x*	34
27	367	a^1	89 983	g^1	10 017	g^1	385	*x*	33
28	383	*c*	90 009	g^1	09 991	g^1	375	*x*	32
29	9,79 399	*c*	9,90 035	g^1	10,09 965	g^1	9,89 364	*v*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +.	″	′

″	10″	20″	30″	40″	50″
a	3	6	8	11	14
b	2	5	8	10	13
c	3	5	8	11	13
d	4	9	13	17	22
e	5	9	13	18	22

51°

″	10″	20″	30″	40″	50″
f	4	9	13	17	21
g	4	8	12	17	21
v	1	3	5	6	8
x	2	4	5	7	9
z	2	3	5	7	8

Sin +, Tan +, add diff.
Cos −, Cot −, subtract diff.

Log. cosec = − log. sin.
,, sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,79 415	*a*	9,90 061	h_1	10,09 939	h_1	9,89 354	*w*	30
31	431	*b*	086	*g*	914	*g*	344	*w*	29
32	447	*b*	112	*g*	888	*g*	334	*w*	28
33	463	*c*	138	*g*	862	*g*	324	*w*	27
34	9,79 478	a^1	9,90 164	f^1	10,09 836	f^1	9,89 314	w^1	26
35	9,79 494	*d*	9,90 190	*f*	10,09 810	*f*	9,89 304	*x*	25
36	510	*a*	216	*f*	784	*f*	294	*x*	24
37	526	b^1	242	*f*	758	*f*	284	*x*	23
38	542	*b*	268	*h*	732	*h*	274	*y*	22
39	9,79 558	*c*	9,90 294	*h*	10,09 706	*h*	9,89 264	*y*	21
40	9,79 573	*d*	9,90 320	*h*	10,09 680	*h*	9,89 254	*y*	20
41	589	*a*	346	h_1	654	h_1	244	y^1	19
42	605	*b*	371	*g*	629	*g*	233	*w*	18
43	621	*b*	397	*g*	603	*g*	223	*w*	17
44	9,79 636	a^1	9,90 423	f^1	10,09 577	f^1	9,89 213	*x*	16
45	9,79 652	*a*	9,90 449	*f*	10,09 551	*f*	9,89 203	*x*	15
46	668	*b*	475	*f*	525	*f*	193	x^1	14
47	684	*c*	501	*h*	499	*h*	183	*y*	13
48	699	*d*	527	*h*	473	*h*	173	*y*	12
49	9,79 715	b^1	9,90 553	*h*	10,09 447	*h*	9,89 162	*w*	11
50	9,79 731	*b*	9,90 578	*g*	10,09 422	*g*	9,89 152	w^1	10
51	746	*d*	604	*g*	396	*g*	142	*x*	9
52	762	*a*	630	*f*	370	*f*	132	x^1	8
53	778	*b*	656	*f*	344	*f*	122	*y*	7
54	9,79 793	*d*	9,90 682	*h*	10,09 318	*h*	9,89 112	y^1	6
55	9,79 809	b^1	9,90 708	*h*	10,09 292	*h*	9,89 101	*w*	5
56	825	*b*	734	h_1	266	h_1	091	*x*	4
57	840	*d*	759	*g*	241	*g*	081	x^1	3
58	856	b^1	785	f^1	215	f^1	071	*y*	2
59	9,79 872	*c*	9,90 811	*f*	10,09 189	*f*	9,89 060	*w*	1
60	9,79 887	*a*	9,90 837	h^1	10,09 163	h^1	9,89 050	w^1	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	51°	″	10″	20″	30″	40″	50″
a	3	5	8	11	13		*g*	5	9	13	18	22
b	2	5	8	10	13		*h*	4	8	13	17	21
c	2	5	7	10	13		*w*	1	3	5	6	8
d	3	6	8	11	13		*x*	2	3	5	7	8
f	4	9	13	17	22		*y*	2	4	5	7	9

Log. cosec = − log. sin. Log. sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,79 887	a	9,90 837	e^1	10,09 163	e^1	9,89 050	w^1	60
1	903	b^1	863	e	137	e	040	x	59
2	918	a^1	889	e_1	111	e_1	030	x^1	58
3	934	c	914	g^1	086	g^1	020	y	57
4	9,79 950	d	9,90 940	g	10,09 060	g	9,89 009	w^1	56
5	9,79 965	c	9,90 966	h	10,09 034	h	9,88 999	x	55
6	981	b	90 992	e	09 008	e	989	x^1	54
7	79 996	a	91 018	e	08 982	e	978	y	53
8	80 012	b	043	g^1	957	g^1	968	w^1	52
9	9,80 027	a	9,91 069	g	10,08 931	g	9,88 958	x	51
10	9,80 043	b	9,91 095	h	10,08 905	h	9,88 948	x^1	50
11	058	a	121	e	879	e	937	w^1	49
12	074	b	147	e	853	e	927	x	48
13	089	a	172	g^1	828	g^1	917	x^1	47
14	9,80 105	b	9,91 198	g	10,08 802	g	9,88 906	w	46
15	9,80 120	c	9,91 224	h	10,08 776	h	9,88 896	x_1	45
16	136	d	250	e	750	e	886	x^1	44
17	151	c	276	e_1	724	e_1	875	w	43
18	166	a^1	301	g^1	699	g^1	865	x_1	42
19	9,80 182	b^1	9,91 327	h	10,08 673	h	9,88 855	x^1	41
20	9,80 197	a	9,91 353	e	10,08 647	e	9,88 844	w	40
21	213	b	379	e	621	e	834	x	39
22	228	c	404	g^1	596	g^1	824	x^1	38
23	244	d	430	h	570	h	813	w^1	37
24	9,80 259	c	9,91 456	e^1	10,08 544	e^1	9,88 803	x	36
25	9,80 274	a	9,91 482	e	10,08 518	e	9,88 793	y	35
26	290	d	507	g^1	493	g^1	782	x_1	34
27	305	c	533	g	467	g	772	x^1	33
28	320	a	559	e^1	441	e^1	761	w^1	32
29	9,80 336	d	9,91 585	e	10,08 415	e	9,88 751	x	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	50°	″	10″	20″	30″	40″	50″
a	3	5	8	11	13		g	5	9	13	17	22
b	2	5	7	10	13		h	4	9	13	17	22
c	3	5	8	10	13		w	1	3	5	6	8
d	2	5	7	10	12		x	2	3	5	7	9
e	4	8	13	17	21		y	2	4	6	7	9

Sin +, Tan +, add diff.
Cos −, Cot −, subtract diff.

Log. cosec = − log. sin.
„ sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,80 351	a	9,91 610	e^1	10,08 390	e^1	9,88 741	w	30
31	366	a^1	636	f^1	364	f^1	730	x^1	29
32	382	c	662	f	338	f	720	y	28
33	397	a	688	g	312	g	709	x	27
34	9,80 412	a	9,91 713	e^1	10,08 287	e^1	9,88 699	y	26
35	9,80 428	c	9,91 739	f^1	10,08 261	f^1	9,88 688	x	25
36	443	d	765	g	235	g	678	z	24
37	458	a	791	g_1	209	g_1	668	w	23
38	473	a^1	816	f^1	184	f^1	657	z	22
39	9,80 489	c	9,91 842	f	10,08 158	f	9,88 647	w	21
40	9,80 504	d	9,91 868	g	10,08 132	g	9,88 636	z	20
41	519	a	893	e^1	107	e^1	626	w	19
42	534	a	919	f^1	081	f^1	615	z	18
43	550	c	945	g	055	g	605	w	17
44	9,80 565	c	9,91 971	g_1	10,08 029	g_1	9,88 594	z	16
45	9,80 580	d^1	9,91 996	f^1	10,08 004	f^1	9,88 584	w	15
46	595	a	92 022	g	07 978	g	573	z	14
47	610	a	048	g_1	952	g_1	563	w	13
48	625	a^1	073	e	927	e	552	z	12
49	9,80 641	c	9,92 099	f	10,07 901	f	9,88 542	w	11
50	9,80 656	c	9,92 125	g	10,07 875	g	9,88 531	z	10
51	671	d	150	e	850	e	521	w	9
52	686	a	176	f	824	f	510	y	8
53	701	a	202	g	798	g	499	x	7
54	9,80 716	a	9,92 227	e	10,07 773	e	9,88 489	y	6
55	9,80 731	a	9,92 253	f	10,07 747	f	9,88 478	x	5
56	746	a^1	279	g	721	g	468	w	4
57	762	c	304	e	696	e	457	z	3
58	777	c	330	f	670	f	447	w	2
59	9,80 792	c	9,92 356	g	10,07 644	g	9,88 436	y	1
60	9,80 807	c	9,92 381	e	10,07 619	e	9,88 425	x	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	50°	″	10″	20″	30″	40″	50″
a	3	5	8	10̄	13		g	4	8	12̄	17	21
c	2	5	7	10	12		w	2	4	6	7	9
d	2	5	7̄	10	13		x	1̄	3	5	7	8
e	5	9	13	17̄	22		y	2	4	5	7	9
f	4	9	13	17	21̄		z	2	3	5	7	9

Log. cosec = − log. sin. Log. sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,80 807	*a*	9,92 381	*d*	10,07 619	*d*	9,88 425	*u*	60
1	822	*a*	407	e^1	593	e^1	415	*v*	59
2	837	*a*	433	*e*	567	*e*	404	*w*	58
3	852	*a*	458	*d*	542	*d*	394	v^1	57
4	9,80 867	*a*	9,92 484	e^1	10,07 516	e^1	9,88 383	*x*	56
5	9,80 882	*a*	9,92 510	*e*	10,07 490	*e*	9,88 372	*y*	55
6	897	*a*	535	*d*	465	*d*	362	*v*	54
7	912	*a*	561	*f*	439	*f*	351	*x*	53
8	927	*a*	587	*e*	413	*e*	340	*u*	52
9	9,80 942	*a*	9,92 612	f^1	10,07 388	f^1	9,88 330	*v*	51
10	9,80 957	*a*	9,92 638	*f*	10,07 362	*f*	9,88 319	*w*	50
11	972	*a*	663	d^1	337	d^1	308	*u*	49
12	80 987	*a*	689	e^1	311	e^1	298	*v*	48
13	81 002	*a*	715	*e*	285	*e*	287	*x*	47
14	9,81 017	*a*	9,92 740	*d*	10,07 260	*d*	9,88 276	*y*	46
15	9,81 032	*a*	9,92 766	*f*	10,07 234	*f*	9,88 266	*v*	45
16	047	*b*	792	*e*	208	*e*	255	*x*	44
17	061	*c*	817	e^1	183	e^1	244	*z*	43
18	076	*c*	843	*f*	157	*f*	234	v^1	42
19	9,81 091	*c*	9,92 868	*d*	10,07 132	*d*	9,88 223	*v*	41
20	9,81 106	a^1	9,92 894	*f*	10,07 106	*f*	9,88 212	*w*	40
21	121	*a*	920	*e*	080	*e*	201	*y*	39
22	136	*a*	945	f^1	055	f^1	191	*v*	38
23	151	*a*	971	*f*	029	*f*	180	*x*	37
24	9,81 166	*b*	9,92 996	*d*	10,07 004	*d*	9,88 169	*w*	36
25	9,81 180	*c*	9,93 022	*f*	10,06 978	*f*	9,88 158	*y*	35
26	195	*c*	048	*e*	952	*e*	148	v^1	34
27	210	b^1	073	e^1	927	e^1	137	*x*	33
28	225	*a*	099	*f*	901	*f*	126	*w*	32
29	9,81 240	*a*	9,93 124	*d*	10,06 876	*d*	9,88 115	*y*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	$\bar{2}$	5	$\bar{7}$	10	12
b	$\bar{2}$	$\bar{4}$	7	$\bar{9}$	12
c	3	5	8	10	13
d	5	9	13	$1\bar{7}$	22
e	4	$\bar{8}$	$1\bar{2}$	17	21
f	4	$\bar{8}$	13	17	$2\bar{1}$

49°

″	10″	20″	30″	40″	50″
u	1	3	5	7	8
v	2	4	6	$\bar{7}$	9
w	2	3	5	7	9
x	2	4	5	7	9
y	1	3	5	7	9
z	1	4	5	7	9

Log. cosec = − log. sin. Log. sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,81 254	*a*	9,93 150	*e*	10,06 850	*e*	9,88 105	x^1	30
31	269	*a*	175	f^1	825	f^1	094	*w*	29
32	284	*b*	201	*h*	799	*h*	083	*x*	28
33	299	*b*	227	g^1	773	g^1	072	y^1	27
34	9,81 314	*c*	9,93 252	*f*	10,06 748	*f*	9,88 061	*y*	26
35	9,81 328	*a*	9,93 278	*e*	10,06 722	*e*	9,88 051	x^1	25
36	343	*b*	303	h^1	697	h^1	040	x^1	24
37	358	*b*	329	*e*	671	*e*	029	*z*	23
38	372	*a*	354	f^1	646	f^1	018	*x*	22
39	9,81 387	d^1	9,93 380	*h*	10,06 620	*h*	9,88 007	y^1	21
40	9,81 402	*b*	9,93 406	g^1	10,06 594	g^1	9,87 996	*y*	20
41	417	*c*	431	*h*	569	*h*	985	*y*	19
42	431	*a*	457	g^1	543	g^1	975	x^1	18
43	446	*b*	482	h^1	518	h^1	964	x^1	17
44	9,81 461	*c*	9,93 508	*e*	10,06 492	*e*	9,87 953	*z*	16
45	9,81 475	*a*	9,93 533	h^1	10,06 467	h^1	9,87 942	*x*	15
46	490	*b*	559	*e*	441	*e*	931	*x*	14
47	505	c^1	584	h^1	416	h^1	920	y^1	13
48	519	d^1	610	*e*	390	*e*	909	y^1	12
49	9,81 534	*b*	9,93 636	g^1	10,06 364	g^1	9,87 898	*y*	11
50	9,81 549	*c*	9,93 661	*h*	10,06 339	*h*	9,87 887	*y*	10
51	563	*d*	687	g^1	313	g^1	877	z^1	9
52	578	c^1	712	*h*	288	*h*	866	x^1	8
53	592	*a*	738	g^1	262	g^1	855	x^1	7
54	9,81 607	*b*	9,93 763	*h*	10,06 237	*h*	9,87 844	x^1	6
55	9,81 622	*c*	9,93 789	g^1	10,06 211	g^1	9,87 833	*z*	5
56	636	*d*	814	*h*	186	*h*	822	*z*	4
57	651	c^1	840	*e*	160	*e*	811	*z*	3
58	665	*d*	865	h^1	135	h^1	800	*z*	2
59	9,81 680	*c*	9,93 891	*e*	10,06 109	*e*	9,87 789	*z*	1
60	9,81 694	d^1	9,93 916	h^1	10,06 084	h^1	9,87 778	*z*	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	3	5	8	10	13
b	2	5	7	10	12
c	2	4	7	9	12
d	3	5	7	10	12
e	4	8	13	17	21
f	4	9	13	17	22

49°

″	10″	20″	30″	40″	50″
g	3	8	12	17	21
h	4	9	13	17	21
w	2	3	6	7	9
x	2	4	5	7	9
y	1	3	5	7	9
z	2	4	6	7	9

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,81 694	*a*	9,93 916	*f*	10,06 084	*f*	9,87 778	*w*	**60**
1	709	*b*	942	*g*	058	*g*	767	*x*	59
2	723	*a*	967	*f*	033	*f*	756	*x*	58
3	738	*b*	93 993	*g*	06 007	*g*	745	*x*	57
4	9,81 752	*a*	9,94 018	*f*	10,05 982	*f*	9,87 734	*x*	56
5	9,81 767	*b*	9,94 044	*g*	10,05 956	*g*	9,87 723	*w*	55
6	781	*a*	069	*f*	931	*f*	712	*w*	54
7	796	b_1	095	*g*	905	*g*	701	*w*	53
8	810	*a*	120	*f*	880	*f*	690	*w*	52
9	9,81 825	b_1	9,94 146	*g*	10,05 854	*g*	9,87 679	*w*	51
10	9,81 839	*d*	9,94 171	*f*	10,05 829	*f*	9,87 668	x^1	**50**
11	854	e^1	197	*g*	803	*g*	657	x^1	49
12	868	*b*	222	*f*	778	*f*	646	x^1	48
13	882	a^1	248	*g*	752	*g*	635	*y*	47
14	9,81 897	*b*	9,94 273	*f*	10,05 727	*f*	9,87 624	*y*	46
15	9,81 911	*a*	9,94 299	*g*	10,05 701	*g*	9,87 613	*y*	45
16	926	b_1	324	*f*	676	*f*	601	*z*	44
17	940	*d*	350	*g*	650	*g*	590	*z*	43
18	955	*e*	375	g^1	625	g^1	579	z^1	42
19	9,81 969	b_1	9,94 401	g_1	10,05 599	g^1	9,87 568	*x*	41
20	9,81 983	*d*	9,94 426	g^1	10,05 574	g^1	9,87 557	*w*	**40**
21	81 998	e^1	452	*g*	548	*g*	546	*w*	39
22	82 012	*b*	477	*g*	523	*g*	535	x^1	38
23	026	*d*	503	g_1	497	g_1	524	*y*	37
24	9,82 041	e^1	9,94 528	g^1	10,05 472	g^1	9,87 513	*y*	36
25	9,82 055	*b*	9,94 554	g_1	10,05 446	g_1	9,87 501	*z*	35
26	069	*d*	579	*g*	421	*g*	490	z^1	34
27	084	*e*	604	*f*	396	*f*	479	*x*	33
28	098	b_1	630	*g*	370	*g*	468	*w*	32
29	9,82 112	*d*	9,94 655	*f*	10,05 345	*f*	9,87 457	*y*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	3	5	8	10	12
b	2	5	7	10	12
d	3	5	7	10	12
e	2	4	7	9	11
f	5	9	13	17	22

48°

″	10″	20″	30″	40″	50″
g	4	8	13	17	21
w	2	4	6	7	9
x	2	4	5	7	9
y	2	4	6	8	10
z	1	3	5	7	9

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff.

Log. cosec = −log. sin.
,, sec = −log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,82 126	a^1	9,94 681	d^1	10,05 319	d^1	9,87 446	v	30
31	141	b	706	e^1	294	e^1	434	w	29
32	155	b^1	732	d	268	d	423	x	28
33	169	a	757	f	243	f	412	x^1	27
34	9,82 184	c	9,94 783	d	10,05 217	d	9,87 401	y^1	26
35	9,82 198	b	9,94 808	f	10,05 192	f	9,87 390	v	25
36	212	c^1	834	d	166	d	378	w	24
37	226	a	859	d^1	141	d^1	367	y	23
38	240	a^1	884	e^1	116	e^1	356	x^1	22
39	9,82 255	c	9,94 910	d^1	10,05 090	d^1	9,87 345	v	21
40	9,82 269	c^1	9,94 935	e^1	10,05 065	e^1	9,87 334	v	20
41	283	c^1	961	d	039	d	322	x	19
42	297	a	94 986	f	05 014	f	311	x^1	18
43	311	a	95 012	d	04 988	d	300	v	17
44	9,82 326	c	9,95 037	f	10,04 963	f	9,87 288	w	16
45	9,82 340	c	9,95 062	e^1	10,04 938	e^1	9,87 277	y	15
46	354	c^1	088	d^1	912	d^1	266	y^1	14
47	368	c^1	113	e^1	887	e^1	255	v	13
48	382	b^1	139	d	861	d	243	x	12
49	9,82 396	a	9,95 164	f	10,04 836	f	9,87 232	v_1	11
50	9,82 410	a	9,95 190	d	10,04 810	d	9,87 221	v	10
51	424	a^1	215	f	785	f	209	w	9
52	439	c	240	e^1	760	e^1	198	x^1	8
53	453	c	266	d^1	734	d^1	187	v	7
54	9,82 467	c	9,95 291	e	10,04 709	e	9,87 175	w	6
55	9,82 481	c^1	9,95 317	d	10,04 683	d	9,87 164	x^1	5
56	495	c^1	342	f	658	f	153	v	4
57	509	c^1	368	d_1	632	d_1	141	w^1	3
58	523	c^1	393	d^1	607	d^1	130	x^1	2
59	9,82 537	c^1	9,95 418	e^1	10,04 582	e^1	9,87 119	v	1
60	9,82 551	c^1	9,95 444	d	10,04 556	d	9,87 107	x	0
′	Cos −	″	Cot −	″	Tan +	′	Sin +	″	′

″	10″	20″	30″	40″	50″
a	3	5	$\overline{7}$	10	12
b	2	$\overline{4}$	7	$\overline{9}$	12
c	2	$\overline{4}$	7	9	$1\overline{1}$
d	4	8	$1\overline{2}$	$1\underline{7}$	21
e	5	9	13	17	$2\overline{1}$

48°

″	10″	20″	30″	40″	50″
f	4	9	13	17	21
v	$\underline{2}$	4	6	$\underline{8}$	$1\underline{0}$
w	1	3	$\overline{5}$	7	9
x	2	$\overline{3}$	$\overline{5}$	7	9
y	2	4	$\overline{5}$	$\overline{7}$	9

Log. cosec = − log. sin. Log. sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,82 551	a^1	9,95 444	d	10,04 556	d	9,87 107	v	**60**
1	565	a^1	469	d^1	531	d^1	096	w	59
2	579	a^1	495	e	505	e	085	w	58
3	593	a^1	520	f	480	f	073	x	57
4	9,82 607	a^1	9,95 545	g^1	10,04 455	g^1	9,87 062	w	56
5	9,82 621	a^1	9,95 571	d	10,04 429	d	9,87 050	v	55
6	635	a^1	596	d^1	404	d^1	039	w	54
7	649	a^1	622	e	378	e	028	w	53
8	663	a^1	647	f	353	f	016	x	52
9	9,82 677	a^1	9,95 672	g	10,04 328	g	9,87 005	w	51
10	9,82 691	a^1	9,95 698	d	10,04 302	d	9,86 993	y	**50**
11	705	a^1	723	d^1	277	d^1	982	w	49
12	719	a	748	g^1	252	g^1	970	v	48
13	733	b^1	774	f	226	f	959	w	47
14	9,82 747	b^1	9,95 799	g	10,04 201	g	9,86 947	z	46
15	9,82 761	b^1	9,95 825	d	10,04 175	d	9,86 936	w	45
16	775	b	850	f	150	f	924	z	44
17	788	c^1	875	g^1	125	g^1	913	w	43
18	802	c^1	901	d	099	d	902	w	42
19	9,82 816	c	9,95 926	d^1	10,04 074	d^1	9,86 890	w	41
20	9,82 830	a^1	9,95 952	e	10,04 048	e	9,86 879	w	**40**
21	844	a	95 977	f	04 023	f	867	w	39
22	858	b^1	96 002	g	03 998	g	855	z	38
23	872	b^1	028	d	972	d	844	w	37
24	9,82 885	c^1	9,96 053	d^1	10,03 947	d^1	9,86 832	z	36
25	9,82 899	c^1	9,96 078	g^1	10,03 922	g^1	9,86 821	w	35
26	913	a^1	104	d	896	d	809	y	34
27	927	a	129	d^1	871	d^1	798	w	33
28	941	b^1	155	e	845	e	786	x	32
29	9,82 955	b	9,96 180	f	10,03 820	f	9,86 775	w	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**47°**	″	10″	20″	30″	40″	50″
a	2	5	7	9	11̄		g	5	9	13	17	21̄
b	2	4	6̄	9	11		v	2	3̄	5	7	9
c	3	5	7	9̄	12		w	2	4	6	8	10
d	4	8̄	12̄	17	21		x	2	4	6	7	9
e	4	8	12	16	21		y	2	4	5	7	9
f	4	8	13	17	21		z	1	3	5	7	9

Log. cosec = − log. sin. Log. sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −		′
30	9,82 968	a	9,96 205	e	10,03 795	e	9,86 763	x	30
31	982	b^1	231	f	769	f	752	x	29
32	82 996	b	256	g	744	g	740	x	28
33	83 010	b	281	f^1	719	f^1	728	y	27
34	9,83 023	a	9,96 307	f	10,03 693	f	9,86 717	x	26
35	9,83 037	b^1	9,96 332	g	10,03 668	g	9,86 705	x	25
36	051	b	357	h	643	h	694	x	24
37	065	b	383	f	617	f	682	x	23
38	078	a	408	e	592	e	670	y^1	22
39	9,83 092	b^1	9,96 433	h	10,03 567	h	9,86 659	x	21
40	9,83 106	b	9,96 459	f	10,03 541	f	9,86 647	x	20
41	120	c	484	e	516	e	635	y	19
42	133	b^1	510	k	490	k	624	x	18
43	147	b	535	g	465	g	612	x	17
44	9,83 161	c	9,96 560	e	10,03 440	e	9,86 600	y	16
45	9,83 174	d	9,96 586	k	10,03 414	k	9,86 589	x	15
46	188	b	611	g	389	g	577	x	14
47	202	c	636	e	364	e	565	y^1	13
48	215	b^1	662	k	338	k	554	x	12
49	9,83 229	b	9,96 687	g	10,03 313	g	9,86 542	x	11
50	9,83 242	a	9,96 712	e	10,03 288	e	9,86 530	x	10
51	256	c^1	738	k	262	k	518	z	9
52	270	b	763	g	237	g	507	x	8
53	283	d	788	e	212	e	495	x	7
54	9,83 297	b	9,96 814	k	10,03 186	k	9,86 483	z^1	6
55	9,83 310	a	9,96 839	g	10,03 161	g	9,86 472	x	5
56	324	c^1	864	e	136	e	460	x	4
57	338	c	890	k	110	k	448	x	3
58	351	b^1	915	g	085	g	436	x	2
59	9,83 365	b	9,96 940	e	10,03 060	e	9,86 425	x	1
60	9,83 378	d	9,96 966	k	10,03 034	k	9,86 413	x	0
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″
a	3	5	7	10	12
b	2	$\bar{4}$	7	9	$1\bar{1}$
c	2	$\bar{4}$	$\bar{6}$	9	11
d	3	5	7	9	12
e	4	9	13	17	21
f	$\bar{4}$	$\bar{8}$	$1\bar{2}$	17	21

47°

″	10″	20″	30″	40″	50″
g	4	8	13	17	21
h	5	9	13	17	22
k	4	8	12	16	21
x	2	4	6	8	10
y	2	4	$\bar{5}$	7	9
z	$\bar{1}$	$\bar{3}$	$\bar{5}$	$\bar{7}$	9

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,83 378	*a*	9,96 966	*f*	10,03 034	*f*	9,86 413	*x*	**60**
1	392	*b*	96 991	*g*	03 009	*g*	401	*x*	59
2	405	*a*	97 016	*h*	02 984	*h*	389	*x*	58
3	419	*b*	042	*f*	958	*f*	377	y^1	57
4	9,83 432	*a*	9,97 067	*g*	10,02 933	*g*	9,86 366	*x*	56
5	9,83 446	*b*	9,97 092	*h*	10,02 908	*h*	9,86 354	*x*	55
6	459	*a*	118	*f*	882	*f*	342	*x*	54
7	473	*b*	143	*g*	857	*g*	330	*x*	53
8	486	*a*	168	*h*	832	*h*	318	*x*	52
9	9,83 500	*b*	9,97 193	*f*	10,02 807	*f*	9,86 306	*y*	51
10	9,83 513	*a*	9,97 219	f^1	10,02 781	f^1	9,86 295	*x*	**50**
11	527	*b*	244	*h*	756	*h*	283	*x*	49
12	540	*a*	269	k^1	731	k^1	271	*x*	48
13	554	*b*	295	f^1	705	f^1	259	*x*	47
14	9,83 567	*c*	9,97 320	*h*	10,02 680	*h*	9,86 247	*x*	46
15	9,83 581	d^1	9,97 345	*k*	10,02 655	*k*	9,86 235	*x*	45
16	594	*c*	371	f^1	629	f^1	223	*x*	44
17	608	*d*	396	*g*	604	*g*	211	*z*	43
18	621	*b*	421	*k*	579	*k*	200	*x*	42
19	9,83 634	*e*	9,97 447	f^1	10,02 553	f^1	9,86 188	*x*	41
20	9,83 648	d^1	9,97 472	*g*	10,02 528	*g*	9,86 176	*x*	**40**
21	661	*c*	497	*h*	503	*h*	164	*x*	39
22	674	*a*	523	*f*	477	*f*	152	*x*	38
23	688	*b*	548	*g*	452	*g*	140	*x*	37
24	9,83 701	*c*	9,97 573	*h*	10,02 427	*h*	9,86 128	*x*	36
25	9,83 715	*d*	9,97 598	k^1	10,02 402	k^1	9,86 116	*x*	35
26	728	*b*	624	f^1	376	f^1	104	*x*	34
27	741	*c*	649	*h*	351	*h*	092	*x*	33
28	755	*d*	674	*k*	326	*k*	080	*x*	32
29	9,83 768	*b*	9,97 700	f^1	10,02 300	f^1	9,86 068	*x*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**46°**	″	10″	20″	30″	40″	50″
a	3	5	7	9	12		*g*	4	8	13	17	21
b	2	4	7	9	11		*h*	4	9	13	17	21
c	2	5	7	9	11		*k*	5	9	13	17	$2\bar{1}$
d	2	4	6	$\bar{8}$	11		*x*	2	4	6	8	10
e	3	5	7	9	11		*y*	2	4	$\bar{5}$	7	9
f	4	8	12	$1\bar{6}$	21		*z*	2	3	5	7	9

Log. cosec = − log. sin. Log. sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,83 781	*a*	9,97 725	*e*	10,02 275	*e*	9,86 056	*y*	30
31	795	*b*	750	*f*	250	*f*	044	*y*	29
32	808	*b*¹	776	*g*	224	*g*	032	*y*	28
33	821	*a*	801	*e*	199	*e*	020	*y*	27
34	9,83 834	*a*¹	9,97 826	*h*	10,02 174	*h*	9,86 008	*y*	26
35	9,83 848	*b*¹	9,97 851	*k*	10,02 149	*k*	9,85 996	*y*	25
36	861	*c*	877	*l*	123	*l*	984	*y*	24
37	874	*a*	902	*h*	098	*h*	972	*y*	23
38	887	*d*¹	927	*f*	073	*f*	960	*y*	22
39	9,83 901	*b*¹	9,97 953	*l*	10,02 047	*l*	9,85 948	*y*	21
40	9,83 914	*c*	9,97 978	*e*	10,02 022	*e*	9,85 936	*y*	20
41	927	*a*	98 003	*h*	01 997	*h*	924	*y*	19
42	940	*a*¹	029	*g*	971	*g*	912	*y*	18
43	954	*b*	054	*l*	946	*l*	900	*y*	17
44	9,83 967	*b*¹	9,98 079	*h*	10,01 921	*h*	9,85 888	*y*	16
45	9,83 980	*c*	9,98 104	*k*	10,01 896	*k*	9,85 876	*y*	15
46	83 993	*a*	130	*l*	870	*l*	864	*d*	14
47	84 006	*a*¹	155	*e*	845	*e*	851	*y*	13
48	020	*b*	180	*f*	820	*f*	839	*y*	12
49	9,84 033	*b*¹	9,98 206	*g*	10,01 794	*g*	9,85 827	*y*	11
50	9,84 046	*c*	9,98 231	*e*	10,01 769	*e*	9,85 815	*y*	10
51	059	*c*	256	*h*	744	*h*	803	*y*	9
52	072	*a*	281	*k*	719	*k*	791	*y*	8
53	085	*a*¹	307	*l*	693	*l*	779	*y*	7
54	9,84 098	*a*¹	9,98 332	*e*	10,01 668	*e*	9,85 766	*y*	6
55	9,84 112	*b*	9,98 357	*f*	10,01 643	*f*	9,85 754	*y*	5
56	125	*b*	383	*g*	617	*g*	742	*y*	4
57	138	*b*¹	408	*e*	592	*e*	730	*y*	3
58	151	*b*¹	433	*h*	567	*h*	718	*y*	2
59	9,84 164	*c*	9,98 458	*k*	10,01 542	*k*	9,85 706	*z*	1
60	9,84 177	*c*	9,98 484	*l*	10,01 516	*l*	9,85 693	*y*	0
′	Cos −	″	Cot −	″	Tan +	′	Sin +	″	′

″	10″	20″	30″	40″	50″	46°	″	10″	20″	30″	40″	50″
a	2̄	5	7	9	11		*g*	4	8	12	16	21
b	2	4	6	8̄	11		*h*	4	9	13	17	21
c	2	4	7	9	11		*k*	5	9	13	17	22
d	3	5	7	9	11̄		*l*	4	8	12	17	21
e	4	8	13	17	21		*y*	2	4	6	8	10
f	5	9	13	17	21		*z*	2	4	6	9	11

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
0	9,84 177	*a*	9,98 484	*g*	10,01 516	*g*	9,85 693	*d*	**60**
1	190	*b*	509	*h*	491	*h*	681	*d*	59
2	203	*b*	534	*f*	466	*f*	669	*d*	58
3	216	*c*	560	*k*	440	*k*	657	*d*	57
4	9,84 229	*c*	9,98 585	*g*	10,01 415	*g*	9,85 645	*b*	56
5	9,84 242	*c*	9,98 610	*f*	10,01 390	*f*	9,85 632	*d*	55
6	255	*c*	635	*l*	365	*l*	620	*d*	54
7	269	*d*	661	*g*	339	*g*	608	*d*	53
8	282	*d*	686	*h*	314	*h*	596	*b*	52
9	9,84 295	*d*	9,98 711	*f*	10,01 289	*f*	9,85 583	*d*	51
10	9,84 308	*d*	9,98 737	*k*	10,01 263	*k*	9,85 571	*d*	**50**
11	321	*d*	762	*g*	238	*g*	559	*d*	49
12	334	*d*	787	*h*	213	*h*	547	*c*	48
13	347	*d*	812	*l*	188	*l*	534	*d*	47
14	9,84 360	*d*	9,98 838	*k*	10,01 162	*k*	9,85 522	*d*	46
15	9,84 373	*d*	9,98 863	*h*	10,01 137	*h*	9,85 510	*a*	45
16	385	*c*	888	*f*	112	*f*	497	*d*	44
17	398	*c*	913	l^1	087	l^1	485	*d*	43
18	411	*c*	939	*g*	061	*g*	473	*a*	42
19	9,84 424	*b*	9,98 964	*h*	10,01 036	*h*	9,85 460	*d*	41
20	9,84 437	*b*	9,98 989	*f*	10,01 011	*f*	9,85 448	*d*	**40**
21	450	*a*	99 015	*k*	00 985	*k*	436	*a*	39
22	463	*a*	040	*g*	960	*g*	423	*d*	38
23	476	e^1	065	*f*	935	*f*	411	*d*	37
24	9,84 489	e^1	9,99 090	*l*	10,00 910	*l*	9,85 399	*b*	36
25	9,84 502	*e*	9,99 116	*k*	10,00 884	*k*	9,85 386	*d*	35
26	515	*d*	141	*h*	859	*h*	374	*e*	34
27	528	*d*	166	*f*	834	*f*	361	*d*	33
28	540	*c*	191	*l*	809	*l*	349	*d*	32
29	9,84 553	*b*	9,99 217	*g*	10,00 783	*g*	9,85 337	*b*	31
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**45°**	″	10″	20″	30″	40″	50″
a	2	4	7	9	11		*f*	4	9	13	17	21
b	2	5	7	9	11		*g*	4	8	12	17	21
c	3	5	7	9	11		*h*	4	8	13	17	21
d	2	4	6	8	10		*k*	4	8	12	16	21
e	2	4	6	$\bar{8}$	11		*l*	5	9	13	17	21

Sin+, Tan+, add diff.
Cos−, Cot−, subtract diff.

Log. cosec = − log. sin.
,, sec = − log. cos.

′	Sin +	″	Tan +	″	Cot −	″	Cos −	″	′
30	9,84 566	*a*	9,99 242	*g*	10,00 758	*g*	9,85 324	*d*	**30**
31	579	*b*	267	*h*	733	*h*	312	*d*¹	29
32	592	*d*¹	293	*k*	707	*k*	299	*d*	28
33	605	*d*	318	*l*	682	*l*	287	*d*	27
34	9,84 618	*d*	9,99 343	*g*	10,00 657	*g*	9,85 274	*d*	26
35	9,84 630	*f*¹	9,99 368	*m*	10,00 632	*m*	9,85 262	*d*	25
36	643	*a*	394	*k*	606	*k*	250	*f*	24
37	656	*b*	419	*l*	581	*l*	237	*d*	23
38	669	*d*	444	*h*	556	*h*	225	*f*	22
39	9,84 682	*d*	9,99 469	*m*	10,00 531	*m*	9,85 212	*d*	21
40	9,84 694	*f*	9,99 495	*l*	10,00 505	*l*	9,85 200	*a*	**20**
41	707	*a*	520	*g*	480	*g*	187	*d*	19
42	720	*d*¹	545	*h*	455	*h*	175	*a*	18
43	733	*d*	570	*n*	430	*n*	162	*d*	17
44	9,84 745	*f*¹	9,99 596	*l*	10,00 404	*l*	9,85 150	*a*	16
45	9,84 758	*a*	9,99 621	*g*	10,00 379	*g*	9,85 137	*d*	15
46	771	*d*¹	646	*h*	354	*h*	125	*f*	14
47	784	*d*	672	*k*	328	*k*	112	*d*	13
48	796	*f*	697	*l*	303	*l*	100	*f*¹	12
49	9,84 809	*b*	9,99 722	*g*	10,00 278	*g*	9,85 087	*d*	11
50	9,84 822	*d*	9,99 747	*m*	10,00 253	*m*	9,85 074	*d*	**10**
51	835	*d*	773	*l*	227	*l*	062	*d*	9
52	847	*a*	798	*g*	202	*g*	049	*d*	8
53	860	*d*	823	*h*	177	*h*	037	*a*	7
54	9,84 873	*d*	9,99 848	*m*	10,00 152	*m*	9,85 024	*d*	6
55	9,84 885	*a*	9,99 874	*l*	10,00 126	*l*	9,85 012	*f*¹	5
56	898	*d*	899	*h*	101	*h*	84 999	*d*	4
57	911	*d*	924	*h*	076	*h*	986	*d*	3
58	923	*a*	949	*n*	051	*n*	974	*b*	2
59	9,84 936	*d*	9,99 975	*l*	10,00 025	*l*	9,84 961	*d*	1
60	9,84 949	*d*	10,00 000	*l*¹	10,00 000	*l*¹	9,84 949	*d*	**0**
′	Cos −	″	Cot −	″	Tan +	″	Sin +	″	′

″	10″	20″	30″	40″	50″	**45°**	″	10″	20″	30″	40″	50″
a	2	4	7	9	11		*h*	4	9	13	17	21
b	2	4	6	9	11		*k*	4	8	12	16	21
d	2	4	6	8	10		*l*	4	8	12	17	21
f	2	5	7	9	11		*m*	5	9	13	17	21
g	4	8	13	17	21		*n*	5	9	13	17	22

Log. cosec = −log. sin. Log. sec = −log. cos.

INTRODUCTION
TO
TABLES OF
NATURAL FUNCTIONS OF ARC
AND
FACTORS FOR
NAPIERIAN LOGARITHMS.

The natural functions of arc are the actual ratios obtained for such functions by direct division. When these ratios enter into calculations as is commonly the case their logarithms (pp. 49-143) are used. On the other hand for certain purposes, to some of which attention is called below, the actual ratios are convenient. There is not, however, for the purposes to which they are applied any necessity for more than three or four figures beyond the decimal point.

By means of the tables, pp. 149-160, the natural function of an arc to each minute may quickly be found. It may be well to give an example or two as to the mode of using the tables.

Required the value of sin 6° 36′. — By main table, p. 150, we have sin 6° 30′ = 0·1132, against this we have the reference letter b_1, and for 6′ in supplementary table in line b we have 18. Hence as b_1 indicates that where a dash occurs below the letter we are to subtract one from the figures with a dash below, we add 17 instead of 18 so sin 6° 36′ = 0·1132 + 17 = 0·1149.

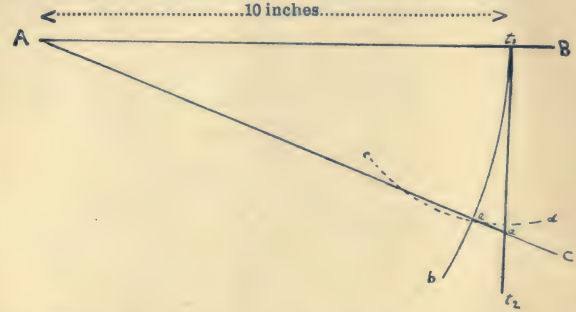
Required the value of sin 6° 37′.—Proceed as above but add the number given for 1′ in line b. Thus sin 6° 37′ = sin 6° 36′ + 3, that is 0·1149 + 3 = 0·1152.

Required the value of cot 9° 14′.—In main table, p. 151, value of 9° 10′ is 6·197 with reference letter k. In line k of supplementary table under 4′ we have 45. Hence noting that for cot we *subtract*, not add, we have cot 9° 14′ = 6·197 − 45 = 6·152.

Required the value of tan 78° 24′.—Tan 78° 24′ = Cot 11° 36′ = 4·915 − 43 = 4·872. See p. 42. The method of this example should be followed in all cases where the degrees are above 45 and fractions of 10′ are involved.

Examples of the use of Natural Functions of Arc.

A direction $A\,B$, and a direction $A\,C$ have been noted as containing an angle of 23° 13′. Plot this angle on paper.



Draw a line $A\,B$ and set off a distance $A\,t_1 = 10$ inches, and draw a line $t_1 t_2$ at right angles to $A\,B$. Then referring to table of natural tangents, p. 154, note that tan 23° 13′ = 0·4287. Make $t_1 a = 0{\cdot}4287 \times 10$ in. = 4·29 in. approximately, and through $A\,a$ draw the line $A\,C$ when we have the required angle set out.

Another method. Set out $A\,t_1 = 10$ inches. From centre A strike an arc $t_1 b$ and make the chord $t_1 e$ = the chord of 23° 13′. Draw a line $A\,C$ touching the extremity e of the chord and we have the required angle plotted.

The chord $t_1 e$ is found by first finding the sine of half the given angle, in this case the sine of one-half of 23° 13′ = sin of 11° 36′ (approx.) = 0·2011 and then doubling this, which gives 0·4022 and to 10 in. radius = 4·02. Setting the compasses to 4·02 in. and striking the arc $c\,d$, cutting the arc $t_1 b$ in e, we have the extremity e of the chord plotted.

Again in many engineering formulæ the natural functions of arc have to be multiplied once only into a quantity, and in this case—especially if the multipliers are of few figures—it is easier to use the slide rule or contracted multiplication (see p. 47) than to look out logarithms.

Example. Required the total axial pressure needed in shipping a friction clutch of the axial type.

Let P = required pressure, F = total pressure between the cones, A = half the angle at the apex of the cone, μ = coefficient of friction.

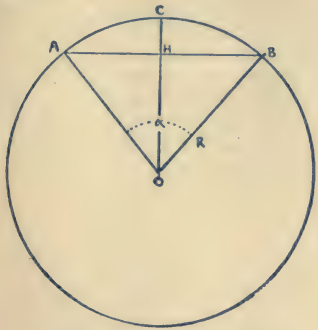
$P = F \sin A + F\,\mu \cos A = F\,(\sin A + \mu \cos A)$.

Then if $F = 2150$ lbs., $A = 4°\ 55'$, $\mu = 0{\cdot}15$.

$P = 2150\ (0{\cdot}0857 + 0{\cdot}15 \times 0{\cdot}9963)$.

$= 2150 \times 0{\cdot}2351 = 505{\cdot}46$.

Example. To find the area of a segment of a circle, having given the radius R of the circle and the central angle α in circular measure, subtended by the arc of the segment.



$$\text{Area } ACB = \frac{R^2}{2}(\alpha - \sin \alpha)$$

Note.—If the angle is given as A in degrees convert into circular measure by dividing A by 57·29578 (see numbers often wanted, p. 164).

Thus find area of the segment ACB when $A = 47°$ and $R = 11{\cdot}5$ inches.

$$\alpha = \frac{47}{57{\cdot}29578} = 0{\cdot}8203$$

$$\sin 47° = 0{\cdot}7314$$

$$\text{and } \alpha - \sin A = 0{\cdot}8203 - 0{\cdot}7314 = 0{\cdot}0889.$$

Then log. area = 2 log. 11·5 + log. 0·0889 − log. 2

and area = 5·879 square inches approximately.

Note.—If the height of the segment CH is given

then $\cos \frac{1}{2} A = \frac{R - CH}{R}$ or if the chord AB is given

then $\sin \frac{1}{2} A = \frac{AB}{2R}$ from either of which A is found.

Mr. R. W. H. Edwards, of King's College, has been kind enough to send me the following explanation :—

$$\text{Area } ACB = \text{sector } AOB - \text{triangle } AOB$$

$$= \frac{\alpha}{2\pi} \text{ of } \pi R^2 - \tfrac{1}{2} R^2 \sin \alpha$$

$$= \frac{R^2}{2}(\alpha - \sin \alpha)$$

Napierian, Hyperbolic, or Natural Logarithms.—These logarithms are used in many calculations. To give a fairly complete table of them would take up many pages, so such tables are only met with exceptionally, as *e.g.* in "Hutton" and in some Engineers' Pocket Books. A table of factors, as given on p. 166, enables one easily to transfer one system to the other. The mode of making the conversion is shown at p. 166.

Example 1.—Find the mean effective pressure (P) in the cylinder of a condensing steam engine when the pressure of steam on admission is 80 lbs. absolute, cut off at one-fourth of the stroke. Back pressure 3 lbs. per square inch. See Ripper "Steam," p. 55.

$$P = 80 \times \frac{1 + \text{Nap. Log. } 4}{4} - 3.$$

Nap. Log. $4 = \text{Com. Log. } 4 \times 2{\cdot}30259 = 1{\cdot}38630$, see p. 166.

$$\text{Hence } P = 80 \times \frac{1 + 1{\cdot}3863}{4} - 3 = 44{\cdot}726.$$

Example 2.—A fully-charged condenser gave a deflection of 300 divisions (V). After being re-charged and allowed to discharge itself through a resistance of 500 megohms (R) for 60 seconds (T) the discharge deflection obtained was 200 divisions (v). What was the capacity (F) of the condenser? ("Kempe," 1900, p. 362).

$$F = \frac{T}{R \log_{\epsilon} \frac{V}{v}}$$

$$F = \frac{60}{500 \log_{\epsilon} \frac{300}{200}} = \frac{60}{500 \times 2{\cdot}30259 \times \log_{10} 1{\cdot}5}$$

$$= \frac{6}{50 \times 2{\cdot}30259 \times 0{\cdot}17609}$$

$$= 0{\cdot}297 \text{ microfarads.}$$

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
0	0	0·0 000	*a*	0·0 000	*a*	∞	*d*	1·0 000		0	90
	10	0 029	c^1	0 029	c^1	343·77	*e*	1·0 000		50	
	20	0 058	c^1	0 058	c^1	171·89	*f*	1·0 000		40	
	30	0 087	a^1	0 087	a^1	114·59	*g*	1 0 000		30	
	40	0 116	a^1	0 116	a^1	85·940	*h*	0·9 999		20	
	50	0·0 145	a^1	0·0 145	a^1	68·750	*i*	0·9 999		10	
1	0	0·0 175	c_1	0·0 175	c_1	57·290	*j*	0·9 998	*a*	0	89
	10	0 204	c_1	0 204	c_1	49·104	*k*	9 998	a^1	50	
	20	0 233	*c*	0 233	*c*	42·964	*l*	9 997	*a*	40	
	30	0 262	*c*	0 262	*a*	38·188	*m*	9 997	γ	30	
	40	0 291	*c*	0 291	*a*	34·368	*n*	9 996	β^1	20	
	50	0·0 320	*a*	0·0 320	c^1	31·242	*o*	0·9 995	β	10	
2	0	0·0 349	*a*	0·0 349	a^1	28·636	*p*	0·9 994	β^1	0	88
	10	0 378	c^1	0 378	a^1	26·432	*q*	9 993	β^1	50	
	20	0 407	c^1	0 407	a^1	24·542	*r*	9 992	γ	40	
	30	0 436	c_1	0 437	c_1	22·904	*s*	9 990	a^1	30	
	40	0 465	c^1	0 466	*c*	21·470	*t*	9 989	β	20	
	50	0·0 494	a^1	0·0 495	*a*	20·206	*u*	0·9 988	γ	10	
3	0	0·0 523	a^1	0·0 524	c^1	19·081	*v*	0·9 986	β	0	87
	10	0 552	a^1	0 553	a^1	18·075	*w*	9 985	δ_1	50	
	20	0 581	a^1	0 582	a^1	17·169	*x*	9 983	β^1	40	
	30	0 610	a^1	0 612	c_1	16·350	*y*	9 981	β	30	
	40	0 640	c_1	0 641	*a*	15·605	*z*	9 980	δ	20	
	50	0·0 669	c_1	0·0 670	c^1	14·924	*	0·9 978	δ	10	
4	0	0·0 698	c_1	0·0 699	a^1	14·301	†	0·9 976	δ	0	86
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	3	6	12	17	23	*q*	0·202	0·401	0·790	1·168	1·534
b	3	6	12	18	23	*r*	0·174	0·346	0·683	1·010	1·328
c	3	6	11	17	23	*s*	0·152	0·302	0·596	0·882	1·161
*d**	3437·7	1719·0	859·4	573·0	429·7	*t*	0·133	0·265	0·524	0·777	1·024
e	31·25	57·31	98·22	128·9	152·8	*u*	0·119	0·236	0·466	0·690	0·910
f	8·185	15·63	28·65	39·67	49·12	*v*	0·105	0·210	0·415	0·617	0·813
g	3·698	7·164	13·48	19·10	24·13	*w*	0·095	0·189	0·373	0·554	0·732
h	2·096	4·093	7·814	11·21	14·32	*x*	0·085	0·170	0·337	0·501	0·662
i	1·348	2·645	5·093	7·367	9·484	*y*	0·078	0·155	0·307	0·455	0·602
j	0·939	1·848	3·581	5·209	6·741	*z*	0·071	0·141	0·280	0·416	0·549
k	0·692	1·364	2·655	3·878	5·038	*	0·064	0·129	0·255	0·380	0·503
l	0·531	1·048	2·047	2·999	3·907	†	0·059	0·119	0·236	0·350	0·463
m	0·419	0·830	1·625	2·388	3·119	*a*	0	0	0	0	0
n	0·339	0·674	1·323	1·947	2·547	β	0	0	0	1	1
o	0·282	0·559	1·097	1·618	2·120	γ	0	1	1	1	1
p	0·237	0·470	0·924	1·365	1·791	δ	0	1	1	2	2

* Actual Cotangents for 1′, 2′, 4′, 6′, and 8′

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
4	0	0·06 98	*c*	0·06 99	a^1	14·301	*d*	0·99 76	*a*	0	86
	10	07 27	*c*	07 29	*c*	13·727	*e*	99 74	*a*	50	
	20	07 56	*c*	07 58	*a*	13·197	*f*	99 71	a_1	40	
	30	07 85	*c*	07 87	*b*	12·706	*g*	99 69	β_1	30	
	40	08 14	*c*	08 16	a^1	12·251	*h*	99 67	*a*	20	
	50	0·08 43	*c*	0·08 46	*c*	11·826	*i*	0·99 64	β_1	10	
5	0	0·08 72	*c*	0·08 75	c^1	11·430	*j*	0·99 62	*a*	0	85
	10	09 01	*c*	09 04	a^1	11·059	*k*	99 59	β_1	50	
	20	09 29	a^1	09 34	*c*	10·712	*l*	99 57	a^1	40	
	30	09 58	a^1	09 63	*b*	10·385	*m*	99 54	*a*	30	
	40	09 87	a^1	09 92	a^1	10·078	*n*	99 51	β	20	
	50	0·10 16	*b*	0·10 22	*a*	9·788	*o*	0·99 48	β	10	
6	0	0·10 45	*b*	0·10 51	a^1	9·514	*p*	0·99 45	β	0	84
	10	10 74	*b*	10 80	a^1	9·255	*q*	99 42	β	50	
	20	11 03	b_1	11 10	*b*	9·010	*r*	99 39	γ_1	40	
	30	11 32	b_1	11 39	a^1	8·777	*s*	99 36	γ	30	
	40	11 61	*a*	11 69	*b*	8·556	*t*	99 32	β	20	
	50	0·11 90	*a*	0·11 98	a^1	8·345	*u*	0·99 29	γ_1	10	
7	0	0·12 19	*c*	0·12 28	*b*	8·144	*v*	0·99 25	β	0	83
	10	12 48	*c*	12 57	a^1	7·953	*w*	99 22	γ	50	
	20	12 76	*b*	12 87	a^1	7·770	*x*	99 18	γ_1	40	
	30	13 05	*b*	13 17	*c*	7·596	*y*	99 14	β^1	30	
	40	13 34	c^1	13 46	a^1	7·429	*z*	99 11	γ^1	20	
	50	0·13 63	*a*	0·13 76	*b*	7·269	*	0·99 07	γ^1	10	
8	0	0·13 92	*c*	0·14 05	a^1	7·115	†	0·99 03	γ^1	0	82
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	3	6	11	17	23	*q*	25	50	99	149	197
b	3	6	12	18	23	*r*	23	48	95	141	187
c	3	5	11	17	23	*s*	23	45	90	134	178
d	60	119	236	350	463	*t*	22	43	86	128	170
e	55	110	217	323	427	*u*	20	41	81	122	161
f	51	101	201	299	396	*v*	19	39	77	116	153
g	47	94	186	277	367	*w*	18	37	74	111	147
h	44	88	174	259	342	*x*	18	35	70	105	140
i	41	81	162	241	319	*y*	17	34	68	101	134
j	38	76	151	225	298	*z*	16	33	65	97	129
k	35	71	141	211	279	*	16	31	62	93	123
l	33	67	133	198	263	†	15	30	59	89	118
m	31	63	125	186	247	*a*	0	1	1	2	2
n	29	59	118	176	233	β	0	0	1	2	2
o	28	56	111	166	220	γ	0	1	2	2	3
p	26	53	105	157	208						

Note.—On this page and all following pages differences are all decimals. Put last figure of difference under last figure of table. See p. 145

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
8	0	0·13 92	*a*	0·14 05	*c*	7·115	*d*	0·99 03	*α*	0	82
	10	14 21	*a*	14 35	*c*	6·968	*e*	98 99	*α*	50	
	20	14 49	b^1	14 65	*c*	6·827	*f*	98 94	β_1	40	
	30	14 78	*b*	14 95	*a*	6·691	*g*	98 90	α_1	30	
	40	15 07	b_1	15 24	*c*	6·561	*h*	98 86	*α*	20	
	50	0·15 36	*a*	0·15 54	*c*	6·435	*i*	0·98 81	*β*	10	
9	0	0·15 64	b^1	0·15 84	*c*	6·314	*j*	0·98 77	*δ*	0	81
	10	15 93	*b*	16 14	*c*	6·197	*k*	98 72	β^1	50	
	20	16 22	b_1	16 44	b_1	6·084	*l*	98 68	*α*	40	
	30	16 50	b^1	16 73	*c*	5·976	*m*	98 63	*α*	30	
	40	16 79	*b*	17 03	*c*	5·871	*n*	98 58	*δ*	20	
	50	0·17 08	b_1	0·17 33	*c*	5·769	*o*	0·98 53	*δ*	10	
10	0	0·17 36	b^1	0·17 63	*c*	5·671	*p*	0·98 48	*δ*	0	80
	10	17 65	*b*	17 93	*c*	5·576	*q*	98 43	*α*	50	
	20	17 94	*a*	18 23	*c*	5·485	*r*	98 38	*α*	40	
	30	18 22	b^1	18 53	*c*	5·396	*s*	98 33	δ^1	30	
	40	18 51	b_1	18 83	c^1	5·309	*t*	98 27	*δ*	20	
	50	0·18 80	a_1	0·19 14	*c*	5·226	*u*	0·98 22	γ_1	10	
11	0	0·19 08	*b*	0·19 44	*c*	5·145	*v*	0·98 16	*δ*	0	79
	10	19 37	a_1	19 74	*c*	5·066	*w*	98 11	*γ*	50	
	20	19 65	*b*	20 04	*c*	4·989	*x*	98 05	α^1	40	
	30	19 94	a_1	20 35	*c*	4·915	*y*	97 99	*δ*	30	
	40	20 22	*b*	20 65	*c*	4·843	*z*	97 93	*δ*	20	
	50	0·20 51	a_1	0·20 95	*c*	4·773	*	0·97 87	*δ*	10	
12	0	0·20 79	b_1	0·21 26	*c*	4·705	†	0·97 81	*δ*	0	78
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	3	5	11	17	23	*q*	9	18	37	55	73
b	3	6	12	17	23	*r*	9	18	36	54	72
c	3	6	12	18	24	*s*	9	18	35	52	70
d	15	29	59	89	118	*t*	8	17	33	50	67
e	14	28	57	85	113	*u*	8	17	33	49	65
f	14	28	55	82	109	*v*	8	16	32	48	64
g	13	26	53	79	105	*w*	8	16	31	46	61
h	13	26	51	76	101	*x*	7	15	30	44	59
i	12	25	49	73	97	*y*	7	14	29	43	58
j	12	24	47	71	94	*z*	7	14	28	42	56
k	11	23	45	68	90	*	7	14	28	41	55
l	11	22	43	65	87	†	7	14	27	40	54
m	11	21	43	64	84	*α*	1	1	2	3	4
n	10	21	41	61	82	*β*	0	1	1	2	3
o	10	19	39	59	78	*γ*	1	1	3	4	5
p	9	19	38	57	76	*δ*	0	1	2	3	4

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
12	0	0·20 79	a^1	0·21 26	b	4·70 46	e	0·97 81	γ_1	0	78
	10	21 08	a_1	21 56	b	63 82	f	97 75	α_1	50	
	20	21 36	a^1	21 86	d	57 36	g	97 69	α	40	
	30	21 64	b_1	22 17	b	51 07	h	97 63	γ	30	
	40	21 93	a_1	22 47	d	44 94	i	97 57	γ^1	20	
	50	0·22 21	b_1	0·22 78	d_1	4·38 97	j	0·97 50	α^1	10	
13	0	0·22 50	a_1	0·23 09	b	4·33 15	k	0·97 44	γ^1	0	77
	10	22 78	a	23 39	c	27 47	l	97 37	γ	50	
	20	23 06	a^1	23 70	d_1	21 93	m	97 30	α^1	40	
	30	23 34	b_1	24 01	b	16 53	n	97 24	γ^1	30	
	40	23 63	a_1	24 32	b	11 26	o	97 17	γ^1	20	
	50	0·23 91	a^1	0·24 62	d	4·06 11	p	0·97 10	β_1	10	
14	0	0·24 19	b_1	0·24 93	c	4·01 08	q	0·97 03	β_1	0	76
	10	24 47	b_1	25 24	c	3·96 17	r	96 96	γ^1	50	
	20	24 76	a_1	25 55	c	91 36	s	96 89	β	40	
	30	25 04	a_1	25 86	c	86 67	t	96 81	α^1	30	
	40	25 32	a	26 17	c	82 08	u	96 74	β_1	20	
	50	0·25 60	a^1	0·26 48	d	3·77 60	v	0·96 67	β	10	
15	0	0·25 88	a^1	0·26 79	d^1	3·73 21	w	0·96 59	β_1	0	75
	10	26 16	b_1	27 11	d_1	68 91	x	96 52	β	50	
	20	26 44	b_1	27 42	c_1	64 70	y	96 44	β	40	
	30	26 72	b_1	27 73	d	60 59	z	96 36	β_1	30	
	40	27 00	b_1	28 05	d_1	56 56	*	96 28	β_1	20	
	50	0·27 28	b_1	0·28 36	c	3·52 61	†	0·96 21	β^1	10	
16	0	0·27 56	a^1	0·28 67	d	3·48 74	‡	0·96 13	β^1	0	74
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	3	6	11	17	22	q	49	99	198	296	394
b	3	6	12	18	24	r	48	97	194	290	385
c	3	6	13	19	25	s	47	94	189	282	376
d	3	7	13	19	25	t	46	92	185	276	368
e	67	134	267	400	532	u	45	90	180	270	360
f	65	130	260	389	518	v	44	89	177	265	352
g	63	127	253	379	504	w	43	87	173	259	345
h	61	124	247	370	492	x	42	85	169	253	337
i	59	121	241	360	479	y	41	83	165	248	330
j	58	118	235	351	467	z	41	81	162	243	323
k	57	115	229	343	456	*	40	80	159	238	317
l	56	112	223	334	444	†	39	78	156	233	310
m	54	109	217	325	433	‡	38	76	152	228	304
n	53	106	212	318	423	α	0	1	2	4	5
o	51	104	208	311	413	β	1	2	3	5	6
p	50	102	203	303	404	γ	1	1	3	4	5

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
16	0	0·27 56	a^1	0·28 67	c	3·48 74	f	0·96 13	β_1	0	74
	10	27 84	a	28 99	d^1	44 95	g	96 05	β_1	50	
	20	28 12	a	29 31	d_1	41 24	h	95 96	α_1	40	
	30	28 40	a_1	29 62	d^1	37 59	i	95 88	α_1	30	
	40	28 68	a_1	29 94	d	34 02	j	95 80	α	20	
	50	0·28 96	b^1	0·30 26	d	3·30 52	k	0·95 72	β	10	
17	0	0·29 24	b	0·30 57	c	3·27 09	l	0·95 63	α^1	0	73
	10	29 52	b	30 89	c	23 71	m	95 55	β	50	
	20	29 79	a	31 21	c_1	20 41	n	95 46	β_1	40	
	30	30 07	a_1	31 53	c_1	17 16	o	95 37	α^1	30	
	40	30 35	b	31 85	c_1	13 97	p	95 28	α	20	
	50	0·30 62	a^1	0·32 17	c_1	3·10 84	q	0·95 20	β^1	10	
18	0	0·30 90	a_1	0·32 49	e	3·07 77	r	0·95 11	β^1	0	72
	10	31 18	b	32 81	e	04 75	s	95 02	β^1	50	
	20	31 45	a	33 14	d^1	01 78	t	94 92	α	40	
	30	31 73	a_1	33 46	c_1	2·98 87	u	94 83	α^1	30	
	40	32 01	b_1	33 78	c^1	2·96 00	v	94 74	β^1	20	
	50	0·32 28	a_1	0·34 11	c_1	2·93 19	w	0·94 65	β^1	10	
19	0	0·32 56	b_1	0·34 43	c^1	2·90 42	x	0·94 55	β	0	71
	10	32 83	a_1	34 76	c_1	87 70	y	94 46	β^1	50	
	20	33 11	b_1	35 08	e^1	85 02	z	94 36	β^1	40	
	30	33 38	a_1	35 41	e	82 39	*	94 26	α^1	30	
	40	33 65	a_1	35 74	e	79 80	†	94 17	β^1	20	
	50	0·33 93	b	0·36 07	e_1	2·77 25	‡	0·94 07	β^1	10	
20	0	0·34 20	a_1	0·36 40	c_1	2·74 75	§	0·93 97	β^1	0	70
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	3	6	11	17	23	q	31	62	123	185	246
b	3	5	11	16	22	r	30	61	122	182	242
c	3	7	13	19	26	s	30	60	119	179	238
d	3	6	12	19	25	t	29	58	117	175	233
e	3	7	13	20	26	u	29	58	115	173	230
f	38	76	152	228	304	v	28	56	113	169	225
g	37	75	149	224	298	w	28	56	111	167	222
h	36	74	147	220	292	x	27	55	109	164	218
i	35	72	143	215	286	y	27	54	108	161	214
j	35	70	141	211	280	z	26	53	105	158	211
k	35	69	138	207	275	*	26	52	104	156	207
l	34	68	136	203	271	†	26	51	102	153	204
m	33	66	133	199	265	‡	25	50	100	150	200
n	32	66	131	196	261	§	25	50	99	149	198
o	32	64	128	192	256	α	1	1	3	5	7
p	31	63	126	188	251	β	1	2	4	6	7

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
20	0	0·34 20	a^1	0·36 40	d_1	2·74 75	g	0·93 97	α	0	70
	10	34 47	a^1	36 73	d_1	72 28	h	93 87	α	50	
	20	34 75	a	37 06	e_1	69 85	i	93 77	α	40	
	30	35 02	b^1	37 39	e_1	67 46	j	93 67	α	30	
	40	35 29	a^1	37 72	d	65 11	k	93 56	α	20	
	50	0·35 57	b_1	0·38 05	d^1	2·62 79	l	0·93 46	α	10	
21	0	0·35 84	b	0·38 39	e_1	2·60 51	m	0·93 36	α^1	0	69
	10	36 11	a	38 72	d	58 26	n	93 25	α	50	
	20	36 38	a	39 06	e_1	56 05	o	93 15	γ_1	40	
	30	36 65	a	39 39	c_1	53 86	p	93 04	α	30	
	40	36 92	a	39 73	f_1	51 71	q^1	92 93	α	20	
	50	0·37 19	a	0·40 06	e^1	2·49 60	q	0·92 83	β^1	10	
22	0	0·37 46	a	0·40 40	e	2·47 51	r	0·92 72	β^1	0	68
	10	37 73	a	40 74	e	45 45	s	92 61	γ_1	50	
	20	38 00	b	41 08	e	43 42	t	92 50	β^1	40	
	30	38 27	b	41 42	e	41 42	u	92 39	β^1	30	
	40	38 54	b_1	41 76	v	39 45	v	92 28	γ	20	
	50	0·38 80	a^1	0·42 10	c^1	2·37 50	w	0·92 16	α^1	10	
23	0	0·39 07	b^1	0·42 45	f^1	2·35 58	x	0·92 05	β^1	0	67
	10	39 34	b	42 79	v	33 69	y^1	91 94	γ^1	50	
	20	39 61	b_1	43 14	f	31 83	y	91 82	γ_1	40	
	30	39 87	b^1	43 48	c^1	29 98	z^1	91 71	γ^1	30	
	40	40 14	b	43 83	c	28 17	z	91 59	β^1	20	
	50	0·40 41	b_1	0·44 17	c^1	2·26 37	$*^1$	0·91 47	γ_1	10	
24	0	0·40 67	b^1	0·44 52	c^1	2·24 60	*	0·91 35	γ_1	0	66
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	3	$\bar{5}$	11	$1\bar{6}$	22	p	21	43	86	129	172
b	3	$\bar{5}$	$1\underline{1}$	16	$2\bar{1}$	q	21	42	$8\bar{4}$	$12\bar{6}$	$16\bar{8}$
c	$\bar{3}$	7	$1\underline{4}$	$2\underline{1}$	$2\underline{8}$	r	21	42	83	124	165
d	$\bar{3}$	$\underline{7}$	$1\bar{3}$	$2\underline{0}$	$2\underline{7}$	s	20	41	81	122	162
e	$\bar{3}$	$\underline{7}$	$1\underline{4}$	$2\underline{1}$	$2\underline{7}$	t	20	40	80	120	160
f	$\underline{4}$	$\bar{6}$	13	20	27	u	20	40	79	119	158
g	25	50	99	149	198	v	20	39	78	117	156
h	24	49	98	146	194	w	19	38	77	115	153
i	24	48	96	144	191	x	19	38	75	113	151
j	24	47	94	141	188	y	19	37	$7\bar{4}$	$11\bar{1}$	$14\bar{8}$
k	23	47	93	140	186	z	18	36	$7\bar{2}$	$10\bar{8}$	$14\bar{4}$
l	23	46	92	137	183	*	17	35	$7\bar{0}$	$10\bar{5}$	$14\bar{0}$
m	23	45	90	135	180	α	1	2	4	6	$\bar{8}$
n	22	44	89	133	177	β	1	2	5	$\bar{6}$	$\bar{8}$
o	22	44	88	132	175	γ	1	$\underline{3}$	$\underline{5}$	7	$\bar{9}$

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
24	0	0·40 67	a^1	0·44 52	d_1	2·24 60	l	0·91 35	α	0	66
	10	40 94	b^1	44 87	e^1	22 86	m	91 24	β^1	50	
	20	41 20	a^1	45 22	d_1	21 13	n^1	91 12	β^1	40	
	30	41 47	b^1	45 57	d_1	19 43	n	91 00	β^1	30	
	40	41 73	a^1	45 92	h	17 75	o	90 88	β^1	20	
	50	0·42 00	a	0·46 28	e	2·16 09	p	0·90 75	β_1	10	
25	0	0·42 26	b^1	0·46 63	e^1	2·14 45	q	0·90 63	β	0	65
	10	42 53	b_1	46 99	e	12 83	r	90 51	β^1	50	
	20	42 79	b	47 34	f	11 23	s	90 38	β	40	
	30	43 05	b^1	47 70	e	09 65	t^1	90 26	β^1	30	
	40	43 31	c^1	48 06	e	08 09	t_1	90 13	β	20	
	50	0·43 58	c_1	0·48 41	d^1	2·06 55	u^1	0·90 01	γ^1	10	
26	0	0·43 84	a_1	0·48 77	d^1	2·05 03	u_1	0·89 88	β^1	0	64
	10	44 10	a_1	49 13	d^1	03 53	v^1	89 75	γ	50	
	20	44 36	a	49 50	f_1	02 04	v_1	89 62	β	40	
	30	44 62	a	49 86	g_1	2·00 57	w^1	89 49	β	30	
	40	44 88	a	50 22	h	1·99 12	w	89 36	γ	20	
	50	0·45 14	a	0·50 59	g_1	1·97 68	x	0·89 23	γ	10	
27	0	0·45 40	a_1	0·50 95	g^1	1·96 26	y^1	0·89 10	γ^1	0	63
	10	45 66	c_1	51 32	h	94 86	y	88 97	γ^1	50	
	20	45 92	c_1	51 69	g	93 47	z^1	88 84	δ^1	40	
	30	46 17	c^1	52 06	d	92 10	z	88 70	γ^1	30	
	40	46 43	b^1	52 43	g	90 74	$*^1$	88 57	δ	20	
	50	0·46 69	c	0·52 80	h^1	1·89 40	$*$	0·88 43	γ^1	10	
28	0	0·46 95	c_1	0·53 17	k	1·88 07	†	0·88 29	γ	0	62
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	3	$\bar{5}$	$1\bar{0}$	$1\underline{6}$	$2\bar{1}$	r	16	32	64	96	128
b	$\bar{2}$	5	$1\bar{0}$	$1\underline{6}$	21	s	16	31	63	95	126
c	3	$\bar{5}$	$1\bar{0}$	$1\bar{5}$	$2\underline{1}$	t	15	31	$6\bar{1}$	$9\underline{2}$	$12\bar{4}$
d	4	$\bar{7}$	$1\bar{4}$	$2\underline{2}$	$2\underline{9}$	u	15	30	$6\bar{0}$	$9\bar{0}$	$12\bar{1}$
e	$\bar{3}$	7	14	21	28	v	15	30	$5\bar{9}$	$8\bar{9}$	$11\bar{9}$
f	$\underline{4}$	7	$1\bar{4}$	21	29	w	15	29	58	87	$11\bar{5}$
g	$\bar{3}$	$\bar{7}$	$1\underline{5}$	22	$2\bar{9}$	x	14	28	57	85	114
h	4	7	15	22	$2\bar{9}$	y	14	28	56	84	$11\bar{1}$
k	4	8	15	23	30	z	14	$2\bar{7}$	55	82	$10\bar{9}$
l	17	35	70	105	140	*	13	27	$5\bar{3}$	$8\bar{0}$	$10\bar{6}$
m	17	35	70	104	138	†	13	26	52	79	105
n	17	34	$6\bar{7}$	$10\bar{1}$	$13\bar{5}$	α	1	$\underline{2}$	4	7	9
o	17	33	67	100	133	β	1	$\bar{2}$	5	$\bar{7}$	$1\underline{0}$
p	17	33	66	99	131	γ	1	$\bar{2}$	5	8	$1\bar{0}$
q	16	32	65	97	130	δ	$\underline{2}$	3	6	$\bar{8}$	$1\underline{1}$

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
28	0	0·46 95	*b*	0·53 17	*f*	1·88 07	k^1	0·88 29	α_1	0	62
	10	47 20	a^1	53 54	*f*	86 76	*k*	88 16	β	50	
	20	47 46	*b*	53 92	*e*	85 46	l^1	88 02	α^1	40	
	30	47 72	*a*	54 30	*d*	84 18	*l*	87 88	*a*	30	
	40	47 97	b^1	54 67	g^1	82 91	l_1	87 74	*a*	20	
	50	0·48 23	*a*	0·55 05	*f*	1·81 65	*m*	0·87 60	*a*	10	
29	0	0·48 48	*b*	0·55 43	g^1	1·80 40	n^1	0·87 46	*a*	0	61
	10	48 74	*a*	55 81	g^1	79 17	*n*	87 32	α^1	50	
	20	48 99	*b*	56 19	f^1	77 96	o^1	87 18	γ_1	40	
	30	49 24	*b*	56 58	f_1	76 75	*o*	87 04	γ	30	
	40	49 50	*a*	56 96	f^1	75 56	o_1	86 89	α^1	20	
	50	0·49 75	*a*	0·57 35	g^1	1·74 37	*p*	0·86 75	γ	10	
30	0	0·50 00	*b*	0·57 74	*g*	1·73 21	p^1	0·86 60	α^1	0	60
	10	50 25	*b*	58 12	*h*	72 05	*q*	86 46	γ	50	
	20	50 50	*b*	58 51	*h*	70 90	*r*	86 31	γ_1	40	
	30	50 75	*b*	58 90	*h*	69 77	*s*	86 16	γ_1	30	
	40	51 00	*b*	59 30	g^1	68 64	t^1	86 01	β_1	20	
	50	0·51 25	*b*	0·59 69	*h*	1·67 53	*t*	0·85 87	γ	10	
31	0	0·51 50	*b*	0·60 09	g^1	1·66 43	*t*	0·85 72	γ	0	59
	10	51 75	*b*	60 48	*h*	65 34	u^1	85 57	γ	50	
	20	52 00	*b*	60 88	*h*	64 26	*u*	85 42	δ	40	
	30	52 25	*a*	61 28	*h*	63 19	v^1	85 26	γ_1	30	
	40	52 50	*a*	61 68	*h*	62 12	*v*	85 11	γ_1	20	
	50	0·52 75	*a*	0·62 08	h^1	1·61 07	w^1	0·84 96	γ	10	
32	0	0·52 99	*b*	0·62 49	*h*	1·60 03	*w*	0·84 80	γ_1	0	58
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	2	5	10	15	20	*p*	12	23	46	70	93
b	3	5	10	15	20	*q*	12	23	46	69	92
c	3	4	9	14	19	*r*	11	23	45	68	91
d	3	7	15	22	30	*s*	12	23	45	68	90
e	4	7	15	23	30	*t*	11	22	44	66	88
f	4	8	15	23	30	*u*	11	22	43	65	86
g	3	7	15	23	31	*v*	10	21	42	63	84
h	4	8	16	24	32	*w*	10	20	41	62	82
k	13	26	52	78	104	α	1	3	5	8	11
l	13	26	51	77	102	β	2	3	6	8	11
m	13	25	50	75	100	γ	2	3	6	9	12
n	12	24	49	73	97	δ	2	3	6	10	13
o	12	24	48	72	96						

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
32	0	0·52 99	a^1	0·62 49	e	1·60 03	l^1	0·84 80	a_1	0	58
	10	53 24	b^1	62 89	e^1	59 00	l	84 65	α	50	
	20	53 48	a^1	63 30	f_1	57 98	l_1	84 50	a^1	40	
	30	53 73	b^1	63 71	e	56 97	m^1	84 34	β^1	30	
	40	53 98	d_1	64 12	f_1	55 97	m^1	84 18	β	20	
	50	0·54 22	b^1	0·64 53	e^1	1·54 97	m_1	0·84 03	γ^1	10	
33	0	0·54 46	a^1	0·64 94	f	1·53 99	m	0·83 87	γ	0	57
	10	54 71	b	65 36	f_1	53 01	n^1	83 71	γ	50	
	20	54 95	b^1	65 77	f	52 04	n	83 55	γ	40	
	30	55 19	a^1	66 19	f	51 08	n_1	83 39	γ	30	
	40	55 44	b_1	66 61	f	50 13	o^1	83 23	γ	20	
	50	0·55 68	b	0·67 03	f^1	1·49 19	o	0·83 07	γ^1	10	
34	0	0·55 92	c	0·67 45	h	1·48 26	o^1	0·82 90	δ	0	56
	10	56 16	c	67 87	g	47 33	p^1	82 74	δ^1	50	
	20	56 40	c	68 30	h	46 41	p	82 58	γ^1	40	
	30	56 64	c	68 73	h_1	45 50	p_1	82 41	ϵ	30	
	40	56 88	c	69 16	h_1	44 60	q^1	82 25	ϵ^1	20	
	50	0·57 12	c_1	0·69 59	h_1	1·43 70	q	0·82 08	ϵ	10	
35	0	0·57 36	b	0·70 02	h^1	1·42 81	r^1	0·81 92	ζ	0	55
	10	57 60	b_1	70 46	h_1	41 93	r	81 75	ζ_1	50	
	20	57 83	c^1	70 89	g^1	41 06	s^1	81 58	η	40	
	30	58 07	b	71 33	k_1	40 19	s	81 41	η	30	
	40	58 31	b_1	71 77	k_1	39 34	t	81 24	η_1	20	
	50	0·58 54	d	0·72 21	k	1·38 48	u	0·81 07	η_1	10	
36	0	0·58 78	c_1	0·72 65	k^1	1·37 64	v	0·80 90	η^1	0	54
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	$\bar{2}$	5	10	15	19	q	9	18	35	53	71
b	2	5	9	14	19	r	8	17	35	52	69
c	2	5	10	14	19	s	8	17	34	51	68
d	3	5	10	14	19	t	8	18	35	52	69
e	4	8	16	24	32	u	8	17	34	50	67
f	4	8	17	25	33	v	9	17	34	51	67
g	4	9	18	26	35	α	2	3	6	9	12
h	4	9	17	26	34	β	1	3	6	9	12
k	4	9	18	27	36	γ	2	3	7	10	13
l	10	20	41	61	82	δ	1	3	6	9	13
m	10	20	40	59	79	ϵ	1	3	6	10	13
n	9	19	38	57	77	ζ	2	4	7	11	14
o	9	19	37	56	75	η	2	3	7	10	13
p	9	18	36	55	73						

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
36	0	0·58 78	b	0·72 65	e^1	1·37 64	m	0·80 90	a	0	54
	10	59 01	b^1	73 10	e	36 80	n	80 73	a	50	
	20	59 25	b	73 55	e	35 97	o^1	80 56	a^1	40	
	30	59 48	b^1	74 00	e	35 14	o	80 39	a^1	30	
	40	59 72	a_1	74 45	e	34 32	p^1	80 21	a	20	
	50	0·59 95	b	0·74 90	e^1	1·33 51	p	0·80 04	a^1	10	
37	0	0·60 18	b	0·75 36	e	1·32 70	p	0·79 86	a_1	0	53
	10	60 41	b^1	75 81	f	31 90	p_1	79 69	γ	50	
	20	60 65	c	76 27	f	31 11	q^1	79 51	a	40	
	30	60 88	c	76 73	f^1	30 32	p_1	79 34	γ^1	30	
	40	61 11	c	77 20	f_1	29 54	q	79 16	γ	20	
	50	0·61 34	c	0·77 66	f	1·28 76	r	0·78 98	γ	10	
38	0	0·61 57	c	0·78 13	f	1·27 99	s^1	0·78 80	δ	0	52
	10	61 80	c	78 60	g	27 23	r	78 62	δ	50	
	20	62 02	b	79 07	g	26 47	r_1	78 44	δ	40	
	30	62 25	b_1	79 54	g^1	25 72	r_1	78 26	δ^1	30	
	40	62 48	a_1	80 02	g^1	24 97	s	78 08	ϵ	20	
	50	0·62 71	c	0·80 50	h	1·24 23	t	0·77 90	ϵ^1	10	
39	0	0·62 93	b_1	0·80 98	h	1·23 49	t_1	0·77 71	δ	0	51
	10	63 16	c	81 46	k^1	22 76	u^1	77 53	ϵ	50	
	20	63 38	a	81 95	k_1	22 03	u	77 35	ϵ^1	40	
	30	63 61	c	82 43	l	21 31	u_1	77 16	ϵ_1	30	
	40	63 83	d^1	82 92	l	20 59	v^1	76 98	ϵ^1	20	
	50	0·64 06	d	0·83 42	k	1·19 88	v	0·76 79	ϵ	10	
40	0	0·64 28	c	0·83 91	l	1·19 18	w	0·76 60	a_1	0	50
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	3	5	9	14	18	p	8	16	32	48	64
b	2	5	9	14	19	q	8	16	31	47	62
c	2	4	9	13	18	r	8	15	30	46	61
d	2	4	8	13	17	s	7	15	30	45	60
e	4	9	18	27	36	t	8	15	30	45	59
f	5	9	19	28	37	u	7	14	29	43	58
g	5	9	19	28	38	v	7	14	28	42	56
h	5	9	19	29	38	w	7	15	29	43	57
k	5	9	19	29	39	α	2	3	7	10	14
l	5	10	20	30	40	β	2	4	7	11	13
m	9	17	34	51	67	γ	2	4	7	11	14
n	8	17	33	50	67	δ	2	3	7	11	14
o	8	16	33	49	65	ϵ	2	4	7	11	15

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
40	0	0·64 28	a	0·83 91	f	1·19 18	n^1	0·76 60	α	0	50
	10	64 50	a^1	84 41	f	18 47	n_1	76 42	α^1	50	
	20	64 72	b^1	84 91	f	17 78	n	76 23	β	40	
	30	64 94	b^1	85 41	f	17 08	o	76 04	β	30	
	40	65 17	b	85 91	g	16 40	o^1	75 85	β_1	20	
	50	0·65 39	b	0·86 42	g_1	1·15 71	q^1	0·75 66	β_1	10	
41	0	0·65 61	b	0·86 93	g	1·15 04	p	0·75 47	β	0	49
	10	65 83	b	87 44	g^1	14 36	q_1	75 28	β^1	50	
	20	66 04	c^1	87 96	g	13 69	p_1	75 09	γ^1	40	
	30	66 26	a^1	88 47	h	13 03	q	74 90	γ^1	30	
	40	66 48	c	88 99	h^1	12 37	q_1	74 70	γ	20	
	50	0·66 70	b	0·89 52	h_1	1·11 71	r^1	0·74 51	γ^1	10	
42	0	0·66 91	a^1	0·90 04	h^1	1·11 06	r^1	0·74 31	α	0	48
	10	67 13	c	90 57	k_1	10 41	r_1	74 12	γ^1	50	
	20	67 34	a^1	91 10	k	09 77	r	73 92	δ_1	40	
	30	67 56	b	91 63	k^1	09 13	r_1	73 73	δ	30	
	40	67 77	d^1	92 17	l	08 50	s^1	73 53	δ	20	
	50	0·67 99	e^1	0·92 71	l	1·07 86	s	0·73 33	δ	10	
43	0	0·68 20	b	0·93 25	m_1	1·07 24	t^1	0·73 14	α	0	47
	10	68 41	d	93 80	m_1	06 61	t	72 94	δ	50	
	20	68 62	d^1	94 35	m_1	05 99	t	72 74	δ	40	
	30	68 84	e	94 90	m_1	05 38	u	72 54	δ	30	
	40	69 05	e	95 45	m	04 77	u^1	72 34	δ	20	
	50	0·69 26	e	0·96 01	m	1·04 16	v^1	0·72 14	δ^1	10	
44	0	0·69 47	e	0·96 57	m^1	1·03 55	v	0·71 93	δ	0	46
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	2	$\bar{4}$	9	13	18	o	7	$13\bar{}$	$27\bar{}$	41	55
b	2	$\bar{4}$	$\bar{8}$	$13\bar{}$	$17\bar{}$	p	$\bar{7}$	$14\bar{}$	$27\bar{}$	$41\bar{}$	$54\bar{}$
c	$\bar{2}$	$\bar{4}$	9	13	$17\bar{}$	q	7	13	$27\bar{}$	40	$53\bar{}$
d	2	$\bar{4}$	9	13	17	r	6	13	$26\bar{}$	$38\bar{}$	$51\bar{}$
e	2	4	8	12	$16\bar{}$	s	6	$12\bar{}$	$25\bar{}$	$37\bar{}$	$50\bar{}$
f	5	10	20	30	40	t	6	$12\bar{}$	$24\bar{}$	$37\bar{}$	$49\bar{}$
g	5	10	20	$31\bar{}$	41	u	6	$12\bar{}$	25	37	49
h	5	$11\bar{}$	$21\bar{}$	$31\bar{}$	42	v	6	12	24	36	$48\bar{}$
k	$\bar{5}$	$11\bar{}$	$21\bar{}$	32	$43\bar{}$	α	2	$\bar{3}$	$\bar{7}$	$11\bar{}$	15
l	$\bar{5}$	11	22	$32\bar{}$	$43\bar{}$	β	2	4	$\bar{8}$	$11\bar{}$	15
m	$\bar{6}$	11	22	$33\bar{}$	$45\bar{}$	γ	2	4	$\bar{7}$	$11\bar{}$	$15\bar{}$
n	7	$14\bar{}$	28	$42\bar{}$	$56\bar{}$	δ	2	4	$\bar{8}$	$12\bar{}$	$16\bar{}$

°	′	Sin +	′	Tan +	′	Cot −	′	Cos −	′	′	°
44	0	0·69 47	*a*	0·96 57	*e*	1·03 55	*h*	0·71 93	*α*	0	46
	10	69 67	b^1	97 13	e^1	02 95	*h*	71 73	*α*	50	
	20	69 88	*b*	97 70	*f*	02 35	*k*	71 53	*α*	40	
	30	70 09	*c*	98 27	*f*	01 76	*l*	71 33	*β*	30	
	40	70 30	*a*	98 84	f^1	01 17	m^1	71 12	*α*	20	
	50	0·70 50	*d*	0·99 42	f^1	1·00 58	*m*	0·70 92	*γ*	10	
45	0	0·70 71	c_1	1·00 00	*g*	1·00 00	l_1	0·70 71	*α*	0	45
°	′	Cos −	′	Cot −	′	Tan +	′	Sin +	′	′	°

	1′	2′	4′	6′	8′		1′	2′	4′	6′	8′
a	2	4	8	12	16	*h*	6	12	24	36	48
b	2	4	9	13	17	*k*	6	11	23	35	47
c	2	4	8	13	17	*l*	6	12	24	35	47
d	2	5	9	13	17	*m*	6	11	23	35	46
e	6	11	22	34	45	*α*	2	4	8	12	16
f	6	11	23	34	46	*β*	2	5	9	13	17
g	6	12	23	35	47	*γ*	2	4	9	13	17

Shillings and Pence into Decimals of £1, and for Reconversion. See p. 7.

Shillings.	0d.	1d.	2d.	3d.	4d.	5d.	6d.	7d.	8d.	9d.	10d	11d	Shillings.
0/-	...	·004	·008	·012	·017	·021	·025	·029	·033	·037	·042	·046	0/-
1/-	·050	·054	·058	·062	·067	·071	·075	·079	·083	·087	·092	·096	1/-
2/-	·100	·104	·108	·112	·117	·121	·125	·129	·133	·137	·142	·146	2/-
3/-	·150	·154	·158	·162	·167	·171	·175	·179	·183	·187	·192	·196	3/-
4/-	·200	·204	·208	·212	·217	·221	·225	·229	·233	·237	·242	·246	4/-
5/-	·250	·254	·258	·262	·267	·271	·275	·279	·283	·287	·292	·296	5/-
6/-	·300	·304	·308	·312	·317	·321	·325	·329	·333	·337	·342	·346	6/-
7/-	·350	·354	·358	·362	·367	·371	·375	·379	·383	·387	·392	·396	7/-
8/-	·400	·404	·408	·412	·417	·421	·425	·429	·433	·437	·442	·446	8/-
9/-	·450	·454	·458	·462	·467	·471	·475	·479	·483	·487	·492	·496	9/-
10/-	·500	·504	·508	·512	·517	·521	·525	·529	·533	·537	·542	·546	10/-
11/-	·550	·554	·558	·562	·567	·571	·575	·579	·583	·587	·592	·596	11/-
12/-	·600	·604	·608	·612	·617	·621	·625	·629	·633	·637	·642	·646	12/-
13/-	·650	·654	·658	·662	·667	·671	·675	·679	·683	·687	·692	·696	13/-
14/-	·700	·704	·708	·712	·717	·721	·725	·729	·733	·737	·742	·746	14/-
15/-	·750	·754	·758	·762	·767	·771	·775	·779	·783	·787	·792	·796	15/-
16/-	·800	·804	·808	·812	·817	·821	·825	·829	·833	·837	·842	·846	16/-
17/-	·850	·854	·858	·862	·867	·871	·875	·879	·883	·887	·892	·896	17/-
18/-	·900	·904	·908	·912	·917	·921	·925	·929	·933	·937	·942	·946	18/-
19/-	·950	·954	·958	·962	·967	·971	·975	·979	·983	·987	·992	·996	19/-
	0d.	1d.	2d.	3d.	4d.	5d.	6d.	7d.	8d.	9d.	10d	11d	

Measures and Weights.

English = French.		Log.	French = English.		Log.
1 inch ...	2·5399541 cm.	0·40482 59	1 metre	39·37079 in.	1·59517 42
1 foot ...	30·479449 ,,	1·48400 71	,,	3·2808992 ft.	0·51599 29
1 mile ...	160931·49 ,,	5·20664 11	1 kilom.	1093·6331 yds	3·03887 16
1 sq. inch	6·4513669 sq. cm.	0·80965 18	1 sq. cm.	0·1550059 sq. in.	$\bar{1}$·19034 82
1 sq. foot	928·99683 ,,	2·96801 42	1 ,, dcm.	15·500591 ,,	1·19034 82
1 sq. yard	8360·9715 ,,	3·92225 67	1 ,, metre	10·764299 sq. ft.	1·03198 58
1 cub. in.	16·386176 c. cm.	1·21447 78	1 c.cm.	0·0610271 c. in.	$\bar{2}$·78552 24
1 cub. ft.	28315·312 ,,	4·45202 14	1 litre	61·027052 ,,	1·78552 24
1 cub. yd	764513·42 ,,	5·88338 51	,,	0·0353166 c. ft.	$\bar{2}$·54797 89
1 pint ...	567·93225 ,,	2·75429 65	,,	1·7607734 pt.	0·24570 33
1 gallon	4543·4580 ,,	3·65738 66	,,	0·2200967 gal.	$\bar{1}$·34261 35
1 grain ...	0·0647990 gm.	$\bar{2}$·81156 83	1 gm.	15·432349 grs.	1·18843 21
1 oz. Av.	28·349541 ,,	1·45254 60	1 kgm.	15432·349 ,,	4·18843 21
1 lb. Av.	453·59265 ,,	2·65666 61	,,	2·2046212 lbs. Av.	0·34333 37

COMPOUND INTEREST CALCULATIONS.

If R = amount that £1 will become in one year at a rate of interest i, then the amount A of principal P and interest together in n years is given by the formula.

$A = PR^n$ and log. A = log. $P + n$ (log. R).

If, as in table below, we find once for all the logarithms of the values of $1+i$ for different rates of interest, and for different periods, problems on compound interest are quickly solved. The values in the table have kindly been supplied to me by Professor R. S. Heath, Vice-Principal of the University of Birmingham.

Example.—Required the amount that £500 will become in 60 years put out at 3½% compound interest, payable half-yearly.

By table p. 163 $R = 1{\cdot}0175$. Sixty years = 120 half-years.

Hence amount $A = 500 \times 1{\cdot}0175^{120}$

Log. A = log. 500 + (log. 1·0175) × 120
= 2·69 897 + (0·00 753 442) × 120
= 2·69 897 + 0·90 413
= 3·60 310 N = 4010

A = £4010

Rate per Annum.	Payable	$R = 1+i$.	Log. R to ten figures. *
2¼	Quarterly	1·005625	0·00 243 606 14
2½	,,	1·00625	0·00 270 589 33
2¾	,,	1·006875	0·00 297 555 77
3	,,	1·0075	0·00 324 505 48
3¼	,,	1·008125	0·00 351 438 47
3½	,,	1·00875	0·00 378 354 77
3¾	,,	1·009375	0·00 405 254 41
4	,,	1·01	0·00 432 137 36
4¼	,,	1 010625	0·00 459 003 72
4½	,,	1·01125	0·00 485 853 46
4¾	,,	1·011875	0·00 512 686 61
5	,,	1·0125	0·00 539 503 18
5¼	,,	1·013125	0·00 566 303 21
5½	,,	1·01375	0·00 593 086 72
5¾	,,	1·014375	0·00 619 853 71
6	,,	1·015	0·00 646 604 22

Rate per Annum.	Payable	$R=1+i$.	Log. R to ten figures.*
$2\frac{1}{4}$	Half-yearly.	1·01125	0·00 485 853 46
$2\frac{1}{2}$	,,	1·0125	0·00 539 503 18
$2\frac{3}{4}$	,,	1·01375	0·00 593 086 72
3	,,	1·015	0·00 646 604 22
$3\frac{1}{4}$	,,	1·01625	0·00 700 055 86
$3\frac{1}{2}$	,,	1·0175	0·00 753 441 80
$3\frac{3}{4}$	,,	1·01875	0·00 806 762 17
4	,,	1·02	0·00 860 017 18
$4\frac{1}{4}$	,,	1·02125	0·00 913 206 96
$4\frac{1}{2}$	,,	1·0225	0·00 966 331 67
$4\frac{3}{4}$	,,	1·02375	0·01 019 391 47
5	,,	1·025	0·01 072 386 53
$5\frac{1}{4}$	,,	1·02625	0·01 125 317 01
$5\frac{1}{2}$	,,	1·0275	0·01 178 183 05
$5\frac{3}{4}$	,,	1·02875	0·01 230 984 82
6	,,	1·03	0·01 283 722 47
$2\frac{1}{4}$	Yearly	1·0225	0·00 966 331 67
$2\frac{1}{2}$	,,	1·025	0·01 072 386 54
$2\frac{3}{4}$	,,	1·0275	0·01 178 183 05
3	,,	1·03	0·01 283 722 47
$3\frac{1}{4}$	,,	1·0325	0·01 389 006 03
$3\frac{1}{2}$	,,	1·035	0·01 494 034 98
$3\frac{3}{4}$	,,	1·0375	0·01 598 810 54
4	,,	1·04	0·01 703 333 93
$4\frac{1}{4}$	,,	1·0425	0·01 807 606 36
$4\frac{1}{2}$	,,	1·045	0·01 911 629 04
$4\frac{3}{4}$	,,	1·0475	0·02 015 403 16
5	,,	1·05	0·02 118 929 91
$5\frac{1}{4}$	,,	1·0525	0·02 222 210 45
$5\frac{1}{2}$	,,	1·055	0·02 325 245 96
$5\frac{3}{4}$	,,	1·0575	0·02 428 037 60
6	,,	1·06	0·02 530 586 53
$6\frac{1}{4}$	,,	1·0625	0·02 632 893 87
$6\frac{1}{2}$	,,	1·065	0·02 734 960 78
$6\frac{3}{4}$	,,	1·0675	0·02 836 788 37
7	,,	1·07	0·02 938 377 77
$7\frac{1}{2}$	,,	1·075	0·03 140 846 43
8	,,	1·08	0·03 342 375 55
9	,,	1·09	0·03 742 649 79
10	,,	1 1	0·04 139 268 52

* The logarithms of R are given to 10 places for the convenience of those who may be using high-figure logarithms. Of course for five-figure logarithms it is useless to take more than six or seven figures for finding n (log. R).

NUMBERS OFTEN WANTED.

	App. Number.	Logarithm.
Circumference circle / diameter, or π	22/7 or 3·1416	0·49714 99
Radian in degrees	57·29578	1·75812 26
Circumference of circle $= 2\pi r$ ...	2π	0·79817 99
Area of circle $= \pi r^2$		
Surface of sphere $= 4\pi r^2$	4π	1·09920 99
Content of sphere $= \frac{4}{3}\pi r^3$	$\frac{4}{3}\pi$	0·62208 86
Content of cone or pyramid ... ... $= \frac{1}{3} a\ h$...		
a area of base. h = vertical height...		
g at Greenwich	981·17 cms.	2·99174 43
g at lat. 45°	980·6056 „	2·99149 45
At any latitude λ and height h in centimetres above sea level ... $g = 980\cdot6056(1 - \cdot00257 \cos 2\lambda - 1\cdot96\, h \times 10^{-9})$*		
Volume of 31·92 gm. oxygen in litres (mol. vol.)	22·325	1·34879 15
Conventional mol. vol. in litres ...	22·4	1·35024 80
Coeff. exp. air, constant pressure	0 00367	$\bar{3}$·56466 61
Coeff. elasticity air, constant volume	0·003665	$\bar{3}$·56407 40
Coeff. expansion mercury 1° C. ...	0·0001802	$\bar{4}$·25575 48
Mass 1 c.cm. mercury 0°C. ...	13·596 gms.	1·13341 12
Mech. equiv. Heat C.G.S. (Everett)	$4\cdot2 \times 10^7$ ergs.	7·62324 93
„ „ „	773·24 ft. lbs. F.	2·88831 43
„ „ „	1391·83 ft. lbs. C.	3·14358 62
„ „ „	42422 gm. cm. C.	4·62759 11
Watt (Volt-Ampere)...	0 2381 cal. or 10^7 ergs	$\bar{1}$·37675 94 7 00000 00

100 c. in. air, 30 in. and 60° F. = 30·938 grains (W. A. Miller). Log. 30·938 = 1·49049 22. Coeff. exp. air for 1° F. = 0·002039 (Stewart).

*Everett, *Units and Physical Constants*, 1886, p. 26.

EXAMINATION TABLES.

Taken from "Mathematical Tables for the use of Students." Is inserted by permission of the Controller of H.M. Stationery Office.

(A copy of these Tables will be supplied as necessary to each candidate at certain of the Examinations, in accordance with the Science Syllabuses published by the Board).

USEFUL CONSTANTS.

1 Inch = 25·40 millimetres.

1 Gallon = ·1604 cubic foot = 10 lb. of water at 62° F.

1 Knot = 6080 feet per hour = 1 Nautical mile per hour.

Weight of 1 lb. in London = 445,000 dynes.

One pound avoirdupois = 7000 grains = 453·6 grammes.

1 Cubic foot of water weighs 62·3 lb.

1 Cubic foot of air at 0° C. and 1 atmosphere, weighs ·0807 lb.

1 Cubic foot of Hydrogen at 0° C. and 1 atmosphere, weighs ·00559 lb.

1 Foot-pound = $1·3562 \times 10^7$ ergs.

1 Horse-power-hour = $33,000 \times 60$ foot-pounds.

1 Electrical unit = 1000 watt-hours.

Joule's Equivalent to suit Regnault's H, is { 774 ft.-lb. = 1 Fahr. unit. / 1393 ft.-lb. = 1 Cent. ,,

1 Horse-power = 33,000 foot pounds per minute = 746 watts.

Volts × ampères = watts.

1 Atmosphere = 14·7 lb. per square inch = 2116 lb. per square foot = 760 mm. of mercury = 10^6 dynes per sq. cm. nearly.

A column of water 2·3 feet high corresponds to a pressure of 1 lb. per sq. inch.

Absolute temp., $t = \theta° \text{ C.} + 273°$.

Regnault's $H = 606·5 + ·305\ \Theta° \text{ C.} = 1082 + ·305\ \Theta° \text{ F.}$

$p\, u^{1·0646} = 479.$

$$\log_{10} p = 6·1007 - \frac{B}{t} - \frac{C}{t^2},$$

where $\log_{10} B = 3·1812$, $\log_{10} C = 5·0882$.

p is in pounds per square inch, t is absolute temperature Centigrade.

u is the volume in cubic feet per pound of steam.

$\pi = 3·1416$.

One radian = 57·30 degrees.

To convert common into Napierian logarithms, multiply by 2·3026.

The base of the Napierian logarithms is $e = 2·7183$.

The value of g at London = 32·182 feet per sec. per sec.

1. COMMON LOGARITHMS TO NAPIERIAN LOGARITHMS. *See p.* 148 *and Example below.*

Com. Log.	Characteristic	1st decimal.	2nd decimal.	3rd decimal.	4th decimal.	5th decimal.
1	2·30 259	0·23 026	0·02 303	0·00 230	0·00 023	0·00 002
2	4·60 517	0·46 052	·04 605	·00 461	046	05
3	6·90 776	0·69 078	·06 908	·00 691	069	07
4	9·21 034	0·92 103	0·09 210	0·00 921	0·00 092	0·00 009
5	11·51 293	1·15 129	0·11 513	0·01 151	0·00 115	0·00 012
6	13·81 551	1·38 155	·13 816	·01 382	138	14
7	16·11 810	1·61 181	·16 118	·01 612	161	16
8	18·42 068	1·84 207	·18 421	·01 842	184	18
9	20·72 327	2·07 233	0·20 723	0·02 072	0·00 207	0·00 021

2. NAPIERIAN LOGARITHMS TO COMMON LOGARITHMS. *See p.* 148 *and Example below.*

Nap. Log.	Characteristic.	1st decimal.	2nd decimal.	3rd decimal.	4th decimal.	5th decimal
1	0·43 429	0·04 343	0·00 434	0·00 043	0·00 004	0·00 000
2	0·86 859	·08 686	·00 869	087	09	1
3	1·30 288	·13 029	·01 303	130	13	1
4	1·73 718	0·17 372	0·01 737	0·00 174	0·00 017	0·00 002
5	2·17 147	0·21 715	0·02 171	0·00 217	0·00 022	0·00 002
6	2·60 577	·26 058	·02 606	261	26	3
7	3·04 006	·30 041	·03 040	304	30	3
8	3·47 436	·34 744	·03 474	347	35	3
9	3·90 865	0·39 087	0·03 909	0·0 0391	0·00 039	0·00 004

Example.—Convert common log. 0·49715 to Nap. log.

By table

0·4	... ...	0·92103
0·09	... ...	20723
0·007	... ...	1612
0·0001	... ...	23
0·00005	... ...	12
0·49715 C.L.		= 1·14473 N.L.

Example.—Convert Nap. log. = 6·48158 to common log.

By table

6·00000	...	2·60577
0·4	...	17372
0·08	...	03474
0·001	...	43
0·0005	...	22
0·00008	...	3
6·48158 N.L.		= 2·81491 C.L.

INDEX TO FIND PAGE ON WHICH A GIVEN LOGARITHM OF AN ARC FUNCTION WILL BE FOUND.

For explanation, see page 47.

Note.—A dash under the first figure of an index mantissa indicates that the characteristic is 8. A dash above the first figure of an index mantissa indicates that the characteristic is 10. When there is no dash the characteristic is 9, and when (as in a few cases) there is a dash both above and below, the index is 11. See example, p. 47.

Tangents and Cotangents.