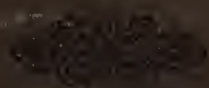


ORAL  
ARITHMETIC



WENTWORTH & SMITH

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WENTWORTH-SMITH MATHEMATICAL SERIES

# ORAL ARITHMETIC

BY

22808

GEORGE WENTWORTH

AND

DAVID EUGENE SMITH

GINN AND COMPANY

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## PREFACE

Ever since Warren Colburn, following in the footsteps of Pestalozzi, published his *Intellectual Arithmetic* early in the last century, teachers have recognized the great value of oral work in number. Oral work is furnished in the text-books in primary arithmetic, and in some cases in books for higher grades. Most text-books used in the last four years of the elementary school, however, need supplementing in this important particular, and this reason prompted the authors to prepare this book.

The chief principles that have guided the selection and arrangement of material have been as follows: The oral arithmetic needed for practical life relates mainly to the fundamental operations. These operations should, therefore, be reviewed in each school year, the degree of difficulty increasing slightly as the pupil proceeds, but never becoming greater than that encountered in daily business life. Together with the work in abstract number, which Pestalozzi so strongly emphasized, should go a range of applications related to the pupil's interests as they vary from year to year. No particular effort should be made to conform to the sequence of any text-book in written arithmetic, since the prime object of oral arithmetic is continually to review topics that have been passed in the usual sequence of written work.

The effectiveness of oral arithmetic demands that this work should form part of every recitation, or at least of

every other recitation. A text-book upon this subject, therefore, serves its purpose best when arranged in four chapters for the last four years of the elementary school, each chapter being divided into a hundred exercises, thus allowing about a half exercise for each day, or a whole exercise for every second day.

Teachers are advised to accustom their pupils from the beginning to rapid, sprightly, crisp responses. Such a habit will soon result in a mental alertness in number work that not only will be valuable in after life, but will react very favorably upon the work in ordinary written arithmetic. Teachers will naturally make such a rearrangement of the exercises as seems best, particularly in the last chapter, and will supplement the applied problems with others relating to local customs and industries.

The best results are obtained with any oral arithmetic by introducing the book in the class for which the first chapter is written. It may, however, be introduced at a later period, provided a sufficient review of the earlier work is undertaken to accustom the pupils to rapid mental work. In general, the problems are of such a nature that all the work can easily be done mentally if the preceding exercises have been taken; but, as is always the case in oral arithmetic, the teacher will find it advisable occasionally to write some of the numbers on the blackboard, particularly if cancellation is involved.

Any corrections or suggestions relating to the book will be thankfully received.

GEORGE WENTWORTH  
DAVID EUGENE SMITH

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# ORAL ARITHMETIC

## CHAPTER I

22808

### I. OPERATIONS WITH INTEGERS

#### 1. Adding 2's and 3's

1.  $12 + 2$ .      5.  $26 + 2$ .      9.  $42 + 3$ .      13.  $26 + 3$ .  
2.  $15 + 2$ .      6.  $23 + 2$ .      10.  $18 + 3$ .      14.  $33 + 3$ .  
3.  $18 + 2$ .      7.  $27 + 2$ .      11.  $17 + 3$ .      15.  $35 + 3$ .  
4.  $24 + 2$ .      8.  $19 + 2$ .      12.  $34 + 3$ .      16.  $19 + 3$ .

17. How much is \$17 and \$3? 19 ft. and 3 ft.? 18 yd. and 3 yd.?

18. How much is \$19 and \$2? \$12 and \$9?  $9 + 2$ ?  
 $2 + 9$ ?

19. How much is \$29 and \$3? \$23 and \$9?  $9 + 3$ ?  
 $3 + 9$ ?

#### 2. Adding 4's and 5's

1.  $22 + 4$ .      5.  $65 + 4$ .      9.  $36 + 5$ .      13.  $72 + 5$ .  
2.  $36 + 4$ .      6.  $73 + 4$ .      10.  $44 + 5$ .      14.  $77 + 5$ .  
3.  $44 + 4$ .      7.  $77 + 4$ .      11.  $58 + 5$ .      15.  $83 + 5$ .  
4.  $58 + 4$ .      8.  $89 + 4$ .      12.  $65 + 5$ .      16.  $89 + 5$ .

17. How much is \$76 and \$4? 88 ft. and 4 ft.? 77 bu. and 4 bu.?

18. How much is \$76 and \$5? 37 in. and 5 in.? 88 yd. and 5 yd.?

19. How much is \$89 and \$5? \$85 and \$9?  $9 + 5$ ?  
 $5 + 9$ ?

## 3. Adding 6's and 7's

1.  $54 + 6$ .      5.  $92 + 6$ .      9.  $43 + 7$ .      13.  $64 + 7$ .  
 2.  $66 + 6$ .      6.  $77 + 6$ .      10.  $86 + 7$ .      14.  $32 + 7$ .  
 3.  $73 + 6$ .      7.  $75 + 6$ .      11.  $78 + 7$ .      15.  $75 + 7$ .  
 4.  $88 + 6$ .      8.  $99 + 6$ .      12.  $77 + 7$ .      16.  $99 + 7$ .
17. How much is \$27 and \$6? 38 ft. and 6 ft.?  
 18. How much is 42 mi. and 7 mi.? 68¢ and 7¢?  
 19. How much is 67¢ and 6¢? 65¢ and 7¢? 28 sq. in. and 6 sq. in.?
- ✓ 20. If you have 37 marbles and buy 7 more, how many will you then have?  
 ✓ 21. If a grocer has 87 bbl. of flour and buys 7 more, how many will he then have?  
 22. If a farmer has 46 head of cattle and buys half a dozen more, how many will he then have?

## 4. Adding 8's and 9's

1.  $24 + 8$ .      5.  $35 + 8$ .      9.  $23 + 9$ .      13.  $37 + 9$ .  
 2.  $26 + 8$ .      6.  $27 + 8$ .      10.  $36 + 9$ .      14.  $54 + 9$ .  
 3.  $23 + 8$ .      7.  $92 + 8$ .      11.  $35 + 9$ .      15.  $92 + 9$ .  
 4.  $38 + 8$ .      8.  $99 + 8$ .      12.  $48 + 9$ .      16.  $99 + 9$ .
17. How much is \$68 and \$8? \$107 and \$8?  
 18. How much is \$33 and \$9? \$106 and \$9? \$199 and \$9?  
 19. Which, if either, is greater, \$108 + \$9, or \$109 + \$8? State the sums.  
 20. If a man pays \$23 for a saddle and \$8 for a bridle, how much does he pay for both?  
 21. If a man has a farm of 166 acres and buys 9 acres more, how much does he then have?  
 22. The three sides of a triangle are 9 ft., 7 ft., and 8 ft. What is the sum of the sides of the triangle?

## 5. Miscellaneous Addition

1.  $15 + 7$ .      5.  $27 + 3$ .      9.  $26 + 5$ .      13.  $39 + 5$ .  
 2.  $17 + 4$ .      6.  $48 + 2$ .      10.  $34 + 8$ .      14.  $94 + 3$ .  
 3.  $16 + 8$ .      7.  $56 + 4$ .      11.  $47 + 5$ .      15.  $83 + 8$ .  
 4.  $19 + 9$ .      8.  $73 + 7$ .      12.  $58 + 3$ .      16.  $95 + 6$ .
17. How much is  $55\text{¢}$  and  $7\text{¢}$ ?  $57\text{¢}$  and  $5\text{¢}$ ?  
 18. How much is 69 ft. and 7 ft.? 67 ft. and 9 ft.?  
 19. How much is \$138 and \$4? \$134 and \$8?  
 20. How much is 54 acres and 9 acres? 98 acres and 4 acres?  
 21. The four sides of a flower bed are 4 ft., 2 ft., 4 ft., 5 ft. What is the perimeter?  
 22. A man weighing 158 lb. is carrying a basket that weighs 3 lb. in which there are 9 lb. of groceries. What is the combined weight of all three?

## 6. Miscellaneous Addition

1.  $52 + 9$ .      5.  $56 + 6$ .      9.  $85 + 5$ .      13.  $97 + 9$ .  
 2.  $83 + 9$ .      6.  $97 + 7$ .      10.  $67 + 6$ .      14.  $69 + 8$ .  
 3.  $94 + 6$ .      7.  $98 + 8$ .      11.  $68 + 8$ .      15.  $49 + 7$ .  
 4.  $75 + 8$ .      8.  $45 + 6$ .      12.  $98 + 6$ .      16.  $98 + 5$ .
17. Add \$78 and \$5; \$75 and \$8; 5 and 8; 8 and 5.  
 18. Add  $59\text{¢}$  and  $4\text{¢}$ ;  $54\text{¢}$  and  $9\text{¢}$ ; 9 and 4; 4 and 9.  
 19. Add  $77\text{¢}$  and  $7\text{¢}$ ;  $88\text{¢}$  and  $8\text{¢}$ ; 7 and 7; 8 and 8.  
 20. How much is 86 ft. and 9 ft.? 56 yd. and 9 yd.? 96 and 9?  
 21. How much is 16 in. and 8 in.? \$76 and \$8? \$9 and \$6?  
 22. If you buy groceries weighing 31 lb., 5 lb., and 9 lb., what is the total weight?  
 23. If you spend  $37\text{¢}$ ,  $8\text{¢}$ , and  $5\text{¢}$ , how much do you spend in all?

**7. Adding Two-figure Numbers**

Think of  $25 + 17$  as  $25 + 10 + 7$ , and then as  $35 + 7$ . State aloud only the result, 42.

1.  $30 + 10.$     5.  $26 + 10.$     9.  $29 + 10.$     13.  $32 + 10.$

2.  $30 + 17.$     6.  $26 + 14.$     10.  $29 + 12.$     14.  $32 + 17.$

3.  $23 + 10.$     7.  $28 + 10.$     11.  $27 + 10.$     15.  $45 + 10.$

4.  $23 + 15.$     8.  $28 + 13.$     12.  $27 + 18.$     16.  $45 + 15.$

17. How much is  $24\text{¢}$  and  $15\text{¢}$ ?  $35\text{¢}$  and  $18\text{¢}$ ?  $48\text{¢}$  and  $15\text{¢}$ ?

18. If you buy  $36\text{¢}$  worth of sugar and  $18\text{¢}$  worth of fruit, what is the total cost?

19. If a pony costs  $\$85$  and a saddle costs  $\$17$ , how much do both cost?

20. A boy has a fishing rod that cost  $\$3.25$  and a line that cost  $18\text{¢}$ . How much did both cost?

**8. Adding Larger Two-figure Numbers**

Think of  $38 + 24$  as  $38 + 20 + 4$ , or  $58 + 4$ , as in Exercise 7 above. State aloud only the result, 62.

1.  $30 + 20.$     5.  $30 + 40.$     9.  $40 + 20.$     13.  $50 + 10.$

2.  $38 + 20.$     6.  $37 + 40.$     10.  $44 + 20.$     14.  $58 + 10.$

3.  $38 + 26.$     7.  $37 + 42.$     11.  $44 + 24.$     15.  $58 + 12.$

4.  $38 + 27.$     8.  $37 + 44.$     12.  $44 + 29.$     16.  $58 + 15.$

17. How much is  $\$24$  and  $\$14$ ?  $\$24$  and  $\$17$ ?

18. How much is  $35\text{¢}$  and  $22\text{¢}$ ?  $35\text{¢}$  and  $28\text{¢}$ ?  $48\text{¢}$  and  $17\text{¢}$ ?

19. If your bill at the grocer's is  $45\text{¢}$  and  $27\text{¢}$ , what is the total?

20. If a man paid  $35\text{¢}$  for his railway ticket and  $18\text{¢}$  for his son's, how much did he pay for both?

21. If a lady paid  $\$1.05$  for some cloth and  $75\text{¢}$  for some ribbon, how much did she pay for both?

## 9. Adding Larger Two-figure Numbers

1.  $70 + 20$ .    5.  $80 + 20$ .    9.  $90 + 70$ .    13.  $70 + 60$ .  
 2.  $70 + 30$ .    6.  $85 + 20$ .    10.  $90 + 72$ .    14.  $77 + 60$ .  
 3.  $73 + 30$ .    7.  $85 + 23$ .    11.  $92 + 72$ .    15.  $77 + 63$ .  
 4.  $73 + 34$ .    8.  $85 + 25$ .    12.  $92 + 78$ .    16.  $77 + 67$ .
17. How much is  $40¢$  and  $30¢$ ?  $47¢$  and  $30¢$ ?  
 18. How much is  $80¢$  and  $50¢$ ?  $84¢$  and  $50¢$ ?  $84¢$  and  $58¢$ ?  
 19. If you give a boy a start of 15 yd. in a race, and overtake him after he has run 98 yd., how far have you run?  
 20. If a boy has 235 ft. of kite string and ties on 45 ft. more, how many feet does he then have?  
 21. If a certain village had a population of 2075 five years ago, and has gained 87 since then, what is the present population of the village?

## 10. Adding Larger Two-figure Numbers

1.  $80 + 20$ .    5.  $80 + 40$ .    9.  $70 + 50$ .    13.  $90 + 20$ .  
 2.  $87 + 20$ .    6.  $83 + 40$ .    10.  $74 + 50$ .    14.  $98 + 20$ .  
 3.  $87 + 23$ .    7.  $83 + 49$ .    11.  $74 + 56$ .    15.  $98 + 27$ .  
 4.  $87 + 28$ .    8.  $84 + 46$ .    12.  $78 + 51$ .    16.  $98 + 29$ .
17. Add 74 ft. and 36 ft.; 83 in. and 27 in.; \$75 and \$27.  
 18. Add 86 in. and 34 in.; 92 bu. and 38 bu.; \$94 and \$36.  
 19. Add \$96 and \$80; \$96 and \$82; \$96 and \$87.  
 20. The three sides of a triangle are 23 in., 19 in., and 17 in. What is the sum of the sides of the triangle?  
 21. A boy weighs 67 lb. and his dog weighs 28 lb. What do the two together weigh?  
 22. If there are 39 pupils in one class and 26 in another, how many are there in both classes?  
 23. If a man pays \$155 for a horse and \$35 for a harness, how much does he pay for both?

## 11. Subtraction. No Reduction

1.  $17 - 3$ .    5.  $48 - 7$ .    9.  $33 - 10$ .    13.  $58 - 11$ .  
 2.  $26 - 4$ .    6.  $59 - 8$ .    10.  $48 - 10$ .    14.  $66 - 11$ .  
 3.  $78 - 5$ .    7.  $29 - 9$ .    11.  $23 - 10$ .    15.  $78 - 11$ .  
 4.  $39 - 6$ .    8.  $42 - 10$ .    12.  $45 - 10$ .    16.  $89 - 11$ .
17. From \$65 take \$12.  
 18. From the sum of \$17 and \$25 take \$2.  
 19. How much more is 27 than 6? than 3?  
 20. How much less is 7 than 39? than 48? than 97?  
 21. What number must be added to 8 to make 49? to make 58?  
 22. What number must be subtracted from 37 to leave 11? to leave 26?  
 23. If a boy has 75 yd. of kite string and loses 11 yd., how much has he left? How much if he loses 11 yd. more?

## 12. Subtraction. No Reduction

1.  $37 - 10$ .    5.  $52 - 10$ .    9.  $52 - 11$ .    13.  $37 - 11$ .  
 2.  $28 - 10$ .    6.  $87 - 10$ .    10.  $34 - 11$ .    14.  $49 - 11$ .  
 3.  $43 - 10$ .    7.  $58 - 10$ .    11.  $57 - 11$ .    15.  $73 - 11$ .  
 4.  $35 - 10$ .    8.  $69 - 10$ .    12.  $65 - 11$ .    16.  $99 - 11$ .
17. From \$78 take the sum of \$10 and \$7.    61  
 18. If a man buys a bicycle for \$35 and pays \$12 down, how much is still due?    23  
 19. It is 42 mi. to a certain place. How far is it to a place 10 mi. this side of it?  
 20. If a boy picks 23 qt. of berries and sells 11 qt., how many has he left?  
 21. If there are 24 pupils in a class and 11 are boys, how many are girls?  
 22. If a man pays \$125 for one horse and \$10 less for another, how much does he pay for the second?



## 13. Minuend ending in 0 or 1

- |               |               |                |                |
|---------------|---------------|----------------|----------------|
| 1. $20 - 9$ . | 5. $40 - 4$ . | 9. $21 - 4$ .  | 13. $51 - 5$ . |
| 2. $50 - 3$ . | 6. $30 - 6$ . | 10. $41 - 9$ . | 14. $31 - 2$ . |
| 3. $40 - 2$ . | 7. $20 - 8$ . | 11. $31 - 3$ . | 15. $51 - 8$ . |
| 4. $60 - 5$ . | 8. $40 - 7$ . | 12. $71 - 6$ . | 16. $21 - 7$ . |

17. If you have 20¢ and spend 6¢, how much have you left?

18. What number must be added to 3 to make 30? to make 41?

19. If you have gained 9 lb. in a year and now weigh 71 lb., how much did you weigh a year ago?

✓20. If a man has to drive 21 mi., how much farther must he go after he has driven 7 mi.?

21. A man having 48 head of cattle bought 13 more. He then sold 8. How many cattle did he then have?

## 14. Minuend ending in 2 or 3

- |               |               |                |                |
|---------------|---------------|----------------|----------------|
| 1. $42 - 4$ . | 5. $32 - 2$ . | 9. $23 - 6$ .  | 13. $33 - 5$ . |
| 2. $32 - 6$ . | 6. $62 - 5$ . | 10. $43 - 4$ . | 14. $73 - 9$ . |
| 3. $22 - 3$ . | 7. $72 - 9$ . | 11. $33 - 3$ . | 15. $43 - 7$ . |
| 4. $82 - 8$ . | 8. $52 - 7$ . | 12. $23 - 2$ . | 16. $63 - 8$ . |

17. If a class numbers 32, and 4 pupils are absent, how many are present?

18. What number must be added to 9 to make 52? to make 73?

✓19. A boy having a kite string 82 yd. long lost 7 yd. in the telephone wires. How many yards had he left?

✓20. A girl and her cat together weigh 62 lb., and the cat weighs 8 lb. How much does the girl weigh?

21. For a room and entrance hall 33 yd. of carpet are required. For the hall 7 yd. are needed. How much is needed for the room?

## 15. Minuend ending in 4, 5, or 6

- |               |               |                |                |
|---------------|---------------|----------------|----------------|
| 1. $34 - 4$ . | 5. $54 - 8$ . | 9. $75 - 5$ .  | 13. $26 - 8$ . |
| 2. $24 - 7$ . | 6. $64 - 3$ . | 10. $36 - 7$ . | 14. $35 - 8$ . |
| 3. $44 - 9$ . | 7. $94 - 2$ . | 11. $75 - 9$ . | 15. $65 - 6$ . |
| 4. $34 - 5$ . | 8. $24 - 6$ . | 12. $36 - 9$ . | 16. $35 - 7$ . |

17. What number must be added to 7 to make 35? to make 84?

✓18. If a dealer has 54 qt. of peanuts and sells 9 qt., how many quarts has he left?

✓19. If I had 74 crayons yesterday and 8 less to-day, how many have I now?

20. The distance from here to a certain place X is 65 mi. How far is it to a place 6 mi. this side of X?

21. There are 84 pupils in a certain school and 5 were absent on Monday. How many were present?

## 16. Minuend ending in 7 or 8, and Review

- |               |               |                |                |
|---------------|---------------|----------------|----------------|
| 1. $27 - 8$ . | 5. $43 - 6$ . | 9. $26 - 9$ .  | 13. $68 - 9$ . |
| 2. $47 - 9$ . | 6. $75 - 7$ . | 10. $32 - 7$ . | 14. $77 - 8$ . |
| 3. $38 - 9$ . | 7. $60 - 3$ . | 11. $23 - 5$ . | 15. $31 - 7$ . |
| 4. $62 - 8$ . | 8. $41 - 6$ . | 12. $85 - 8$ . | 16. $92 - 6$ . |

17. How much is 65 yr. minus 7 yr.?

18. If a dealer has 91 qt. of milk and sells 8 qt., how many quarts has he left?

19. If you made a score of 53 in a game and I made 6 less, how much did I make?

20. If a flag pole 75 ft. high broke off 7 ft. from the top, how much remained standing?

21. If an exercise has 22 examples and you have solved 8, how many are left to be solved?

22. If a dealer bought 93 qt. of berries and 7 qt. were spoiled, how many quarts of good berries had he?



**17. Subtraction. No Reduction**

Think of  $87 - 25$  as  $87 - 20 - 5$ , or  $67 - 5$ . State aloud only the result, 62.

- |                |                |                 |                 |
|----------------|----------------|-----------------|-----------------|
| 1. $86 - 10$ . | 5. $48 - 20$ . | 9. $38 - 27$ .  | 13. $98 - 56$ . |
| 2. $73 - 10$ . | 6. $67 - 23$ . | 10. $53 - 23$ . | 14. $77 - 44$ . |
| 3. $42 - 11$ . | 7. $75 - 32$ . | 11. $87 - 51$ . | 15. $81 - 31$ . |
| 4. $75 - 12$ . | 8. $86 - 45$ . | 12. $96 - 32$ . | 16. $68 - 25$ . |

17. What number must be added to 23 to make 75?

18. If Mr. A has \$75 and spends \$42, how much is left?

✓19. If a girl has 27 yd. of ribbon and uses 15 yd., how many yards has she left?

20. If a man sells 32 acres from a lot of 96 acres, how many acres has he left?

21. Our flag has 46 stars and 13 stripes. How many more stars than stripes are there in our flag?

**18. Reduction required**

Think of  $75 - 36$  as  $75 - 30 - 6$ , or  $45 - 6$ . State aloud only the result, 39.

- |                |                |                 |                 |
|----------------|----------------|-----------------|-----------------|
| 1. $75 - 30$ . | 5. $86 - 20$ . | 9. $54 - 20$ .  | 13. $31 - 20$ . |
| 2. $75 - 32$ . | 6. $86 - 24$ . | 10. $54 - 23$ . | 14. $31 - 21$ . |
| 3. $75 - 35$ . | 7. $86 - 26$ . | 11. $54 - 24$ . | 15. $31 - 22$ . |
| 4. $75 - 38$ . | 8. $86 - 29$ . | 12. $54 - 28$ . | 16. $31 - 24$ . |

17. What number subtracted from 72 leaves 38?

18. Mr. B has 82 cows and sells 45. How many are left?

19. A man 52 yr. old is 43 yr. older than his son. How old is his son?

20. A building is 62 ft. high and the lowest story is 16 ft. high. How high is it above the lowest story?

✓21. A man went around the world in 63 days and was 16 days in crossing the Pacific. How long did it take for the rest of the journey?

## 19. Subtracting from 100

Think of  $100 - 67$  as  $90 - 60$  and  $10 - 7$ , or 33. It may also be thought of as  $40 - 7$ .

1.  $100 - 28$ .    5.  $100 - 78$ .    9.  $100 - 77$ .    13.  $100 - 69$ .
2.  $100 - 32$ .    6.  $100 - 51$ .    10.  $100 - 30$ .    14.  $100 - 70$ .
3.  $100 - 46$ .    7.  $100 - 24$ .    11.  $100 - 45$ .    15.  $100 - 49$ .
4.  $100 - 19$ .    8.  $100 - 83$ .    12.  $100 - 78$ .    16.  $100 - 81$ .
17. I owe 82¢ and pay a dollar. How much change is due?
18. I owe 48¢ and pay a dollar. How much change is due?
19. I owe 17¢ and 32¢ and pay a dollar. How much change is due?
20. My purchases at a store amount to 35¢ and 16¢. How much change is due from \$1?

## 20. Making Change to \$1

*Find the change due from \$1 if you make purchases of:*

- |                      |                      |          |          |          |
|----------------------|----------------------|----------|----------|----------|
| 1. 10¢.              | 13. 27¢.             | 25. 78¢. | 37. 46¢. | 49. 60¢. |
| 2. 42¢.              | 14. 32¢.             | 26. 43¢. | 38. 59¢. | 50. 88¢. |
| 3. 71¢.              | 15. 49¢.             | 27. 45¢. | 39. 68¢. | 51. 56¢. |
| 4. 33¢.              | 16. 34¢.             | 28. 50¢. | 40. 37¢. | 52. 99¢. |
| 5. 24¢.              | 17. 31¢.             | 29. 58¢. | 41. 72¢. | 53. 65¢. |
| 6. 81¢.              | 18. 35¢.             | 30. 38¢. | 42. 47¢. | 54. 69¢. |
| 7. 30¢.              | 19. 39¢.             | 31. 54¢. | 43. 74¢. | 55. 83¢. |
| 8. 44¢.              | 20. 94¢.             | 32. 61¢. | 44. 77¢. | 56. 70¢. |
| 9. 25¢.              | 21. 52¢.             | 33. 73¢. | 45. 75¢. | 57. 93¢. |
| 10. 36¢.             | 22. 64¢.             | 34. 89¢. | 46. 63¢. | 58. 66¢. |
| 11. 26¢.             | 23. 48¢.             | 35. 82¢. | 47. 92¢. | 59. 84¢. |
| 12. 23¢.             | 24. 87¢.             | 36. 55¢. | 48. 86¢. | 60. 79¢. |
| 61. 5¢ + 10¢ + 25¢.  | 63. 30¢ + 50¢ + 10¢. |          |          |          |
| 62. 25¢ + 25¢ + 15¢. | 64. 15¢ + 35¢ + 45¢. |          |          |          |

**21. Subtracting from Hundreds**

Think of  $200 - 68$  as  $190 - 60$  and  $10 - 8$ , or  $132$ . It may also be thought of as  $140 - 8$ .

1.  $200 - 52$ .
2.  $200 - 75$ .
3.  $200 - 36$ .
4.  $200 - 61$ .
5.  $300 - 33$ .
6.  $300 - 74$ .
7.  $400 - 67$ .
8.  $400 - 88$ .
9.  $500 - 20$ .
10.  $600 - 39$ .
11.  $700 - 48$ .
12.  $800 - 27$ .
13.  $600 - 47$ .
14.  $700 - 63$ .
15.  $800 - 49$ .
16.  $900 - 90$ .
17. I owe  $78\%$ . How much change is due from  $\$2$ ?
18. If you owe  $91\%$ , how much change is due from  $\$2$ ?
19. If your purchases amount to  $35\%$  and  $18\%$ , how much change is due from  $\$5$ ?
20. How much must be added to  $38\%$  to make  $\$6$ ? to make  $\$7$ ? to make  $99\%$ ?
21. What year is  $63$  years before  $1900$ ? What year is  $89$  years before  $2000$ ?  $77$  years before  $2000$ ?

**22. Subtracting from Hundreds**

1.  $200 - 27$ .
2.  $200 - 59$ .
3.  $200 - 46$ .
4.  $200 - 38$ .
5.  $300 - 62$ .
6.  $300 - 78$ .
7.  $300 - 49$ .
8.  $300 - 67$ .
9.  $400 - 54$ .
10.  $400 - 35$ .
11.  $400 - 21$ .
12.  $400 - 39$ .
13.  $500 - 23$ .
14.  $500 - 41$ .
15.  $500 - 28$ .
16.  $500 - 32$ .
17. If I have  $\$1$  and spend  $77\%$ , how much have I left?
18. If I have  $\$2$  and spend  $50\%$ , how much have I left?
19. If I have  $\$5$  and spend  $78\%$ , how much have I left?
20. If a fruit grower has  $300$  trees, all but  $38$  bearing fruit, how many are bearing?
21. If a farmer has  $200$  acres,  $46$  being wooded, how many acres are not wooded?
22. If I owe  $50\%$  and  $42\%$ , how much change should I receive from  $\$5$ ?
23. If I owe  $75\%$  and  $16\%$ , how much change should I receive from  $\$2$ ?

## 23. Making Change

To give the change due from \$5 on a purchase of \$2.45, a merchant thinks "5 (to make 250) and 250 (to make 500) are 255," and he pays \$2.55.

*Find the change due from \$2 if you make purchases of:*

- |            |            |            |            |             |
|------------|------------|------------|------------|-------------|
| 1. \$1.40. | 3. \$1.75. | 5. \$1.10. | 7. \$1.23. | 9. \$1.38.  |
| 2. \$1.72. | 4. \$1.48. | 6. \$1.66. | 8. \$1.78. | 10. \$1.17. |

*Also the change due from \$3:*

- |             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|
| 11. \$2.24. | 12. \$2.06. | 13. \$2.55. | 14. \$2.65. | 15. \$2.03. |
|-------------|-------------|-------------|-------------|-------------|

*Also the change due from \$5:*

- |             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|
| 16. \$4.32. | 17. \$3.75. | 18. \$2.60. | 19. \$1.45. | 20. \$2.05. |
|-------------|-------------|-------------|-------------|-------------|

21. If your purchases amount to \$1, \$1.25, and 40¢, how much change is due you from \$5?

## 24. Making Change

*Find the change due from \$2 if you make purchases of:*

- |            |            |            |             |             |
|------------|------------|------------|-------------|-------------|
| 1. \$1.25. | 4. \$1.15. | 7. \$1.58. | 10. \$1.81. | 13. \$0.28. |
| 2. \$1.50. | 5. \$1.27. | 8. \$1.72. | 11. \$1.07. | 14. \$0.41. |
| 3. \$1.35. | 6. \$1.36. | 9. \$1.49. | 12. \$1.63. | 15. \$0.90. |

*Also the change due from \$5:*

- |             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|
| 16. \$2.40. | 20. \$4.25. | 24. \$1.95. | 28. \$3.49. | 32. \$3.41. |
| 17. \$3.50. | 21. \$3.35. | 25. \$2.90. | 29. \$2.81. | 33. \$1.09. |
| 18. \$3.75. | 22. \$4.65. | 26. \$1.26. | 30. \$1.77. | 34. \$2.07. |
| 19. \$1.25. | 23. \$2.85. | 27. \$2.38. | 31. \$2.68. | 35. \$4.30. |

36. If your purchases amount to 15¢, 35¢, and 50¢, what is the total?

37. If your purchases amount to 22¢, 25¢, and 35¢, and you give the dealer a dollar bill, how much change should you receive?

**25. Review of the Multiplication Table**

Following the custom of most modern American writers, the multiplier is placed first in these exercises. Thus,  $2 \times 15$  is read "2 times 15."

- |                   |                    |                    |                    |
|-------------------|--------------------|--------------------|--------------------|
| 1. $2 \times 3$ . | 9. $3 \times 7$ .  | 17. $4 \times 4$ . | 25. $5 \times 5$ . |
| 2. $2 \times 7$ . | 10. $3 \times 5$ . | 18. $4 \times 6$ . | 26. $5 \times 3$ . |
| 3. $2 \times 4$ . | 11. $3 \times 8$ . | 19. $4 \times 3$ . | 27. $5 \times 7$ . |
| 4. $2 \times 6$ . | 12. $3 \times 6$ . | 20. $4 \times 8$ . | 28. $5 \times 9$ . |
| 5. $2 \times 9$ . | 13. $3 \times 3$ . | 21. $4 \times 7$ . | 29. $5 \times 4$ . |
| 6. $2 \times 2$ . | 14. $3 \times 9$ . | 22. $4 \times 2$ . | 30. $5 \times 2$ . |
| 7. $2 \times 8$ . | 15. $3 \times 2$ . | 23. $4 \times 9$ . | 31. $5 \times 8$ . |
| 8. $2 \times 5$ . | 16. $3 \times 4$ . | 24. $4 \times 5$ . | 32. $5 \times 6$ . |
33.  $2 \times 3 \times 4$  is how much greater than  $2 \times 2 \times 3$  ?
34.  $2 \times 4 \times 2$  is how much greater than  $2 \times 3 \times 2$  ?
35.  $2 \times 4 \times 5$  is how much greater than  $2 \times 4 \times 3$  ?
36.  $3 \times 3 \times 2$  is how much less than  $4 \times 3 \times 2$  ?

**26. Review of the Multiplication Table**

- |                   |                    |                    |                    |
|-------------------|--------------------|--------------------|--------------------|
| 1. $6 \times 5$ . | 9. $7 \times 3$ .  | 17. $8 \times 6$ . | 25. $9 \times 5$ . |
| 2. $6 \times 3$ . | 10. $7 \times 7$ . | 18. $8 \times 3$ . | 26. $9 \times 4$ . |
| 3. $6 \times 9$ . | 11. $7 \times 9$ . | 19. $8 \times 5$ . | 27. $9 \times 9$ . |
| 4. $6 \times 7$ . | 12. $7 \times 5$ . | 20. $8 \times 9$ . | 28. $9 \times 7$ . |
| 5. $6 \times 2$ . | 13. $7 \times 8$ . | 21. $8 \times 2$ . | 29. $9 \times 3$ . |
| 6. $6 \times 6$ . | 14. $7 \times 4$ . | 22. $8 \times 8$ . | 30. $9 \times 8$ . |
| 7. $6 \times 4$ . | 15. $7 \times 2$ . | 23. $8 \times 4$ . | 31. $9 \times 2$ . |
| 8. $6 \times 8$ . | 16. $7 \times 6$ . | 24. $8 \times 7$ . | 32. $9 \times 6$ . |
33.  $2 \times 2 \times 2$  is how much less than  $2 \times 3 \times 3$  ?
34. By what number must  $2 \times 2 \times 3$  be multiplied to be equal to 36 ?
35. By what number must  $3 \times 3 \times 3$  be multiplied to be equal to 54 ?
36. By what number must  $5 \times 5 \times 2$  be multiplied to be equal to  $10 \times 10 \times 2$  ?

## 27. Review of the Multiplication Table

- |                   |                            |                   |                                     |
|-------------------|----------------------------|-------------------|-------------------------------------|
| 1. $4 \times 8.$  | 12. $8 \times 9.$          | 23. $2 \times 5.$ | 34. $9 \times 8.$                   |
| 2. $5 \times 9.$  | 13. $5 \times 7.$          | 24. $9 \times 7.$ | 35. $3 \times 7.$                   |
| 3. $5 \times 6.$  | 14. $7 \times 9.$          | 25. $9 \times 9.$ | 36. $9 \times 6.$                   |
| 4. $4 \times 5.$  | 15. $5 \times 5.$          | 26. $9 \times 5.$ | 37. $7 \times 5.$                   |
| 5. $4 \times 4.$  | 16. $8 \times 4.$          | 27. $8 \times 6.$ | 38. $8 \times 7.$                   |
| 6. $6 \times 7.$  | 17. $6 \times 6.$          | 28. $6 \times 9.$ | 39. $6 \times 5.$                   |
| 7. $7 \times 7.$  | 18. $2 \times 9.$          | 29. $7 \times 8.$ | 40. $8 \times 5.$                   |
| 8. $3 \times 6.$  | 19. $3 \times 5.$          | 30. $3 \times 8.$ | 41. $6 \times 4.$                   |
| 9. $3 \times 4.$  | 20. $4 \times 6.$          | 31. $4 \times 7.$ | 42. $9 \times 4.$                   |
| 10. $2 \times 4.$ | 21. $4 \times 9.$          | 32. $8 \times 8.$ | 43. $9 \times 2.$                   |
| 11. $6 \times 8.$ | 22. $5 \times 8.$          | 33. $3 \times 9.$ | 44. $9 \times 3.$                   |
|                   | 45. $2 \times 2 \times 2.$ |                   | 48. $2 \times 2 \times 2 \times 2.$ |
|                   | 46. $2 \times 5 \times 2.$ |                   | 49. $2 \times 2 \times 2 \times 3.$ |
|                   | 47. $5 \times 2 \times 3.$ |                   | 50. $2 \times 2 \times 3 \times 3.$ |

## 28. Two-figure Multiplicand

- |                   |                    |                    |                    |
|-------------------|--------------------|--------------------|--------------------|
| 1. $2 \times 10.$ | 6. $7 \times 20.$  | 11. $3 \times 13.$ | 16. $6 \times 31.$ |
| 2. $3 \times 20.$ | 7. $8 \times 30.$  | 12. $4 \times 21.$ | 17. $7 \times 40.$ |
| 3. $4 \times 20.$ | 8. $9 \times 20.$  | 13. $5 \times 20.$ | 18. $7 \times 41.$ |
| 4. $5 \times 11.$ | 9. $2 \times 12.$  | 14. $5 \times 21.$ | 19. $9 \times 50.$ |
| 5. $6 \times 11.$ | 10. $2 \times 23.$ | 15. $6 \times 30.$ | 20. $9 \times 51.$ |
21. At  $12\text{¢}$  a yard, what will 4 yd. of ribbon cost?
22. At  $13\text{¢}$  a pound, what will 3 lb. of meat cost?
23. At  $22\text{¢}$  a dozen, what will 4 doz. peaches cost?
24. At  $32\text{¢}$  a pound, what will 3 lb. of butter cost?
25. If one bushel of wheat costs  $92\text{¢}$ , what will 3 bu. cost?
26. At  $70\text{¢}$  a yard, what will 2 yd. of matting cost?
27. At 60 lb. to a bushel, how much will 7 bu. of wheat weigh?
28. At 21 lb. to a foot, how much will 7 ft. of iron pipe weigh?



**29. Two-figure Multiplicand**

It is easy to multiply 27 by 3 mentally. Think of  $3 \times 27$  as  $3 \times 20$  and  $3 \times 7$ , or  $60 + 21 = 81$ . State aloud only 81.

- |                    |                    |                     |                     |
|--------------------|--------------------|---------------------|---------------------|
| 1. $2 \times 20$ . | 5. $3 \times 20$ . | 9. $3 \times 30$ .  | 13. $3 \times 40$ . |
| 2. $2 \times 22$ . | 6. $3 \times 23$ . | 10. $3 \times 32$ . | 14. $3 \times 41$ . |
| 3. $2 \times 23$ . | 7. $3 \times 25$ . | 11. $3 \times 34$ . | 15. $3 \times 43$ . |
| 4. $2 \times 27$ . | 8. $3 \times 26$ . | 12. $3 \times 35$ . | 16. $3 \times 44$ . |

17. At 28¢ a pound, what will 3 lb. of meat cost?
18. At 24¢ a yard, what will 4 yd. of cloth cost?
19. How many inches in 7 ft.? in 8 ft.? in 9 ft.?
20. If the side of a square is 34 in., how long is the perimeter?
21. If each side of a triangle is 25 in., how long is the perimeter?
22. At 17 lb. each, how much will 8 bicycles weigh?

**30. Two-figure Multiplicand**

- |                    |                    |                     |                     |
|--------------------|--------------------|---------------------|---------------------|
| 1. $4 \times 20$ . | 5. $5 \times 20$ . | 9. $6 \times 20$ .  | 13. $7 \times 31$ . |
| 2. $4 \times 21$ . | 6. $5 \times 21$ . | 10. $6 \times 21$ . | 14. $8 \times 30$ . |
| 3. $4 \times 22$ . | 7. $5 \times 22$ . | 11. $6 \times 22$ . | 15. $8 \times 32$ . |
| 4. $4 \times 23$ . | 8. $5 \times 23$ . | 12. $6 \times 23$ . | 16. $9 \times 12$ . |

17. How much is  $2 \times 12$  and  $3 \times 12$ ?
18. How much is  $2 \times 15$  and  $4 \times 15$ ?
19. At \$45 a head, how much are 5 head of cattle worth?
20. If each side of a triangle is 27 in. long, how long is the perimeter?
21. If each side of a six-sided flower bed is 13 ft. long, how long is the perimeter?
22. If each can of fruit weighs 3 lb., how much will 36 cans of fruit weigh?
23. At \$48 each, how much will 6 sets of bedroom furniture cost?

**31. Two-figure Multiplicand**

1.  $6 \times 30$ .
2.  $6 \times 31$ .
3.  $6 \times 32$ .
4.  $7 \times 32$ .
5.  $9 \times 10$ .
6.  $9 \times 13$ .
7.  $9 \times 20$ .
8.  $9 \times 22$ .
9. At 60¢ a yard, how much will 6 yd. of cloth cost?
10. At 65¢ a dozen, how much will 2 doz. pencils cost?
11. At 32¢ each, how much will 4 baseball bats cost?
12. At 65¢ a dozen, how much will 3 doz. tablets cost?
13. At 23¢ a dozen, how much will 5 doz. bananas cost?
14. At 70¢ a yard, how much will 8 yd. of carpet cost?
15. At \$42 a head, how much will 5 head of cattle cost?
16. At \$32 each, how much will 6 bicycles cost?
17. At \$3 each, how much will 12 school desks cost?
18. At \$7 each, how much will 22 sheep cost? 32 sheep?
19. At 12¢ a pair, how much will 7 pairs of silk shoe laces cost? 5 pairs? 9 pairs?

**32. Two-figure Multiplicand**

1.  $3 \times 22$ .
2.  $3 \times 27$ .
3.  $3 \times 36$ .
4.  $4 \times 35$ .
5.  $5 \times 30$ .
6.  $5 \times 32$ .
7.  $5 \times 34$ .
8.  $5 \times 35$ .
9.  $7 \times 21$ .
10.  $7 \times 22$ .
11.  $8 \times 21$ .
12.  $8 \times 22$ .
13.  $9 \times 40$ .
14.  $9 \times 41$ .
15.  $9 \times 42$ .
16.  $9 \times 45$ .
17. I bought 3 lamps at \$2 each. How much change should I receive from \$10?
18. I bought 12 chairs at \$3 each. How much change should I receive from \$50?
- ✓ 19. I bought 5 yd. of cloth at 40¢ a yard. How much change should I receive from \$5?
- ✓ 20. I bought 12 yd. of cloth at 8¢ a yard. How much change should I receive from \$1?
- ✓ 21. A farmer bought a cow for \$40, 2 sheep at \$6 each, and a harness for \$30. How much did he pay for all? What change should he receive from \$100?



**33. Cost of Purchases**

*Find the cost of the following :*

- |                                   |                                |
|-----------------------------------|--------------------------------|
| 1. 6 books at \$1 $\frac{1}{2}$ . | 13. 8 yd. of carpet at 70¢.    |
| 2. 3 lb. of tea at 42¢.           | 14. 5 cans of cocoa at 41¢.    |
| 3. 4 cows at \$41.                | 15. 9 gal. of gasoline at 21¢. |
| 4. 6 lb. of steak at 21¢.         | 16. 7 tennis balls at 20¢.     |
| 5. 7 collars at 21¢.              | 17. 3 writing tablets at 15¢.  |
| 6. 7 lb. of butter at 30¢.        | 18. 6 flags at 15¢.            |
| 7. 6 lb. of figs at 15¢.          | 19. 12 pencils at 3¢.          |
| 8. 2 bu. of wheat at 90¢.         | 20. 15 trout flies at 8¢.      |
| 9. 9 lb. of meat at 20¢.          | 21. 21 yd. of ribbon at 9¢.    |
| 10. 8 lb. of walnuts at 15¢.      | 22. 12 lb. of sugar at 6¢.     |
| 11. 3 lb. of cheese at 32¢.       | 23. 18 doz. buttons at 5¢.     |
| 12. 9 cans of soup at 12¢.        | 24. 4 sewing machines at \$42. |

**34. Cost of Purchases**

*Find the cost of the following, and the change due from the amount paid :*

1. 8 books at 30¢. Paid \$5.
2. 5 lb. of tea at 60¢. Paid \$5.
3. 6 cans of peas at 15¢. Paid \$1.
4. 6 lb. of roast beef at 20¢. Paid \$1.25.
5. 5 yd. of cloth at 90¢. Paid \$5.
- ✓ 6. 7 writing tablets at 12¢. Paid \$1.
7. 2 pencils at 5¢ and 3 tablets at 12¢. Paid 50¢.
- ✓ 8. 3 cows at \$40 and 2 sheep at \$6. Paid \$140.
9. 2 horses at \$125 and a carriage at \$100. Paid \$400.
10. 5 acres of land at \$90 and 2 acres at \$50. Paid \$600.
- ✓ 11. 7 cows at \$50 and 6 cows at \$40. Paid \$600.
12. 5 tables at \$15 and 20 desks at \$4. Paid \$160.
- ✓ 13. 8 chairs at \$2 and a table at \$9. Paid \$30.

**35. Cost of Purchases**

*Find the cost, and the change due from the amount paid :*

1. 2 cows at \$46. Paid \$100.
2. 3 lb. of coffee at 35¢. Paid \$1.10.
3. 4 yd. of cloth at 27¢. Paid \$1.25.
4. 5 kitchen stoves at \$33. Paid \$165.
5. 6 cans of peaches at 17¢. Paid \$1.10.
6. 7 gold watches at \$44. Paid \$308.
7. 8 lb. of meat at 18¢. Paid \$1.50.
8. 9 yd. of silk at 45¢. Paid \$4.25.
9. 24 lb. sugar at 6¢. Paid \$1.50.
10. 48 postage stamps at 2¢. Paid \$1.
11. 75 street-car tickets at 5¢. Paid \$5.
12. 36 bottles of mucilage at 5¢. Paid \$2.
13. 4 doz. hats at \$2 apiece. Paid \$100.

**36. Measures**

- |                      |                       |                           |
|----------------------|-----------------------|---------------------------|
| 1. $3 \times 23$ in. | 7. $5 \times 14$ ft.  | 13. $15 \times 3$ yd.     |
| 2. $3 \times 27$ in. | 8. $5 \times 28$ ft.  | 14. $24 \times 2$ rd.     |
| 3. $3 \times 36$ in. | 9. $5 \times 32$ ft.  | 15. $35 \times 4$ rd.     |
| 4. $4 \times 25$ in. | 10. $6 \times 12$ rd. | 16. $21 \times 5$ sq. ft. |
| 5. $4 \times 27$ in. | 11. $6 \times 14$ rd. | 17. $23 \times 4$ sq. in. |
| 6. $4 \times 36$ in. | 12. $6 \times 18$ rd. | 18. $33 \times 5$ sq. yd. |
19. If one side of a square is 27 in., what is the perimeter?
  20. If one side of a square is 46 in., what is the perimeter?
  21. If each side of a triangle is 36 in., what is the perimeter?
  22. If a schoolroom is 32 ft. long and 22 ft. wide, what is the perimeter?
  23. If you have made a kite with four sides, two being 18 in. each, and the other two 24 in. each, what is the perimeter of the kite?

**37. Dividing by 2**

- |                 |                 |                  |                  |
|-----------------|-----------------|------------------|------------------|
| 1. $20 \div 2.$ | 5. $22 \div 2.$ | 9. $24 \div 2.$  | 13. $28 \div 2.$ |
| 2. $40 \div 2.$ | 6. $44 \div 2.$ | 10. $46 \div 2.$ | 14. $42 \div 2.$ |
| 3. $60 \div 2.$ | 7. $66 \div 2.$ | 11. $62 \div 2.$ | 15. $68 \div 2.$ |
| 4. $80 \div 2.$ | 8. $88 \div 2.$ | 12. $84 \div 2.$ | 16. $86 \div 2.$ |

17. At 2¢ each, how many postage stamps can you buy for 82¢?

18. At 2¢ each, how many newspapers can you buy for 48¢?

19. At 2 ft. to a step, how many steps would you take in walking 64 ft.?

20. At 2¢ a mile, how many miles can you travel for \$1.80?

21. How many quarts are there in 2 pt.? in 26 pt.? in 48 pt.? in 64 pt.? in 82 pt.?

**38. Dividing by 2 or 3**

- |                 |                 |                  |                  |
|-----------------|-----------------|------------------|------------------|
| 1. $30 \div 2.$ | 5. $36 \div 2.$ | 9. $30 \div 3.$  | 13. $96 \div 3.$ |
| 2. $50 \div 2.$ | 6. $54 \div 2.$ | 10. $60 \div 3.$ | 14. $24 \div 3.$ |
| 3. $70 \div 2.$ | 7. $72 \div 2.$ | 11. $90 \div 3.$ | 15. $45 \div 3.$ |
| 4. $90 \div 2.$ | 8. $92 \div 2.$ | 12. $33 \div 3.$ | 16. $54 \div 3.$ |

17. At 2¢ each, how many pencils can you buy for 38¢?

18. At 3¢ each, how many pencils can you buy for 42¢?

19. At 3¢ each, how many erasers can you buy for 45¢?

20. At 2¢ each, how many penholders can you buy for 52¢?

21. At 3¢ a yard, how many yards of ribbon can you buy for 78¢?

22. At 3¢ each, how many newspapers can you buy for 48¢?

23. If one pair of shoes cost \$3, how many pairs can be bought for \$51?

**39. Dividing by 4, 5, or 6**

To divide 52 by 4, think of dividing  $40 + 12$  by 4. Think of the sum of  $10 + 3$ , but state only the result, 13.

- |                  |                  |                   |                   |
|------------------|------------------|-------------------|-------------------|
| 1. $44 \div 4$ . | 5. $72 \div 4$ . | 9. $65 \div 5$ .  | 13. $72 \div 6$ . |
| 2. $48 \div 4$ . | 6. $88 \div 4$ . | 10. $70 \div 5$ . | 14. $84 \div 6$ . |
| 3. $52 \div 4$ . | 7. $92 \div 4$ . | 11. $85 \div 5$ . | 15. $90 \div 6$ . |
| 4. $64 \div 4$ . | 8. $96 \div 4$ . | 12. $90 \div 5$ . | 16. $96 \div 6$ . |
17. At  $4\text{¢}$  each, how many cakes can be bought for  $68\text{¢}$  ?  
 18. At  $5\text{¢}$  each, how many pads can be bought for  $75\text{¢}$  ?  
 19. At  $6\text{¢}$  each, how many erasers can be bought for  $78\text{¢}$  ?  
 20. At  $\$6$  each, how many sheep can be bought for  $\$102$  ?  
 21. At  $5\text{¢}$  each, how many trolley tickets can be bought for  $95\text{¢}$  ?  
 22. How many 4-cent postage stamps can be bought for  $76\text{¢}$  ?

**40. Dividing by 7, 8, or 9**

To divide 128 by 8, think of dividing  $80 + 48$  by 8. State, however, only the result, 16.

- |                  |                   |                    |                    |
|------------------|-------------------|--------------------|--------------------|
| 1. $77 \div 7$ . | 5. $96 \div 8$ .  | 9. $99 \div 9$ .   | 13. $270 \div 9$ . |
| 2. $84 \div 7$ . | 6. $160 \div 8$ . | 10. $108 \div 9$ . | 14. $360 \div 9$ . |
| 3. $91 \div 7$ . | 7. $168 \div 8$ . | 11. $117 \div 9$ . | 15. $450 \div 9$ . |
| 4. $88 \div 8$ . | 8. $240 \div 8$ . | 12. $126 \div 9$ . | 16. $540 \div 9$ . |
17. At  $\$7$  each, how many tables can be bought for  $\$140$  ?  
 18. At  $\$7$  each, how many rugs can be bought for  $\$147$  ?  
 19. At  $7\text{¢}$  each, how many rulers can be bought for  $84\text{¢}$  ?  
 20. At  $8\text{¢}$  a yard, how much cloth can be bought for  $96\text{¢}$  ?  
 ✓21. At  $\$8$  each, how many chairs can be bought for  $\$72$  ?  
 22. How many 9's are there in 270 ? in 279 ? in 288 ?  
 23. At  $\$9$  each, how many trunks can be bought for  $\$198$  ?  
 24. At  $9\text{¢}$  each, how many cans of soup can be bought for  $18\text{¢}$  ? for  $\$1.80$  ?

**41. Division with Remainder**

In dividing 21 by 2 we may proceed as follows:  $21 \div 2 = 10$ , and 1 remainder.

- |                  |                  |                   |                   |
|------------------|------------------|-------------------|-------------------|
| 1. $5 \div 2$ .  | 5. $8 \div 3$ .  | 9. $9 \div 4$ .   | 13. $26 \div 5$ . |
| 2. $21 \div 2$ . | 6. $32 \div 3$ . | 10. $45 \div 4$ . | 14. $37 \div 5$ . |
| 3. $45 \div 2$ . | 7. $61 \div 3$ . | 11. $47 \div 4$ . | 15. $48 \div 5$ . |
| 4. $51 \div 2$ . | 8. $28 \div 3$ . | 12. $66 \div 4$ . | 16. $54 \div 5$ . |

17. What is the remainder when 38 is divided by 6?

18. How do the remainders of  $54 \div 7$  and  $68 \div 7$  compare?

19. How much larger is the remainder of  $72 \div 7$  than that of  $65 \div 8$ ?

✓20. What number can you add to 38 so that the result divided by 5 shall have no remainder?

✓21. What number can you subtract from 38 so that the result divided by 5 shall have no remainder?

**42. Division with Remainder**

- |                  |                  |                   |                   |
|------------------|------------------|-------------------|-------------------|
| 1. $37 \div 6$ . | 5. $37 \div 7$ . | 9. $27 \div 8$ .  | 13. $28 \div 9$ . |
| 2. $44 \div 6$ . | 6. $45 \div 7$ . | 10. $37 \div 8$ . | 14. $38 \div 9$ . |
| 3. $33 \div 6$ . | 7. $69 \div 7$ . | 11. $63 \div 8$ . | 15. $50 \div 9$ . |
| 4. $53 \div 6$ . | 8. $74 \div 7$ . | 12. $67 \div 8$ . | 16. $80 \div 9$ . |

17. At \$4 a dozen, how many dozen cans of peaches can be bought for \$70, and how much money will be left?

18. A man buys as many bridles as possible for \$100, paying \$9 apiece. How many does he buy and how much money has he left?

19. What is the remainder when 10 is divided by 9? when 20 is divided by 9? 30? 40? 50? 60? 70? 80?

20. What are the remainders when 12 and  $1 + 2$  are divided by 9? when 23 and  $2 + 3$  are divided by 9? also 35 and  $3 + 5$ ? also 41 and  $4 + 1$ ? also 52 and  $5 + 2$ ? also 62 and  $6 + 2$ ? Do you see some law in all these?

## 43. Division with Remainder

- |                  |                  |                   |                   |
|------------------|------------------|-------------------|-------------------|
| 1. $41 \div 2$ . | 5. $82 \div 4$ . | 9. $38 \div 6$ .  | 13. $83 \div 8$ . |
| 2. $53 \div 2$ . | 6. $75 \div 4$ . | 10. $56 \div 6$ . | 14. $50 \div 8$ . |
| 3. $37 \div 3$ . | 7. $52 \div 5$ . | 11. $75 \div 7$ . | 15. $97 \div 9$ . |
| 4. $55 \div 3$ . | 8. $63 \div 5$ . | 12. $85 \div 7$ . | 16. $75 \div 9$ . |
17. What is the remainder when 771 is divided by 7 ?
18. What are the remainders of  $442 \div 4$  and  $302 \div 3$  ?
19. What is the smallest number that you can add to 72 so that when you divide by 5 there shall be no remainder ?
20. What is the smallest number that you can add to 75 so that when you divide by 9 there shall be no remainder ?
21. At \$6 each, how many school desks can be bought for \$100, and how much will be left over ?
22. What number can you subtract from 89 so that when you divide by 7 there shall be no remainder ?

## 44. Fraction in the Quotient

Instead of stating a remainder it is customary to express a fraction in the quotient, thus :  $37 \div 5 = 7\frac{2}{5}$ . Similarly,  $66 \div 8 = 8\frac{3}{4}$ , or  $8\frac{1}{2}$ .

- |                  |                  |                   |                   |
|------------------|------------------|-------------------|-------------------|
| 1. $23 \div 2$ . | 5. $44 \div 6$ . | 9. $39 \div 6$ .  | 13. $39 \div 8$ . |
| 2. $34 \div 3$ . | 6. $72 \div 7$ . | 10. $55 \div 6$ . | 14. $51 \div 8$ . |
| 3. $33 \div 4$ . | 7. $68 \div 8$ . | 11. $71 \div 7$ . | 15. $71 \div 9$ . |
| 4. $44 \div 5$ . | 8. $93 \div 9$ . | 12. $93 \div 7$ . | 16. $93 \div 9$ . |
17. How much is  $\frac{1}{2}$  of 101 ? How much is  $\frac{1}{4}$  of 202 ?
18. If \$441 is divided equally among 4 people, what is the share of each ?
19. If the perimeter of a square is 27 in., what is the length of each side ?
20. A figure bounded by 5 equal sides has a perimeter of 81 in. What is the length of each side ?
21. How many square yards are there in 105 sq. ft. ? in 452 sq. ft. ? in 723 sq. ft. ?



## 45. Fraction in the Quotient

1.  $43 \div 2$ .
  2.  $47 \div 2$ .
  3.  $49 \div 2$ .
  4.  $31 \div 2$ .
  5.  $40 \div 3$ .
  6.  $20 \div 3$ .
  7.  $26 \div 3$ .
  8.  $29 \div 3$ .
  9.  $43 \div 4$ .
  10.  $35 \div 4$ .
  11.  $23 \div 4$ .
  12.  $49 \div 4$ .
  13.  $36 \div 5$ .
  14.  $27 \div 5$ .
  15.  $33 \div 5$ .
  16.  $49 \div 5$ .
17. How much is  $\frac{1}{2}$  of \$17?  $\frac{1}{2}$  of \$23?
18. How much is  $\frac{1}{3}$  of 17 in.?  $\frac{1}{3}$  of 25 in.?
19. How much is  $\frac{1}{4}$  of 15 hr.?  $\frac{1}{4}$  of 17 hr.?
20. How much is  $\frac{1}{8}$  of 20 oz.?  $\frac{1}{8}$  of 25 oz.?
21. The perimeter of a square is 97 in. What is the length of each side?
22. The perimeter of a triangle is 28 in., and all the sides are equal. What is the length of each side?
23. If 47 yd. of carpet is cut into 5 equal strips, what is the length of each strip?

## 46. Fraction in the Quotient

1.  $35 \div 2$ .
  2.  $55 \div 2$ .
  3.  $71 \div 3$ .
  4.  $91 \div 3$ .
  5.  $37 \div 4$ .
  6.  $53 \div 4$ .
  7.  $71 \div 5$ .
  8.  $92 \div 5$ .
  9.  $304 \div 3$ .
  10.  $334 \div 3$ .
  11.  $504 \div 5$ .
  12.  $554 \div 5$ .
  13.  $704 \div 7$ .
  14.  $773 \div 7$ .
  15.  $903 \div 9$ .
  16.  $996 \div 9$ .
17. How much is  $\frac{1}{2}$  of \$41?  $\frac{1}{2}$  of \$53?
18. How much is  $\frac{1}{4}$  of \$31?  $\frac{1}{4}$  of \$47?
19. How much is  $\frac{1}{8}$  of 27 yd.?  $\frac{1}{8}$  of 51 yd.?
20. A flower bed having 6 equal sides has a perimeter of 19 ft. What is the length of each side?
21. If 4 boys pick 35 qt. of berries and divide them equally, what is the share of each?
22. If \$75 is divided equally among 6 men, what is the share of each man?
23. If a man pays \$884 for 8 horses, what is the average price per horse?

## 47. Division by Multiples of 10

In dividing by a multiple of 10, first divide by 10 and then by the number of tens. Think of  $560 \div 70$  as  $56 \div 7$ , and state the result, 8.

- |                    |                    |                      |
|--------------------|--------------------|----------------------|
| 1. $300 \div 30$ . | 5. $660 \div 60$ . | 9. $560 \div 80$ .   |
| 2. $630 \div 30$ . | 6. $780 \div 60$ . | 10. $960 \div 80$ .  |
| 3. $320 \div 40$ . | 7. $630 \div 70$ . | 11. $990 \div 90$ .  |
| 4. $750 \div 50$ . | 8. $840 \div 70$ . | 12. $1080 \div 90$ . |

13. How many hours in 720 minutes?

14. What is the quotient of  $3330 \div 30$ ? of  $6060 \div 30$ ?

15. If we should allow 30 days to the month, how many months should we find in 1230 days?

16. How many rods in 1 mi.? How many times is 20 rd. contained in 1 mi.?

17. At \$50 each, how many cows can be bought for \$150? for \$350?

## 48. Review

- |                |                |                     |                    |
|----------------|----------------|---------------------|--------------------|
| 1. $23 + 17$ . | 5. $75 - 25$ . | 9. $2 \times 32$ .  | 13. $91 \div 7$ .  |
| 2. $36 + 25$ . | 6. $72 - 26$ . | 10. $3 \times 33$ . | 14. $91 \div 8$ .  |
| 3. $48 + 34$ . | 7. $83 - 14$ . | 11. $4 \times 53$ . | 15. $78 \div 9$ .  |
| 4. $53 + 47$ . | 8. $92 - 25$ . | 12. $6 \times 31$ . | 16. $75 \div 10$ . |

17. How many minutes in 960 sec.?

18. How many yards in 39 ft.? in 72 ft.?

19. How many pounds in 16 oz.? in 32 oz.? in 64 oz.?

20. How many horses at \$90 each can be bought for \$1170?

21. How many library desks at \$20 each can be bought for \$240? for \$620?

22. At \$20 each, how much will 10 library desks cost? How much will 12 cost?

23. A man buys goods for \$435 and pays \$500. How much change is due him?



II. COMMON FRACTIONS

49. To Different Denominators

*Reduce as indicated :*

To lowest terms :	1. $\frac{2}{4}$ .	2. $\frac{3}{6}$ .	3. $\frac{2}{6}$ .	4. $\frac{3}{9}$ .
To fourths :	5. $\frac{1}{2}$ .	6. $\frac{2}{8}$ .	7. $\frac{8}{16}$ .	8. $\frac{12}{16}$ .
To thirds :	9. $\frac{2}{6}$ .	10. $\frac{4}{6}$ .	11. $\frac{6}{9}$ .	12. $\frac{10}{15}$ .
To eighths :	13. $\frac{1}{4}$ .	14. $\frac{3}{4}$ .	15. $\frac{1}{2}$ .	16. $\frac{10}{16}$ .
To twelfths :	17. $\frac{1}{4}$ .	18. $\frac{1}{6}$ .	19. $\frac{3}{4}$ .	20. $\frac{5}{6}$ .
To tenths :	21. $\frac{1}{2}$ .	22. $\frac{1}{5}$ .	23. $\frac{3}{5}$ .	24. $\frac{4}{20}$ .
To sixths :	25. $\frac{1}{2}$ .	26. $\frac{1}{3}$ .	27. $\frac{2}{3}$ .	28. $\frac{1}{12}$ .

29.  $\frac{3}{4}$  ft. = how many 12ths of a foot ? how many inches ?

30.  $\frac{2}{3}$  yd. = how many 36ths of a yard ? how many inches ?

31.  $\frac{2}{3}$  of a dime = how many 10ths of a dime ? how many cents ?

50. Integers to Fractions

Since  $1 = \frac{5}{5}$ , therefore  $3 = \frac{3 \times 5}{5}$ , or  $\frac{15}{5}$ .

*Reduce as indicated :*

To halves :	1. 1.	2. 3.	3. 7.	4. 9.
To thirds :	5. 2.	6. 4.	7. 5.	8. 7.
To fourths :	9. 4.	10. 3.	11. 2.	12. 6.
To fifths :	13. 3.	14. 5.	15. 9.	16. 7.
To sixths :	17. 2.	18. 7.	19. 8.	20. 12.
To eighths :	21. 5.	22. 3.	23. 2.	24. 12.
To tenths :	25. 6.	26. 7.	27. 3.	28. 15.
To twelfths :	29. 4.	30. 2.	31. 3.	32. 12.

33. How many 12ths of a foot in a foot ?

34. How many inches in a foot ? in 3 ft. ?

35. How many 10ths of a dime in 7 dimes ?

36. How many cents in a dime ? in 9 dimes ?

## 51. Improper Fractions to Integers

In reducing  $\frac{8}{2}$  to an integer, remember that  $\frac{8}{2}$  means  $8 \div 2$ , which equals 4. State only the result, 4.

*Reduce to integers :*

- |                     |                     |                      |                      |                      |
|---------------------|---------------------|----------------------|----------------------|----------------------|
| 1. $\frac{4}{2}$ .  | 5. $\frac{3}{3}$ .  | 9. $\frac{12}{4}$ .  | 13. $\frac{8}{8}$ .  | 17. $\frac{15}{5}$ . |
| 2. $\frac{6}{2}$ .  | 6. $\frac{9}{3}$ .  | 10. $\frac{8}{4}$ .  | 14. $\frac{32}{8}$ . | 18. $\frac{28}{7}$ . |
| 3. $\frac{10}{2}$ . | 7. $\frac{15}{3}$ . | 11. $\frac{16}{4}$ . | 15. $\frac{24}{8}$ . | 19. $\frac{45}{9}$ . |
| 4. $\frac{14}{2}$ . | 8. $\frac{21}{3}$ . | 12. $\frac{48}{4}$ . | 16. $\frac{48}{8}$ . | 20. $\frac{63}{9}$ . |

21. How many inches are there in 72 eighths of an inch ?  
 22. A boy has 10 half dollars. How many dollars has he ?  
 23. Another boy has 16 quarters. How many dollars has he ?  
 24. How many hours are 12 thirds of an hour ? 12 fourths of an hour ?

## 52. Improper Fractions to Mixed Numbers

The improper fraction  $\frac{14}{4}$  means  $14 \div 4$ , which equals  $3\frac{3}{4}$ , and this equals  $3\frac{1}{2}$ .

*Reduce to mixed numbers :*

- |                     |                     |                      |                      |                      |
|---------------------|---------------------|----------------------|----------------------|----------------------|
| 1. $\frac{5}{2}$ .  | 5. $\frac{5}{3}$ .  | 9. $\frac{17}{4}$ .  | 13. $\frac{17}{8}$ . | 17. $\frac{22}{5}$ . |
| 2. $\frac{7}{2}$ .  | 6. $\frac{7}{3}$ .  | 10. $\frac{19}{4}$ . | 14. $\frac{18}{8}$ . | 18. $\frac{30}{7}$ . |
| 3. $\frac{15}{2}$ . | 7. $\frac{17}{3}$ . | 11. $\frac{18}{4}$ . | 15. $\frac{26}{8}$ . | 19. $\frac{48}{9}$ . |
| 4. $\frac{21}{2}$ . | 8. $\frac{25}{3}$ . | 12. $\frac{22}{4}$ . | 16. $\frac{28}{8}$ . | 20. $\frac{60}{9}$ . |

21. The sum of  $\frac{2}{3}$  and  $\frac{2}{3}$  and  $\frac{2}{3}$  is  $\frac{6}{3}$ . Express this as a whole number.  
 22. The sum of  $\frac{2}{3}$  and  $\frac{2}{3}$  is  $\frac{4}{3}$ . Express this as a whole number plus a fraction.  
 23. Express  $\frac{52}{8}$  as a whole number plus eighths; as a whole number plus some other fraction.  
 24. If we lay side by side 35 strips of paper, each  $\frac{1}{8}$  in. wide, what will be the total width ?

## 53. Mixed Numbers to Improper Fractions

To reduce  $5\frac{2}{3}$  to an improper fraction, think of it as  $\frac{15}{3} + \frac{2}{3}$ , or  $\frac{17}{3}$ . State only the result,  $\frac{17}{3}$ .

*Reduce to improper fractions :*

- |                     |                      |                       |                       |                       |
|---------------------|----------------------|-----------------------|-----------------------|-----------------------|
| 1. $1\frac{1}{2}$ . | 6. $3\frac{1}{2}$ .  | 11. $1\frac{7}{8}$ .  | 16. $1\frac{1}{16}$ . | 21. $12\frac{1}{2}$ . |
| 2. $1\frac{1}{3}$ . | 7. $3\frac{2}{3}$ .  | 12. $1\frac{1}{12}$ . | 17. $1\frac{3}{16}$ . | 22. $13\frac{1}{3}$ . |
| 3. $1\frac{2}{3}$ . | 8. $2\frac{1}{8}$ .  | 13. $1\frac{5}{12}$ . | 18. $2\frac{1}{16}$ . | 23. $40\frac{1}{2}$ . |
| 4. $2\frac{1}{3}$ . | 9. $2\frac{2}{3}$ .  | 14. $2\frac{1}{12}$ . | 19. $2\frac{3}{16}$ . | 24. $20\frac{1}{4}$ . |
| 5. $2\frac{2}{3}$ . | 10. $1\frac{5}{8}$ . | 15. $2\frac{5}{12}$ . | 20. $2\frac{5}{16}$ . | 25. $10\frac{3}{4}$ . |

26. Express  $6\frac{1}{2}$  as halves.

27. Express  $6\frac{2}{3}$  as thirds. In  $6\frac{2}{3}$  in. how many thirds of an inch?

28. Express  $4\frac{2}{7}$  as sevenths. In  $4\frac{2}{7}$  weeks how many sevenths of a week? how many days?

## 54. Improper Fractions Reduced

*Reduce to integers :*

- |                    |                     |                     |                       |                       |
|--------------------|---------------------|---------------------|-----------------------|-----------------------|
| 1. $\frac{2}{2}$ . | 4. $\frac{12}{4}$ . | 7. $\frac{24}{6}$ . | 10. $\frac{24}{12}$ . | 13. $\frac{32}{16}$ . |
| 2. $\frac{8}{2}$ . | 5. $\frac{12}{4}$ . | 8. $\frac{16}{8}$ . | 11. $\frac{36}{12}$ . | 14. $\frac{64}{16}$ . |
| 3. $\frac{6}{3}$ . | 6. $\frac{20}{4}$ . | 9. $\frac{54}{9}$ . | 12. $\frac{48}{12}$ . | 15. $\frac{64}{16}$ . |

*Reduce to mixed numbers :*

- |                      |                      |                      |                       |                       |
|----------------------|----------------------|----------------------|-----------------------|-----------------------|
| 16. $\frac{3}{2}$ .  | 19. $\frac{20}{3}$ . | 22. $\frac{27}{5}$ . | 25. $\frac{25}{8}$ .  | 28. $\frac{30}{12}$ . |
| 17. $\frac{9}{2}$ .  | 20. $\frac{23}{4}$ . | 23. $\frac{33}{5}$ . | 26. $\frac{65}{8}$ .  | 29. $\frac{33}{16}$ . |
| 18. $\frac{10}{3}$ . | 21. $\frac{30}{4}$ . | 24. $\frac{25}{6}$ . | 27. $\frac{25}{12}$ . | 30. $\frac{65}{12}$ . |

*Reduce to integers or mixed numbers :*

- |                       |                       |                      |                        |                       |
|-----------------------|-----------------------|----------------------|------------------------|-----------------------|
| 31. $\frac{64}{8}$ .  | 34. $\frac{26}{12}$ . | 37. $\frac{72}{4}$ . | 40. $\frac{100}{10}$ . | 43. $\frac{34}{12}$ . |
| 32. $\frac{96}{8}$ .  | 35. $\frac{28}{12}$ . | 38. $\frac{75}{4}$ . | 41. $\frac{34}{16}$ .  | 44. $\frac{36}{12}$ . |
| 33. $\frac{60}{12}$ . | 36. $\frac{64}{4}$ .  | 39. $\frac{96}{8}$ . | 42. $\frac{36}{16}$ .  | 45. $\frac{40}{12}$ . |

46. Express  $1\frac{4}{12}$  as sixths; as fourths; as thirds; as an integer.

## 55. Reduction to Lowest Terms

To reduce  $\frac{2}{3}$  to lowest terms, mentally cancel the highest factor you see, and continue until there are no common factors.

*Reduce to lowest terms :*

- |                      |                       |                       |                       |                       |
|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1. $\frac{4}{12}$ .  | 6. $\frac{4}{16}$ .   | 11. $\frac{2}{24}$ .  | 16. $\frac{2}{32}$ .  | 21. $\frac{4}{48}$ .  |
| 2. $\frac{6}{12}$ .  | 7. $\frac{6}{16}$ .   | 12. $\frac{6}{24}$ .  | 17. $\frac{4}{32}$ .  | 22. $\frac{6}{48}$ .  |
| 3. $\frac{8}{12}$ .  | 8. $\frac{8}{16}$ .   | 13. $\frac{8}{24}$ .  | 18. $\frac{8}{32}$ .  | 23. $\frac{8}{48}$ .  |
| 4. $\frac{9}{12}$ .  | 9. $\frac{10}{16}$ .  | 14. $\frac{10}{24}$ . | 19. $\frac{10}{32}$ . | 24. $\frac{9}{48}$ .  |
| 5. $\frac{16}{12}$ . | 10. $\frac{14}{16}$ . | 15. $\frac{16}{24}$ . | 20. $\frac{16}{32}$ . | 25. $\frac{14}{48}$ . |

26. In measuring the thickness of some glass I find that it is  $\frac{6}{32}$  in. Express this in lowest terms.

27. A mechanic has a ruler marked in 16ths of an inch. In measuring a steel rod for a machine he finds the diameter to be  $\frac{1}{16}$  in. Express this in lowest terms.

## 56. Least Common Denominator

*Reduce to fractions having the least common denominator :*

- |                                  |                                  |                                  |                                  |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 1. $\frac{1}{2}, \frac{1}{4}$ .  | 6. $\frac{1}{4}, \frac{1}{12}$ . | 11. $\frac{3}{4}, \frac{3}{8}$ . | 16. $\frac{2}{3}, \frac{1}{4}$ . |
| 2. $\frac{1}{2}, \frac{1}{8}$ .  | 7. $\frac{1}{4}, \frac{1}{16}$ . | 12. $\frac{3}{4}, \frac{7}{8}$ . | 17. $\frac{1}{3}, \frac{1}{5}$ . |
| 3. $\frac{1}{2}, \frac{1}{12}$ . | 8. $\frac{1}{4}, \frac{1}{32}$ . | 13. $\frac{1}{2}, \frac{1}{3}$ . | 18. $\frac{2}{3}, \frac{1}{5}$ . |
| 4. $\frac{1}{2}, \frac{1}{16}$ . | 9. $\frac{1}{2}, \frac{3}{4}$ .  | 14. $\frac{1}{2}, \frac{2}{3}$ . | 19. $\frac{2}{3}, \frac{4}{5}$ . |
| 5. $\frac{1}{4}, \frac{1}{8}$ .  | 10. $\frac{3}{4}, \frac{1}{8}$ . | 15. $\frac{1}{3}, \frac{1}{4}$ . | 20. $\frac{1}{5}, \frac{1}{6}$ . |

21. If I wish to add  $\frac{1}{8}$  and  $\frac{1}{12}$ , what denominator should I use for the fraction? Express each with that denominator. What other denominator might I use?

22. If I wish to subtract  $\frac{1}{3}$  from  $\frac{3}{8}$ , what denominator should I use for the fraction? Express each with that denominator.

23. Could I add the fractions  $\frac{1}{4}$  and  $\frac{1}{8}$ , using 32 as a common denominator? or using 16? Is there a better common denominator, and if so why is it better?

57. Addition. Same Denominators

In adding fractions having the same denominator, proceed as follows:  $\frac{5}{8} + \frac{5}{8} = \frac{10}{8} = \frac{5}{4} = 1\frac{1}{4}$ .

- |                                  |                                   |                                   |                                   |
|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1. $\frac{1}{2} + \frac{1}{2}$ . | 6. $\frac{1}{8} + \frac{3}{8}$ .  | 11. $\frac{1}{5} + \frac{3}{5}$ . | 16. $\frac{1}{6} + \frac{5}{6}$ . |
| 2. $\frac{1}{4} + \frac{1}{4}$ . | 7. $\frac{1}{8} + \frac{5}{8}$ .  | 12. $\frac{1}{5} + \frac{4}{5}$ . | 17. $\frac{5}{6} + \frac{5}{6}$ . |
| 3. $\frac{1}{4} + \frac{3}{4}$ . | 8. $\frac{1}{8} + \frac{7}{8}$ .  | 13. $\frac{2}{5} + \frac{3}{5}$ . | 18. $\frac{3}{5} + \frac{3}{5}$ . |
| 4. $\frac{1}{8} + \frac{1}{8}$ . | 9. $\frac{1}{5} + \frac{2}{5}$ .  | 14. $\frac{1}{6} + \frac{1}{6}$ . | 19. $\frac{3}{8} + \frac{3}{8}$ . |
| 5. $\frac{5}{8} + \frac{3}{8}$ . | 10. $\frac{7}{8} + \frac{7}{8}$ . | 15. $\frac{5}{8} + \frac{7}{8}$ . | 20. $\frac{3}{8} + \frac{7}{8}$ . |
- ✓ 21. How much is  $\frac{3}{4}$  yd. and  $\frac{3}{4}$  yd.?  
 ✓ 22. How much is  $\frac{5}{8}$  mi. and  $\frac{3}{8}$  mi.?  $\frac{3}{8}$  mi. and  $\frac{3}{8}$  mi.?  
 ✓ 23. How much is  $\$ \frac{1}{4}$  and  $\$ \frac{1}{4}$ ?  $\$ \frac{1}{4}$  and  $\$ \frac{3}{4}$ ?  
 ✓ 24. If I live  $\frac{7}{8}$  mi. from the school and you live  $\frac{5}{8}$  mi. farther, how far from the school do you live?  
 ✓ 25. A  $\frac{7}{8}$ -inch frame has a  $\frac{3}{8}$ -inch beading added to its width. How wide does this make the frame?

58. Different Denominators

In adding fractions having different denominators, proceed as follows:  $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$ . Also  $\frac{3}{4} + \frac{3}{8} = \frac{6}{8} + \frac{3}{8} = \frac{9}{8} = 1\frac{1}{8}$ .

- |                                  |                                  |                                   |                                   |
|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|
| 1. $\frac{2}{4} + \frac{1}{4}$ . | 5. $\frac{4}{8} + \frac{3}{8}$ . | 9. $\frac{2}{8} + \frac{1}{8}$ .  | 13. $\frac{1}{4} + \frac{7}{8}$ . |
| 2. $\frac{1}{2} + \frac{1}{4}$ . | 6. $\frac{1}{2} + \frac{3}{8}$ . | 10. $\frac{1}{4} + \frac{1}{8}$ . | 14. $\frac{3}{4} + \frac{1}{8}$ . |
| 3. $\frac{4}{8} + \frac{1}{8}$ . | 7. $\frac{1}{2} + \frac{5}{8}$ . | 11. $\frac{1}{4} + \frac{3}{8}$ . | 15. $\frac{3}{4} + \frac{5}{8}$ . |
| 4. $\frac{1}{2} + \frac{1}{8}$ . | 8. $\frac{1}{2} + \frac{7}{8}$ . | 12. $\frac{1}{4} + \frac{5}{8}$ . | 16. $\frac{3}{4} + \frac{7}{8}$ . |
17. How much is  $\frac{1}{2} + \frac{1}{4} + \frac{1}{4}$ ?  
 18. Add  $\frac{1}{2}$  in.,  $\frac{1}{4}$  in., and  $\frac{1}{8}$  in. Add  $\frac{1}{2}$  in. and  $\frac{3}{4}$  in.  
 19. How much must be added to 1 in. to equal  $\frac{1}{2}$  in. +  $\frac{5}{8}$  in.?  
 ✓ 20. Two strips of paper, each  $\frac{7}{8}$  in. wide, are placed side by side. How wide are the two together?  
 21. Three strips of ribbon, each  $\frac{5}{8}$  in. wide, are placed side by side. How wide are the three together?  
 ✓ 22. Four boards, each  $\frac{7}{8}$  in. thick, are placed one on another. How high is the pile?

## 59. Addition. Mixed Numbers

1.  $1\frac{1}{2} + \frac{1}{2}$ .
2.  $2\frac{1}{2} + 1\frac{1}{2}$ .
3.  $3\frac{1}{2} + 5\frac{1}{2}$ .
4.  $4\frac{1}{4} + \frac{3}{4}$ .
5.  $2\frac{1}{4} + 1\frac{3}{4}$ .
6.  $2\frac{1}{8} + 1\frac{1}{8}$ .
7.  $2\frac{3}{8} + 2\frac{1}{8}$ .
8.  $3\frac{7}{8} + 1\frac{3}{8}$ .
9.  $2\frac{1}{5} + 1\frac{1}{5}$ .
10.  $3\frac{1}{5} + 2\frac{1}{5}$ .
11.  $2\frac{2}{5} + 2\frac{3}{5}$ .
12.  $2\frac{2}{5} + 1\frac{3}{5}$ .
13.  $3\frac{3}{5} + 1\frac{1}{5}$ .
14.  $3\frac{3}{5} + 2\frac{2}{5}$ .
15.  $2\frac{1}{7} + 2\frac{6}{7}$ .
16.  $3\frac{2}{7} + 1\frac{4}{7}$ .
17. How much is  $\$2\frac{3}{4}$  and  $\$3\frac{3}{4}$ ?
18. How much is  $3\frac{1}{4}$  in. and  $5\frac{3}{4}$  in.?
19. How much is  $5\frac{3}{8}$  in. and  $3\frac{7}{8}$  in.?
20. How much is  $2\frac{7}{8}$  in. and  $5\frac{7}{8}$  in.?
21. The three sides of a triangle are  $2\frac{1}{4}$  in.,  $2\frac{1}{4}$  in., and  $2\frac{3}{4}$  in. What is the perimeter?
22. The three sides of a triangle are  $3\frac{3}{8}$  in.,  $3\frac{5}{8}$  in., and  $3\frac{7}{8}$  in. What is the perimeter?
23. The four sides of a figure are  $2\frac{1}{2}$  in.,  $3\frac{1}{2}$  in., 3 in., and  $3\frac{1}{2}$  in. What is the perimeter?

## 60. Addition. Mixed Numbers

To add  $2\frac{3}{4}$  to  $3\frac{5}{8}$  mentally, first add 2 and  $3\frac{5}{8}$  and then add  $\frac{3}{4}$ , thinking " $5\frac{5}{8}$  and  $\frac{6}{8}$  are  $5\frac{11}{8}$ , or  $6\frac{3}{8}$ ." State only the answer.

1.  $1\frac{1}{2} + \frac{1}{4}$ .
2.  $2\frac{1}{2} + 1\frac{1}{4}$ .
3.  $2\frac{1}{2} + \frac{3}{4}$ .
4.  $3\frac{1}{2} + 1\frac{3}{4}$ .
5.  $1\frac{1}{2} + \frac{1}{8}$ .
6.  $2\frac{1}{2} + 1\frac{1}{8}$ .
7.  $3\frac{1}{2} + \frac{3}{8}$ .
8.  $3\frac{1}{2} + 1\frac{3}{8}$ .
9.  $2\frac{1}{2} + \frac{5}{8}$ .
10.  $3\frac{1}{2} + 1\frac{5}{8}$ .
11.  $3\frac{1}{2} + \frac{7}{8}$ .
12.  $3\frac{1}{2} + 2\frac{7}{8}$ .
13.  $2\frac{1}{4} + \frac{1}{8}$ .
14.  $5\frac{1}{4} + 1\frac{1}{8}$ .
15.  $4\frac{1}{4} + \frac{3}{8}$ .
16.  $4\frac{3}{4} + 1\frac{3}{8}$ .
17. How much is  $2\frac{3}{4}$  in. and  $\frac{7}{8}$  in.?
18. How much is  $\$2\frac{1}{4}$ ,  $\$2\frac{3}{4}$ , and  $\$2\frac{1}{2}$ ?
19. A lady decides to add  $\frac{1}{4}$  in. to the width of a  $3\frac{3}{8}$ -inch ruffle. How wide will this make it?
20. A picture frame incloses a space  $10\frac{3}{8}$  in. wide. Each side of the frame is  $2\frac{1}{8}$  in. wide. What is the total width?
21. Some writing paper is ruled  $\frac{1}{4}$  in. between the lines, and another kind is ruled  $\frac{1}{8}$  in. wider. What is the distance between the lines of this second kind?



## 61. Subtraction. Same Denominators

In subtracting fractions having the same denominator, proceed as follows:  $\frac{5}{8} - \frac{3}{8} = \frac{2}{8} = \frac{1}{4}$ .

- |                                  |                                  |                                   |                                   |
|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|
| 1. $\frac{3}{4} - \frac{1}{4}$ . | 5. $\frac{7}{8} - \frac{3}{8}$ . | 9. $\frac{4}{5} - \frac{2}{5}$ .  | 13. $\frac{9}{8} - \frac{5}{8}$ . |
| 2. $\frac{3}{8} - \frac{1}{8}$ . | 6. $\frac{7}{8} - \frac{1}{8}$ . | 10. $\frac{5}{6} - \frac{1}{6}$ . | 14. $\frac{7}{4} - \frac{3}{4}$ . |
| 3. $\frac{5}{8} - \frac{1}{8}$ . | 7. $\frac{3}{5} - \frac{1}{5}$ . | 11. $\frac{9}{8} - \frac{1}{8}$ . | 15. $\frac{7}{4} - \frac{1}{4}$ . |
| 4. $\frac{7}{8} - \frac{5}{8}$ . | 8. $\frac{4}{5} - \frac{3}{5}$ . | 12. $\frac{9}{8} - \frac{7}{8}$ . | 16. $\frac{9}{5} - \frac{4}{5}$ . |

17. If a  $\frac{7}{8}$ -inch board is planed down  $\frac{1}{8}$  in., what is then its thickness?

18. If I have three quarters of a dollar and spend a quarter of a dollar, how much have I left?

19. If from  $\frac{7}{8}$  yd. we take  $\frac{3}{8}$  yd., how many eighths of a yard remain? how many fourths? how many halves?

20. If a man having  $\frac{5}{8}$  mi. to travel has gone  $\frac{3}{8}$  mi., how much farther has he to go?

## 62. Different Denominators

- |                                  |                                  |                                   |                                   |
|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|
| 1. $\frac{2}{4} - \frac{1}{4}$ . | 5. $\frac{4}{8} - \frac{3}{8}$ . | 9. $\frac{2}{8} - \frac{1}{8}$ .  | 13. $\frac{7}{8} - \frac{1}{4}$ . |
| 2. $\frac{1}{2} - \frac{1}{4}$ . | 6. $\frac{1}{2} - \frac{3}{8}$ . | 10. $\frac{1}{4} - \frac{1}{8}$ . | 14. $\frac{7}{8} - \frac{3}{4}$ . |
| 3. $\frac{4}{8} - \frac{1}{8}$ . | 7. $\frac{5}{8} - \frac{1}{2}$ . | 11. $\frac{3}{8} - \frac{1}{4}$ . | 15. $\frac{3}{4} - \frac{5}{8}$ . |
| 4. $\frac{1}{2} - \frac{1}{8}$ . | 8. $\frac{7}{8} - \frac{1}{2}$ . | 12. $\frac{5}{8} - \frac{1}{4}$ . | 16. $\frac{3}{4} - \frac{1}{8}$ . |

17. How much is  $\$ \frac{3}{4} - \$ \frac{1}{2}$ ?  $\$ \frac{1}{2} - \$ \frac{1}{4}$ ?

18. How much is  $\frac{5}{8}$  in.  $- \frac{1}{2}$  in.?  $\frac{7}{8}$  in.  $- \frac{1}{4}$  in.?

19. What must be subtracted from  $\frac{3}{4}$  to leave  $\frac{1}{8}$ ?

20. What must be added to  $\frac{3}{8}$  to have the sum  $\frac{3}{4}$ ?

21. If a  $\frac{7}{8}$ -inch board is planed down  $\frac{1}{4}$  in., and then a veneer  $\frac{1}{8}$  in. thick is put on, what is the total thickness?

22. If from a strip of carpet  $\frac{3}{4}$  yd. wide a strip  $\frac{1}{2}$  in. wide is cut, how wide is the remainder?

23. If to a piece of cloth  $\frac{3}{4}$  yd. wide a ruffle  $\frac{1}{8}$  yd. is added to one side and a width of  $\frac{1}{4}$  yd. is cut from the other side, how wide is the piece then?



## 63. Integers minus Fractions

Since  $2 = 1\frac{1}{4}$ , therefore  $2 - \frac{1}{4} = 1\frac{3}{4}$ . Proceed in the same way for any integer minus a fraction.

- |                        |                         |                         |                         |
|------------------------|-------------------------|-------------------------|-------------------------|
| 1. $1 - \frac{1}{2}$ . | 6. $1 - \frac{5}{8}$ .  | 11. $2 - \frac{1}{8}$ . | 16. $2 - \frac{2}{3}$ . |
| 2. $1 - \frac{1}{4}$ . | 7. $1 - \frac{7}{8}$ .  | 12. $3 - \frac{3}{8}$ . | 17. $2 - \frac{1}{5}$ . |
| 3. $1 - \frac{3}{4}$ . | 8. $2 - \frac{1}{2}$ .  | 13. $3 - \frac{5}{8}$ . | 18. $2 - \frac{2}{5}$ . |
| 4. $1 - \frac{1}{8}$ . | 9. $2 - \frac{1}{4}$ .  | 14. $4 - \frac{7}{8}$ . | 19. $3 - \frac{3}{5}$ . |
| 5. $1 - \frac{3}{8}$ . | 10. $2 - \frac{3}{4}$ . | 15. $2 - \frac{1}{3}$ . | 20. $4 - \frac{4}{5}$ . |

21. How much is 9 yd.  $- \frac{7}{8}$  yd. ?
22. If I have \$6 and spend  $\$ \frac{3}{4}$ , how much have I left ?
23. If from 5 lb. I take  $\frac{3}{4}$  lb., what is the remainder ?
24. If a kite string 440 ft. long shrinks  $\frac{3}{4}$  ft., how long is it then ?
25. If from a 12-foot stick we saw off  $\frac{3}{8}$  ft., what is then the length ?

## 64. Integers minus Fractions

- |                         |                          |                          |                          |
|-------------------------|--------------------------|--------------------------|--------------------------|
| 1. $10 - \frac{3}{4}$ . | 6. $13 - \frac{5}{8}$ .  | 11. $30 - \frac{1}{6}$ . | 16. $46 - \frac{4}{5}$ . |
| 2. $12 - \frac{3}{8}$ . | 7. $17 - \frac{2}{5}$ .  | 12. $32 - \frac{5}{6}$ . | 17. $52 - \frac{1}{2}$ . |
| 3. $14 - \frac{1}{5}$ . | 8. $18 - \frac{3}{4}$ .  | 13. $25 - \frac{5}{8}$ . | 18. $53 - \frac{3}{4}$ . |
| 4. $12 - \frac{1}{4}$ . | 9. $20 - \frac{3}{8}$ .  | 14. $28 - \frac{1}{4}$ . | 19. $58 - \frac{5}{8}$ . |
| 5. $15 - \frac{7}{8}$ . | 10. $22 - \frac{3}{4}$ . | 15. $41 - \frac{3}{4}$ . | 20. $59 - \frac{1}{8}$ . |

21. If a merchant sells  $\frac{3}{8}$  yd. of velvet from a piece that contains 48 yd., how much has he left ?
22. A dealer having 38 gallons of milk sold 20 gallons and then  $\frac{1}{2}$  gallon. How much had he left ?
23. A man having \$12 paid a quarter of a dollar for eggs and half a dollar for butter. How much money did he then have ?
24. A lady having a piece of cloth  $2\frac{1}{2}$  yd. long sewed on  $3\frac{1}{4}$  yd. more. She then turned in  $\frac{1}{8}$  yd. at one end. How long was the piece then ?

## 65. Mixed Numbers minus Fractions

To subtract a fraction from a mixed number proceed as follows :

$3\frac{1}{4} - \frac{7}{8} = 3\frac{2}{8} - \frac{7}{8}$ , and this equals  $2\frac{10}{8} - \frac{7}{8}$ , or  $2\frac{3}{8}$ .

1.  $1\frac{3}{4} - \frac{1}{4}$ .      5.  $1\frac{1}{4} - \frac{3}{8}$ .      9.  $3\frac{1}{2} - \frac{1}{4}$ .      13.  $5\frac{1}{2} - \frac{1}{2}$ .

2.  $1\frac{3}{4} - \frac{1}{2}$ .      6.  $1\frac{1}{4} - \frac{7}{8}$ .      10.  $3\frac{1}{2} - \frac{3}{8}$ .      14.  $6\frac{1}{8} - \frac{1}{4}$ .

3.  $1\frac{1}{2} - \frac{3}{4}$ .      7.  $2\frac{1}{4} - \frac{3}{4}$ .      11.  $3\frac{1}{2} - \frac{5}{8}$ .      15.  $7\frac{1}{2} - \frac{7}{8}$ .

4.  $1\frac{1}{4} - \frac{1}{8}$ .      8.  $2\frac{3}{4} - \frac{7}{8}$ .      12.  $3\frac{1}{2} - \frac{7}{8}$ .      16.  $7\frac{1}{8} - \frac{3}{4}$ .

17. What number must be added to 2 to make 5? to  $\frac{1}{8}$  to make  $5\frac{3}{8}$ ?

18. What number must be added to  $\frac{7}{8}$  to make  $5\frac{1}{2}$ ? to  $\frac{7}{8}$  to make  $5\frac{1}{8}$ ?

19. If a  $1\frac{7}{8}$ -inch plank is dressed down to  $1\frac{1}{2}$  in., how much is taken off?

20. If from a beam  $16\frac{1}{4}$  in. long  $\frac{1}{8}$  in. is sawed off from one end and  $\frac{3}{8}$  in. from the other end, how long will it be?

## 66. Mixed Numbers

To subtract  $2\frac{3}{8}$  from  $5\frac{3}{4}$  mentally, first subtract 2 and then  $\frac{3}{8}$ , thinking " $3\frac{3}{4} - \frac{3}{8} = 3\frac{6}{8} - \frac{3}{8}$ , or  $3\frac{3}{8}$ ." State only the answer.

1.  $2\frac{3}{4} - 1\frac{1}{4}$ .      5.  $5\frac{7}{8} - 3\frac{3}{8}$ .      9.  $3\frac{1}{8} - 2\frac{1}{4}$ .      13.  $5\frac{3}{8} - 3\frac{7}{8}$ .

2.  $2\frac{7}{8} - 1\frac{3}{8}$ .      6.  $2\frac{7}{8} - 1\frac{1}{4}$ .      10.  $3\frac{1}{8} - 2\frac{1}{2}$ .      14.  $5\frac{1}{8} - 3\frac{5}{8}$ .

3.  $3\frac{7}{8} - 1\frac{5}{8}$ .      7.  $3\frac{7}{8} - 1\frac{1}{2}$ .      11.  $3\frac{1}{8} - 2\frac{3}{4}$ .      15.  $6\frac{3}{8} - 3\frac{5}{8}$ .

4.  $4\frac{7}{8} - 2\frac{1}{8}$ .      8.  $4\frac{7}{8} - 2\frac{3}{4}$ .      12.  $4\frac{3}{8} - 2\frac{3}{4}$ .      16.  $6\frac{1}{8} - 4\frac{3}{4}$ .

17. What remains if  $\frac{7}{8}$  yd. is taken from  $2\frac{1}{4}$  yd.?

18. What is the difference between  $\frac{3}{4}$  yd. and  $3\frac{1}{8}$  yd.?

19. From  $7\frac{3}{8}$  take the sum of  $\frac{1}{4}$  and  $\frac{1}{8}$ .

20. From  $6\frac{1}{2}$  take the sum of  $\frac{3}{4}$  and  $\frac{1}{8}$ .

21. From  $6\frac{1}{4}$  take the sum of  $\frac{1}{5}$  and  $\frac{3}{8}$ ; then subtract  $\frac{1}{2}$ .

22. What number must be added to  $\frac{3}{8}$  to make  $4\frac{1}{2}$ ? to make  $4\frac{1}{8}$ ?

23. What number must be added to the sum of  $2\frac{1}{4}$  and  $\frac{1}{4}$  to make the sum of  $2\frac{1}{2}$  and  $\frac{7}{8}$ ?

## 67. Review

1. How far around a triangle  $2\frac{1}{2}$  in. on a side?
2. How far around a square  $2\frac{1}{2}$  in. on a side?
3. How far around a square room 15 ft. on a side?
4. How many eighths in a quarter? in a half? in one?
5. What is the sum of  $\frac{1}{8}$  mi.,  $\frac{1}{4}$  mi.,  $\frac{1}{2}$  mi., and 1 mi.?
6. What is the sum of  $\frac{3}{8}$  in. and  $\frac{1}{4}$  in.? To this add  $\frac{3}{8}$  in.
7. How much is two dollars and a half less a dollar and three quarters?
8. If you cut  $3\frac{1}{4}$  in. from a stick  $5\frac{1}{2}$  in. long, how much is left?
9. From a  $\frac{3}{4}$ -inch board  $\frac{1}{8}$  in. is planed off. What is now the thickness?
10. A plank  $1\frac{7}{8}$  in. thick has a  $\frac{1}{2}$ -inch board placed on top of it. What is the combined thickness?
11. A  $3\frac{1}{4}$ -inch hem has a  $\frac{3}{8}$ -inch strip of insertion added. What is now the width?
12. At 28¢ a dozen, what will 2 dozen eggs and 15¢ worth of celery cost?
13. The three sides of a triangle are  $2\frac{1}{4}$  in.,  $2\frac{1}{2}$  in., and  $2\frac{3}{8}$  in. What is the perimeter?
14. At  $12\frac{1}{2}$ ¢ a yard, what will 2 yd. of ribbon and a 4-cent spool of thread cost?
15. At 16¢ a pound, what will 3 lb. of meat and a 10-cent can of tomatoes cost?
16. At 36¢ a pound, what will 2 lb. of butter and 15¢ worth of cheese cost?
17. The perimeter of a triangle is 9 in., and two of the sides are each  $3\frac{1}{8}$  in. How long is the third side?
18. What additional width must be sewed on a strip of carpet  $\frac{3}{4}$  yd. wide to make it  $1\frac{1}{8}$  yd. wide?
19. A room is  $22\frac{1}{4}$  ft. long and  $15\frac{1}{4}$  ft. wide. What is the sum of the length and width? What is the perimeter?

**68. Multiplication. By Integers**

Multiplying the numerator multiplies a fraction, thus :

$$2 \times \frac{2}{5} = \frac{2 \times 2}{5}, \text{ or } \frac{4}{5}.$$

- |                             |                             |                              |                              |
|-----------------------------|-----------------------------|------------------------------|------------------------------|
| 1. $2 \times \frac{1}{3}$ . | 5. $2 \times \frac{2}{7}$ . | 9. $5 \times \frac{1}{6}$ .  | 13. $2 \times \frac{4}{9}$ . |
| 2. $2 \times \frac{1}{5}$ . | 6. $2 \times \frac{3}{7}$ . | 10. $3 \times \frac{1}{7}$ . | 14. $4 \times \frac{1}{5}$ . |
| 3. $3 \times \frac{1}{5}$ . | 7. $3 \times \frac{2}{7}$ . | 11. $5 \times \frac{1}{7}$ . | 15. $5 \times \frac{1}{5}$ . |
| 4. $3 \times \frac{1}{8}$ . | 8. $2 \times \frac{2}{5}$ . | 12. $4 \times \frac{1}{7}$ . | 16. $4 \times \frac{2}{5}$ . |

17. What is the combined thickness of three pieces of wood each  $\frac{1}{3}$  in. thick ?

18. If each side of a 5-sided figure is  $\frac{1}{3}$  in., what is the perimeter ?

19. What is the sum of  $\frac{2}{9}$  and  $\frac{4}{9}$  ? How much is  $2 \times \frac{4}{9}$  ?

20. To the sum of what four fractions is  $4 \times \frac{3}{8}$  equal ?

21. To the sum of what three fractions is  $3 \times \frac{2}{7}$  equal ?

**69. By Integers. Reduction**

Multiplying the numerator, or dividing the denominator, multiplies a fraction, thus :

$$2 \times \frac{1}{4} = \frac{2}{4}, \text{ or } \frac{1}{2}. \text{ Also, } 2 \times \frac{5}{8} = \frac{2 \times 5}{8}, \text{ or } 1\frac{1}{4}.$$

- |                             |                             |                              |                              |
|-----------------------------|-----------------------------|------------------------------|------------------------------|
| 1. $2 \times \frac{1}{2}$ . | 5. $3 \times \frac{1}{6}$ . | 9. $2 \times \frac{3}{4}$ .  | 13. $4 \times \frac{7}{8}$ . |
| 2. $2 \times \frac{1}{8}$ . | 6. $3 \times \frac{1}{9}$ . | 10. $2 \times \frac{3}{8}$ . | 14. $2 \times \frac{5}{6}$ . |
| 3. $2 \times \frac{3}{8}$ . | 7. $5 \times \frac{1}{5}$ . | 11. $4 \times \frac{3}{4}$ . | 15. $3 \times \frac{5}{6}$ . |
| 4. $2 \times \frac{1}{6}$ . | 8. $9 \times \frac{1}{9}$ . | 12. $4 \times \frac{3}{8}$ . | 16. $6 \times \frac{5}{6}$ . |

17. If a book is  $\frac{7}{8}$  in. thick, how thick will a pile of 8 such books be ? of 4 such books ? of 2 such books ?

18. If a pencil is  $\frac{3}{8}$  in. thick, how wide a space will 2 such pencils occupy when placed side by side ? 3 such pencils ? 4 such pencils ? 8 such pencils ?

19. If a board is  $\frac{7}{8}$  in. thick, how thick will a pile of 2 such boards be, one on top of the other ? 4 such boards ? 6 such boards ? 8 such boards ?

## 70. Multiplication. By Unit Fractions

- |                         |                          |                          |                          |
|-------------------------|--------------------------|--------------------------|--------------------------|
| 1. $\frac{1}{2}$ of 4.  | 7. $\frac{1}{2}$ of 40.  | 13. $\frac{1}{8}$ of 24. | 19. $\frac{1}{3}$ of 45. |
| 2. $\frac{1}{2}$ of 6.  | 8. $\frac{1}{2}$ of 50.  | 14. $\frac{1}{8}$ of 32. | 20. $\frac{1}{3}$ of 63. |
| 3. $\frac{1}{2}$ of 10. | 9. $\frac{1}{4}$ of 20.  | 15. $\frac{1}{8}$ of 40. | 21. $\frac{1}{5}$ of 20. |
| 4. $\frac{1}{2}$ of 16. | 10. $\frac{1}{4}$ of 24. | 16. $\frac{1}{8}$ of 80. | 22. $\frac{1}{5}$ of 30. |
| 5. $\frac{1}{2}$ of 24. | 11. $\frac{1}{4}$ of 32. | 17. $\frac{1}{3}$ of 24. | 23. $\frac{1}{5}$ of 45. |
| 6. $\frac{1}{2}$ of 30. | 12. $\frac{1}{4}$ of 44. | 18. $\frac{1}{3}$ of 33. | 24. $\frac{1}{5}$ of 75. |
25. In a class of 42, half are boys. How many girls are there ?
26. In a school of 88 pupils  $\frac{1}{8}$  are in the fifth grade. How many are in that grade ?
27. The width of a schoolroom is 10 ft. more than half the length. The length is 40 ft. What is the width ?
28. The perimeter of a six-sided figure is 72 in., and the sides are all equal. How long is each side ?

## 71. By Fractions

Think of  $\frac{2}{3}$  of 6 as twice  $\frac{1}{3}$  of 6, or twice 2, which is 4. State only the result.

- |                         |                          |                          |                          |
|-------------------------|--------------------------|--------------------------|--------------------------|
| 1. $\frac{1}{3}$ of 9.  | 6. $\frac{3}{4}$ of 8.   | 11. $\frac{3}{8}$ of 24. | 16. $\frac{4}{5}$ of 20. |
| 2. $\frac{2}{3}$ of 9.  | 7. $\frac{3}{4}$ of 12.  | 12. $\frac{3}{8}$ of 32. | 17. $\frac{1}{6}$ of 24. |
| 3. $\frac{2}{3}$ of 15. | 8. $\frac{3}{4}$ of 20.  | 13. $\frac{1}{5}$ of 15. | 18. $\frac{5}{6}$ of 12. |
| 4. $\frac{2}{3}$ of 18. | 9. $\frac{1}{8}$ of 16.  | 14. $\frac{2}{5}$ of 15. | 19. $\frac{1}{7}$ of 14. |
| 5. $\frac{1}{4}$ of 8.  | 10. $\frac{3}{8}$ of 16. | 15. $\frac{3}{8}$ of 15. | 20. $\frac{7}{8}$ of 14. |
21. It is 16 mi. to a certain place, and  $\frac{3}{4}$  as far to another place. How far is it to the second place ?
22. If a boy is 48 in. tall, and his sister is  $\frac{7}{8}$  as tall, how tall is she ?
23. If a horse and carriage cost \$240, and the horse cost  $\frac{5}{8}$  of the total, how much did the carriage cost ?
24. If a city building-lot is 96 ft. deep and  $\frac{5}{8}$  as wide, how wide is it ?

## 72. By Fractions

- |                         |                          |                          |                          |
|-------------------------|--------------------------|--------------------------|--------------------------|
| 1. $\frac{1}{3}$ of 27. | 6. $\frac{3}{4}$ of 24.  | 11. $\frac{5}{8}$ of 40. | 16. $\frac{4}{5}$ of 35. |
| 2. $\frac{2}{3}$ of 27. | 7. $\frac{1}{4}$ of 40.  | 12. $\frac{7}{8}$ of 40. | 17. $\frac{1}{6}$ of 30. |
| 3. $\frac{1}{3}$ of 33. | 8. $\frac{3}{4}$ of 40.  | 13. $\frac{1}{5}$ of 35. | 18. $\frac{5}{6}$ of 30. |
| 4. $\frac{2}{3}$ of 33. | 9. $\frac{1}{8}$ of 40.  | 14. $\frac{2}{5}$ of 35. | 19. $\frac{1}{7}$ of 21. |
| 5. $\frac{1}{4}$ of 24. | 10. $\frac{3}{8}$ of 40. | 15. $\frac{3}{5}$ of 35. | 20. $\frac{3}{7}$ of 21. |
21. At 48¢ a yard, what will  $\frac{5}{8}$  yd. of cloth cost?
22. At 36¢ a yard, what will  $\frac{3}{4}$  yd. of cloth cost?
23. At 24¢ a pound, what will  $\frac{3}{4}$  lb. of figs cost?
24. At \$120 an acre, what will  $\frac{1}{4}$  acre of land cost?  $\frac{3}{4}$  acre?
25. At \$160 an acre, what will  $\frac{3}{8}$  of an acre of land cost?
26. If one side of a triangle is  $\frac{3}{8}$  of the perimeter, and the perimeter is 96 in., how long is this side?
27. If a man weighs 180 lb. and his son weighs  $\frac{4}{5}$  as much, how much does his son weigh?

## 73. Mixed Numbers by Integers

In multiplying  $2\frac{1}{3}$  by 3 mentally, it is better to multiply first the 2 and then the  $\frac{1}{3}$ .  $3 \times 2\frac{1}{3} = 6\frac{1}{3}$ , or 7. Also,  $7 \times 5\frac{3}{8} = 35 + 3$ , or 38.

- |                              |                               |                               |                               |
|------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 1. $2 \times 1\frac{1}{2}$ . | 6. $4 \times 3\frac{1}{2}$ .  | 11. $4 \times 2\frac{1}{8}$ . | 16. $5 \times 4\frac{1}{5}$ . |
| 2. $2 \times 2\frac{1}{4}$ . | 7. $4 \times 5\frac{1}{4}$ .  | 12. $4 \times 5\frac{1}{8}$ . | 17. $4 \times 1\frac{3}{4}$ . |
| 3. $2 \times 7\frac{1}{2}$ . | 8. $4 \times 1\frac{1}{8}$ .  | 13. $5 \times 1\frac{1}{5}$ . | 18. $4 \times 2\frac{3}{4}$ . |
| 4. $4 \times 1\frac{1}{4}$ . | 9. $2 \times 1\frac{1}{8}$ .  | 14. $5 \times 2\frac{1}{5}$ . | 19. $8 \times 1\frac{3}{8}$ . |
| 5. $4 \times 1\frac{1}{2}$ . | 10. $2 \times 3\frac{1}{8}$ . | 15. $5 \times 3\frac{1}{5}$ . | 20. $8 \times 2\frac{3}{8}$ . |
- ✓ 21. At \$3 $\frac{1}{2}$  each, what will 4 desks cost?
- ✓ 22. At \$3 $\frac{1}{4}$  each, what will 4 chairs cost?
- ✓ 23. At \$3 $\frac{3}{4}$  each, what will 4 tables cost?
- ✓ 24. At \$2 $\frac{3}{4}$  each, what will a dozen lamps cost?
25. If a strip of cloth is 1 $\frac{1}{2}$  yd. wide, how wide is a piece made of 10 strips?
26. If a book is 1 $\frac{1}{8}$  in. thick, how high will a pile of 4 such books be? of 8 such books?



**74. Multiplication. Whole by Mixed Numbers**

In multiplying by a mixed number, first multiply by the integer, thus:  $2\frac{1}{2}$  times 8 is  $2 \times 8$  and  $\frac{1}{2}$  of 8, or  $16 + 4$ , or 20.

- |                              |                              |                               |                               |
|------------------------------|------------------------------|-------------------------------|-------------------------------|
| 1. $1\frac{1}{2} \times 4.$  | 6. $2\frac{1}{2} \times 6.$  | 11. $5\frac{1}{2} \times 10.$ | 16. $2\frac{3}{4} \times 12.$ |
| 2. $1\frac{1}{2} \times 6.$  | 7. $2\frac{1}{2} \times 10.$ | 12. $4\frac{1}{2} \times 20.$ | 17. $2\frac{1}{8} \times 8.$  |
| 3. $1\frac{1}{2} \times 10.$ | 8. $2\frac{1}{2} \times 20.$ | 13. $2\frac{1}{4} \times 8.$  | 18. $2\frac{2}{8} \times 8.$  |
| 4. $1\frac{1}{2} \times 24.$ | 9. $3\frac{1}{2} \times 4.$  | 14. $2\frac{1}{4} \times 12.$ | 19. $2\frac{5}{8} \times 8.$  |
| 5. $2\frac{1}{2} \times 4.$  | 10. $4\frac{1}{2} \times 4.$ | 15. $2\frac{3}{4} \times 8.$  | 20. $3\frac{7}{8} \times 8.$  |

21. At 20¢ a pound, what will  $2\frac{1}{4}$  lb. of meat cost?  
 22. At 22¢ a pound, what will  $2\frac{1}{2}$  lb. of meat cost?  
 23. At 50¢ a yard, what will  $1\frac{1}{2}$  yd. of cloth cost?  
 24. At \$36 a dozen, what will  $1\frac{1}{4}$  doz. hats cost?  
 25. At 72¢ a yard, what will  $2\frac{1}{8}$  yd. of cloth cost?  
 26. At 24¢ a dozen, what will 2 doz. eggs cost?  $2\frac{1}{4}$  doz.?

$2\frac{1}{2}$  doz.?

**75. Multiplication. Fractions by Fractions**

To take  $\frac{2}{3}$  of  $\frac{4}{5}$ , multiply thus:  $\frac{2 \times 4}{3 \times 5} = \frac{8}{15}$ . To take  $\frac{2}{3}$  of  $\frac{3}{4}$ ,

cancel, thus:  $\frac{2}{3}$  of  $\frac{3}{4} = \frac{1}{2}$ .

- |                                    |                                     |                                     |                                     |
|------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 1. $\frac{1}{2}$ of $\frac{2}{3}.$ | 6. $\frac{1}{3}$ of $\frac{3}{8}.$  | 11. $\frac{1}{2}$ of $\frac{6}{7}.$ | 16. $\frac{2}{3}$ of $\frac{3}{8}.$ |
| 2. $\frac{1}{3}$ of $\frac{3}{4}.$ | 7. $\frac{1}{3}$ of $\frac{3}{8}.$  | 12. $\frac{1}{2}$ of $\frac{1}{3}.$ | 17. $\frac{2}{3}$ of $\frac{3}{4}.$ |
| 3. $\frac{1}{2}$ of $\frac{2}{5}.$ | 8. $\frac{1}{3}$ of $\frac{3}{7}.$  | 13. $\frac{1}{3}$ of $\frac{1}{2}.$ | 18. $\frac{3}{4}$ of $\frac{4}{5}.$ |
| 4. $\frac{1}{2}$ of $\frac{4}{5}.$ | 9. $\frac{1}{5}$ of $\frac{5}{8}.$  | 14. $\frac{1}{2}$ of $\frac{1}{4}.$ | 19. $\frac{3}{4}$ of $\frac{4}{7}.$ |
| 5. $\frac{1}{4}$ of $\frac{4}{5}.$ | 10. $\frac{1}{3}$ of $\frac{6}{7}.$ | 15. $\frac{1}{4}$ of $\frac{1}{2}.$ | 20. $\frac{3}{5}$ of $\frac{5}{8}.$ |

21. Find the value of  $\frac{1}{2}$  of  $\frac{2}{3}$ ; of  $\frac{1}{2}$  of  $\frac{2}{3}$  of  $\frac{3}{4}$ .  
 22. How much is  $\frac{1}{2}$  of three quarters of a yard?  
 23. How much is  $\frac{2}{3}$  of three quarters of a dollar?  
 24. If you live  $\frac{3}{4}$  mi. from the schoolhouse, and I live half as far, how far away do I live?  
 25. If a man owns  $\frac{7}{8}$  of an acre of land and sells  $\frac{1}{2}$  of what he owns, how much does he sell?



**76. Division. Fractions by Integers**

To divide a fraction by an integer, we divide the numerator if possible, thus:  $\frac{4}{5} \div 2 = \frac{2}{5}$ .

- |                           |                                       |                                       |  |
|---------------------------|---------------------------------------|---------------------------------------|--|
| 1. $\frac{2}{3} \div 2$ . | 6. $\frac{6}{7} \div 3$ .             | 11. $\frac{1\frac{2}{5}}{2} \div 4$ . | 16. $\frac{2\frac{7}{2}}{3} \div 9$ .  |
| 2. $\frac{3}{4} \div 3$ . | 7. $\frac{5}{8} \div 5$ .             | 12. $\frac{1\frac{2}{5}}{2} \div 6$ . | 17. $\frac{2\frac{5}{2}}{3} \div 5$ .  |
| 3. $\frac{4}{5} \div 4$ . | 8. $\frac{4}{9} \div 2$ .             | 13. $\frac{1\frac{5}{6}}{1} \div 3$ . | 18. $\frac{3\frac{5}{8}}{4} \div 5$ .  |
| 4. $\frac{4}{5} \div 2$ . | 9. $\frac{8}{9} \div 2$ .             | 14. $\frac{1\frac{5}{6}}{1} \div 5$ . | 19. $\frac{3\frac{5}{8}}{4} \div 7$ .  |
| 5. $\frac{6}{7} \div 2$ . | 10. $\frac{1\frac{2}{5}}{2} \div 3$ . | 15. $\frac{2\frac{7}{2}}{3} \div 3$ . | 20. $\frac{3\frac{3}{8}}{4} \div 11$ . |

21. Reduce  $1\frac{1}{2}$  to halves and then divide by 3.  
 22. Reduce  $1\frac{2}{3}$  to thirds and then divide by 5.  
 23. In the same way, divide  $1\frac{2}{3}$  by 3; also by 9.  
 24. In the same way, divide  $3\frac{1}{3}$  by 4; also by 8.  
 25. In the same way, divide  $2\frac{3}{4}$  by 11; also  $3\frac{1}{2}$  by 7.  
 26. In the same way, divide  $4\frac{2}{3}$  by 2; also by 7; also by 14.

**77. Fractions by Integers**

When it is impossible to divide the numerator, multiply the denominator, thus:  $\frac{4}{5} \div 3 = \frac{4}{15}$ . Also  $\frac{4}{5} \div 6 = \frac{4}{5 \times 6} = \frac{2}{15}$ .

- |                           |                            |                                       |  |
|---------------------------|----------------------------|---------------------------------------|--|
| 1. $\frac{1}{2} \div 3$ . | 6. $\frac{3}{5} \div 2$ .  | 11. $\frac{3}{4} \div 6$ .            | 16. $\frac{2}{1\frac{2}{5}} \div 4$ .  |
| 2. $\frac{1}{3} \div 2$ . | 7. $\frac{5}{8} \div 2$ .  | 12. $\frac{2}{3} \div 8$ .            | 17. $\frac{3}{1\frac{3}{6}} \div 6$ .  |
| 3. $\frac{1}{2} \div 4$ . | 8. $\frac{5}{8} \div 3$ .  | 13. $\frac{2}{7} \div 4$ .            | 18. $\frac{5}{1\frac{5}{6}} \div 10$ . |
| 4. $\frac{1}{4} \div 2$ . | 9. $\frac{2}{3} \div 4$ .  | 14. $\frac{3}{1\frac{3}{6}} \div 6$ . | 19. $\frac{7}{1\frac{7}{6}} \div 14$ . |
| 5. $\frac{3}{4} \div 2$ . | 10. $\frac{3}{5} \div 6$ . | 15. $\frac{8}{9} \div 16$ .           | 20. $\frac{9}{3\frac{9}{2}} \div 18$ . |

21. Reduce  $1\frac{1}{2}$  to halves and then divide by 4.  
 22. If it is  $\frac{3}{4}$  mi. around a square field, what is the length of each side?  
 23. If a man goes  $\frac{2}{3}$  mi. in 4 min. on his bicycle, at what rate is he traveling per minute?  
 24. If a train travels  $3\frac{1}{2}$  mi. in 4 min., what is its rate per minute?

## 78. Integers by Unit Fractions

- |                           |                           |                            |                              |
|---------------------------|---------------------------|----------------------------|------------------------------|
| 1. $1 \div \frac{1}{2}$ . | 5. $2 \div \frac{1}{3}$ . | 9. $6 \div \frac{1}{4}$ .  | 13. $15 \div \frac{1}{2}$ .  |
| 2. $2 \div \frac{1}{2}$ . | 6. $7 \div \frac{1}{3}$ . | 10. $5 \div \frac{1}{5}$ . | 14. $12 \div \frac{1}{3}$ .  |
| 3. $5 \div \frac{1}{2}$ . | 7. $1 \div \frac{1}{4}$ . | 11. $5 \div \frac{1}{6}$ . | 15. $11 \div \frac{1}{4}$ .  |
| 4. $1 \div \frac{1}{3}$ . | 8. $2 \div \frac{1}{4}$ . | 12. $8 \div \frac{1}{7}$ . | 16. $10 \div \frac{1}{12}$ . |

17. How many half inches in 3 in. ?

18. How many quarter dollars in \$8? in \$10? in \$12?

19. How many thirds of a yard in 4 yd. ? How many feet in 4 yd. ?

20. How many twelfths of a foot in 4 ft. ? How many inches in 4 ft. ?

21. If a running track is  $\frac{1}{4}$  mi. around, how many times would you have to go round it to travel 2 mi. ? 3 mi. ?

22. How many twelfths of an inch in 1 in. ? in 3 in. ? in 10 in. ? in a foot ?

## 79. Integers by Fractions

Think of  $7 \div \frac{2}{3}$  as  $\frac{3 \times 7}{2}$ , or  $\frac{21}{2}$ , or  $10\frac{1}{2}$ . Think of  $15 \div \frac{5}{8}$  as  $\frac{8 \times 15}{5}$ , or 24.

- |                           |                           |                            |                             |
|---------------------------|---------------------------|----------------------------|-----------------------------|
| 1. $1 \div \frac{2}{3}$ . | 5. $5 \div \frac{2}{3}$ . | 9. $2 \div \frac{2}{3}$ .  | 13. $2 \div \frac{1}{3}$ .  |
| 2. $2 \div \frac{3}{4}$ . | 6. $6 \div \frac{2}{3}$ . | 10. $3 \div \frac{2}{3}$ . | 14. $3 \div \frac{3}{8}$ .  |
| 3. $2 \div \frac{5}{8}$ . | 7. $2 \div \frac{1}{4}$ . | 11. $6 \div \frac{3}{5}$ . | 15. $6 \div \frac{3}{8}$ .  |
| 4. $2 \div \frac{2}{3}$ . | 8. $2 \div \frac{3}{4}$ . | 12. $6 \div \frac{4}{5}$ . | 16. $14 \div \frac{7}{8}$ . |

17. How many times is  $\frac{3}{8}$  contained in 3?

18. If a book is  $\frac{1}{2}$  in. thick, how many books in a pile 3 in. high?

19. If a book is  $\frac{3}{4}$  in. thick, how many books in a pile 3 in. high?

20. If a book is  $\frac{7}{8}$  in. thick, how many books in a pile 7 in. high? 14 in. high? 21 in. high?

21. How many layers of veneer must be glued together to make a piece 1 in. thick, allowing  $\frac{1}{16}$  in. for each layer?

## 80. Fractions by Fractions

Think of  $\frac{5}{8} \div \frac{3}{4}$  as  $\frac{5}{\cancel{8}^2} \times \frac{\cancel{4}^1}{3}$ , or  $\frac{5}{6}$ .

- |                                      |                                     |                                      |                                      |
|--------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| 1. $\frac{1}{2} \div \frac{1}{2}$ .  | 5. $\frac{1}{2} \div \frac{1}{3}$ . | 9. $\frac{1}{3} \div \frac{1}{2}$ .  | 13. $\frac{1}{3} \div \frac{5}{9}$ . |
| 2. $\frac{1}{2} \div \frac{1}{4}$ .  | 6. $\frac{1}{2} \div \frac{2}{3}$ . | 10. $\frac{2}{3} \div \frac{1}{2}$ . | 14. $\frac{2}{3} \div \frac{1}{9}$ . |
| 3. $\frac{1}{2} \div \frac{1}{8}$ .  | 7. $\frac{1}{2} \div \frac{3}{8}$ . | 11. $\frac{1}{3} \div \frac{1}{6}$ . | 15. $\frac{2}{3} \div \frac{7}{9}$ . |
| 4. $\frac{1}{2} \div \frac{1}{16}$ . | 8. $\frac{1}{2} \div \frac{7}{8}$ . | 12. $\frac{1}{3} \div \frac{7}{9}$ . | 16. $\frac{2}{3} \div \frac{4}{9}$ . |

17. How many quarter dollars in a half dollar?

18. How many eighths of an inch in  $\frac{1}{2}$  in.? in  $\frac{1}{4}$  in.? in  $\frac{3}{4}$  in.?

19. A ruler is marked in thirty-seconds of an inch. How many of these lengths in  $\frac{1}{4}$  in.? in  $\frac{1}{2}$  in.? in  $\frac{1}{8}$  in.? in  $\frac{7}{8}$  in.?

20. How many thirty-sixths of a yard in  $\frac{1}{2}$  yd.? in  $\frac{1}{3}$  yd.? in  $\frac{2}{3}$  yd.? What does this mean, expressed in inches or feet?

## 81. Mixed Numbers

Think of  $4\frac{1}{2} \div \frac{3}{4}$  as  $\frac{9}{2} \times \frac{4}{3}$ , or 6.

- |                                      |                                       |                                       |                                       |
|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 1. $1\frac{1}{2} \div \frac{1}{2}$ . | 4. $1\frac{1}{2} \div \frac{1}{16}$ . | 7. $1\frac{1}{2} \div \frac{3}{16}$ . | 10. $1\frac{1}{3} \div \frac{1}{3}$ . |
| 2. $1\frac{1}{2} \div \frac{1}{4}$ . | 5. $1\frac{1}{2} \div \frac{3}{4}$ .  | 8. $2\frac{1}{2} \div \frac{1}{2}$ .  | 11. $1\frac{1}{3} \div \frac{2}{3}$ . |
| 3. $1\frac{1}{2} \div \frac{1}{8}$ . | 6. $1\frac{1}{2} \div \frac{3}{8}$ .  | 9. $2\frac{1}{2} \div \frac{5}{8}$ .  | 12. $1\frac{1}{3} \div \frac{4}{9}$ . |

13. How many quarter dollars in  $\$3\frac{1}{4}$ ? in  $\$5\frac{1}{2}$ ?

14. A real estate dealer has  $\frac{3}{4}$  of an acre of land divided into lots of  $\frac{1}{8}$  of an acre each. How many lots has he?

15. He also has another piece containing  $2\frac{3}{4}$  acres divided into lots of  $\frac{1}{4}$  of an acre each. How many lots in this piece?

16. He has also another piece containing  $7\frac{1}{2}$  acres divided into lots of  $\frac{1}{2}$  of an acre each. How many lots in this piece?

17. A cooking recipe calls for  $\frac{1}{4}$  pt. of cream to each person, and I take  $3\frac{1}{2}$  pt. of cream. I have enough cream for how many persons?

## III. ALIUOT PARTS

## 82. Multiplying by 5

Since  $5 = 10 \div 2$ , to multiply by 5 we may annex a cipher and divide by 2, when this is easier. Thus  $5 \times 48 = \frac{1}{2}$  of  $480 = 240$ .

- |                    |                    |                     |                     |
|--------------------|--------------------|---------------------|---------------------|
| 1. $5 \times 14$ . | 5. $5 \times 28$ . | 9. $5 \times 32$ .  | 13. $5 \times 51$ . |
| 2. $5 \times 16$ . | 6. $5 \times 44$ . | 10. $5 \times 34$ . | 14. $5 \times 54$ . |
| 3. $5 \times 18$ . | 7. $5 \times 82$ . | 11. $5 \times 36$ . | 15. $5 \times 73$ . |
| 4. $5 \times 24$ . | 8. $5 \times 84$ . | 12. $5 \times 38$ . | 16. $5 \times 77$ . |

17. At 42¢ each, what will 5 books cost?
18. At 24¢ a dozen, what will 5 dozen eggs cost?
19. At 22¢ a pound, what will 5 pounds of meat cost?
20. At \$82 an acre, what will 5 acres of land cost?
21. Try multiplying 58 by 5, mentally, in the way you used to do, and in the way here shown. Which is easier?

## 83. Multiplying by 25

Since  $25 = 100 \div 4$ , to multiply by 25 we may annex two ciphers and divide by 4. Thus  $25 \times 16 = 1600 \div 4 = 400$ .

- |                     |                     |                     |                      |
|---------------------|---------------------|---------------------|----------------------|
| 1. $25 \times 8$ .  | 4. $25 \times 24$ . | 7. $25 \times 44$ . | 10. $25 \times 36$ . |
| 2. $25 \times 6$ .  | 5. $25 \times 28$ . | 8. $25 \times 48$ . | 11. $25 \times 80$ . |
| 3. $25 \times 12$ . | 6. $25 \times 40$ . | 9. $25 \times 32$ . | 12. $25 \times 84$ . |

13. At 32¢ a pound, what will 25 lb. of butter cost?
14. At 36¢ each, what will 25 books cost?
15. At \$48 each, what will 25 cows cost?
16. At \$120 each, what will 25 horses cost?
17. At \$28 each, what will 25 sets of furniture cost?
18. At \$16 each, what will 25 overcoats cost?
19. At 44¢ each, what will railway tickets for a party of 25 cost?
20. At 22¢ a pound, what will 25 lb. of figs cost?  
(Divide \$22 by 4 or divide it by 2 twice.)

## 84. Aliquot Parts of \$1

$$\begin{array}{ll}
 50\text{¢} = \frac{1}{2} \text{ of } \$1. & 33\frac{1}{3}\text{¢} = \frac{1}{3} \text{ of } \$1. \\
 25\text{¢} = \frac{1}{4} \text{ of } \$1. & 20\text{¢} = \frac{1}{5} \text{ of } \$1. \\
 12\frac{1}{2}\text{¢} = \frac{1}{8} \text{ of } \$1. & 10\text{¢} = \frac{1}{10} \text{ of } \$1.
 \end{array}$$

It is easier to multiply  $\frac{1}{2}$  than to multiply 50,  $\frac{1}{4}$  than 25,  $\frac{1}{8}$  than  $12\frac{1}{2}$ , and so on. Therefore  $4 \times 12\frac{1}{2}\text{¢} = 4 \times \$\frac{1}{8} = \$\frac{1}{2}$ ;  $36 \times 25\text{¢} = 36 \times \$\frac{1}{4} = \$9$ ;  $12 \times 33\frac{1}{3}\text{¢} = 12 \times \$\frac{1}{3} = \$4$ .

1.  $6 \times 50\text{¢}$ .    6.  $12 \times 25\text{¢}$ .    11.  $12 \times 12\frac{1}{2}\text{¢}$ .    16.  $15 \times 33\frac{1}{3}\text{¢}$ .
2.  $8 \times 50\text{¢}$ .    7.  $16 \times 25\text{¢}$ .    12.  $24 \times 12\frac{1}{2}\text{¢}$ .    17.  $5 \times 20\text{¢}$ .
3.  $7 \times 50\text{¢}$ .    8.  $24 \times 25\text{¢}$ .    13.  $6 \times 33\frac{1}{3}\text{¢}$ .    18.  $15 \times 20\text{¢}$ .
4.  $9 \times 50\text{¢}$ .    9.  $8 \times 12\frac{1}{2}\text{¢}$ .    14.  $9 \times 33\frac{1}{3}\text{¢}$ .    19.  $25 \times 20\text{¢}$ .
5.  $8 \times 25\text{¢}$ .    10.  $16 \times 12\frac{1}{2}\text{¢}$ .    15.  $12 \times 33\frac{1}{3}\text{¢}$ .    20.  $35 \times 20\text{¢}$ .
21. At 25¢ each, what will 7 fishing poles cost ?
22. At  $12\frac{1}{2}\text{¢}$  a yard, what will 32 yd. of cloth cost ?
23. At 20¢ a yard, what will 160 yd. of cloth cost ?

## 85. Aliquot Parts of \$1

In a case like that of  $7 \times 33\frac{1}{3}\text{¢}$ , we have:

$$7 \times 33\frac{1}{3}\text{¢} = 7 \times \$\frac{1}{3} = \$2\frac{1}{3}.$$

1.  $5 \times 25\text{¢}$ .    4.  $6 \times 25\text{¢}$ .    7.  $11 \times 12\frac{1}{2}\text{¢}$ .    10.  $8 \times 33\frac{1}{3}\text{¢}$ .
2.  $7 \times 25\text{¢}$ .    5.  $9 \times 12\frac{1}{2}\text{¢}$ .    8.  $15 \times 12\frac{1}{2}\text{¢}$ .    11.  $10 \times 33\frac{1}{3}\text{¢}$ .
3.  $9 \times 25\text{¢}$ .    6.  $10 \times 12\frac{1}{2}\text{¢}$ .    9.  $5 \times 33\frac{1}{3}\text{¢}$ .    12.  $11 \times 33\frac{1}{3}\text{¢}$ .
13. At 25¢ each, what will 6 baseballs cost ?
14. At 8¢ a quart, what will 25 qt. of berries cost ?
15. At  $12\frac{1}{2}\text{¢}$  a quart, what will 6 qt. of berries cost ?
16. At  $33\frac{1}{3}\text{¢}$  each, what will 6 books cost ? 9 books ?
17. At 20¢ each, what will 55 books cost ? 75 books ?
18. At 3¢ a foot, how much will  $33\frac{1}{3}$  ft. of molding cost ?  
( $33\frac{1}{3} \times 3\text{¢}$  is the same as  $100$  of 3¢.)
19. At 6¢ a yard, how much will  $33\frac{1}{3}$  yd. of ribbon cost ?
20. At 60¢ a yard, how much will  $33\frac{1}{3}$  yd. of carpet cost ?

## IV. DENOMINATE NUMBERS

## 86. Measures of Length

- |                  |                                |                                |
|------------------|--------------------------------|--------------------------------|
| 1. 3 ft. = ? in. | 9. 1 mi. = ? ft.               | 17. 2 yd. = ? in.              |
| 2. 5 ft. = ? in. | 10. $2\frac{1}{2}$ ft. = ? in. | 18. $\frac{1}{2}$ yd. = ? in.  |
| 3. 7 ft. = ? in. | 11. $2\frac{1}{4}$ ft. = ? in. | 19. $1\frac{1}{2}$ yd. = ? in. |
| 4. 3 yd. = ? ft. | 12. $1\frac{3}{4}$ ft. = ? in. | 20. $\frac{1}{4}$ yd. = ? in.  |
| 5. 5 yd. = ? ft. | 13. $4\frac{1}{3}$ yd. = ? ft. | 21. $\frac{3}{4}$ yd. = ? in.  |
| 6. 7 yd. = ? ft. | 14. $5\frac{1}{3}$ yd. = ? ft. | 22. $1\frac{3}{4}$ yd. = ? in. |
| 7. 1 rd. = ? ft. | 15. $6\frac{2}{3}$ yd. = ? ft. | 23. $\frac{1}{3}$ yd. = ? in.  |
| 8. 2 rd. = ? ft. | 16. 1 yd. = ? in.              | 24. $\frac{2}{3}$ yd. = ? in.  |
25. How many feet long do you think your schoolroom is? How many yards is this?
26. How many feet long do you think the teacher's desk is? How many inches is this?

## 87. Measures of Length

- |                   |                              |                   |
|-------------------|------------------------------|-------------------|
| 1. 27 in. = ? ft. | 4. 36 in. = ? ft.            | 7. 72 in. = ? ft. |
| 2. 27 in. = ? yd. | 5. $2 \times 36$ in. = ? in. | 8. $36 + 18 = ?$  |
| 3. 36 in. = ? yd. | 6. 72 in. = ? yd.            | 9. 54 in. = ? yd. |
10. How much is  $\frac{1}{2}$  of 52?  $\frac{1}{2}$  of 528?  $\frac{1}{2}$  of 5280? How many feet in  $\frac{1}{2}$  mi.?
11. Brussels carpet is  $\frac{3}{4}$  yd. wide. How many inches wide is it?
12. How does  $\frac{2}{3}$  yd. compare in length with 2 ft.? with 24 in.?
13. Which is the longest,  $\frac{3}{4}$  yd., 2 ft. 4 in., or  $2\frac{1}{4}$  ft.? If two are the same, which two?
14. A lady wishes 27 in. of cloth to finish a garment. What part of a yard does she need?
15. A lady wishes 48 in. of cloth to finish some work. Express this length as yards.

## 88. Square Measure

1. 1 sq. ft. = ? sq. in.
2. 1 sq. yd. = ? sq. ft.
3. 1 sq. ft. = ? sq. yd.
4. 3 sq. ft. = ? sq. yd.
5.  $\frac{1}{2}$  sq. ft. = ? sq. in.
6.  $\frac{1}{3}$  sq. yd. = ? sq. ft.
7. 2 sq. ft. = ? sq. in.
8.  $\frac{1}{9}$  sq. yd. = ? sq. ft.
9. The page of a book is 7 in. by 3 in. What is its area?
10. The page of a book is 8 in. by  $4\frac{1}{8}$  in. What is its area?
11. A lot is  $8\frac{3}{4}$  yd. by 20 yd. What is its area?
12. A floor is 16 ft. long and  $10\frac{1}{2}$  ft. wide. What is its area?
13. A table top is 4 ft. long and a yard wide. What is its area in square feet?
14. A field is 25 rd. long and 20 rd. wide. What is its area in square rods?
15. A field is  $33\frac{1}{3}$  rd. long and 30 rd. wide. What is its area in square rods?

## 89. Square Measure

The area of a triangle is half that of a rectangle of the same base and height. The area of a triangle whose base is 4 ft. and height 3 ft. is  $\frac{1}{2}$  of  $4 \times 3$  sq. ft., or 6 sq. ft.

*Find the areas of the triangles whose bases and altitudes (heights) are given as follows:*

1. 4 ft., 4 ft.
2. 5 ft., 4 ft.
3. 6 in., 3 in.
4. 2 in., 10 in.
5. 3 in., 5 in.
6. 5 ft., 7 ft.
7. 2 in.,  $2\frac{1}{2}$  in.
8. 1 in.,  $2\frac{1}{2}$  in.
9. 3 in.,  $2\frac{1}{2}$  in.
10. Which has the greater area, a square 7 in. on a side, or a rectangle 4 in. by 12 in.?
11. Which has the greater area, a square that is 9 in. on a side, or a triangle whose base is 16 in. and height 10 in.?
12. Which has the greater area, a triangle whose base is 15 in. and height 5 in., or one whose base is 10 in. and height  $7\frac{1}{2}$  in.?



## 90. Cubic Measure

1. 1 cu. ft. = ? cu. in.
2. 1 cu. yd. = ? cu. ft.
3.  $\frac{1}{3}$  cu. yd. = ? cu. ft.
4.  $\frac{1}{9}$  cu. yd. = ? cu. ft.
5. 2 cu. yd. = ? cu. ft.
6.  $1\frac{1}{3}$  cu. yd. = ? cu. ft.
7.  $1\frac{1}{9}$  cu. yd. = ? cu. ft.
8.  $2\frac{1}{3}$  cu. yd. = ? cu. ft.
9. How many cubic feet in a room 20 ft. long, 20 ft. wide, and 10 ft. high?
10. How many cubic inches in a box 5 in. long, 4 in. wide, and 3 in. deep?
11. Does a box that is 20 in. long, 10 in. wide, and 10 in. deep, contain more than or less than 1 cu. ft.?
12. How many cubic inches in a box that is 8 in. long,  $3\frac{1}{4}$  in. wide, and 1 in. deep?
13. How many cubic feet in a box that is 6 ft. long,  $4\frac{1}{2}$  ft. wide, and 2 ft. deep?

## 91. Weight

1. 1 T. = ? lb.
2. 2 T. = ? lb.
3. 1 lb. = ? oz.
4. 2 lb. = ? oz.
5.  $\frac{1}{2}$  T. = ? lb.
6.  $1\frac{1}{2}$  T. = ? lb.
7. 5 lb. = ? oz.
8. 10 lb. = ? oz.
9. 25 lb. = ? oz.
10.  $\frac{1}{2}$  lb. = ? oz.
11.  $\frac{1}{4}$  lb. = ? oz.
12.  $\frac{3}{4}$  lb. = ? oz.
13.  $\frac{3}{8}$  lb. = ? oz.
14.  $\frac{1}{8}$  lb. = ? oz.
15.  $1\frac{1}{2}$  lb. = ? oz.
16.  $1\frac{1}{4}$  lb. = ? oz.
17.  $1\frac{3}{4}$  lb. = ? oz.
18.  $1\frac{1}{8}$  lb. = ? oz.
19. How much is  $3\frac{1}{2} \times 12\text{¢}$ ?
20. How much will 3 lb. 8 oz. of meat cost at 20¢ a pound?
21. Instead of speaking of 4 lb. 4 oz. of meat, what will the dealer state as the weight?
22. Instead of speaking of 37 lb. 4 oz. of butter, what will a dealer state as the weight?
23. Instead of speaking of your weight as 75 lb. 12 oz., how will you state it?

## 92. Dry Measure

- |                   |                                |
|-------------------|--------------------------------|
| 1. 8 qt. = ? pk.  | 10. $3\frac{1}{4}$ pk. = ? qt. |
| 2. 2 qt. = ? pk.  | 11. $5\frac{1}{8}$ pk. = ? qt. |
| 3. 4 qt. = ? pk.  | 12. 8 pk. = ? bu.              |
| 4. 16 qt. = ? pk. | 13. 12 pk. = ? bu.             |
| 5. 12 qt. = ? pk. | 14. 16 pk. = ? bu.             |
| 6. 24 qt. = ? pk. | 15. 18 pk. = ? bu.             |
| 7. 48 qt. = ? pk. | 16. 5 bu. = ? pk.              |
| 8. 32 qt. = ? pk. | 17. $2\frac{1}{2}$ bu. = ? pk. |
| 9. 6 pk. = ? qt.  | 18. 1 bu. = ? qt.              |

19. At 90¢ a bushel, what will 3 bu. of wheat cost?

20. At \$1 a bushel, what will 8 bu. 2 pk. of wheat cost?  
Instead of 8 bu. 2 pk., what will this be called?

21. At  $\$1\frac{1}{8}$  a bushel, what will 16 bu. of wheat cost?  
Instead of  $\$1\frac{1}{8}$ , what will this be called?

## 93. Liquid Measure

- |                   |                                 |
|-------------------|---------------------------------|
| 1. 2 pt. = ? qt.  | 10. 20 qt. = ? pt.              |
| 2. 1 pt. = ? qt.  | 11. $\frac{1}{2}$ qt. = ? pt.   |
| 3. 4 pt. = ? qt.  | 12. $1\frac{1}{2}$ qt. = ? pt.  |
| 4. 8 pt. = ? qt.  | 13. $5\frac{1}{2}$ qt. = ? pt.  |
| 5. 5 pt. = ? qt.  | 14. 3 gal. = ? qt.              |
| 6. 7 pt. = ? qt.  | 15. 6 gal. = ? qt.              |
| 7. 30 pt. = ? qt. | 16. 8 qt. = ? gal.              |
| 8. 3 qt. = ? pt.  | 17. $3\frac{1}{2}$ gal. = ? qt. |
| 9. 5 qt. = ? pt.  | 18. 10 qt. = ? gal.             |

19. At 60¢ a quart, what will  $\frac{1}{2}$  pt. of cream cost?

20. At 32¢ a gallon, what will 3 qt. of milk cost?

21. At 48¢ a quart, what will a pint of cream cost?

22. A dealer has a gallon of cream. What is this worth  
at 30¢ a pint?

23. How many pints in a gallon? in 2 gal.? in  $1\frac{1}{2}$  gal.?

## 94. Addition

$$\begin{array}{r} 1. \text{ 2 ft. 3 in.} \\ 3 \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \text{ 3 ft. 4 in.} \\ 3 \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 7. \text{ 3 yd. 27 in.} \\ 2 \quad 9 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \text{ 3 ft. 6 in.} \\ 5 \quad 5 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \text{ 4 ft. 3 in.} \\ 5 \quad 9 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \text{ 2 ft. 9 in.} \\ 3 \quad 9 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \text{ 3 yd. 10 in.} \\ 2 \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \text{ 2 yd. 2 ft.} \\ 3 \quad 1 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \text{ 3 yd. 2 ft.} \\ 2 \quad 2 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \text{ 5 sq. ft. 100 sq. in.} \\ 2 \quad 44 \\ \hline \end{array}$$

$$\begin{array}{r} 11. \text{ 3 cu. yd. 20 cu. ft.} \\ 2 \quad 7 \\ \hline \end{array}$$

12. A lady buys 27 yd. 18 in. of cloth to add to 18 yd. 18 in. that she has. How many yards has she now?

13. A lady buys  $33\frac{1}{2}$  yd. of cloth and finds that she needs  $4\frac{1}{4}$  yd. more. She decides to buy 18 in. more than this. How much does she buy in all?

14. A man wishes to send an article by express. It weighs 7 lb. 13 oz., and he finds that the wrapping paper weighs 12 oz. What is the total weight of the package?

15. A man has worked 2 wk. 5 da. on a job, and must work 3 wk. 4 da. longer to finish it. Allowing six working days to a week, how long will it take to do the whole work?

16. The opening in a picture frame has an area of 2 sq. ft. 37 sq. in., and the frame itself has an area of 78 sq. in. What is the total area of the frame and opening?

17. A man sells  $52\frac{1}{2}$  yd. of carpet. The next day the purchaser buys  $3\frac{1}{4}$  yd. more. He loses 18 in. by sewing and matching. How many yards in the carpet as laid?

18. A contractor excavated  $48\frac{1}{2}$  cu. yd. of earth one day and  $51\frac{1}{2}$  cu. yd. the next day. How many cubic feet did he excavate in the two days together?

95. Addition

$$\begin{array}{r} 1. \text{ 1 ft. 4 in.} \\ \underline{2 \quad 6} \end{array}$$

$$\begin{array}{r} 5. \text{ 8 lb. 10 oz.} \\ \underline{2 \quad 14} \end{array}$$

$$\begin{array}{r} 9. \text{ 8 rd. 10 ft.} \\ \underline{3 \quad 6} \end{array}$$

$$\begin{array}{r} 2. \text{ 3 ft. 8 in.} \\ \underline{2 \quad 4} \end{array}$$

$$\begin{array}{r} 6. \text{ 5 lb. 11 oz.} \\ \underline{2 \quad 8} \end{array}$$

$$\begin{array}{r} 10. \text{ 7 bu. 2 pk.} \\ \underline{2 \quad 2} \end{array}$$

$$\begin{array}{r} 3. \text{ 7 ft. 9 in.} \\ \underline{3 \quad 4} \end{array}$$

$$\begin{array}{r} 7. \text{ 7 yd. 2 ft.} \\ \underline{8 \quad 1} \end{array}$$

$$\begin{array}{r} 11. \text{ 7 gal. 1 qt.} \\ \underline{5 \quad 3} \end{array}$$

$$\begin{array}{r} 4. \text{ 2 lb. 3 oz.} \\ \underline{4 \quad 9} \end{array}$$

$$\begin{array}{r} 8. \text{ 9 yd. 2 ft.} \\ \underline{6 \quad 2} \end{array}$$

$$\begin{array}{r} 12. \text{ 9 gal. 3 qt.} \\ \underline{8 \quad 3} \end{array}$$

13. A table is 3 ft. 8 in. long and 2 ft. 6 in. wide. What is the sum of its length and breadth?

14. A table is 4 ft. 7 in. long and 3 ft. 6 in. wide. What is the perimeter of the table?

15. A room is 18 ft. 9 in. long and 12 ft. 6 in. wide. What is the perimeter of the room?

16. A lamp weighing 3 lb. 9 oz. contains 13 oz. of oil. What is the combined weight of the lamp and the oil?

17. A rug is 3 yd. 2 in. long and 1 yd. 10 in. wide. How many yards of braid will it take to bind it, allowing 12 in. for waste?

18. A piece of fence extends 8 rd.  $8\frac{1}{4}$  ft. along a field, and  $3\frac{1}{2}$  rd. more must be built. What will be the total length when it is finished?

19. A man has worked 7 wk. 2 da. on a job and must work 4 wk. 3 da. longer to finish it. Allowing six working days to a week, how long will it take to do the whole work?

20. A carpenter has built 10 rd.  $8\frac{1}{4}$  ft. of fence, and has to build  $2\frac{1}{2}$  rd. more to complete one side of a square. What will be the perimeter of the square?

## 96. Subtraction

$$\begin{array}{r} 1. \quad 4 \text{ ft. } 11 \text{ in.} \\ \quad \quad 2 \quad \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 8 \text{ hr. } 15 \text{ min.} \\ \quad \quad \quad \quad 20 \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 8 \text{ lb. } 5 \text{ oz.} \\ \quad \quad 2 \quad \quad 6 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 4 \text{ lb. } 14 \text{ oz.} \\ \quad \quad 1 \quad \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 16 \text{ bu. } 2 \text{ pk.} \\ \quad \quad \quad \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 5 \text{ rd. } 10 \text{ ft.} \\ \quad \quad 2 \quad \quad 5\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 5 \text{ gal. } 3 \text{ qt.} \\ \quad \quad 2 \quad \quad 1 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 4 \text{ wk. } 3 \text{ da.} \\ \quad \quad 1 \quad \quad 5 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 6 \text{ mi. } 35 \text{ rd.} \\ \quad \quad 4 \quad \quad 17 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 5 \text{ sq. ft. } 0 \text{ sq. in.} \\ \quad \quad 1 \quad \quad 44 \\ \hline \end{array}$$

$$\begin{array}{r} 11. \quad 3 \text{ cu. yd. } 3 \text{ cu. ft.} \\ \quad \quad 1 \quad \quad 20 \\ \hline \end{array}$$

12. A rug 3 yd. 6 in. long is placed on a floor 5 yd. 4 in. long. How much of the length of the floor is not covered?

13. A man borrowed some money 2 mo. 12 da. ago, for 6 mo. How long after to-day before the money is due?

14. A boy weighs  $75\frac{1}{4}$  lb., and has gained 6 lb. 8 oz. since his last birthday. How much did he then weigh?

15. A girl weighs 67 lb. 4 oz., and the last time she was weighed her weight was 65 lb. 12 oz. How much has she gained?

16. A man weighed 162 lb. 4 oz. on January 1, and the next time he was weighed he had lost  $3\frac{1}{2}$  lb. How much did he then weigh?

17. A lady having purchased  $14\frac{1}{2}$  yd. of cloth finds that she should have bought 17 yd. 18 in. How much more should she buy?

18. A lady having purchased  $16\frac{1}{2}$  yd. of cloth finds she has 27 in. too much. How much did she really need?

19. A lady purchased  $27\frac{1}{4}$  yd. of cloth for a dress, and then found she could have made it with  $25\frac{3}{4}$  yd. How many inches did she waste?

## 97. Subtraction

$$\begin{array}{r} 1. \ 19 \text{ ft. } 9 \text{ in.} \\ \underline{2 \quad 6} \end{array}$$

$$\begin{array}{r} 5. \ 10 \text{ lb. } 10 \text{ oz.} \\ \underline{\quad \quad 13} \end{array}$$

$$\begin{array}{r} 9. \ 4 \text{ rd. } \frac{1}{2} \text{ ft.} \\ \underline{\quad \quad \quad 7} \end{array}$$

$$\begin{array}{r} 2. \ 18 \text{ ft. } 7 \text{ in.} \\ \underline{5 \quad 7} \end{array}$$

$$\begin{array}{r} 6. \ 21 \text{ lb. } 10 \text{ oz.} \\ \underline{1 \quad 13} \end{array}$$

$$\begin{array}{r} 10. \ 21 \text{ mi. } 70 \text{ rd.} \\ \underline{\quad \quad 16} \end{array}$$

$$\begin{array}{r} 3. \ 10 \text{ ft. } 6 \text{ in.} \\ \underline{\quad \quad 8} \end{array}$$

$$\begin{array}{r} 7. \ 12 \text{ yd. } 1 \text{ ft.} \\ \underline{\quad \quad 2} \end{array}$$

$$\begin{array}{r} 11. \ 4 \text{ mi. } 20 \text{ rd.} \\ \underline{\quad \quad 40} \end{array}$$

$$\begin{array}{r} 4. \ 12 \text{ ft. } 6 \text{ in.} \\ \underline{1 \quad 8} \end{array}$$

$$\begin{array}{r} 8. \ 32 \text{ yd. } 1 \text{ ft.} \\ \underline{1 \quad 2} \end{array}$$

$$\begin{array}{r} 12. \ 12 \text{ mi. } 1 \text{ ft.} \\ \underline{\quad \quad 4 \quad 81} \end{array}$$

13. A boy is 11 yr. 4 mo. old, and his sister is exactly 2 yr. 6 mo. younger than he. How old is his sister?

14. A man had to travel  $6\frac{1}{2}$  mi., and has already traveled 2 mi. 160 rd. How far has he still to travel?

15. A room is 3 ft. 8 in. longer than it is wide. It is 17 ft. long. How wide is it?

16. A building is 31 ft. 8 in. high. The lowest story is 10 ft. 9 in. high. How high is the building above the lowest story?

17. A rug 6 ft. 8 in. wide lies on a floor 14 ft. 4 in. wide. How much of the width of the floor is not covered?

18. An express package weighs 17 lb. 4 oz. It consists of a box and some goods, the goods weighing 13 lb. 8 oz. How much does the box weigh?

19. A man is 37 yr. 8 mo. old, his son is 12 yr. 2 mo. old, and his daughter 10 yr. 8 mo. old. How much older is the man than his son? than his daughter?

20. A man is 36 yr. 6 mo. old, his wife is 32 yr. 4 mo. old, and his son 11 yr. 3 mo. old. How much older than the son is the father? is the mother?

## 98. Multiplication

*Express as inches, and then as feet :*

1.  $2 \times 6$  in.    2.  $3 \times 4$  in.    3.  $2 \times 12$  in.    4.  $4 \times 9$  in.

*Express as ounces, and then as pounds :*

5.  $4 \times 4$  oz.    6.  $8 \times 2$  oz.    7.  $4 \times 8$  oz.    8.  $2 \times 16$  oz.

*Express as quarts, and then as gallons :*

9.  $2 \times 2$  qt.    10.  $8 \times 1$  qt.    11.  $2 \times 8$  qt.    12.  $4 \times 2$  qt.

*Express as feet or inches, and then as yards :*

13.  $3 \times 2$  ft.    14.  $9 \times 2$  ft.    15.  $3 \times 12$  in.    16.  $2 \times 18$  in.

*Express as quarts or pecks, and then as bushels :*

17.  $2 \times 16$  qt.    18.  $4 \times 8$  qt.    19.  $4 \times 4$  pk.    20.  $8 \times 4$  pk.

*Multiply :*

- |                       |                        |
|-----------------------|------------------------|
| 21. 1 ft. 3 in. by 2. | 27. 2 lb. 9 oz. by 2.  |
| 22. 1 ft. 6 in. by 2. | 28. 3 yd. 1 ft. by 3.  |
| 23. 1 ft 9 in. by 2.  | 29. 3 yd. 2 ft. by 6.  |
| 24. 3 ft. 8 in. by 3. | 30. 2 gal. 2 qt. by 2. |
| 25. 3 ft 7 in. by 4.  | 31. 2 gal. 2 qt. by 8. |
| 26. 2 lb. 8 oz. by 2. | 32. 8 qt. 1 pt. by 8.  |

33. Find the perimeter of a square 4 ft. 3 in. on a side.

34. If a square flower bed is 3 ft. 6 in. on a side, how long will be a string stretched around the perimeter ?

35. One side of a square is 8 in. Express the perimeter in inches ; in feet and inches ; in feet and a fraction.

36. If a triangular flower bed is 3 ft. 4 in. on a side, and we wish to put a wire fence around it of three strands, how much wire must we have, allowing 5 ft. extra for all the fastenings ?



## 99. Division

*Express as inches, and then as feet :*

1. 24 in.  $\div$  2.    2. 48 in.  $\div$  2.    3. 72 in.  $\div$  2.    4. 72 in.  $\div$  3.

*Express as ounces, and then as pounds :*

5. 32 oz.  $\div$  2.    6. 48 oz.  $\div$  3.    7. 64 oz.  $\div$  2.    8. 64 oz.  $\div$  4.

*Express as quarts, and then as gallons :*

9. 16 qt.  $\div$  2.    10. 32 qt.  $\div$  8.    11. 64 qt.  $\div$  8.    12. 48 qt.  $\div$  12.

*Express as feet or inches, and then as yards :*

13. 12 ft.  $\div$  2.    14. 60 ft.  $\div$  2.    15. 9 ft.  $\div$  3.    16. 72 in.  $\div$  2.

*Express as quarts or pecks, and then as bushels :*

17. 64 qt.  $\div$  2.    18. 16 pk.  $\div$  4.    19. 32 pk.  $\div$  4.    20. 64 pk.  $\div$  8.

*Divide :*

21. 10 ft. 4 in.  $\div$  2.

27. 64 mi. 16 rd.  $\div$  8.

22. 18 ft. 6 in.  $\div$  6.

28. 1 ft. 6 in.  $\div$  3.

23. 16 yd. 2 ft.  $\div$  2.

29. 2 ft. 6 in.  $\div$  10.

24. 25 lb. 15 oz.  $\div$  5.

30. 2 lb. 8 oz.  $\div$  20.

25. 21 gal. 7 pt.  $\div$  7.

31. 66 ft.  $\div$  11 ft.

26. 81 bu. 18 qt.  $\div$  9.

32. 42 lb.  $\div$  21 lb.

33. How many times is 1 ft. 8 in. contained in 5 ft. ?

34. If a book covers 32 sq. in., how many such books will it take to cover 96 sq. in. ? 320 sq. in. ?

35. If a wheel is 9 ft. in circumference, how many revolutions will it make in going 108 ft. ?

36. If a gallon of ice cream is allowed for 24 persons, what part of a pint is allowed to each ?

37. The perimeter of a triangle is 72 in. and the sides are all equal. Express each side in inches ; in feet.

## 100. Review

- |               |                     |                    |                   |
|---------------|---------------------|--------------------|-------------------|
| 1. $99 + 8.$  | 7. $75 - 17.$       | 13. $4 \times 22.$ | 19. $108 \div 9.$ |
| 2. $33 + 8.$  | 8. $52 - 28.$       | 14. $6 \times 35.$ | 20. $132 \div 6.$ |
| 3. $98 + 20.$ | 9. $\$1 - 72\phi.$  | 15. $7 \times 27.$ | 21. $63 \div 8.$  |
| 4. $76 + 35.$ | 10. $\$1 - 54\phi.$ | 16. $8 \times 33.$ | 22. $52 \div 7.$  |
| 5. $73 + 42.$ | 11. $\$2 - 28\phi.$ | 17. $14 \times 7.$ | 23. $43 \div 6.$  |
| 6. $63 + 28.$ | 12. $\$2 - 37\phi.$ | 18. $16 \times 8.$ | 24. $80 \div 9.$  |

*Reduce to lowest terms :*

- |                    |                    |                    |                    |
|--------------------|--------------------|--------------------|--------------------|
| 25. $\frac{2}{4}.$ | 26. $\frac{2}{8}.$ | 27. $\frac{3}{9}.$ | 28. $\frac{3}{6}.$ |
|--------------------|--------------------|--------------------|--------------------|

*Reduce to improper fractions :*

- |                     |                     |                     |                     |
|---------------------|---------------------|---------------------|---------------------|
| 29. $1\frac{2}{3}.$ | 30. $3\frac{1}{4}.$ | 31. $5\frac{1}{8}.$ | 32. $3\frac{3}{8}.$ |
|---------------------|---------------------|---------------------|---------------------|

*Perform the operations indicated :*

- |                                   |                                   |                          |                                     |
|-----------------------------------|-----------------------------------|--------------------------|-------------------------------------|
| 33. $\frac{1}{2} + \frac{1}{8}.$  | 41. $\frac{1}{2} - \frac{1}{8}.$  | 49. $3 - \frac{1}{8}.$   | 57. $3 \times 2\frac{1}{3}.$        |
| 34. $\frac{1}{2} + \frac{3}{8}.$  | 42. $\frac{1}{2} - \frac{1}{4}.$  | 50. $4 - \frac{3}{4}.$   | 58. $4 \times 2\frac{3}{4}.$        |
| 35. $\frac{1}{4} + \frac{1}{8}.$  | 43. $\frac{3}{4} - \frac{1}{2}.$  | 51. $5 - \frac{7}{8}.$   | 59. $5 \times 3\frac{2}{5}.$        |
| 36. $\frac{3}{4} + \frac{1}{8}.$  | 44. $\frac{3}{4} - \frac{1}{8}.$  | 52. $7 - \frac{5}{8}.$   | 60. $8 \times 2\frac{7}{8}.$        |
| 37. $\frac{3}{4} + \frac{3}{8}.$  | 45. $\frac{7}{8} - \frac{3}{4}.$  | 53. $\frac{1}{4}$ of 36. | 61. $\frac{1}{2}$ of $\frac{3}{4}.$ |
| 38. $\frac{3}{4} + \frac{5}{8}.$  | 46. $1\frac{1}{2} - \frac{1}{8}.$ | 54. $\frac{3}{4}$ of 44. | 62. $\frac{2}{3}$ of $\frac{3}{4}.$ |
| 39. $\frac{3}{4} + \frac{7}{8}.$  | 47. $2\frac{1}{4} - \frac{1}{4}.$ | 55. $\frac{3}{8}$ of 48. | 63. $\frac{1}{2}$ of $\frac{2}{3}.$ |
| 40. $1\frac{1}{2} + \frac{1}{8}.$ | 48. $2\frac{1}{4} - \frac{1}{2}.$ | 56. $\frac{5}{8}$ of 64. | 64. $\frac{3}{4}$ of $\frac{4}{5}.$ |
65. How many inches in  $\frac{3}{4}$  yd. ? in  $\frac{1}{3}$  of  $\frac{3}{4}$  yd. ?
66. How many pints in 2 gal. ? in  $\frac{1}{2}$  gal. ? in  $3\frac{1}{2}$  gal. ?
67. At 24¢ a pound, how much will  $3\frac{1}{2}$  lb. of meat cost ?
68. At 32¢ a pound, how much will  $2\frac{1}{4}$  lb. of butter cost ?
69. If I go to the grocer's and spend 37¢ for sugar, 44¢ for butter, and 22¢ for cheese, how much do I spend for all ? How much change is due from \$1.10 ?
70. If I spend 62¢, 35¢, 20¢, and 8¢, how much do I spend in all ? Express the result as cents ; as dollars and cents ; as dollars and a fraction.

## CHAPTER II

### I. OPERATIONS WITH INTEGERS

#### 1. Adding 2's and 3's

1.  $32 + 2$ .
  2.  $45 + 2$ .
  3.  $178 + 2$ .
  4.  $164 + 2$ .
  5.  $86 + 20$ .
  6.  $73 + 20$ .
  7.  $97 + 20$ .
  8.  $89 + 20$ .
  9.  $92 + 3$ .
  10.  $78 + 3$ .
  11.  $297 + 3$ .
  12.  $384 + 3$ .
  13.  $66 + 30$ .
  14.  $83 + 30$ .
  15.  $75 + 30$ .
  16.  $99 + 30$ .
17. How much is \$117 and \$3? 149 ft. and 30 ft.?
18. How much is 239 ft. and 3 ft.? 239 ft. and 20 ft.?
19. How much is \$229 and \$2? \$222 and \$9? 269 and 10 and 2? 269 and 12? 263 and 19?
20. How much is 179 ft. and 3 ft.? 173 ft. and 9 ft.? 173 and 10 and 9? 173 and 19? 273 and 39?

#### 2. Adding 4's and 5's

1.  $72 + 4$ .
  2.  $46 + 4$ .
  3.  $394 + 4$ .
  4.  $488 + 4$ .
  5.  $95 + 40$ .
  6.  $83 + 40$ .
  7.  $97 + 40$ .
  8.  $99 + 40$ .
  9.  $96 + 5$ .
  10.  $77 + 5$ .
  11.  $264 + 5$ .
  12.  $798 + 5$ .
  13.  $45 + 50$ .
  14.  $32 + 50$ .
  15.  $97 + 50$ .
  16.  $89 + 50$ .
17. How much is \$176 and \$5? \$298 and \$4?
18. How much is \$297 and \$4? \$399 and \$5?
19. How much is 198 ft. and 5 ft.? 198 ft. and 10 ft.? 298 ft. and 15 ft.?
20. If a man weighs 149 lb. and carries a 50-pound box, how much do the man and box together weigh? What would this be if the box weighed 51 lb.? 55 lb.?

## 3. Adding 6's and 7's

1.  $98 + 6$ .
2.  $96 + 6$ .
3.  $263 + 6$ .
4.  $384 + 6$ .
5.  $72 + 60$ .
6.  $97 + 60$ .
7.  $95 + 60$ .
8.  $99 + 60$ .
9.  $83 + 7$ .
10.  $96 + 7$ .
11.  $297 + 7$ .
12.  $488 + 7$ .
13.  $94 + 70$ .
14.  $72 + 70$ .
15.  $95 + 70$ .
16.  $89 + 70$ .
17. Add \$197 and \$6; \$196 and \$7.
18. Add \$187 and \$20; \$187 and \$23.
19. How much is 89 mi. and 7 mi. and 6 mi.?
20. If you have 39 marbles and 6 marbles, how many marbles have you?
21. If a man has \$297 in the bank and deposits \$7 one week and \$60 the next week, how much does he then have?
22. If a farmer has 193 acres of land and buys 10 more from one man, 7 from another, and 60 from another, how many acres does he then have?

## 4. Adding 8's and 9's

1.  $99 + 8$ .
2.  $95 + 8$ .
3.  $297 + 8$ .
4.  $462 + 8$ .
5.  $88 + 80$ .
6.  $93 + 80$ .
7.  $76 + 80$ .
8.  $94 + 80$ .
9.  $99 + 9$ .
10.  $92 + 9$ .
11.  $484 + 9$ .
12.  $677 + 9$ .
13.  $98 + 90$ .
14.  $75 + 90$ .
15.  $86 + 90$ .
16.  $63 + 90$ .
17. Add \$288 and \$8 and \$90.
18. Add \$148 and \$20 and \$8.
19. Add \$167 and \$10 and \$9.
20. How does the sum of \$398 and \$9 compare with that of \$399 and \$8?
21. How does the sum of 36 marbles and 9 marbles compare with that of 38 marbles and 7 marbles?
22. If a man pays \$89 for clothes and \$8 for shoes and \$4 for a hat, what is the total?
23. The three sides of a triangle are 14 in., 9 in., and 8 in. Express the sum in inches; in feet and a fraction.

**5. Adding Two-figure Numbers**

To add 27 to 46 mentally, it is a little easier first to add 20 and then to add 7, thinking 66, 73. State aloud only 73.

1.  $40 + 30$ .
2.  $46 + 30$ .
3.  $46 + 34$ .
4.  $46 + 39$ .
5.  $50 + 40$ .
6.  $57 + 40$ .
7.  $57 + 43$ .
8.  $57 + 48$ .
9.  $60 + 70$ .
10.  $64 + 70$ .
11.  $64 + 75$ .
12.  $64 + 79$ .
13.  $80 + 50$ .
14.  $86 + 50$ .
15.  $86 + 57$ .
16.  $86 + 59$ .
17. How much is 27 in. and 25 in. ?
18. If you have 76¢ and 71¢, how much have you ?
19. What is the sum of 38 and 8 and 14 ? (First take 38 + 8.)
20. If I pay 65¢ for a book and 75¢ for some note paper, how much do I pay for both ?
21. If I buy at a grocery store goods costing 36¢, 28¢, and 36¢, what is the total cost ?

**6. Adding Two-figure Numbers**

1.  $80 + 70$ .
2.  $87 + 70$ .
3.  $87 + 76$ .
4.  $87 + 79$ .
5.  $70 + 30$ .
6.  $78 + 30$ .
7.  $78 + 33$ .
8.  $78 + 37$ .
9.  $50 + 90$ .
10.  $57 + 90$ .
11.  $57 + 95$ .
12.  $57 + 98$ .
13.  $60 + 80$ .
14.  $68 + 80$ .
15.  $68 + 89$ .
16.  $68 + 88$ .
17.  $125 + 30$ .
18.  $125 + 37$ .
19.  $125 + 39$ .
20.  $175 + 40$ .
21.  $\$175 + \$46$ .
22.  $\$175 + \$48$ .
23. What is the sum of \$235 and \$38 ?
24. A farmer having 175 acres of land buys 36 acres more. How many acres does he then have ?
25. If the distance from here to a certain place called X is 158 mi., and another place called Y is 63 mi. beyond X, how far is Y from here ?
26. If there are 38 pupils in the fifth grade of a certain school, 32 in the sixth grade, and 30 in the seventh grade, how many pupils are there in the three grades together ?

### 7. Adding Two-figure Numbers

1.  $28 + 14$ .    5.  $38 + 32$ .    9.  $86 + 25$ .    13.  $98 + 46$ .
2.  $34 + 19$ .    6.  $58 + 27$ .    10.  $95 + 35$ .    14.  $79 + 48$ .
3.  $46 + 27$ .    7.  $87 + 38$ .    11.  $97 + 15$ .    15.  $94 + 73$ .
4.  $29 + 13$ .    8.  $59 + 26$ .    12.  $87 + 44$ .    16.  $78 + 82$ .
17. How much is  $99\phi$  and  $16\phi$ ?  $95\phi$  and  $17\phi$ ?
18. A school paid \$94 for new blackboards, \$7 for erasers, and \$4 for crayons. How much did it pay for all?
19. If a man pays \$135 for a horse, \$8 for delivering it at his home, and \$3 for feed, what is the total?
20. A lady paid  $47\phi$  for cloth,  $26\phi$  for braid, and  $8\phi$  for thread. What was the total?
21. A lady paid  $36\phi$  for braid,  $18\phi$  for needles,  $15\phi$  for thread,  $5\phi$  for car fare, and  $26\phi$  for postage stamps. How much did she pay in all?

### 8. Adding Two-figure Numbers

1.  $70 + 56$ .    5.  $80 + 68$ .    9.  $90 + 35$ .    13.  $60 + 56$ .
2.  $75 + 56$ .    6.  $87 + 68$ .    10.  $96 + 35$ .    14.  $69 + 56$ .
3.  $75 + 55$ .    7.  $87 + 63$ .    11.  $96 + 34$ .    15.  $69 + 51$ .
4.  $75 + 57$ .    8.  $87 + 66$ .    12.  $96 + 37$ .    16.  $69 + 58$ .
17. Add \$265 and \$80; \$265 and \$86.
18. If a rectangle is 135 ft. long and 65 ft. wide, what is the perimeter?
19. If a school spends \$135 for repairs and \$78 for fuel, what is the total?
20. If a man has 68 cows and 17 sheep, how many head of stock does he have?
21. If a man has \$275 in the bank and deposits \$18 more, how much does he then have?
22. If a man has \$260 in the bank and deposits \$50 more to-day and \$75 more to-morrow, how much will he then have?

## 9. Subtraction

- |              |              |               |               |
|--------------|--------------|---------------|---------------|
| 1. $42 - 8.$ | 5. $23 - 4.$ | 9. $57 - 9.$  | 13. $31 - 8.$ |
| 2. $36 - 7.$ | 6. $34 - 6.$ | 10. $26 - 8.$ | 14. $53 - 7.$ |
| 3. $28 - 9.$ | 7. $41 - 7.$ | 11. $35 - 7.$ | 15. $46 - 7.$ |
| 4. $52 - 7.$ | 8. $73 - 8.$ | 12. $52 - 6.$ | 16. $37 - 8.$ |

17. If a strip 8 in. wide is cut from a strip of carpet  $\frac{3}{4}$  yd. wide, how many inches wide is the remainder?

18. If a town is 72 mi. from here, and another town is 8 mi. this side of it, how far is this other town from here?

19. What is the base of a rectangle whose perimeter is 44 in. and whose altitude is 8 in.?

20. What must be added to 9 to make 61? What must be subtracted from 61 to make 8?

21. How much must be added to 48 ft. of rope to make 55 ft.? to make 53 ft.? to make 51 ft.?

## 10. Subtraction

To subtract 15 from 37 it is best to think of  $37 - 10 - 5$ , or  $27 - 5$ . State only the result, 22.

- |                 |                  |                  |                |
|-----------------|------------------|------------------|----------------|
| 1. $37 - 15.$   | 5. $82 - 31.$    | 9. $76 - 23.$    | 13. $93 - 52.$ |
| 2. $48 - 12.$   | 6. $65 - 23.$    | 10. $87 - 45.$   | 14. $96 - 66.$ |
| 3. $54 - 32.$   | 7. $77 - 25.$    | 11. $96 - 31.$   | 15. $85 - 75.$ |
| 4. $69 - 27.$   | 8. $84 - 33.$    | 12. $88 - 44.$   | 16. $75 - 42.$ |
| 17. $125 - 20.$ | 18. $235 - 100.$ | 19. $325 - 125.$ |                |

20. What must be added to 22 to make 77?

21. What must be subtracted from 85 to make 60?

22. What number is 12 less than 42? 12 less than 72?

23. If I have \$1.75 and spend 32¢, how much have I left?

24. If a playground is 185 ft. long and 72 ft. wide, how much greater is the length than the width?

25. If a farmer having 78 head of cattle should sell 36 head, how many head would he have left?



## 11. Subtraction

To subtract 48 from 83 mentally, it is easier first to subtract 40, and then to subtract 8, thinking 43, 35. State aloud only 35.

1.  $83 - 30$ .
2.  $83 - 35$ .
3.  $72 - 20$ .
4.  $72 - 28$ .
5.  $64 - 40$ .
6.  $64 - 47$ .
7.  $91 - 50$ .
8.  $91 - 52$ .
9.  $87 - 60$ .
10.  $87 - 68$ .
11.  $65 - 20$ .
12.  $65 - 27$ .
13.  $56 - 20$ .
14.  $56 - 29$ .
15.  $80 - 30$ .
16.  $80 - 32$ .
17.  $135 - 60$ .
18.  $135 - 65$ .
19.  $135 - 69$ .
20. How much more than \$45 is \$82?
21. How much less than \$73 is \$45?
22. What number must be added to 27 in. to make 54 in.?
23. If a man has \$525 in the bank, and takes out \$100, how much will he have? Instead of \$100, suppose he takes out \$125? suppose he takes out \$127?

## 12. Subtraction

1.  $50 - 20$ .
2.  $53 - 20$ .
3.  $53 - 23$ .
4.  $53 - 28$ .
5.  $70 - 40$ .
6.  $72 - 40$ .
7.  $72 - 42$ .
8.  $72 - 49$ .
9.  $51 - 32$ .
10.  $63 - 24$ .
11.  $65 - 28$ .
12.  $84 - 58$ .
13.  $86 - 29$ .
14.  $85 - 27$ .
15.  $92 - 36$ .
16.  $94 - 47$ .
17. What number must be added to 28 make 252?
18. How much more is \$120 than \$30? than \$35?
19. How much more is \$125 than \$40? than \$47?
20. What number must be subtracted from 72 ft. to make 36 ft.?
21. The perimeter of a triangle is 31 in., and two sides are 13 in. and 9 in. What is the third side?
22. If you have made a score of 57 in a game and some one else has made 39, how much are you ahead?
23. If in a running match one boy has run 111 yd. and another has run 98 yd., the first boy is how far ahead?

## 13. Subtraction

1.  $81 - 50$ .    5.  $63 - 40$ .    9.  $45 - 20$ .    13.  $77 - 58$ .  
 2.  $81 - 53$ .    6.  $63 - 48$ .    10.  $45 - 29$ .    14.  $77 - 49$ .  
 3.  $72 - 30$ .    7.  $54 - 20$ .    11.  $66 - 40$ .    15.  $80 - 52$ .  
 4.  $72 - 39$ .    8.  $54 - 27$ .    12.  $66 - 48$ .    16.  $83 - 55$ .  
 17.  $\$105 - \$40$ .    18.  $\$105 - \$45$ .    19.  $\$105 - \$48$ .  
 20. What is the difference between 35 bu. and 100 bu.?  
 21. What is the difference between 48 ft. and 148 ft.?  
 48 ft. and 144 ft.? 48 ft. and 134 ft.?  
 22. If a retail dealer owes a wholesale dealer  $\$425$  and pays him  $\$125$ , how much does he still owe?  
 23. If a merchant sold  $\$130$  worth of goods one day,  $\$98$  worth the next day, and  $\$89$  worth the next day, his sales for the first day were how much greater than for the second? than for the third?

## 14. Subtracting from 100

To subtract 48 from 100, subtract  $40 + 8$  from  $90 + 10$ , thinking  $50 + 2 = 52$ . State aloud only 52.

1.  $100 - 26$ .    5.  $100 - 47$ .    9.  $100 - 53$ .    13.  $100 - 81$ .  
 2.  $100 - 58$ .    6.  $100 - 54$ .    10.  $100 - 69$ .    14.  $100 - 66$ .  
 3.  $100 - 25$ .    7.  $100 - 82$ .    11.  $100 - 18$ .    15.  $100 - 78$ .  
 4.  $100 - 36$ .    8.  $100 - 61$ .    12.  $100 - 38$ .    16.  $100 - 92$ .

*Find the change due from \$1 on purchases of:*

17.  $16\phi$ .    21.  $33\phi$ .    25.  $75\phi$ .    29.  $29\phi$ .    33.  $57\phi$ .  
 18.  $37\phi$ .    22.  $40\phi$ .    26.  $30\phi$ .    30.  $95\phi$ .    34.  $13\phi$ .  
 19.  $49\phi$ .    23.  $52\phi$ .    27.  $25\phi$ .    31.  $85\phi$ .    35.  $86\phi$ .  
 20.  $28\phi$ .    24.  $88\phi$ .    28.  $50\phi$ .    32.  $15\phi$ .    36.  $46\phi$ .  
 37. How much is 100 ft.  $- 68$  ft.?

38. If a man owes  $\$100$  and pays  $\$59$ , how much does he still owe?

## 15. Subtracting from Hundreds

In subtracting 138 from 700, think of 700 as  $600 + 90 + 10$ , and subtract from left to right.

1.  $100 - 20$ .    5.  $200 - 43$ .    9.  $400 - 55$ .    13.  $500 - 120$ .
2.  $100 - 26$ .    6.  $200 - 69$ .    10.  $400 - 38$ .    14.  $500 - 125$ .
3.  $200 - 26$ .    7.  $300 - 72$ .    11.  $500 - 29$ .    15.  $600 - 130$ .
4.  $200 - 57$ .    8.  $300 - 47$ .    12.  $500 - 78$ .    16.  $600 - 135$ .
17. What must be subtracted from \$700 to make \$138?
18. If the distance from Chicago to New York is 1000 mi., and Detroit is 256 mi. from Chicago, how far is Detroit from New York by this route?
19. If a man owes \$142 and pays two \$100 bills, how much change is due him?
20. If your purchases amount to \$1.50, 50¢, 25¢, and 75¢, how much change is due you from \$10?

## 16. Making Change

For the method of making change see page 12, or follow the plan of Exercise 15 above.

*Find the change due from \$1 if you make purchases of:*

1. 72¢.    2. 17¢.    3. 26¢.    4. 41¢.    5. 83¢.

*Find the change due from \$2 if you make purchases of:*

6. \$1.25.    7. \$1.36.    8. \$1.14.    9. \$1.50.    10. \$1.85.

*Find the change due from \$3 if you make purchases of:*

11. \$2.35.    12. \$2.48.    13. \$2.05.    14. \$2.27.    15. \$2.75.

*Find the change due from \$5 if you make purchases of:*

16. \$4.20.    17. \$4.35.    18. \$3.40.    19. \$2.80.    20. \$1.60.
21. How much is  $\$15 - \$12.75$ ?
22. How much is  $\$33 - \$21.70$ ?

## 17. Review of the Table

- |                  |                   |                   |                   |
|------------------|-------------------|-------------------|-------------------|
| 1. $4 \times 4.$ | 8. $2 \times 4.$  | 15. $5 \times 8.$ | 22. $5 \times 7.$ |
| 2. $3 \times 4.$ | 9. $7 \times 8.$  | 16. $4 \times 5.$ | 23. $3 \times 9.$ |
| 3. $2 \times 7.$ | 10. $6 \times 6.$ | 17. $4 \times 6.$ | 24. $9 \times 6.$ |
| 4. $5 \times 5.$ | 11. $3 \times 5.$ | 18. $8 \times 8.$ | 25. $2 \times 2.$ |
| 5. $3 \times 3.$ | 12. $6 \times 7.$ | 19. $9 \times 8.$ | 26. $3 \times 8.$ |
| 6. $4 \times 7.$ | 13. $9 \times 9.$ | 20. $3 \times 6.$ | 27. $7 \times 9.$ |
| 7. $7 \times 7.$ | 14. $2 \times 3.$ | 21. $6 \times 8.$ | 28. $4 \times 9.$ |

29. How much is  $7 \times \$9$ ?  $9 \times \$7$ ?

30. The product of what two other whole numbers equals the product of 4 and 9?

31. The product of what two other whole numbers equals the product of 8 and 7?

32. State two whole numbers whose product is 32. Give as many different answers as you can.

## 18. Review of the Table

- |                  |                   |                   |                   |
|------------------|-------------------|-------------------|-------------------|
| 1. $9 \times 7.$ | 9. $8 \times 4.$  | 17. $3 \times 7.$ | 25. $9 \times 5.$ |
| 2. $7 \times 2.$ | 10. $6 \times 2.$ | 18. $8 \times 9.$ | 26. $8 \times 6.$ |
| 3. $8 \times 2.$ | 11. $4 \times 3.$ | 19. $6 \times 9.$ | 27. $9 \times 4.$ |
| 4. $6 \times 5.$ | 12. $3 \times 2.$ | 20. $2 \times 8.$ | 28. $8 \times 5.$ |
| 5. $6 \times 3.$ | 13. $5 \times 6.$ | 21. $2 \times 9.$ | 29. $8 \times 3.$ |
| 6. $7 \times 4.$ | 14. $8 \times 7.$ | 22. $2 \times 5.$ | 30. $7 \times 6.$ |
| 7. $5 \times 3.$ | 15. $2 \times 6.$ | 23. $4 \times 8.$ | 31. $6 \times 4.$ |
| 8. $4 \times 2.$ | 16. $9 \times 3.$ | 24. $5 \times 9.$ | 32. $7 \times 3.$ |

33. Of what two whole numbers is 35 the product? 49? 21? 33?

34. Of what two whole numbers is 55 the product? 77? 39? 51?

35. How many yards of cloth can I buy, and at what price, so that the cost amounts to  $64\text{¢}$ ? Give as many different answers in whole numbers as you can.

## 19. Two-figure Multiplicand

Think of  $4 \times 21$  as  $80 + 4$ ; of  $4 \times 32$  as  $120 + 8$ , beginning at the left to multiply.

- |                   |                    |                    |                    |
|-------------------|--------------------|--------------------|--------------------|
| 1. $4 \times 21.$ | 6. $5 \times 21.$  | 11. $8 \times 20.$ | 16. $7 \times 61.$ |
| 2. $4 \times 20.$ | 7. $6 \times 30.$  | 12. $8 \times 21.$ | 17. $8 \times 40.$ |
| 3. $4 \times 30.$ | 8. $6 \times 31.$  | 13. $2 \times 50.$ | 18. $8 \times 41.$ |
| 4. $4 \times 31.$ | 9. $7 \times 30.$  | 14. $2 \times 53.$ | 19. $9 \times 70.$ |
| 5. $5 \times 20.$ | 10. $7 \times 31.$ | 15. $7 \times 60.$ | 20. $9 \times 71.$ |

21. At  $32\phi$  a yard, what will 4 yd. of cloth cost?

22. At  $62\phi$  a yard, what will 3 yd. of carpet cost?

23. At  $2\phi$  each, what will 23 postage stamps cost? (Multiply 23 by 2, although when you give an explanation you must say 23 times  $2\phi$ .)

24. At  $5\phi$  each, what will 31 postage stamps for foreign letters cost? what will 22 postage stamps cost?

## 20. Two-figure Multiplicand

Think of  $3 \times 47$  as  $3 \times 40$  and  $3 \times 7$ , or  $120 + 21$ , or 141. State only the result.

- |                   |                    |                    |                    |
|-------------------|--------------------|--------------------|--------------------|
| 1. $3 \times 30.$ | 7. $4 \times 23.$  | 13. $6 \times 30.$ | 19. $7 \times 62.$ |
| 2. $3 \times 33.$ | 8. $4 \times 26.$  | 14. $6 \times 31.$ | 20. $7 \times 65.$ |
| 3. $3 \times 34.$ | 9. $5 \times 40.$  | 15. $6 \times 33.$ | 21. $9 \times 20.$ |
| 4. $3 \times 37.$ | 10. $5 \times 41.$ | 16. $6 \times 36.$ | 22. $9 \times 21.$ |
| 5. $4 \times 20.$ | 11. $5 \times 42.$ | 17. $7 \times 60.$ | 23. $8 \times 30.$ |
| 6. $4 \times 22.$ | 12. $5 \times 45.$ | 18. $7 \times 61.$ | 24. $8 \times 32.$ |

25. At  $36\phi$  a dozen, what will 6 doz. oranges cost?

26. At  $32\phi$  a pound, what will 8 lb. of butter cost?

27. At  $16\phi$  a jar, what will 7 jars of marmalade cost?

28. At \$42 a thousand, what will 6 thousand feet of lumber cost?

29. At \$48 a thousand, what will 9 thousand feet of lumber cost?

## 21. Multiplication

- |                   |                    |                    |                    |
|-------------------|--------------------|--------------------|--------------------|
| 1. $3 \times 40.$ | 6. $4 \times 62.$  | 11. $6 \times 54.$ | 16. $7 \times 85.$ |
| 2. $3 \times 43.$ | 7. $4 \times 65.$  | 12. $6 \times 55.$ | 17. $9 \times 50.$ |
| 3. $3 \times 45.$ | 8. $4 \times 69.$  | 13. $7 \times 80.$ | 18. $9 \times 51.$ |
| 4. $3 \times 49.$ | 9. $6 \times 50.$  | 14. $7 \times 81.$ | 19. $9 \times 52.$ |
| 5. $4 \times 60.$ | 10. $6 \times 51.$ | 15. $7 \times 82.$ | 20. $9 \times 54.$ |

21. At \$55 each, what will 8 head of cattle cost?
22. At \$45 a set, what will 4 sets of furniture cost?
23. At 75¢ a dozen, what will 6 doz. pencils cost?
24. If one arithmetic costs 45¢, how much will 6 arithmetics cost?
25. If there are 48 ft. in each of 4 fishing lines, how many feet in all?
26. If you have 37 marbles and some one else has three times as many, how many marbles has he?

## 22. Multiplication

- |                   |                    |                    |                    |
|-------------------|--------------------|--------------------|--------------------|
| 1. $5 \times 60.$ | 7. $8 \times 60.$  | 13. $7 \times 60.$ | 19. $6 \times 80.$ |
| 2. $5 \times 67.$ | 8. $8 \times 64.$  | 14. $7 \times 67.$ | 20. $6 \times 84.$ |
| 3. $4 \times 70.$ | 9. $3 \times 90.$  | 15. $9 \times 50.$ | 21. $7 \times 70.$ |
| 4. $4 \times 73.$ | 10. $3 \times 96.$ | 16. $9 \times 55.$ | 22. $7 \times 72.$ |
| 5. $6 \times 40.$ | 11. $2 \times 80.$ | 17. $4 \times 40.$ | 23. $8 \times 60.$ |
| 6. $6 \times 47.$ | 12. $2 \times 88.$ | 18. $4 \times 48.$ | 24. $6 \times 36.$ |

25. What will 5 sets of furniture cost at \$30? at \$32?
26. What will 7 cows cost at \$40? at \$42? at \$44? at \$48? at \$52?
27. What will 9 office desks cost at \$20? at \$21? at \$22? at \$26?
28. What will 8 sets of dishes cost at \$20? at \$21? at \$23? at \$27?
29. What will be the total cost of 2 horses at \$75 each and 3 cows at \$42 each?



## 23. Multiplication

- |                   |                   |                    |                    |
|-------------------|-------------------|--------------------|--------------------|
| 1. $2 \times 33.$ | 5. $4 \times 42.$ | 9. $6 \times 72.$  | 13. $8 \times 25.$ |
| 2. $2 \times 37.$ | 6. $4 \times 45.$ | 10. $7 \times 41.$ | 14. $8 \times 27.$ |
| 3. $3 \times 23.$ | 7. $5 \times 31.$ | 11. $7 \times 43.$ | 15. $9 \times 71.$ |
| 4. $3 \times 28.$ | 8. $5 \times 36.$ | 12. $6 \times 71.$ | 16. $9 \times 73.$ |

17. At \$6.70 each, how much will 2 dictionaries cost?

18. At \$140 each, how much will 4 horses cost?

19. At \$160 each, how much will 3 carriages cost?

20. At 35¢ each, how much must a school pay for 9 text-books?

21. If the average number in each class of a school of 8 grades is 34, what is the total number in school?

22. If the average number of examples in each of 7 exercises in arithmetic is 24, how many examples are there in all the 7 exercises?

## 24. Cost of Purchases

*Find the cost of the following:*

- |                                       |                                   |
|---------------------------------------|-----------------------------------|
| 1. 4 bicycles at \$32.                | 13. 6 carts at \$52.              |
| 2. 3 tables at \$12.                  | 14. 7 acres of land at \$62.      |
| 3. 5 plows at \$22.                   | 15. 5 sets of dishes at \$33.     |
| 4. 7 stoves at \$32.                  | 16. 3 large mirrors at \$36.      |
| 5. 7 rugs at \$22.                    | 17. 4 sets of harness at \$32.    |
| 6. 6 trunks at \$23.                  | 18. 8 watch chains at \$42.       |
| 7. 9 bedsteads at \$22.               | 19. 9 watches at \$42.            |
| 8. 8 sofas at \$32.                   | 20. 8 overcoats at \$25.          |
| 9. 6 writing desks at \$21.           | 21. 9 doz. hats at \$33.          |
| 10. 2 typewriters at \$87.            | 22. 5 show cases at \$82.         |
| 11. 8 pairs of lace curtains at \$23. | 23. 6 sewing machines at \$43.    |
| 12. 5 suits of clothes at \$34.       | 24. 4 doz. window frames at \$43. |



## 25. Dividing by 2 .

- |                  |                   |                   |                    |
|------------------|-------------------|-------------------|--------------------|
| 1. $6 \div 2$ .  | 6. $32 \div 2$ .  | 11. $80 \div 2$ . | 16. $640 \div 2$ . |
| 2. $66 \div 2$ . | 7. $34 \div 2$ .  | 12. $86 \div 2$ . | 17. $340 \div 2$ . |
| 3. $64 \div 2$ . | 8. $50 \div 2$ .  | 13. $88 \div 2$ . | 18. $560 \div 2$ . |
| 4. $82 \div 2$ . | 9. $54 \div 2$ .  | 14. $90 \div 2$ . | 19. $808 \div 2$ . |
| 5. $30 \div 2$ . | 10. $56 \div 2$ . | 15. $92 \div 2$ . | 20. $980 \div 2$ . |

21. How many 2-cent stamps can you buy for \$1.40?

22. How many newspapers can you buy for 78¢, at 2¢ each?

23. At 2¢ a mile, how far can you travel for \$1.60? how far for \$1.70?

24. A class of 54 marched out of the room two by two. How many couples were there?

25. In a class of 78 pupils there are as many boys as girls. How many are there of each?

## 26. Dividing by 3

- |                  |                   |                   |                    |
|------------------|-------------------|-------------------|--------------------|
| 1. $9 \div 3$ .  | 6. $69 \div 3$ .  | 11. $78 \div 3$ . | 16. $960 \div 3$ . |
| 2. $90 \div 3$ . | 7. $36 \div 3$ .  | 12. $81 \div 3$ . | 17. $609 \div 3$ . |
| 3. $96 \div 3$ . | 8. $45 \div 3$ .  | 13. $51 \div 3$ . | 18. $750 \div 3$ . |
| 4. $60 \div 3$ . | 9. $75 \div 3$ .  | 14. $54 \div 3$ . | 19. $810 \div 3$ . |
| 5. $63 \div 3$ . | 10. $72 \div 3$ . | 15. $57 \div 3$ . | 20. $570 \div 3$ . |

21. How many yards are there in 66 ft.?

22. How many yards are there in 93 ft.?

23. How many yards are there in 360 ft.?

24. At \$3 each, how many hats can be bought for \$48?

25. At \$3 each, how many curtains can be bought for \$87?

26. At 3¢ each, how many pencils can be bought for 72¢?

27. At 3¢ each, how many yards of ribbon can be bought for 84¢?

28. The perimeter of a triangle is 150 ft. and the sides are all equal. How many feet are there in each side?

**27. Dividing by 4, 5, or 6**

- |                  |                   |                   |                    |
|------------------|-------------------|-------------------|--------------------|
| 1. $8 \div 4$ .  | 7. $50 \div 5$ .  | 13. $60 \div 6$ . | 19. $840 \div 4$ . |
| 2. $80 \div 4$ . | 8. $60 \div 5$ .  | 14. $66 \div 6$ . | 20. $520 \div 4$ . |
| 3. $84 \div 4$ . | 9. $75 \div 5$ .  | 15. $72 \div 6$ . | 21. $750 \div 5$ . |
| 4. $40 \div 4$ . | 10. $80 \div 5$ . | 16. $48 \div 6$ . | 22. $950 \div 5$ . |
| 5. $48 \div 4$ . | 11. $85 \div 5$ . | 17. $54 \div 6$ . | 23. $720 \div 6$ . |
| 6. $52 \div 4$ . | 12. $95 \div 5$ . | 18. $78 \div 6$ . | 24. $780 \div 6$ . |

25. At \$4 each, how many desks can be bought for \$48?

26. How many gallons are there in 64 qt.?

27. At \$5 a dozen, how many dozen baseballs can be bought for \$65?

28. At \$6 a head, how many sheep can be bought for \$126? How many can be bought for \$186?

29. How many inches in 10 ft.? How many times does this contain 4 in.? How many times does it contain 6 in.?

**28. Dividing by 7, 8, or 9**

- |                  |                   |                   |                    |
|------------------|-------------------|-------------------|--------------------|
| 1. $70 \div 7$ . | 7. $72 \div 8$ .  | 13. $54 \div 9$ . | 19. $840 \div 7$ . |
| 2. $77 \div 7$ . | 8. $56 \div 8$ .  | 14. $81 \div 9$ . | 20. $980 \div 7$ . |
| 3. $84 \div 7$ . | 9. $48 \div 8$ .  | 15. $99 \div 9$ . | 21. $960 \div 8$ . |
| 4. $63 \div 7$ . | 10. $64 \div 8$ . | 16. $45 \div 9$ . | 22. $480 \div 8$ . |
| 5. $91 \div 7$ . | 11. $88 \div 8$ . | 17. $72 \div 9$ . | 23. $990 \div 9$ . |
| 6. $98 \div 7$ . | 12. $96 \div 8$ . | 18. $63 \div 9$ . | 24. $630 \div 9$ . |

25. How many 7's are there in 49? in 490? in 497?

26. At \$7 a dozen, how many dozen neckties can a dealer buy for \$84?

27. How many boards, each 8 in. wide, will cover 104 in. when laid side by side?

28. If a schoolroom has 8 panes of glass in each window, and 88 panes in all, how many windows are there?

29. What is the largest number of baseball nines that can be formed at the same time from 243 boys?

## 29. Division

- |                  |                   |                   |                    |
|------------------|-------------------|-------------------|--------------------|
| 1. $40 \div 2$ . | 7. $48 \div 4$ .  | 13. $66 \div 6$ . | 19. $580 \div 2$ . |
| 2. $48 \div 2$ . | 8. $52 \div 4$ .  | 14. $72 \div 6$ . | 20. $720 \div 3$ . |
| 3. $58 \div 2$ . | 9. $56 \div 4$ .  | 15. $84 \div 6$ . | 21. $560 \div 4$ . |
| 4. $60 \div 3$ . | 10. $35 \div 5$ . | 16. $64 \div 4$ . | 22. $850 \div 5$ . |
| 5. $66 \div 3$ . | 11. $75 \div 5$ . | 17. $45 \div 5$ . | 23. $840 \div 6$ . |
| 6. $72 \div 3$ . | 12. $85 \div 5$ . | 18. $90 \div 6$ . | 24. $540 \div 6$ . |
25. At \$6 each, how many chairs can be bought for \$78 ?
26. At 5¢ each, how many pencils can I buy for 75¢ ?
27. How many boxes, each 5 in. high, in a pile 5 ft. high ?
28. How many hands (4 in., used in measuring the height of horses) in 72 in. ?
29. If I wish to pay \$1.60 in 5-cent pieces, how many do I need ? How many do I need to pay \$1.75 ?

## 30. Division

- |                  |                   |                   |                    |
|------------------|-------------------|-------------------|--------------------|
| 1. $42 \div 7$ . | 6. $96 \div 8$ .  | 11. $96 \div 3$ . | 16. $910 \div 7$ . |
| 2. $56 \div 7$ . | 7. $54 \div 9$ .  | 12. $96 \div 4$ . | 17. $960 \div 8$ . |
| 3. $91 \div 7$ . | 8. $81 \div 9$ .  | 13. $96 \div 6$ . | 18. $117 \div 9$ . |
| 4. $48 \div 8$ . | 9. $99 \div 9$ .  | 14. $98 \div 7$ . | 19. $900 \div 5$ . |
| 5. $72 \div 8$ . | 10. $96 \div 2$ . | 15. $96 \div 8$ . | 20. $207 \div 9$ . |
21. How many pecks in 64 qt. ?
22. How many bushels in 200 pk. ?
23. How many yards in 102 ft. ?
24. How many gallons in 200 qt. ?
25. How many feet in 240 in. ?
26. At \$3 each, how many hats can be bought for \$96 ?
27. At \$9 each, how many desks can be bought for \$81 ?
28. At \$8 each, how many rugs can be bought for \$104 ?
29. At \$7 a dozen, how many dozen knives can be bought for \$105 ?

## 31. Division

We may say that  $21 \div 2 = 10$  with remainder 1, but it is customary to say that it equals  $10\frac{1}{2}$ .

- |                  |                   |                   |                   |
|------------------|-------------------|-------------------|-------------------|
| 1. $21 \div 2$ . | 6. $32 \div 3$ .  | 11. $55 \div 4$ . | 16. $89 \div 5$ . |
| 2. $31 \div 2$ . | 7. $52 \div 3$ .  | 12. $62 \div 4$ . | 17. $37 \div 6$ . |
| 3. $53 \div 2$ . | 8. $53 \div 3$ .  | 13. $36 \div 5$ . | 18. $50 \div 6$ . |
| 4. $75 \div 2$ . | 9. $41 \div 4$ .  | 14. $47 \div 5$ . | 19. $63 \div 6$ . |
| 5. $31 \div 3$ . | 10. $82 \div 4$ . | 15. $68 \div 5$ . | 20. $76 \div 6$ . |
21. By what number must 2 be multiplied to make 27?  
 22. What number must be multiplied by 3 to make 44?  
 23. By what number must 75 be divided to make 15?  
 24. If \$75 is divided equally among 6 persons, what is the share of each?  
 25. If \$101 is divided equally among 4 persons, what is the share of each?

## 32. Division

- |                  |                  |                   |                   |
|------------------|------------------|-------------------|-------------------|
| 1. $43 \div 7$ . | 5. $49 \div 8$ . | 9. $55 \div 9$ .  | 13. $77 \div 6$ . |
| 2. $79 \div 7$ . | 6. $50 \div 8$ . | 10. $75 \div 9$ . | 14. $67 \div 7$ . |
| 3. $94 \div 7$ . | 7. $67 \div 8$ . | 11. $69 \div 9$ . | 15. $57 \div 8$ . |
| 4. $68 \div 7$ . | 8. $76 \div 8$ . | 12. $95 \div 9$ . | 16. $47 \div 9$ . |
17. How many yards in 46 ft.?  
 18. How many feet in 24 in.? in 30 in.?  
 19. How many gallons in 100 qt.? in 102 qt.?  
 20. How many gallons in 32 pt.? in 72 pt.? in 74 pt.?  
 21. How many bushels in 64 pk.? in 70 pk.? in 75 pk.?  
 22. If 8 boys gather 76 qt. of nuts and divide them equally, what is the share of each?  
 23. The product of two numbers is 160 and one of them is 8. What is the other number?  
 24. The product of two numbers is 164 and one of them is 8. What is the other number?

**33. Division by Multiples of 10**

- |                    |                    |                      |
|--------------------|--------------------|----------------------|
| 1. $220 \div 20$ . | 5. $720 \div 60$ . | 9. $640 \div 80$ .   |
| 2. $960 \div 30$ . | 6. $960 \div 60$ . | 10. $1040 \div 80$ . |
| 3. $640 \div 40$ . | 7. $560 \div 70$ . | 11. $1170 \div 90$ . |
| 4. $850 \div 50$ . | 8. $910 \div 70$ . | 12. $1260 \div 90$ . |
13. How many minutes in 540 sec. ?
14. How many hours in 420 min. ?
15. By what number must 30 be multiplied to make 270 ?
16. By what number must we multiply 40 to make 320 ?
17. At 40 mi. an hour, how long will it take a train to go 280 mi. ?
18. At 50 mi. an hour, how long will it take a train to go 250 mi. ?
19. At \$80 a head, how many ponies can be bought for \$960 ? How many can be bought for \$720 ?

**34. Two-figure Divisor**

- |                   |                   |                     |
|-------------------|-------------------|---------------------|
| 1. $33 \div 11$ . | 5. $60 \div 12$ . | 9. $64 \div 32$ .   |
| 2. $77 \div 11$ . | 6. $72 \div 12$ . | 10. $96 \div 32$ .  |
| 3. $24 \div 12$ . | 7. $32 \div 16$ . | 11. $480 \div 16$ . |
| 4. $48 \div 12$ . | 8. $48 \div 16$ . | 12. $960 \div 32$ . |
13. How many feet in 84 in. ?
14. How many feet in 60 in. ? in 66 in. ? in 63 in. ?
15. How many quarts in 1 bu. ? How many bushels in 64 qt. ?
16. How many square feet in 1 sq. yd. ? How many square yards in 54 sq. ft. ?
17. How many ounces in a pound ? How many pounds in 32 oz. ? in 320 oz. ?
18. There are 12 pence in an English shilling. How many shillings are there in 132 pence ?
19. How many feet in a rod ? How many rods in 33 ft. ?

## 35. Review

- |               |               |                    |                  |
|---------------|---------------|--------------------|------------------|
| 1. $28 + 28.$ | 5. $72 - 35.$ | 9. $2 \times 36.$  | 13. $56 \div 2.$ |
| 2. $35 + 47.$ | 6. $83 - 46.$ | 10. $3 \times 24.$ | 14. $45 \div 3.$ |
| 3. $29 + 27.$ | 7. $84 - 37.$ | 11. $4 \times 37.$ | 15. $72 \div 4.$ |
| 4. $56 + 28.$ | 8. $55 - 29.$ | 12. $5 \times 29.$ | 16. $85 \div 5.$ |
17. What is the cost of 7 cows at \$42?
18. What is the cost of 5 lb. of meat at 16¢?
19. What is the cost of 2 bu. of wheat at 85¢?
20. What is the cost of 6 yd. of cotton at 12¢?
21. What is the cost of 3 lb. of figs at 18¢?
22. What is the length of 4 boards, each 14 ft. long?
23. What is the width of 3 strips of cloth, each 27 in. wide?
24. What is the weight of 5 bu. of corn, each bushel weighing 56 lb.?

## 36. Review

- |                   |                   |                   |                    |
|-------------------|-------------------|-------------------|--------------------|
| 1. $35 + 47.$     | 5. $81 - 42.$     | 9. $6 \times 16.$ | 13. $37 + 27.$     |
| 2. $52 - 36.$     | 6. $5 \times 17.$ | 10. $72 \div 6.$  | 14. $80 - 59.$     |
| 3. $3 \times 14.$ | 7. $68 \div 4.$   | 11. $41 - 28.$    | 15. $7 \times 12.$ |
| 4. $72 \div 4.$   | 8. $35 + 29.$     | 12. $65 + 18.$    | 16. $91 \div 7.$   |
17. What is a quarter of the sum of 42 and 30?
18. If 7 sheep cost \$56, what is the average price?
19. If 5 lb. of steak cost 90¢, what does 1 lb. cost?
20. If 2 yd. of cloth cost 52¢, what does 1 yd. cost?
21. If 6 boys weigh 306 lb., what is the average weight?
22. What is an eighth of the difference between 97 and 25?
23. If 8 men contribute \$96, what is the average contribution?
24. If 9 strips of ribbon are 27 in. wide, what is the average width?

## II. SHORT METHODS

## 37. Addition

In short columns of two-figure numbers add both columns at once. Thus, in Exercise 1, think 22, 32, 35, 45, 50, stating only the answer.

1. 15	4. 20	7. 20	10. 15	13. 15
13	16	25	27	44
<u>22</u>	<u>34</u>	<u>35</u>	<u>38</u>	<u>36</u>
2. 23	5. 27	8. 49	11. 62	14. 34
54	28	32	31	26
<u>36</u>	<u>29</u>	<u>36</u>	<u>43</u>	<u>31</u>
3. 22	6. 42	9. 21	12. 48	15. 27
32	23	32	22	13
<u>44</u>	<u>35</u>	<u>41</u>	<u>27</u>	<u>26</u>

## 38. Addition

1. 52	3. 45	5. \$2.62	7. \$2.50	9. \$1.20
64	38	3.	1.80	2.60
<u>48</u>	<u>22</u>	<u>4.80</u>	<u>1.20</u>	<u>2.40</u>
2. 24	4. 25	6. \$1.50	8. \$3.75	10. \$3.35
36	32	.25	1.20	2.25
<u>80</u>	<u>33</u>	<u>2.75</u>	<u>1.80</u>	<u>2.75</u>

11. Add  $1 + 2 + 3 + 4 + 5 + 6$ .

12. My purchases cost  $37\text{¢}$ ,  $42\text{¢}$ , and  $50\text{¢}$ . What is the total?

13. Three boys weigh 68 lb., 72 lb., 64 lb. What is their total weight?

14. If I pay \$2.50 for a hat, \$3 for some shoes, and \$6.50 for a coat, what do all three cost?



## 39. Subtraction

There are two short methods of subtracting 217 from 900. We may think of 900 as  $800 + 90 + 10$ , and subtract from left to right,  $8 - 2 = 6$ ,  $9 - 1 = 8$ ,  $10 - 7 = 3$ , thus easily reading the result, 683. Or we may "make change," thus,  $217 + 3 = 220$ ,  $220 + 80 = 300$ ,  $300 + 600 = 900$ ; therefore the result is 683.

*Subtract by the first of these methods :*

- |               |                   |                    |
|---------------|-------------------|--------------------|
| 1. 600 - 73.  | 6. 400 - 142.     | 11. \$7 - \$1.64.  |
| 2. 700 - 82.  | 7. \$9 - \$1.35.  | 12. \$9 - \$2.88.  |
| 3. 500 - 67.  | 8. \$8 - \$2.65.  | 13. \$10 - \$1.25. |
| 4. 800 - 128. | 9. \$7 - \$4.28.  | 14. \$10 - \$2.73. |
| 5. 600 - 237. | 10. \$8 - \$2.27. | 15. \$10 - \$5.26. |
16. Subtract \$26.50 from \$100.
17. If my purchases amount to \$7.28, how much change should I receive from \$10?

## 40. Subtraction

*Subtract by the "making change" method :*

- |                   |                    |                     |
|-------------------|--------------------|---------------------|
| 1. \$5 - \$2.75.  | 5. \$10 - \$7.20.  | 9. \$15 - \$13.20.  |
| 2. \$5 - \$3.20.  | 6. \$10 - \$1.75.  | 10. \$20 - \$11.25. |
| 3. \$5 - \$1.80.  | 7. \$15 - \$10.75. | 11. \$20 - \$16.40. |
| 4. \$10 - \$6.25. | 8. \$15 - \$12.30. | 12. \$20 - \$18.30. |
13. If my purchases amount to \$2.50 and \$1.25, how much change should I receive from \$5?
14. If I buy 8 yd. of cloth at 30¢ a yard, how much change should I receive from \$5?
15. If I buy  $\frac{3}{8}$  yd. of velvet at \$1.60 a yard, how much change should I receive from \$1?
16. If I buy 21 yd. of cloth at 50¢ a yard, how much change should I receive from \$15?
17. If I buy  $1\frac{1}{2}$  yd. of silk at \$1.50 a yard, how much change should I receive from \$5?

## 41. Review

*Find the total cost in each example :*

1. 4 lb. of figs at 18¢ a pound.
2. 8 lb. of rice at 12¢ a pound.
3. 8 cans of tomatoes at 15¢ a can.
4. 36¢ worth of cheese, and 3 doz. eggs at 30¢ a dozen.
5. 18¢ worth of spice, 22¢ worth of raisins, and 60¢ worth of tea.
6. 3 bottles of olives at 20¢ each, and 2 bottles of pickles at 15¢ each.
7. 10 lb. of sugar at 8¢ a pound, and a 15¢ can of mustard.
8. Half a dozen boxes of crackers at 10¢ a box, and 2 boxes of tea at 40¢ a box.

*Find the change due in each example :*

9. 2 lb. of butter at 32¢ a pound ; \$1 paid.
10. 6 cans of soup at 15¢ a can ; \$1 paid.
11. 15¢ worth of allspice, and 2 cans of peaches at 22¢ each ; \$1 paid.
12. 10 lb. of oatmeal at 6¢ a pound, and 6 cans of plums at 20¢ each ; \$5 paid.
13. A 30¢ box of pepper, 28¢ worth of codfish, and 2 boxes of cereal at 20¢ a box ; \$5 paid.
14. \$2.60 worth of canned goods, 20 lb. of sugar at 7¢ a pound, and \$2.25 worth of vegetables ; \$10 paid.
15. 20 yd. of cloth at 50¢ a yard and 10 yd. of lining at 30¢ a yard ; \$15 paid.
16. A 5-cent bottle of mucilage, 10¢ worth of ink, 75¢ worth of stationery, and a book costing \$1.20 ; \$5 paid.
17. An arithmetic costing 45¢, a writing tablet costing 8¢, 3 pencils at 4¢ each, and 5¢ worth of pens ; \$1 paid.

## 42. Multiplication

*Multiply by 10 by the shortest method you know :*

1. 77.      2. 82.      3. \$6.40.      4. \$.34.      5. \$1.27.

*Multiply by 100 :*

6. 83.      7. 43.      8. \$.72.      9. \$.63.      10. \$2.46.

*Multiply by 1000 :*

11. 29.      12. 68.      13. \$.32.      14. \$1.27.      15. \$3.48.

*Multiply by 5 by the shortest method you know :*

16. 28.      17. 34.      18. \$.40.      19. \$2.48.      20. \$4.04.

*Multiply by 25 :*

21. 24.      22. 48.      23. \$.80.      24. \$2.44.      25. \$8.04.

## 43. Multiplication

*Multiply by  $33\frac{1}{3}$  by multiplying by 100 and dividing by 3 :*

1. 6.      2. 75.      3. 48.      4. \$.24.      5. \$1.23.

*Multiply by  $12\frac{1}{2}$  :*

6. 8.      7. 48.      8. 24.      9. \$.64.      10. \$8.40.

*Multiply by 9 by subtracting the number from 10 times itself :*

11. 12.      12. 32.      13. 16.      14. 45.      15. 35.

*Multiply by 11 by adding the number to 10 times itself :*

16. 12.      17. 32.      18. 41.      19. 52.      20. 71.

*Multiply by 125 by multiplying by 1000 and dividing by 8 :*

21. 32.      22. 24.      23. 88.      24. \$2.48.      25. \$8.16.

**44. Multiplication**

*Find the cost of the following :*

1. 10 yd. of linen at 87¢.
2. 10 lb. of feathers at 46¢.
3. 10 yd. of burlap at \$1.15.
4. 10 gross of buttons at  $12\frac{1}{2}$ ¢.
5. 100 yd. of carpet at  $87\frac{1}{2}$ ¢.
6. 100 yd. of canvas at 53¢.
7. 100 yd. of cheese cloth at  $4\frac{1}{2}$ ¢.
8. 100 feather boxes at  $37\frac{1}{2}$ ¢.
9. 1000 yd. of jute burlap at  $37\frac{1}{2}$ ¢.
10. 1000 yd. of toweling at  $12\frac{1}{2}$ ¢.
11. 5 yd. of cotton cloth at 24¢.
12. 5 yd. of farmer's satin at 42¢.
13. 5 doz. whalebones at \$2.38 a dozen.
14. 5 balls of fine cotton at 36¢.
15. 25 yd. of felt at \$1.64.
16. 25 yd. of cambric at 12¢.
17. 25 yd. of coarse linen at 48¢.
18. 25 yd. of fine Persian lawn at 32¢.
19. 125 yd. of linoleum at 80¢.
20. 125 yd. of Brussels carpet at \$1.20.
21. 125 yd. of ingrain carpet at 64¢.
22. 125 lb. of hammock cord at 24¢.
23. 24 yd. of common Persian lawn at 25¢.
24. 24 yd. of Axminster carpet at \$1.25.
25. 72 yd. of toweling at  $12\frac{1}{2}$ ¢.
26. 64 yd. of cambric at  $12\frac{1}{2}$ ¢.
27. 25 yd. of Brussels carpet at \$1.60.
28. 28 acres of meadow land at \$80.
29. 125 acres of pasture land at \$64.
30. 50 cords of wood at \$3; at \$3.60.

## 45. Multiplication

*Find the cost of the following :*

1. 60 lb. of fine candy at  $33\frac{1}{3}\%$ .
2. 900 lb. of tea at  $33\frac{1}{3}\%$ .
3. 16 doz. eggs at  $12\frac{1}{2}\%$ .
4. 96 cans of plums at  $12\frac{1}{2}\%$ .
5.  $12\frac{1}{2}$  lb. of butter at  $24\%$ .
6. 30 cases of lemon soda at  $33\frac{1}{3}\%$ .
7. 12 lb. of licorice drops at 3 lb. for \$1.
8. 80 lb. of peanut brittle at  $12\frac{1}{2}\%$ .
9. 9 lb. of mixed candy at  $25\%$ .
10. 9 boxes of caramels at \$1.20.
11. 9 boxes of chocolate almonds at \$1.30.
12. 9 boxes of pepsin gum at  $60\%$ .
13. 11 doz. boxes of chocolates at \$1.80 a dozen.
14. 11 boxes of salted peanuts at  $80\%$ .
15. 11 boxes of vanilla chocolates at  $75\%$ .
16. 11 lb. of fine chocolate creams at  $52\%$ .
17. If a grocer buys 600 lb. of tea and sells it at a profit of  $11\%$  a pound, how much does he gain ?
18. If a grocer buys 200 doz. cans of soup and sells it at a profit of  $25\%$  a dozen, how much does he gain ?
19. If a grocer buys 80 bbl. of sugar and sells it at a profit of \$1.25 a barrel, how much does he gain ?
20. If a dry goods dealer buys 640 yd. of silk and sells it at a profit of  $25\%$  a yard, how much does he gain ?
21. If a carpet dealer buys 810 yd. of carpet and sells it at a profit of  $9\%$  a yard, how much does he gain ?
22. If a bookseller sells 220 arithmetics and makes a profit of  $7\%$  on each, how much is his total profit ?
23. If a creamery sells 720 lb. of butter at  $25\%$  a pound, how much does it receive for all the butter ?

## 46. Division

*Divide by 10 by the shortest method you know :*

- |        |         |         |         |           |
|--------|---------|---------|---------|-----------|
| 1. 70. | 3. 750. | 5. 800. | 7. 160. | 9. 1250.  |
| 2. 60. | 4. 820. | 6. 600. | 8. 320. | 10. 6250. |

*Divide by 100 :*

- |          |          |           |             |           |
|----------|----------|-----------|-------------|-----------|
| 11. 700. | 12. 800. | 13. 7500. | 14. 40,000. | 15. 7000. |
|----------|----------|-----------|-------------|-----------|

*Divide by 1000 :*

- |           |           |           |             |             |
|-----------|-----------|-----------|-------------|-------------|
| 16. 6000. | 17. 5000. | 18. 2000. | 19. 35,000. | 20. 62,000. |
|-----------|-----------|-----------|-------------|-------------|

*Divide by 5 by dividing by 10 and multiplying by 2 :*

- |          |          |          |          |          |
|----------|----------|----------|----------|----------|
| 21. 120. | 24. 640. | 27. 220. | 30. 810. | 33. 650. |
| 22. 600. | 25. 360. | 28. 640. | 31. 800. | 34. 540. |
| 23. 160. | 26. 720. | 29. 420. | 32. 710. | 35. 260. |

## 47. Division

*Divide by 25 by dividing by 100 and multiplying by 4 :*

- |         |         |         |          |          |
|---------|---------|---------|----------|----------|
| 1. 500. | 2. 600. | 3. 800. | 4. 1200. | 5. 2200. |
|---------|---------|---------|----------|----------|

*Divide by 125 by dividing by 1000 and multiplying by 8 :*

- |          |          |          |          |             |
|----------|----------|----------|----------|-------------|
| 6. 5000. | 7. 6000. | 8. 8000. | 9. 1500. | 10. 12,000. |
|----------|----------|----------|----------|-------------|

*Divide by  $12\frac{1}{2}$  by dividing by 100 and multiplying by 8 :*

- |          |          |          |         |          |
|----------|----------|----------|---------|----------|
| 11. 200. | 12. 300. | 13. 700. | 14. 75. | 15. 150. |
|----------|----------|----------|---------|----------|

*Divide by  $33\frac{1}{3}$  by dividing by 100 and multiplying by 3 :*

- |          |          |          |                        |          |
|----------|----------|----------|------------------------|----------|
| 16. 200. | 17. 500. | 18. 800. | 19. $333\frac{1}{3}$ . | 20. 300. |
|----------|----------|----------|------------------------|----------|

*Perform these divisions :*

- |                     |                      |                       |
|---------------------|----------------------|-----------------------|
| 21. $1230 \div 5$ . | 22. $2150 \div 25$ . | 23. $1000 \div 125$ . |
|---------------------|----------------------|-----------------------|

## 48. Division

- ✓1. If 10 yd. of gingham cost \$1.20, what does 1 yd. cost?
- ✓2. If 10 doz. buttons cost \$1.30, what does 1 doz. cost?
- ✓3. If 10 yd. of chambray cost \$2.20, what does 1 yd. cost?
4. If 10 yd. of velvet carpet cost \$13.50, what does 1 yd. cost?
5. If 100 yd. of Brussels carpet cost \$84, what does 1 yd. cost?
6. If 100 yd. of oilcloth cost \$37.50, what does 1 yd. cost?
7. If 100 gross of bone buttons cost \$22.50, what does 1 gross cost?
8. If 100 pieces of binding cost \$12.50, what does 1 piece cost?
9. If 1000 yd. of canvas cost \$450, what does 1 yd. cost?
10. If 1000 yd. of dimity cost \$140, what does 1 yd. cost?
11. If 1000 yd. of ingrain carpet cost \$520, what does 1 yd. cost?
12. If 1000 pieces of braid cost \$85, what does 1 piece cost?
13. If 5 yd. of cotton flannel cost 80¢, what does 1 yd. cost?
14. If 5 yd. of linen cost \$2.40, what does 1 yd. cost?
15. If 5 yd. of crinoline cost 55¢, what does 1 yd. cost?
16. If 5 balls of crochet cotton cost \$2.40, what does 1 ball cost?
17. If 25 yd. of cashmere cost \$20, what does 1 yd. cost?
18. If 125 yd. of carpet cost \$100, what does 1 yd. cost?
19. If  $12\frac{1}{2}$  doz. boxes cost \$30, what does 1 doz. cost?
20. If  $33\frac{1}{3}$  yd. of cloth cost \$9, what does 1 yd. cost?
21. If  $33\frac{1}{3}$  yd. of oilcloth cost \$12, what does 1 yd. cost?
22. If 125 cows cost \$5000, what does 1 cow cost?



## 49. Review

✓1. If a man earns \$2.40 a day for 10 da., and \$2.50 a day for 2 da., how much does he earn in the 12 days?

2. If a merchant buys goods for \$120, \$70, \$60, and \$100, and sells them for \$450, how much does he gain?

3. If a man carts away 75 loads of dirt at  $33\frac{1}{3}\%$  a load, how much should he receive?

4. If a plasterer does some work at  $12\frac{1}{2}\%$  a square yard, how much should he receive for 160 sq. yd.?

5. If a farmer sells 11 doz. eggs to a grocer at 16¢ a dozen, and buys 75¢ worth of sugar, what balance is due?

✓6. If a vegetable gardener set out 320 tomato plants, but lost  $\frac{1}{8}$  of them by frost, how many had he left?

7. Suppose you go to a grocery and make purchases amounting to \$1.20, 60¢, 35¢, and 15¢. How much change should you receive from \$2.50?

✓8. Suppose a boy buys 6 fishing flies at 10¢, a rod at \$1.25, and pays 30¢ for a line. How much change should he receive from \$2.25? ,10

✓9. If a man's income is \$1200 a year and his expenses are \$825, how much does he save? 375

10. If a boy earns 72¢ one week and 84¢ the next, and then puts \$1.50 in the savings bank, how much has he left?

11. If you walk 160 yd. away from the schoolhouse and 75 yd. back, how far are you then from the schoolhouse?

12. If you walk 225 yd. directly north from here and then turn and walk 300 yd. south, how far will you then be from here and in what direction?

✓13. If a man is in debt \$750 and pays \$370 on the debt, how much does he still owe?

14. If a man is in debt \$275 at the beginning of a year and saves \$600 that year, how much will he have after paying the debt?

## III. COMMON FRACTIONS

## 50. Factors

The prime factors of 36 are 2, 2, 3, 3. Numbers like 7, 11, 17, and 23 are themselves prime and have no factors.

*Find the prime factors in :*

1. 6.	4. 33.	7. 51.	10. 64.	13. 77.
2. 9.	5. 34.	8. 88.	11. 75.	14. 49.
3. 21.	6. 35.	9. 72.	12. 65.	15. 91.

*Find only one prime factor in :*

16. 707.	21. 108.	26. 147.	31. 220.	36. 243.
17. 330.	22. 145.	27. 312.	32. 121.	37. 705.
18. 135.	23. 213.	28. 321.	33. 130.	38. 603.
19. 712.	24. 635.	29. 123.	34. 143.	39. 357.
20. 414.	25. 637.	30. 111.	35. 707.	40. 497.

## 51. Multiples

Two multiples of 3 are 6 and 9, or 9 and 12, and so on. Any number has an indefinitely large number of multiples.

*Find any two multiples of :*

1. 2.	3. 7.	5. 11.	7. 14.	9. 31.
2. 5.	4. 9.	6. 13.	8. 23.	10. 70.

The number 54 is a multiple common to both 6 and 9, but 18 is the least multiple that is common to both 6 and 9.

*Find any multiple common to these two numbers :*

11. 2, 5.	12. 4, 10.	13. 7, 11.	14. 8, 12.
-----------	------------	------------	------------

The number 18 is the least common multiple of 6 and 9; 9 is the least common multiple of 3 and 9.

*Find the least common multiple of these two numbers :*

15. 2, 4.	16. 3, 8.	17. 6, 8.	18. 8, 12.
-----------	-----------	-----------	------------

## 52. Reduction

*Reduce as indicated :*

To halves :	1. $\frac{4}{8}$ .	2. $\frac{5}{10}$ .	3. $\frac{8}{4}$ .	4. $\frac{18}{2}$ .
To fourths :	5. $\frac{2}{8}$ .	6. $\frac{5}{2}$ .	7. $\frac{9}{12}$ .	8. $\frac{8}{16}$ .
To fifths :	9. $\frac{6}{10}$ .	10. $\frac{9}{5}$ .	11. $\frac{12}{20}$ .	12. $\frac{18}{30}$ .
To sixths :	13. $\frac{2}{3}$ .	14. $\frac{5}{3}$ .	15. $\frac{8}{12}$ .	16. $\frac{6}{9}$ .
To eighths :	17. $\frac{1}{2}$ .	18. $\frac{1}{4}$ .	19. $\frac{12}{16}$ .	20. $\frac{16}{64}$ .
To twelfths :	21. $\frac{1}{2}$ .	22. $\frac{1}{3}$ .	23. $\frac{3}{4}$ .	24. $\frac{5}{6}$ .
To sixteenths :	25. $\frac{1}{2}$ .	26. $\frac{1}{4}$ .	27. $\frac{3}{8}$ .	28. $\frac{3}{32}$ .
To thirty-seconds :	29. $\frac{1}{2}$ .	30. $\frac{1}{4}$ .	31. $\frac{3}{4}$ .	32. $\frac{5}{8}$ .
To forty-eighths :	33. $\frac{1}{2}$ .	34. $\frac{1}{4}$ .	35. $\frac{3}{4}$ .	36. $\frac{7}{8}$ .
To ninths :	37. $\frac{1}{3}$ .	38. $\frac{2}{3}$ .	39. $\frac{4}{6}$ .	40. $\frac{16}{18}$ .
To fifteenths :	41. $\frac{1}{3}$ .	42. $\frac{2}{3}$ .	43. $\frac{3}{5}$ .	44. $\frac{4}{5}$ .
To twentieths :	45. $\frac{1}{4}$ .	46. $\frac{3}{4}$ .	47. $\frac{2}{5}$ .	48. $\frac{3}{5}$ .
To twenty-fourths :	49. $\frac{3}{4}$ .	50. $\frac{2}{3}$ .	51. $\frac{5}{6}$ .	52. $\frac{3}{8}$ .

## 53. Reduction

*Reduce as indicated :*

To halves :	1. $\frac{2}{4}$ .	2. $\frac{3}{6}$ .	3. $\frac{6}{12}$ .	4. $\frac{6}{4}$ .
To thirds :	5. $\frac{4}{6}$ .	6. $\frac{8}{6}$ .	7. $\frac{3}{9}$ .	8. $\frac{8}{12}$ .
To fourths :	9. $\frac{3}{2}$ .	10. $\frac{6}{8}$ .	11. $\frac{4}{8}$ .	12. $\frac{32}{16}$ .
To fifths :	13. $\frac{4}{10}$ .	14. $\frac{3}{15}$ .	15. $\frac{16}{20}$ .	16. $\frac{15}{25}$ .
To sixths :	17. $\frac{1}{3}$ .	18. $\frac{3}{18}$ .	19. $\frac{4}{12}$ .	20. $\frac{3}{9}$ .
To sevenths :	21. $\frac{4}{14}$ .	22. $\frac{10}{14}$ .	23. $\frac{15}{21}$ .	24. $\frac{30}{42}$ .
To eighths :	25. $\frac{14}{16}$ .	26. $\frac{3}{4}$ .	27. $\frac{4}{16}$ .	28. $\frac{5}{8}$ .
To ninths :	29. $\frac{5}{3}$ .	30. $\frac{2}{6}$ .	31. $\frac{6}{18}$ .	32. $\frac{36}{54}$ .
To twelfths :	33. $\frac{2}{3}$ .	34. $\frac{5}{3}$ .	35. $\frac{5}{4}$ .	36. $\frac{21}{36}$ .
To sixteenths :	37. $\frac{7}{8}$ .	38. $\frac{3}{4}$ .	39. $\frac{5}{8}$ .	40. $\frac{21}{48}$ .
To eighteenthths :	41. $\frac{1}{3}$ .	42. $\frac{2}{3}$ .	43. $\frac{5}{6}$ .	44. $\frac{5}{9}$ .
To twenty-fourths :	45. $\frac{1}{4}$ .	46. $\frac{1}{8}$ .	47. $\frac{5}{8}$ .	48. $\frac{7}{8}$ .
To thirty-seconds :	49. $\frac{3}{8}$ .	50. $\frac{7}{8}$ .	51. $\frac{9}{16}$ .	52. $\frac{16}{16}$ .

## 54. Integers to Fractions

Since  $1 = \frac{8}{8}$ , therefore  $7 = \frac{7 \times 8}{8}$  or  $\frac{56}{8}$ . In the same way we may reduce any integer to a fractional form.

*Reduce as indicated:*

To halves :	1. 1.	2. 3.	3. 7.	4. 15.
To thirds :	5. 1.	6. 5.	7. 8.	8. 12.
To fourths :	9. 2.	10. 6.	11. 7.	12. 10.
To fifths :	13. 3.	14. 5.	15. 9.	16. 12.
To sixths :	17. 4.	18. 6.	19. 8.	20. 11.
To eighths :	21. 3.	22. 8.	23. 9.	24. 12.
To twelfths :	25. 2.	26. 3.	27. 4.	28. 10.
To sixteenths :	29. 2.	30. 3.	31. 4.	32. 10.
To thirty-seconds :	33. 1.	34. 2.	35. 3.	36. 10.
To fifteenths :	37. 1.	38. 2.	39. 3.	40. 5.

## 55. Reduction

Since  $1 = \frac{8}{8}$ , therefore  $1\frac{1}{8} = \frac{8}{8} + \frac{1}{8}$ , or  $\frac{9}{8}$ . In the same way we may reduce any mixed number to an improper fraction.

*Reduce to improper fractions:*

1. $1\frac{1}{8}$ .	6. $2\frac{1}{2}$ .	11. $1\frac{3}{2}$ .	16. $1\frac{1}{4}$ .
2. $2\frac{1}{8}$ .	7. $2\frac{5}{2}$ .	12. $1\frac{5}{2}$ .	17. $1\frac{5}{8}$ .
3. $2\frac{3}{8}$ .	8. $2\frac{7}{2}$ .	13. $2\frac{1}{2}$ .	18. $1\frac{1}{8}$ .
4. $3\frac{5}{8}$ .	9. $1\frac{5}{6}$ .	14. $2\frac{3}{2}$ .	19. $2\frac{1}{6}$ .
5. $2\frac{7}{8}$ .	10. $2\frac{7}{6}$ .	15. $2\frac{7}{2}$ .	20. $3\frac{7}{6}$ .

21. Express  $6\frac{2}{3}$  as thirds. In  $6\frac{2}{3}$  yd. how many feet?

22. Express  $5\frac{7}{2}$  as twelfths. In  $5\frac{7}{2}$  ft. how many inches?

23. Express  $10\frac{5}{2}$  as twelfths. In  $10\frac{5}{2}$  yr. how many months, calling  $\frac{1}{2}$  yr. exactly 1 mo.?

24. Express  $3\frac{7}{6}$  as thirtieths. In  $3\frac{7}{6}$  mo., how many days, calling 30 da. exactly 1 mo.?

56. Reduction

Reduce to integers :

- |                       |                   |                     |                      |                      |
|-----------------------|-------------------|---------------------|----------------------|----------------------|
| 1. $\frac{6}{2} = 3$  | 4. $\frac{75}{5}$ | 7. $\frac{72}{3}$   | 10. $\frac{121}{11}$ | 13. $\frac{96}{3}$   |
| 2. $\frac{6}{3} = 2$  | 5. $\frac{72}{6}$ | 8. $\frac{108}{9}$  | 11. $\frac{108}{12}$ | 14. $\frac{96}{4}$   |
| 3. $\frac{16}{4} = 4$ | 6. $\frac{84}{7}$ | 9. $\frac{200}{10}$ | 12. $\frac{320}{16}$ | 15. $\frac{150}{75}$ |

Reduce to mixed numbers :

- |                                   |                                   |  |  |                                    |
|-----------------------------------|-----------------------------------|--|--|------------------------------------|
| 16. $\frac{7}{2} = 3\frac{1}{2}$  | 19. $\frac{26}{5} = 5\frac{1}{5}$ | 22. $\frac{57}{8} = 7\frac{1}{8}$                | 25. $\frac{62}{8} = 7\frac{6}{8} = 7\frac{3}{4}$   | 28. $\frac{40}{16} = \frac{10}{4}$ |
| 17. $\frac{10}{3} = 3\frac{1}{3}$ | 20. $\frac{32}{5} = 6\frac{2}{5}$ | 23. $\frac{66}{8} = 8\frac{3}{8}$                | 26. $\frac{45}{10} = 4\frac{5}{10} = 4\frac{1}{2}$ | 29. $\frac{88}{4} = 22$            |
| 18. $\frac{15}{4} = 3\frac{3}{4}$ | 21. $\frac{50}{7} = 7\frac{1}{7}$ | 24. $\frac{76}{8} = 9\frac{4}{8} = 9\frac{1}{2}$ | 27. $\frac{52}{8} = 6\frac{4}{8} = 6\frac{1}{2}$   | 30. $\frac{72}{4} = 18$            |

Reduce to integers or mixed numbers :

- |                     |                     |                      |                     |                      |
|---------------------|---------------------|----------------------|---------------------|----------------------|
| 31. $\frac{75}{5}$  | 34. $\frac{51}{17}$ | 37. $\frac{160}{16}$ | 40. $\frac{21}{3}$  | 43. $\frac{100}{10}$ |
| 32. $\frac{75}{15}$ | 35. $\frac{52}{4}$  | 38. $\frac{160}{32}$ | 41. $\frac{100}{4}$ | 44. $\frac{100}{3}$  |
| 33. $\frac{51}{3}$  | 36. $\frac{52}{13}$ | 39. $\frac{40}{12}$  | 42. $\frac{100}{4}$ | 45. $\frac{100}{6}$  |

57. Reduction

Reduce to lowest terms :

- |                                  |                                  |                     |                      |                      |
|----------------------------------|----------------------------------|---------------------|----------------------|----------------------|
| 1. $\frac{2}{4} = \frac{1}{2}$   | 5. $\frac{4}{24} = \frac{1}{6}$  | 9. $\frac{14}{32}$  | 13. $\frac{12}{48}$  | 17. $\frac{25}{100}$ |
| 2. $\frac{8}{4} = 2$             | 6. $\frac{12}{24} = \frac{1}{2}$ | 10. $\frac{18}{32}$ | 14. $\frac{18}{48}$  | 18. $\frac{32}{100}$ |
| 3. $\frac{12}{16} = \frac{3}{4}$ | 7. $\frac{18}{24} = \frac{3}{4}$ | 11. $\frac{2}{48}$  | 15. $\frac{24}{48}$  | 19. $\frac{50}{100}$ |
| 4. $\frac{20}{16} = \frac{5}{4}$ | 8. $\frac{6}{32}$                | 12. $\frac{10}{48}$ | 16. $\frac{15}{100}$ | 20. $\frac{75}{100}$ |

21. On a railway time table the distance between two stations is given as  $46\frac{64}{100}$  mi. Express this in lower terms.

22. A ruler is marked in thirty-seconds of an inch. A piece of veneer is measured and found to be  $\frac{6}{32}$  in. thick. Express this thickness in lower terms.

23. A surveyor uses a chain 66 ft. long, made of 100 links. He measures a certain distance and finds it to be 1 chain and 50 links. Express this as a chain and a fraction ; as feet.

## 58. Addition

We add fractions having the same denominator as follows :

$$\frac{5}{16} + \frac{3}{16} = \frac{8}{16} = \frac{1}{2}. \quad \text{Also, } \frac{3}{7} + \frac{5}{7} = \frac{8}{7} = 1\frac{1}{7}.$$

- |                                |                                   |                                   |                                   |
|--------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1. $\frac{1}{3} + \frac{2}{3}$ | 7. $\frac{3}{8} + \frac{5}{8}$    | 13. $\frac{1}{24} + \frac{5}{24}$ | 19. $\frac{7}{9} + \frac{8}{9}$   |
| 2. $\frac{1}{4} + \frac{3}{4}$ | 8. $\frac{1}{12} + \frac{5}{12}$  | 14. $\frac{1}{24} + \frac{7}{24}$ | 20. $\frac{1}{16} + \frac{3}{16}$ |
| 3. $\frac{2}{5} + \frac{3}{5}$ | 9. $\frac{3}{16} + \frac{5}{16}$  | 15. $\frac{1}{24} + \frac{1}{24}$ | 21. $1\frac{1}{2} + 3\frac{1}{2}$ |
| 4. $\frac{1}{5} + \frac{4}{5}$ | 10. $\frac{1}{12} + \frac{7}{12}$ | 16. $\frac{3}{2} + \frac{5}{2}$   | 22. $1\frac{1}{4} + 2\frac{3}{4}$ |
| 5. $\frac{1}{8} + \frac{1}{8}$ | 11. $\frac{1}{6} + \frac{3}{6}$   | 17. $\frac{3}{8} + \frac{7}{8}$   | 23. $2\frac{3}{8} + 1\frac{1}{8}$ |
| 6. $\frac{1}{8} + \frac{3}{8}$ | 12. $\frac{1}{16} + \frac{1}{16}$ | 18. $\frac{3}{4} + \frac{3}{4}$   | 24. $3\frac{5}{8} + 1\frac{1}{8}$ |

25. Add  $\frac{1}{8}$ ,  $\frac{3}{8}$ ,  $\frac{5}{8}$ , and  $\frac{7}{8}$ .

26. The three sides of a triangle are  $1\frac{1}{8}$  in.,  $1\frac{3}{8}$  in., and  $1\frac{5}{8}$  in. What is the perimeter?

27. How much picture molding is needed for a frame  $5\frac{3}{8}$  in. long and  $3\frac{1}{8}$  in. wide?

## 59. Addition

\*Think of  $\frac{3}{4} + \frac{5}{8}$  as  $\frac{6}{8} + \frac{5}{8}$ , or  $1\frac{1}{8}$ , or  $1\frac{2}{8}$ . Proceed in the same way with other fractions having different denominators.

- |                                |                                 |                                 |                                   |
|--------------------------------|---------------------------------|---------------------------------|-----------------------------------|
| 1. $\frac{1}{2} + \frac{1}{4}$ | 6. $\frac{1}{2} + \frac{7}{8}$  | 11. $\frac{3}{4} + \frac{3}{8}$ | 16. $\frac{1}{3} + \frac{3}{4}$   |
| 2. $\frac{1}{2} + \frac{3}{4}$ | 7. $\frac{1}{4} + \frac{1}{8}$  | 12. $\frac{3}{4} + \frac{7}{8}$ | 17. $1\frac{1}{2} + 2\frac{1}{4}$ |
| 3. $\frac{1}{2} + \frac{1}{8}$ | 8. $\frac{1}{4} + \frac{3}{8}$  | 13. $\frac{1}{2} + \frac{1}{3}$ | 18. $3\frac{3}{4} + 1\frac{1}{2}$ |
| 4. $\frac{1}{2} + \frac{3}{8}$ | 9. $\frac{1}{4} + \frac{5}{8}$  | 14. $\frac{1}{2} + \frac{2}{3}$ | 19. $2\frac{1}{8} + 3\frac{1}{4}$ |
| 5. $\frac{1}{2} + \frac{5}{8}$ | 10. $\frac{1}{4} + \frac{7}{8}$ | 15. $\frac{1}{3} + \frac{1}{4}$ | 20. $3\frac{7}{8} + 1\frac{1}{4}$ |

21. How much is  $\$5\frac{1}{2}$  and  $\$6\frac{3}{4}$ ?

22. How much is  $\$10\frac{1}{4}$ ,  $\$5\frac{1}{4}$ , and  $\$4\frac{1}{2}$ ?

23. If I buy  $\$10\frac{3}{4}$  worth of coal and  $\$7\frac{1}{2}$  worth of wood, how much is my total bill?

24. What is the number from which if 2 is taken the result is 1? from which if  $2\frac{1}{3}$  is taken the result is  $1\frac{1}{6}$ ?

25. What number must be added to  $3\frac{1}{4}$  ft. to make 4 ft. to make  $4\frac{1}{8}$  ft.?

## 60. Addition

- |                                  |                                   |                                    |                                    |
|----------------------------------|-----------------------------------|------------------------------------|------------------------------------|
| 1. $\frac{1}{2} + \frac{1}{6}$ . | 5. $\frac{1}{4} + \frac{1}{16}$ . | 9. $\frac{1}{8} + \frac{1}{16}$ .  | 13. $\frac{1}{2} + \frac{1}{32}$ . |
| 2. $\frac{1}{2} + \frac{5}{6}$ . | 6. $\frac{1}{4} + \frac{3}{16}$ . | 10. $\frac{3}{8} + \frac{1}{16}$ . | 14. $\frac{1}{2} + \frac{3}{32}$ . |
| 3. $\frac{3}{4} + \frac{1}{8}$ . | 7. $\frac{1}{4} + \frac{5}{16}$ . | 11. $\frac{3}{8} + \frac{3}{16}$ . | 15. $\frac{1}{4} + \frac{1}{32}$ . |
| 4. $\frac{3}{4} + \frac{5}{8}$ . | 8. $\frac{3}{4} + \frac{5}{16}$ . | 12. $\frac{3}{8} + \frac{7}{16}$ . | 16. $\frac{1}{8} + \frac{1}{32}$ . |

17. The three sides of a triangle are  $1\frac{1}{8}$  in.,  $1\frac{1}{16}$  in.,  $1\frac{1}{32}$  in. What is the perimeter?

18. A field is 20 rd., 24 rd.,  $25\frac{1}{2}$  rd., and  $21\frac{3}{4}$  rd. on the four sides. What is the perimeter?

19. Four packages weigh  $12\frac{1}{2}$  lb.,  $13\frac{1}{4}$  lb.,  $10\frac{3}{4}$  lb., and  $10\frac{3}{4}$  lb. What is the total weight?

20. The page of a book is  $4\frac{3}{8}$  in. wide and  $7\frac{1}{16}$  in. long. What is the sum of the two sides? What is the perimeter?

21. A picture is  $3\frac{1}{4}$  in. wide and the mat is  $1\frac{1}{8}$  in. wide on each side. How wide is the picture and mat together?

## 61. Subtraction

We subtract fractions having the same denominator as follows:

$$\frac{5}{16} - \frac{3}{16} = \frac{2}{16} = \frac{1}{8}. \quad \text{Also } 3\frac{1}{8} - \frac{7}{8} = 2\frac{2}{8} - \frac{7}{8} = 2\frac{2}{8} = 2\frac{1}{4}.$$

- |                                  |                                   |                                      |                                       |
|----------------------------------|-----------------------------------|--------------------------------------|---------------------------------------|
| 1. $\frac{3}{4} - \frac{1}{4}$ . | 6. $\frac{4}{5} - \frac{3}{5}$ .  | 11. $\frac{7}{10} - \frac{1}{10}$ .  | 16. $1\frac{7}{8} - \frac{5}{8}$ .    |
| 2. $\frac{7}{8} - \frac{1}{8}$ . | 7. $\frac{5}{6} - \frac{1}{6}$ .  | 12. $\frac{9}{10} - \frac{3}{10}$ .  | 17. $2\frac{4}{5} - \frac{1}{5}$ .    |
| 3. $\frac{7}{8} - \frac{3}{8}$ . | 8. $\frac{5}{9} - \frac{2}{9}$ .  | 13. $\frac{7}{12} - \frac{1}{12}$ .  | 18. $3\frac{2}{9} - \frac{7}{9}$ .    |
| 4. $\frac{2}{3} - \frac{1}{3}$ . | 9. $\frac{8}{9} - \frac{5}{9}$ .  | 14. $\frac{9}{16} - \frac{7}{16}$ .  | 19. $3\frac{5}{12} - 1\frac{1}{12}$ . |
| 5. $\frac{4}{5} - \frac{2}{5}$ . | 10. $\frac{6}{7} - \frac{4}{7}$ . | 15. $1\frac{5}{16} - \frac{7}{16}$ . | 20. $4\frac{5}{16} - 2\frac{9}{16}$ . |

21. If I have  $\$5\frac{3}{4}$  and spend  $\$1\frac{1}{4}$ , how much have I left?

22. If I have  $\$5\frac{1}{4}$  and spend  $\$3\frac{3}{4}$ , how much have I left?

23. If I have  $\$5\frac{1}{4}$  and spend  $\$2\frac{3}{4}$ , how much have I left?

24. What must be added to  $5\frac{1}{3}$  bu. to make  $5\frac{7}{3}$  bu.?

25. What must be added to  $3\frac{3}{8}$  in. to make  $5\frac{7}{8}$  in.?

26. What must be added to  $10\frac{3}{4}$  rd. to make  $15\frac{1}{4}$  rd.?

27. How much longer is  $11\frac{3}{16}$  in. than  $5\frac{1}{8}$  in.? than  $3\frac{5}{8}$  in.?



## 62. Different Denominators

We subtract  $\frac{1}{2}$  from  $\frac{3}{4}$  thus:  $\frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4}$ .

- |                                |                                 |                                  |                                   |
|--------------------------------|---------------------------------|----------------------------------|-----------------------------------|
| 1. $\frac{3}{4} - \frac{1}{2}$ | 6. $\frac{5}{8} - \frac{1}{4}$  | 11. $\frac{1}{2} - \frac{5}{12}$ | 16. $2\frac{1}{2} - \frac{1}{8}$  |
| 2. $\frac{1}{2} - \frac{1}{4}$ | 7. $\frac{1}{2} - \frac{1}{3}$  | 12. $\frac{7}{12} - \frac{1}{2}$ | 17. $2\frac{3}{4} - \frac{5}{8}$  |
| 3. $\frac{1}{2} - \frac{1}{8}$ | 8. $\frac{2}{3} - \frac{1}{2}$  | 13. $1\frac{1}{2} - \frac{1}{4}$ | 18. $3\frac{2}{3} - \frac{1}{6}$  |
| 4. $\frac{1}{2} - \frac{3}{8}$ | 9. $\frac{2}{3} - \frac{1}{6}$  | 14. $\frac{7}{12} - \frac{1}{4}$ | 19. $3\frac{1}{2} - \frac{1}{2}$  |
| 5. $\frac{5}{8} - \frac{1}{2}$ | 10. $\frac{1}{2} - \frac{1}{6}$ | 15. $\frac{3}{4} - \frac{1}{12}$ | 20. $4\frac{3}{4} - \frac{1}{12}$ |

21. A board  $1\frac{1}{8}$  in. thick is planed down  $\frac{1}{8}$  in. How thick is it then?

22. A board  $\frac{7}{8}$  in. thick is planed down  $\frac{1}{16}$  in. How thick is it then?

23. If I have \$2 $\frac{1}{2}$  and spend \$ $\frac{1}{4}$ , how much have I left? How much shall I have left if I spend \$ $\frac{1}{2}$  more?

24. From a strip of wood 7 $\frac{1}{2}$  in. long a length of  $\frac{3}{4}$  in. is cut. How long is the strip then?

## 63. Subtraction of Fractions

- |                                 |                                  |                                   |                                    |
|---------------------------------|----------------------------------|-----------------------------------|------------------------------------|
| 1. $\frac{1}{2} - \frac{1}{6}$  | 5. $\frac{1}{4} - \frac{3}{16}$  | 9. $\frac{1}{8} - \frac{1}{32}$   | 13. $2\frac{3}{4} - \frac{3}{8}$   |
| 2. $\frac{3}{4} - \frac{1}{8}$  | 6. $\frac{1}{8} - \frac{1}{16}$  | 10. $\frac{3}{16} - \frac{1}{12}$ | 14. $3\frac{3}{8} - \frac{1}{16}$  |
| 3. $\frac{1}{4} - \frac{1}{8}$  | 7. $\frac{1}{2} - \frac{1}{32}$  | 11. $\frac{3}{16} - \frac{5}{32}$ | 15. $3\frac{1}{8} - 1\frac{1}{32}$ |
| 4. $\frac{1}{4} - \frac{1}{16}$ | 8. $\frac{1}{16} - \frac{1}{32}$ | 12. $\frac{7}{16} - \frac{7}{32}$ | 16. $4\frac{1}{4} - 2\frac{5}{8}$  |

17. A plank  $1\frac{7}{8}$  in. thick is planed down  $\frac{1}{16}$  in. How thick is it then?

18. From a piece of picture molding 7 ft. 2 $\frac{1}{2}$  in. long there is cut a piece 2 ft. 1 $\frac{1}{4}$  in. long. How long is the remainder?

19. A piece of marble 8 $\frac{3}{32}$  in. thick is polished down  $\frac{1}{16}$  in. What is then the thickness? How much more will it have to be polished down to be exactly 8 in. thick?

20. A piece of cloth 7 $\frac{1}{2}$  in. wide is folded so as to be  $\frac{3}{4}$  in. less in width. How wide is it then? How much more will have to be folded in to have it 6 $\frac{1}{4}$  in. wide?

## 64. Multiplication by a Fraction

- |                         |                           |                           |                          |
|-------------------------|---------------------------|---------------------------|--------------------------|
| 1. $\frac{1}{2}$ of 20. | 7. $\frac{1}{4}$ of 48.   | 13. $\frac{5}{8}$ of 48.  | 19. $\frac{3}{5}$ of 60. |
| 2. $\frac{1}{2}$ of 28. | 8. $\frac{3}{4}$ of 48.   | 14. $\frac{7}{8}$ of 40.  | 20. $\frac{1}{6}$ of 66. |
| 3. $\frac{1}{2}$ of 50. | 9. $\frac{3}{4}$ of 88.   | 15. $\frac{1}{3}$ of 39.  | 21. $\frac{5}{6}$ of 60. |
| 4. $\frac{1}{2}$ of 58. | 10. $\frac{1}{8}$ of 64.  | 16. $\frac{2}{3}$ of 27.  | 22. $\frac{1}{4}$ of 25. |
| 5. $\frac{1}{4}$ of 32. | 11. $\frac{3}{8}$ of 64.  | 17. $\frac{1}{5}$ of 75.  | 23. $\frac{1}{3}$ of 22. |
| 6. $\frac{1}{2}$ of 21. | 12. $\frac{5}{12}$ of 36. | 18. $\frac{1}{12}$ of 48. | 24. $\frac{1}{5}$ of 33. |

25. How much is half the sum of 27 and 37 ?

26. If the perimeter of an equilateral (equal-sided) triangle is 51 in., what is the length of each side ?

27. If the perimeter of a square is 52 in., what is the length of each side ?

28. If a man has 480 acres of land, and  $\frac{1}{8}$  is wooded, how many acres are wooded ? If  $\frac{3}{8}$  is meadow land, how many acres are meadow land ?

## 65. Multiplication by an Integer

- |                              |                              |                               |   |
|------------------------------|------------------------------|-------------------------------|---|
| 1. $4 \times \frac{1}{2}$ .  | 6. $8 \times \frac{3}{4}$ .  | 11. $8 \times \frac{7}{8}$ .  | 16. $2 \times \frac{3}{5}$ .            |
| 2. $4 \times \frac{1}{4}$ .  | 7. $6 \times \frac{3}{4}$ .  | 12. $16 \times \frac{3}{8}$ . | 17. $2 \times \frac{1}{1\frac{1}{2}}$ . |
| 3. $4 \times \frac{1}{8}$ .  | 8. $12 \times \frac{3}{4}$ . | 13. $6 \times \frac{1}{3}$ .  | 18. $6 \times \frac{1}{1\frac{1}{2}}$ . |
| 4. $4 \times \frac{1}{16}$ . | 9. $4 \times \frac{3}{8}$ .  | 14. $6 \times \frac{2}{3}$ .  | 19. $3 \times \frac{1}{1\frac{1}{2}}$ . |
| 5. $4 \times \frac{3}{4}$ .  | 10. $8 \times \frac{5}{8}$ . | 15. $5 \times \frac{2}{3}$ .  | 20. $6 \times \frac{7}{1\frac{1}{2}}$ . |

21. If each side of a triangle is  $\frac{3}{4}$  in., what is the perimeter ?

22. If one side of a square is  $\frac{5}{8}$  in., what is the perimeter ?

23. At  $\$ \frac{1}{4}$  a dozen, how much will 6 doz. eggs cost ? 8 doz. ?

24. At  $\$ \frac{1}{4}$  a yard, how much will 9 yd. of cloth cost ?

25. If you live  $\frac{3}{8}$  mi. from school, and I live twice as far away, how far from school do I live ?

26. If a board is  $\frac{7}{8}$  in. thick, how thick will be a pile of 32 such boards ?

27. If each boy can pull  $\frac{1}{4}$  of a ton, what fraction of a ton can 8 boys pull ?

## 66. Multiplication

- |                         |                          |                              |                               |
|-------------------------|--------------------------|------------------------------|-------------------------------|
| 1. $\frac{1}{2}$ of 26. | 7. $\frac{1}{4}$ of 56.  | 13. $\frac{3}{8}$ of 32.     | 19. $8 \times \frac{3}{8}$ .  |
| 2. $\frac{1}{2}$ of 30. | 8. $\frac{1}{4}$ of 72.  | 14. $\frac{5}{8}$ of 48.     | 20. $12 \times \frac{5}{8}$ . |
| 3. $\frac{1}{2}$ of 32. | 9. $\frac{3}{4}$ of 32.  | 15. $\frac{1}{16}$ of 32.    | 21. $9 \times \frac{1}{3}$ .  |
| 4. $\frac{1}{2}$ of 72. | 10. $\frac{3}{4}$ of 44. | 16. $\frac{3}{16}$ of 32.    | 22. $9 \times \frac{3}{8}$ .  |
| 5. $\frac{1}{4}$ of 36. | 11. $\frac{1}{8}$ of 48. | 17. $8 \times \frac{1}{4}$ . | 23. $6 \times \frac{5}{8}$ .  |
| 6. $\frac{1}{4}$ of 84. | 12. $\frac{1}{8}$ of 96. | 18. $8 \times \frac{3}{4}$ . | 24. $6 \times \frac{5}{12}$ . |

25. At the rate of  $\frac{5}{8}$  mi. a minute, how far will a train go in 4 min.?

26. How much is  $\frac{1}{8}$  of 48?  $\frac{5}{8}$  of 48 ft.?  $\frac{5}{8}$  of \$48?  $\frac{5}{8}$  of \$480?  $\frac{5}{8}$  of \$4800?

27. If a room is 32 ft. long, and the width is  $\frac{7}{16}$  as much, what is the width?

28. An inch being  $\frac{1}{12}$  ft., how many feet in 48 in.? in 60 in.? in 36 in.? in 72 in.? in 96 in.? in 144 in.?

## 67. Multiplication

Think of  $\frac{2}{3}$  of  $\frac{3}{8}$  as  $\frac{2}{3}$  of  $\frac{3}{8}$ , or  $\frac{1}{4}$ . Always cancel mentally before you multiply, if possible. 4

- |                                     |                                      |                                      |                                      |
|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 1. $\frac{1}{2}$ of $\frac{1}{3}$ . | 6. $\frac{1}{2}$ of $\frac{3}{4}$ .  | 11. $\frac{2}{3}$ of $\frac{1}{4}$ . | 16. $\frac{2}{5}$ of $\frac{5}{8}$ . |
| 2. $\frac{1}{2}$ of $\frac{1}{4}$ . | 7. $\frac{1}{2}$ of $\frac{2}{5}$ .  | 12. $\frac{2}{3}$ of $\frac{3}{4}$ . | 17. $\frac{1}{8}$ of $\frac{8}{9}$ . |
| 3. $\frac{1}{2}$ of $\frac{1}{5}$ . | 8. $\frac{1}{2}$ of $\frac{4}{5}$ .  | 13. $\frac{1}{2}$ of $\frac{1}{8}$ . | 18. $\frac{3}{8}$ of $\frac{8}{9}$ . |
| 4. $\frac{1}{2}$ of $\frac{1}{6}$ . | 9. $\frac{1}{3}$ of $\frac{1}{4}$ .  | 14. $\frac{1}{2}$ of $\frac{5}{8}$ . | 19. $\frac{1}{3}$ of $\frac{5}{9}$ . |
| 5. $\frac{1}{2}$ of $\frac{2}{3}$ . | 10. $\frac{1}{3}$ of $\frac{3}{4}$ . | 15. $\frac{1}{3}$ of $\frac{3}{8}$ . | 20. $\frac{3}{5}$ of $\frac{5}{9}$ . |

21. How much is  $\frac{1}{2}$  of  $\frac{2}{3}$ ?  $\frac{1}{2}$  of  $\frac{2}{3}$  of  $\frac{3}{4}$ ?  $\frac{1}{2}$  of  $\frac{2}{3}$  of  $\frac{3}{4}$  of  $\frac{4}{5}$ ?

22. A foot is what part of a yard? of 5 yd.? of 7 yd.?

23. An inch is what part of a foot?  $\frac{1}{2}$  ft. is what part of a yard?

24. A ruler is marked in quarters of an inch, and each of these spaces is divided into thirds. How long is each of the small divisions?

## 68. Multiplication

- |                                      |                                      |                               |                               |
|--------------------------------------|--------------------------------------|-------------------------------|-------------------------------|
| 1. $\frac{1}{2}$ of 2.               | 6. $\frac{1}{2}$ of $8\frac{1}{3}$ . | 11. $4 \times 1\frac{3}{4}$ . | 16. $2\frac{2}{3} \times 3$ . |
| 2. $\frac{1}{2}$ of $\frac{1}{2}$ .  | 7. $\frac{1}{2}$ of $8\frac{2}{3}$ . | 12. $3 \times 1\frac{2}{3}$ . | 17. $1\frac{1}{8} \times 8$ . |
| 3. $\frac{1}{2}$ of $2\frac{1}{2}$ . | 8. $\frac{1}{3}$ of $6\frac{3}{4}$ . | 13. $3\frac{1}{2} \times 4$ . | 18. $1\frac{3}{8} \times 8$ . |
| 4. $\frac{1}{2}$ of $4\frac{1}{8}$ . | 9. $2 \times 3\frac{1}{2}$ .         | 14. $2\frac{1}{3} \times 6$ . | 19. $8 \times 2\frac{1}{8}$ . |
| 5. $\frac{1}{2}$ of $6\frac{1}{2}$ . | 10. $3 \times 2\frac{1}{3}$ .        | 15. $2\frac{3}{4} \times 4$ . | 20. $8 \times 1\frac{1}{8}$ . |

21. What is the area of a square whose side is 4 in. ?  $\frac{1}{4}$  in. ?  
6 in. ?  $1\frac{1}{2}$  in. ?

22. What is the area of a rectangle 2 in. by 3 in. ? 2 in. by  $3\frac{1}{2}$  in. ?

23. If the side of a square is  $2\frac{1}{4}$  in., what is the perimeter ?

24. If a book is  $1\frac{1}{8}$  in. thick, how high will be a pile of 4 such books ? of 8 such books ?

25. If a board is  $1\frac{3}{8}$  in. thick, what will be the height of a pile of 4 such boards ? of 8 such boards ?

## 69. Multiplication

- |                                     |                                      |                                       |                                       |
|-------------------------------------|--------------------------------------|---------------------------------------|---------------------------------------|
| 1. $\frac{1}{2}$ of $\frac{1}{8}$ . | 7. $\frac{1}{3}$ of $\frac{3}{8}$ .  | 13. $\frac{1}{5}$ of $\frac{5}{2}$ .  | 19. $\frac{3}{4}$ of $\frac{8}{3}$ .  |
| 2. $\frac{1}{2}$ of $\frac{5}{8}$ . | 8. $\frac{1}{2}$ of $\frac{7}{8}$ .  | 14. $\frac{1}{5}$ of $2\frac{1}{2}$ . | 20. $\frac{3}{4}$ of $2\frac{2}{3}$ . |
| 3. $\frac{1}{2}$ of $\frac{3}{8}$ . | 9. $\frac{1}{3}$ of $\frac{3}{5}$ .  | 15. $\frac{2}{5}$ of $2\frac{1}{2}$ . | 21. $\frac{5}{4}$ of 4.               |
| 4. $\frac{1}{4}$ of $\frac{1}{8}$ . | 10. $\frac{2}{3}$ of $\frac{3}{5}$ . | 16. $\frac{4}{5}$ of $2\frac{1}{2}$ . | 22. $1\frac{1}{4} \times 4$ .         |
| 5. $\frac{1}{2}$ of $\frac{3}{5}$ . | 11. $\frac{2}{5}$ of $\frac{5}{4}$ . | 17. $\frac{1}{4}$ of $\frac{8}{3}$ .  | 23. $\frac{7}{3}$ of 6.               |
| 6. $\frac{1}{2}$ of $\frac{3}{8}$ . | 12. $\frac{4}{7}$ of $\frac{7}{8}$ . | 18. $\frac{1}{4}$ of $2\frac{2}{3}$ . | 24. $2\frac{1}{3} \times 6$ .         |

25. I wish to make a drawing  $\frac{1}{3}$  as long as the original. By what length in the drawing shall I represent  $\frac{3}{8}$  in. in the original ?  $\frac{1}{2}$  in. in the original ?

26. I wish to make a drawing of a map  $\frac{3}{8}$  of its original length. By what length in the drawing shall I represent  $\frac{2}{3}$  in. in the original ?  $1\frac{2}{3}$  in. (or  $\frac{5}{3}$  in.) in the original ?

27. I wish to make a floor plan of a room, representing 1 ft. by  $\frac{1}{8}$  in. The floor is 17 ft. wide. By what length shall I represent the width of the room ?

## 70. Division

1.  $\frac{2}{3} \div 2$     2.  $\frac{3}{4} \div 3$     3.  $\frac{6}{7} \div 3$     4.  $\frac{8}{9} \div 4$     5.  $\frac{1}{3} \div 2$   
 6.  $\frac{1}{4} \div 3$     7.  $\frac{1}{3} \div 4$     8.  $\frac{2}{3} \div 5$     9.  $\frac{6}{7} \div 4$     10.  $\frac{9}{10} \div 6$   
 11.  $\frac{2}{3} \div 8$     12.  $\frac{4}{5} \div 6$     13.  $\frac{3}{8} \div 6$     14.  $\frac{3}{16} \div 6$     15.  $\frac{5}{16} \div 10$   
 16.  $\frac{9}{16} \div 6$     17.  $\frac{3}{32} \div 3$     18.  $\frac{5}{32} \div 5$     19.  $\frac{5}{32} \div 10$     20.  $\frac{7}{32} \div 14$

21. Reduce  $2\frac{1}{4}$  to fourths and then divide by 3. Divide  $3\frac{1}{3}$  by 5.

22. Reduce  $2\frac{1}{3}$  to thirds and then divide by 14. Divide  $2\frac{2}{3}$  by 4.

23. If I walk 4 mi. in  $1\frac{1}{3}$  hr., in what fraction of an hour do I walk a mile?

24. If I walk  $5\frac{3}{5}$  mi. in 2 hr., what is my rate per hour?

25. If I walk 3 mi. in 1 hr., how long will it take me to walk 1 mi. ?  $\frac{1}{2}$  mi. ?  $\frac{1}{4}$  mi. ?  $\frac{3}{4}$  mi. ?

## 71. Division

1.  $1 \div \frac{1}{2}$     2.  $3 \div \frac{1}{2}$     3.  $1 \div \frac{1}{4}$     4.  $7 \div \frac{1}{4}$     5.  $8 \div \frac{1}{2}$   
 6.  $7 \div \frac{1}{3}$     7.  $6 \div \frac{2}{3}$     8.  $8 \div \frac{4}{5}$     9.  $\frac{1}{2} \div \frac{1}{2}$     10.  $\frac{1}{2} \div \frac{1}{4}$   
 11.  $\frac{1}{2} \div \frac{3}{4}$     12.  $\frac{1}{2} \div \frac{2}{3}$     13.  $\frac{5}{8} \div \frac{5}{7}$     14.  $\frac{3}{8} \div \frac{6}{7}$     15.  $\frac{7}{8} \div \frac{3}{4}$   
 16.  $\frac{7}{8} \div \frac{5}{8}$     17.  $\frac{3}{2} \div \frac{1}{2}$     18.  $1\frac{1}{2} \div \frac{1}{2}$     19.  $1\frac{1}{3} \div \frac{1}{3}$     20.  $1\frac{1}{3} \div \frac{2}{3}$

21. How many  $\frac{1}{4}$ -inch lengths are there in 2 in. ? in  $2\frac{1}{4}$  in. ? in  $2\frac{1}{2}$  in. ?

22. How many times is  $2\frac{1}{2}$  in. contained in 5 in. ?  $\frac{5}{2}$  in 5 ?  $\frac{5}{2}$  in 5 ?

23. If a strip of carpet is  $\frac{3}{4}$  yd. wide and 9 yd. long, it is how many times as long as it is wide ?

24. How many times is  $1\frac{1}{3}$  contained in  $2\frac{2}{3}$  ? in  $2\frac{2}{3} + \frac{1}{3}$  ? in 3 ?

25. How many times is  $1\frac{1}{4}$  contained in  $2\frac{3}{4}$  ? in  $2\frac{1}{2}$  ? in 5 ? in 10 ?

**72. Multiplication. Aliquot Parts**

Think of  $24 \times 25\phi$  as  $24 \times \$\frac{1}{4}$ , or  $\$6$ . Think of  $48 \times 12\frac{1}{2}\phi$  as  $48 \times \$\frac{1}{8}$ , or  $\$6$ . Think of  $36 \times 50\phi$  as  $36 \times \$\frac{1}{2}$ , or  $\$18$ . Think of  $36 \times 75\phi$  as  $36 \times \$\frac{3}{4}$ , or  $\$27$ .

- |                         |                                    |                                    |
|-------------------------|------------------------------------|------------------------------------|
| 1. $28 \times 50\phi$ . | 5. $48 \times 25\phi$ .            | 9. $72 \times 12\frac{1}{2}\phi$ . |
| 2. $64 \times 50\phi$ . | 6. $88 \times 25\phi$ .            | 10. $24 \times 75\phi$ .           |
| 3. $21 \times 50\phi$ . | 7. $32 \times 12\frac{1}{2}\phi$ . | 11. $32 \times 75\phi$ .           |
| 4. $32 \times 25\phi$ . | 8. $56 \times 12\frac{1}{2}\phi$ . | 12. $44 \times 75\phi$ .           |

13. At  $50\phi$  each, what will 18 books cost?

14. At  $25\phi$  each, what will a dozen lamp shades cost?

15. At  $75\phi$  a yard, what will 80 yd. of Brussels carpet cost?

16. At  $12\frac{1}{2}\phi$  a yard, what will 64 ft. of picture molding cost?

17. At  $12\frac{1}{2}\phi$  a yard, what will 24 yd. of gingham cost? what will 96 yards cost?

**73. Division. Aliquot Parts**

Think of  $\$3 \div \$0.50$  as  $\$3 \div \$\frac{1}{2}$ , or as  $2 \times 3$ , or as 6.

Think of  $\$3 \div \$0.25$  as  $\$3 \div \$\frac{1}{4}$ , or as  $4 \times 3$ , or as 12.

Think of  $\$5 \div \$0.12\frac{1}{2}$  as  $\$5 \div \$\frac{1}{8}$ , or as  $8 \times 5$ , or as 40.

Think of  $\$6 \div \$0.75$  as  $\$6 \div \$\frac{3}{4}$ , or as  $\frac{4 \times 6}{3}$ , or as 8.

- |                        |                                   |                                   |
|------------------------|-----------------------------------|-----------------------------------|
| 1. $\$5 \div \$0.50$ . | 5. $\$6 \div \$0.25$ .            | 9. $\$9 \div \$0.12\frac{1}{2}$ . |
| 2. $\$7 \div \$0.50$ . | 6. $\$8 \div \$0.25$ .            | 10. $\$3 \div \$0.75$ .           |
| 3. $\$9 \div \$0.50$ . | 7. $\$6 \div \$0.12\frac{1}{2}$ . | 11. $\$9 \div \$0.75$ .           |
| 4. $\$4 \div \$0.25$ . | 8. $\$8 \div \$0.12\frac{1}{2}$ . | 12. $\$12 \div \$0.75$ .          |

13. At  $50\phi$  each, how many baskets can be bought for  $\$12$ ?

14. At  $25\phi$  each, how many fishing rods can be bought for  $\$7$ ?

15. At  $12\frac{1}{2}\phi$  a box, how many boxes of berries can be bought for  $\$2$ ? for  $\$2\frac{1}{4}$ ?

16. At  $75\phi$  each, how many books can be bought for  $\$6$ ?

## IV. DECIMAL FRACTIONS

## 74. Reduction

Think of .25 or 0.25 as  $\frac{25}{100}$ , or  $\frac{1}{4}$ . Think of 1.5 as  $1\frac{5}{10}$ , or  $1\frac{1}{2}$ .

*Reduce to common fractions or mixed numbers:*

- |          |          |          |          |           |
|----------|----------|----------|----------|-----------|
| 1. 0.5.  | 4. 0.60. | 7. 0.8.  | 10. 2.8. | 13. 7.50. |
| 2. 0.50. | 5. 0.4.  | 8. 0.75. | 11. 3.5. | 14. 2.20. |
| 3. 0.2.  | 6. 0.40. | 9. 1.4.  | 12. 4.4. | 15. 3.75. |

*Reduce to dollars and common fractions of a dollar:*

- |             |                            |                            |                            |
|-------------|----------------------------|----------------------------|----------------------------|
| 16. \$1.50. | 20. \$2.40.                | 24. \$3.12 $\frac{1}{2}$ . | 28. \$2.16 $\frac{2}{3}$ . |
| 17. \$1.25. | 21. \$3.60.                | 25. \$1.33 $\frac{1}{3}$ . | 29. \$3.37 $\frac{1}{2}$ . |
| 18. \$1.75. | 22. \$5.20.                | 26. \$2.33 $\frac{1}{3}$ . | 30. \$2.62 $\frac{1}{2}$ . |
| 19. \$1.20. | 23. \$1.12 $\frac{1}{2}$ . | 27. \$1.66 $\frac{2}{3}$ . | 31. \$5.87 $\frac{1}{2}$ . |

## 75. Reduction

Think of 2.8 as  $2\frac{4}{5}$ , or  $1\frac{4}{5}$ . Think of 1.75 as  $1\frac{3}{4}$ , or  $\frac{7}{4}$ .

*Reduce to improper common fractions:*

- |         |         |         |          |           |
|---------|---------|---------|----------|-----------|
| 1. 1.5. | 3. 1.4. | 5. 1.8. | 7. 2.25. | 9. 1.20.  |
| 2. 1.2. | 4. 1.6. | 6. 3.5. | 8. 1.75. | 10. 1.40. |

*Reduce to common fractions or mixed numbers:*

- |           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|
| 11. 0.3.  | 14. 0.75. | 17. 2.40. | 20. 3.10. | 23. 5.50. |
| 12. 0.30. | 15. 0.10. | 18. 2.25. | 21. 3.5.  | 24. 7.75. |
| 13. 0.25. | 16. 1.3.  | 19. 5.75. | 22. 4.50. | 25. 8.20. |

*Reduce to improper common fractions:*

- |   |          |           |           |           |
|---|----------|-----------|-----------|-----------|
| 26. 2.5.  | 28. 2.2. | 30. 2.8.  | 32. 7.50. | 34. 1.40. |
| 27. 4.5.  | 29. 2.4. | 31. 4.50. | 33. 3.20. | 35. 1.75. |
| 36. Express 32.12 $\frac{1}{2}$ mi. as miles and a common fraction. |          |           |           |           |



## 76. Reduction

To reduce  $\frac{1}{4}$  to a decimal fraction, think of multiplying both terms by some number that will make the denominator 10, 100, or 1000. Thus  $\frac{1}{4} = \frac{25}{100}$ , or 0.25.

*Reduce to decimal fractions :*

- |                    |                    |                     |                      |                      |
|--------------------|--------------------|---------------------|----------------------|----------------------|
| 1. $\frac{1}{2}$ . | 4. $\frac{3}{8}$ . | 7. $\frac{1}{25}$ . | 10. $\frac{7}{50}$ . | 13. $5\frac{3}{8}$ . |
| 2. $\frac{1}{5}$ . | 5. $\frac{4}{5}$ . | 8. $\frac{2}{25}$ . | 11. $2\frac{1}{2}$ . | 14. $7\frac{3}{8}$ . |
| 3. $\frac{2}{5}$ . | 6. $\frac{3}{4}$ . | 9. $\frac{4}{25}$ . | 12. $3\frac{1}{2}$ . | 15. $3\frac{4}{5}$ . |

*Reduce to dollars and cents :*

16. \$1 $\frac{1}{2}$ .    17. \$1 $\frac{1}{4}$ .    18. \$1 $\frac{3}{4}$ .    19. \$2 $\frac{3}{4}$ .    20. \$5 $\frac{3}{8}$ .
21. How many cents in \$2 $\frac{1}{4}$  ?
22. How many cents in \$3 $\frac{3}{4}$  ?
23. How many quarters of a dollar in \$2.50 ?
24. How many half dollars in \$2.50 ? in \$7.50 ?

## 77. Reduction

*Reduce to decimal fractions :*

- |                    |                    |                     |                      |                       |
|--------------------|--------------------|---------------------|----------------------|-----------------------|
| 1. $\frac{1}{4}$ . | 4. $\frac{3}{8}$ . | 7. $\frac{4}{5}$ .  | 10. $\frac{1}{50}$ . | 13. $6\frac{3}{4}$ .  |
| 2. $\frac{2}{4}$ . | 5. $\frac{5}{8}$ . | 8. $\frac{1}{20}$ . | 11. $8\frac{1}{2}$ . | 14. $5\frac{1}{8}$ .  |
| 3. $\frac{1}{8}$ . | 6. $\frac{7}{5}$ . | 9. $\frac{1}{25}$ . | 12. $7\frac{4}{5}$ . | 15. $2\frac{1}{20}$ . |
16. Express  $75\frac{3}{4}$  mi. as miles and a decimal.
17. Express  $34\frac{1}{8}$  mi. as miles and a decimal.
18. Express \$2 $\frac{1}{4}$  as dollars and a decimal ; as cents.
19. Express \$15 $\frac{3}{4}$  as dollars and a decimal ; as cents.

*Express as the sum of two decimal fractions :*

- |                                   |                                   |                                   |                                   |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 20. $\frac{1}{2} + \frac{1}{2}$ . | 22. $\frac{1}{2} + \frac{3}{4}$ . | 24. $\frac{1}{2} + \frac{3}{5}$ . | 26. $\frac{3}{5} + \frac{1}{8}$ . |
| 21. $\frac{1}{2} + \frac{1}{4}$ . | 23. $\frac{1}{2} + \frac{1}{5}$ . | 25. $\frac{1}{4} + \frac{4}{5}$ . | 27. $\frac{3}{4} + \frac{3}{8}$ . |
28. Express  $2\frac{1}{2} + 4\frac{3}{4}$  as the sum of mixed decimals.
29. A train travels  $45\frac{3}{4}$  mi. an hour. Read this distance as a mixed decimal.

## 78. Addition

*Add the following:*

1. $\begin{array}{r} .2 \\ .7 \\ \hline \end{array}$	5. $\begin{array}{r} .08 \\ .06 \\ \hline \end{array}$	9. $\begin{array}{r} .09 \\ .09 \\ \hline \end{array}$	13. $\begin{array}{r} .07 \\ .07 \\ \hline \end{array}$	17. $\begin{array}{r} .006 \\ .120 \\ \hline \end{array}$
--	--	--	---	---

2. $\begin{array}{r} \frac{3}{10} \\ \frac{9}{10} \\ \hline \end{array}$	6. $\begin{array}{r} .5 \\ .7 \\ \hline \end{array}$	10. $\begin{array}{r} .008 \\ .005 \\ \hline \end{array}$	14. $\begin{array}{r} .08 \\ .03 \\ \hline \end{array}$	18. $\begin{array}{r} .009 \\ .128 \\ \hline \end{array}$
--	--	---	---	---

3. $\begin{array}{r} .3 \\ .9 \\ \hline \end{array}$	7. $\begin{array}{r} .6 \\ .7 \\ \hline \end{array}$	11. $\begin{array}{r} .1 \\ .9 \\ \hline \end{array}$	15. $\begin{array}{r} .009 \\ .090 \\ \hline \end{array}$	19. $\begin{array}{r} .012 \\ .125 \\ \hline \end{array}$
--	--	---	---	---

4. $\begin{array}{r} .7 \\ .9 \\ \hline \end{array}$	8. $\begin{array}{r} .05 \\ .09 \\ \hline \end{array}$	12. $\begin{array}{r} .9 \\ .6 \\ \hline \end{array}$	16. $\begin{array}{r} .007 \\ .072 \\ \hline \end{array}$	20. $\begin{array}{r} .015 \\ .125 \\ \hline \end{array}$
--	--	---	---	---

21. How much is 0.8 in. and 0.7 in.?  $\frac{3}{4}$  in. and  $\frac{3}{4}$  in.?

## 79. Addition

*Add the following:*

1. $\begin{array}{r} .4 \\ .5 \\ \hline \end{array}$	4. $\begin{array}{r} .5 \\ .6 \\ \hline \end{array}$	7. $\begin{array}{r} .5 \\ .25 \\ \hline \end{array}$	10. $\begin{array}{r} .20 \\ .95 \\ \hline \end{array}$	13. $\begin{array}{r} .575 \\ .003 \\ \hline \end{array}$
--	--	---	---	---

2. $\begin{array}{r} .3 \\ .6 \\ \hline \end{array}$	5. $\begin{array}{r} .05 \\ .06 \\ \hline \end{array}$	8. $\begin{array}{r} .50 \\ .70 \\ \hline \end{array}$	11. $\begin{array}{r} .70 \\ .077 \\ \hline \end{array}$	14. $\begin{array}{r} .575 \\ .005 \\ \hline \end{array}$
--	--	--	--	---

3. $\begin{array}{r} .5 \\ .5 \\ \hline \end{array}$	6. $\begin{array}{r} .5 \\ .06 \\ \hline \end{array}$	9. $\begin{array}{r} .50 \\ .75 \\ \hline \end{array}$	12. $\begin{array}{r} .300 \\ .033 \\ \hline \end{array}$	15. $\begin{array}{r} .575 \\ .025 \\ \hline \end{array}$
--	---	--	---	---

16. Add  $\frac{3}{4}$  and  $\frac{1}{4}$ ; add 0.75 and 0.25.17. Add  $\$ \frac{3}{4}$  and  $\$ \frac{1}{2}$ ; add \$0.75 and \$0.50.18. Add  $\$ \frac{1}{8}$  and  $\$ \frac{1}{4}$ ; add  $\$ 0.12\frac{1}{2}$  and \$0.25.19. Add  $\$ \frac{1}{3}$  and  $\$ \frac{2}{3}$ ; add  $\$ 0.33\frac{1}{3}$  and  $\$ 0.66\frac{2}{3}$ .

80. Addition

*Add the following :*

1. $\begin{array}{r} 1.1 \\ \underline{.8} \end{array}$	4. $\begin{array}{r} 2.8 \\ \underline{.8} \end{array}$	7. $\begin{array}{r} 1.7 \\ \underline{1.3} \end{array}$	10. $\begin{array}{r} 3.8 \\ \underline{2.1} \end{array}$	13. $\begin{array}{r} .35 \\ \underline{.16} \end{array}$
2. $\begin{array}{r} 1.4 \\ \underline{.6} \end{array}$	5. $\begin{array}{r} 3.9 \\ \underline{.8} \end{array}$	8. $\begin{array}{r} 1.8 \\ \underline{1.4} \end{array}$	11. $\begin{array}{r} 2.5 \\ \underline{3.5} \end{array}$	14. $\begin{array}{r} .36 \\ \underline{.17} \end{array}$
3. $\begin{array}{r} 1.7 \\ \underline{.6} \end{array}$	6. $\begin{array}{r} 1.2 \\ \underline{1.3} \end{array}$	9. $\begin{array}{r} 2.6 \\ \underline{1.5} \end{array}$	12. $\begin{array}{r} .25 \\ \underline{.35} \end{array}$	15. $\begin{array}{r} .42 \\ \underline{.19} \end{array}$

16. How much is 0.25 in. and 0.5 in. ?

17. How much is 0.25 in. and  $\frac{3}{4}$  in. ?

18. The three sides of a triangle are 0.25 ft., 0.2 ft., and 0.24 ft. What is the perimeter ?

81. Addition

*Add the following :*

1. $\begin{array}{r} .20 \\ \underline{.35} \end{array}$	4. $\begin{array}{r} .35 \\ \underline{.47} \end{array}$	7. $\begin{array}{r} 1.3 \\ \underline{2.7} \end{array}$	10. $\begin{array}{r} 3.6 \\ \underline{2.6} \end{array}$	13. $\begin{array}{r} 2.60 \\ \underline{3.50} \end{array}$
2. $\begin{array}{r} .25 \\ \underline{.35} \end{array}$	5. $\begin{array}{r} .57 \\ \underline{.28} \end{array}$	8. $\begin{array}{r} 1.3 \\ \underline{2.9} \end{array}$	11. $\begin{array}{r} 2.40 \\ \underline{3.40} \end{array}$	14. $\begin{array}{r} 2.60 \\ \underline{3.80} \end{array}$
3. $\begin{array}{r} .28 \\ \underline{.37} \end{array}$	6. $\begin{array}{r} 1.3 \\ \underline{2.4} \end{array}$	9. $\begin{array}{r} 2.5 \\ \underline{2.9} \end{array}$	12. $\begin{array}{r} 2.50 \\ \underline{3.50} \end{array}$	15. $\begin{array}{r} 4.70 \\ \underline{3.45} \end{array}$

16. Add 2.5 mi., 3.3 mi., and 4.5 mi.

17. Add \$2.50 and \$3.50; add \$2.50 and \$3.60.

18. If my purchases amount to \$4.80 and \$3.30, what is the total ?

## 82. Subtraction

*Subtract the following :*

- |   |   |   |  |  |
|---|---|---|--|--|
| 1. $\begin{array}{r} 1.8 \\ \underline{.5} \end{array}$ | 4. $\begin{array}{r} 3.4 \\ \underline{.5} \end{array}$ | 7. $\begin{array}{r} 2.0 \\ \underline{.7} \end{array}$ | 10. $\begin{array}{r} 2.0 \\ \underline{.6} \end{array}$ | 13. $\begin{array}{r} 6.3 \\ \underline{.9} \end{array}$ |
| 2. $\begin{array}{r} 2.8 \\ \underline{.6} \end{array}$ | 5. $\begin{array}{r} 5.6 \\ \underline{.8} \end{array}$ | 8. $\begin{array}{r} 4.0 \\ \underline{.9} \end{array}$ | 11. $\begin{array}{r} 2.3 \\ \underline{.8} \end{array}$ | 14. $\begin{array}{r} 2.4 \\ \underline{.6} \end{array}$ |
| 3. $\begin{array}{r} 3.4 \\ \underline{.4} \end{array}$ | 6. $\begin{array}{r} 3.0 \\ \underline{.4} \end{array}$ | 9. $\begin{array}{r} 3.0 \\ \underline{.8} \end{array}$ | 12. $\begin{array}{r} 3.4 \\ \underline{.7} \end{array}$ | 15. $\begin{array}{r} 3.1 \\ \underline{.8} \end{array}$ |

16. What number must be added to 5 to make 8? to 0.5 to make 0.8?

17. What number must be subtracted from 11 to leave 6? from 1.1 to leave 0.6?

## 83. Subtraction

*Subtract the following :*

- |   |   |   |  |   |
|---|---|---|--|---|
| 1. $\begin{array}{r} 1.6 \\ \underline{.5} \end{array}$ | 4. $\begin{array}{r} 2.0 \\ \underline{.5} \end{array}$ | 7. $\begin{array}{r} 3.5 \\ \underline{.8} \end{array}$ | 10. $\begin{array}{r} 4.1 \\ \underline{.8} \end{array}$ | 13. $\begin{array}{r} 6.1 \\ \underline{1.7} \end{array}$ |
| 2. $\begin{array}{r} 1.2 \\ \underline{.5} \end{array}$ | 5. $\begin{array}{r} 3.0 \\ \underline{.7} \end{array}$ | 8. $\begin{array}{r} 4.3 \\ \underline{.5} \end{array}$ | 11. $\begin{array}{r} 5.3 \\ \underline{.4} \end{array}$ | 14. $\begin{array}{r} 6.3 \\ \underline{2.7} \end{array}$ |
| 3. $\begin{array}{r} 2.3 \\ \underline{.6} \end{array}$ | 6. $\begin{array}{r} 3.4 \\ \underline{.6} \end{array}$ | 9. $\begin{array}{r} 4.2 \\ \underline{.6} \end{array}$ | 12. $\begin{array}{r} 5.4 \\ \underline{.8} \end{array}$ | 15. $\begin{array}{r} 7.8 \\ \underline{3.9} \end{array}$ |

16. What number must be added to 0.5 to make 0.6?

17. What number must be added to 3 to make 21? to 0.3 to make 2.1?

18. What number must be subtracted from 23 to make 8? from 2.3 to make 0.8? from 0.23 to make 0.08?

## 84. Subtraction

To subtract .54 from 2.61 mentally, first subtract .5, leaving 2.11, and then subtract .04.

*Subtract the following :*

1. 1.25 <u>.20</u>	3. 1.25 <u>.15</u>	5. 1.35 <u>.06</u>	7. 1.20 <u>.08</u>	9. 2.05 <u>.05</u>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

2. 1.25 <u>.05</u>	4. 1.35 <u>.35</u>	6. 1.50 <u>.05</u>	8. 1.20 <u>.18</u>	10. 2.00 <u>.50</u>
-----------------------	-----------------------	-----------------------	-----------------------	------------------------

11. How much is \$1.25 - \$0.50 ?
12. If I owe \$0.75 and pay \$5, how much change should I receive ?
13. If I have \$0.37, how much must I add to it to have \$0.50 ?

## 85. Subtraction

*Subtract the following :*

1. 2.5 <u>1.3</u>	3. 2.5 <u>1.8</u>	5. 3.4 <u>1.9</u>	7. 2.25 <u>.27</u>	9. 3.56 <u>.37</u>
----------------------	----------------------	----------------------	-----------------------	-----------------------

2. 2.5 <u>1.5</u>	4. 3.2 <u>1.6</u>	6. 2.25 <u>.07</u>	8. 2.42 <u>.29</u>	10. 3.71 <u>2.46</u>
----------------------	----------------------	-----------------------	-----------------------	-------------------------

11. If I have \$2.25 and spend 8¢, how much is left? How much is left if I spend 17¢ more ?
12. If I have \$2.50 and make purchases amounting to 25¢ and 65¢, how much is left ?
13. If I have \$3.50 and spend \$0.75, how much is left ?
14. If I have \$5 and spend \$4.30, how much is left ?
15. If I have \$10 and spend \$5.75, how much is left ?
16. If I have \$25 and spend \$12.50, how much is left ?

## 86. Multiplication

- |                    |                     |                     |                      |
|--------------------|---------------------|---------------------|----------------------|
| 1. $2 \times .2$ . | 6. $3 \times .8$ .  | 11. $5 \times .2$ . | 16. $2 \times .09$ . |
| 2. $2 \times .5$ . | 7. $4 \times .2$ .  | 12. $6 \times .8$ . | 17. $3 \times .09$ . |
| 3. $2 \times .7$ . | 8. $4 \times .5$ .  | 13. $9 \times .1$ . | 18. $4 \times .12$ . |
| 4. $3 \times .3$ . | 9. $4 \times .9$ .  | 14. $8 \times .5$ . | 19. $7 \times .11$ . |
| 5. $3 \times .5$ . | 10. $5 \times .1$ . | 15. $9 \times .2$ . | 20. $8 \times .20$ . |

21. If a side of a square is  $.25$  in., what is the perimeter?

22. If each side of a triangle is  $.3\frac{1}{3}$  yd., what is the perimeter?

23. If a strip of carpet is  $.75$  yd. wide, how wide will be the width of 2 strips laid side by side? of 4 strips?

24. If a sheet of cardboard is  $0.3$  in. thick, how thick will a pile of 9 sheets be?

25. If a piece of glass is  $0.6$  in. thick, how thick will 6 layers of this glass be?

## 87. Multiplication by Tens

Think of  $40 \times .8$  as  $4 \times 10 \times .8$ , or  $4 \times 8$ , or  $32$ . Similarly, think of  $70 \times 1.1$  as  $7 \times 11$ , or  $77$ .

- |                     |                     |                      |                       |
|---------------------|---------------------|----------------------|-----------------------|
| 1. $10 \times .4$ . | 5. $20 \times .5$ . | 9. $30 \times .6$ .  | 13. $10 \times 1.5$ . |
| 2. $10 \times .5$ . | 6. $30 \times .3$ . | 10. $60 \times .1$ . | 14. $40 \times 2.5$ . |
| 3. $10 \times .8$ . | 7. $30 \times .4$ . | 11. $70 \times .2$ . | 15. $50 \times 1.1$ . |
| 4. $20 \times .4$ . | 8. $30 \times .5$ . | 12. $80 \times .3$ . | 16. $80 \times 2.5$ . |

17. At  $25\text{¢}$  each, what will 40 neckties cost?

18. At  $50\text{¢}$  each, what will 20 knives cost?

19. At  $75\text{¢}$  each, what will 40 baskets cost?

20. If a board is  $0.8$  in. thick, how high will be a pile of 60 such boards?

21. There are 50 sheets of blotting paper in a pile, each sheet being  $0.05$  in. thick. Find the thickness of the pile.

22. There are 60 sheets of paper in a pile, each sheet being  $0.02$  in. thick. Find the thickness of the pile.

## 88. Multiplication

- |                    |                     |                      |                      |
|--------------------|---------------------|----------------------|----------------------|
| 1. $3 \times .2$ . | 6. $6 \times .3$ .  | 11. $5 \times .9$ .  | 16. $8 \times .07$ . |
| 2. $5 \times .2$ . | 7. $6 \times .5$ .  | 12. $7 \times .6$ .  | 17. $3 \times 1.1$ . |
| 3. $2 \times .5$ . | 8. $6 \times .7$ .  | 13. $5 \times .06$ . | 18. $3 \times 1.3$ . |
| 4. $8 \times .7$ . | 9. $5 \times .8$ .  | 14. $5 \times .09$ . | 19. $3 \times 1.5$ . |
| 5. $3 \times .6$   | 10. $8 \times .5$ . | 15. $3 \times .08$ . | 20. $3 \times 2.5$ . |

21. If one tennis ball costs 22¢, what will 5 cost?
22. If one tennis racquet costs \$2.50, what will 3 cost?
23. At 45¢ each, what will three arithmetics cost?
24. If a board is 0.9 in. thick, what is the thickness of a pile of 4 such boards?
25. If each side of a pentagon (5-sided figure) is 0.7 in., what is the perimeter?
26. If each link in a chain is 0.25 in. long, how long is a chain of 30 links?

## 89. Multiplication

- |                    |             |                      |                      |
|--------------------|-------------|----------------------|----------------------|
| 1. $6 \times .7$ . | 5. .3 of 4. | 9. $12 \times .2$ .  | 13. .2 of 15.        |
| 2. .7 of 6.        | 6. .5 of 8. | 10. .2 of 12.        | 14. $2 \times 1.5$ . |
| 3. $5 \times .9$ . | 7. .6 of 7. | 11. $1.2 \times 2$ . | 15. $1.5 \times 2$ . |
| 4. .9 of 5.        | 8. .9 of 8. | 12. $2 \times 1.2$ . | 16. $15 \times .2$ . |
17. How much is  $10 \times .8$ ?  $10 \times .08$ ?  $10 \times \$0.08$ ?
18. How much is  $30 \times 8$ ?  $30 \times .8$ ?  $30 \times .08$ ?  $30 \times .008$ ?
19. How much will 40 quarts of berries cost at 9¢ a quart?
20. How much will 75 postage stamps cost at 2¢ each?
21. How much will 50 postage stamps cost at 5¢ each?
22. At \$50 an acre, what will 0.8 of an acre of land cost?
23. At \$75 an acre, what will 0.8 of an acre of land cost?
24. At \$90 a front foot, how much will a city lot cost that has a frontage of 30.1 ft.?



## 90. Division

1.  $0.6 \div 2$ .      5.  $1.8 \div 6$ .      9.  $.06 \div 3$ .      13.  $.72 \div 8$ .  
 2.  $0.9 \div 3$ .      6.  $2.1 \div 7$ .      10.  $.08 \div 2$ .      14.  $.81 \div 9$ .  
 3.  $1.2 \div 2$ .      7.  $2.5 \div 5$ .      11.  $.24 \div 8$ .      15.  $.63 \div 3$ .  
 4.  $1.5 \div 3$ .      8.  $6.4 \div 8$ .      12.  $.63 \div 9$ .      16.  $.81 \div 3$ .

17. If 8 qt. of berries cost \$0.48, what does 1 qt. cost?  
 What do 3 qt. cost?

18. If a train travels 2.1 mi. in 3 min., what is its rate per minute?

19. If a man is driving at the rate of 0.66 mi. in 3 min., what is his rate per minute?

20. If an automobile is traveling at the rate of 0.62 mi. in 2 min., what is its rate per minute?

21. If an automobile is traveling at the rate of 0.9 mi. in 3 min., what is its rate per minute? per hour?

## 91. Division by Tens

Think of  $.9 \div 30$  as  $.09 \div 3$ , or  $.03$ .

1.  $3 \div 10$ .      5.  $3.1 \div 10$ .      9.  $6 \div 10$ .      13.  $8 \div 10$ .  
 2.  $7 \div 10$ .      6.  $7.3 \div 10$ .      10.  $6 \div 20$ .      14.  $8 \div 20$ .  
 3.  $.3 \div 10$ .      7.  $.21 \div 10$ .      11.  $6 \div 30$ .      15.  $8 \div 40$ .  
 4.  $.7 \div 10$ .      8.  $.41 \div 10$ .      12.  $.6 \div 30$ .      16.  $.8 \div 40$ .

17. If 20 yd. of cloth cost \$14, what does 1 yd. cost?

18. If 50 yd. of lace cost \$75, what does 1 yd. cost?

19. If 30 schoolbooks cost \$7.50, what does 1 schoolbook cost?

20. If a train travels 0.8 mi. in 40 sec., what is its rate per second?

21. If 20 strips of wall paper measure 10 yd. when hung side by side, how wide is each strip?

22. If 30 strips of carpet measure 22.5 yd., when laid side by side, how wide is each strip?

## 92. Division

- |                  |                  |                   |                   |
|------------------|------------------|-------------------|-------------------|
| 1. $.8 \div 4.$  | 5. $1.5 \div 5.$ | 9. $.45 \div 5.$  | 13. $4 \div 10.$  |
| 2. $1.2 \div 4.$ | 6. $2.5 \div 5.$ | 10. $.50 \div 5.$ | 14. $.4 \div 10.$ |
| 3. $1.6 \div 8.$ | 7. $3.5 \div 7.$ | 11. $.75 \div 5.$ | 15. $6 \div 20.$  |
| 4. $2.4 \div 6.$ | 8. $.63 \div 7.$ | 12. $.72 \div 9.$ | 16. $.6 \div 20.$ |

17. If 10 sheets of paper are together 0.4 in. thick, what is the average thickness?

18. If a train travels 20 mi. in 16 min., what is the average time per mile?

19. If a train travels 12 mi. in 20 min., what is the rate per minute?

20. If a train travels 2.73 mi. in 3 min., what is its rate per minute?

21. If a manufacturer uses 153 yd. of cloth in making 30 waists, how many yards does he use for each?

## 93. Division

In dividing .9 by .3, think of both numbers as multiplied by 10, giving  $9 \div 3$ , or 3.

- |                                      |                   |                    |                    |
|--------------------------------------|-------------------|--------------------|--------------------|
| 1. $\$6 \div \$3.$                   | 5. $1.2 \div .4.$ | 9. $2.8 \div .7.$  | 13. $.28 \div .7.$ |
| 2. $\frac{6}{10} \div \frac{3}{10}.$ | 6. $2.5 \div .5.$ | 10. $8.1 \div .9.$ | 14. $.81 \div .9.$ |
| 3. $.6 \div .3.$                     | 7. $3.6 \div .9.$ | 11. $7.2 \div .8.$ | 15. $.72 \div .8.$ |
| 4. $.8 \div .2.$                     | 8. $3.5 \div .7.$ | 12. $5.6 \div .7.$ | 16. $.56 \div .7.$ |

17. By what must .4 be multiplied to equal 2.8?

18. How many times is 0.1 in. contained in 3.8 in.?

19. How long will it take a train traveling 0.7 mi. a minute to go 14.7 mi.?

20. How long will it take a train traveling 0.8 mi. a minute to go 32.8 mi.?

21. An excavation 9.6 yd. long and .8 yd. wide is how many times as long as wide? If a plan of it is drawn in which the width is 1 in., what should be the length?

## V. DENOMINATE NUMBERS

## 94. Reduction Descending

Think of 3 ft. 4 in. as the sum of  $3 \times 12$  in. and 4 in., or 40 in.

*Reduce:*

- |                     |                             |
|---------------------|-----------------------------|
| 1. 1 ft. to inches. | 6. 2 lb. to ounces.         |
| 2. 8 ft. to inches. | 7. 1 ft. 7 in. to inches.   |
| 3. 3 yd. to feet.   | 8. 4 ft. 11 in. to inches.  |
| 4. 9 yd. to feet.   | 9. 5 yd. 2 ft. to feet.     |
| 5. 4 bu. to pecks.  | 10. 4 gal. 1 qt. to quarts. |
11. How many cubic feet in 1 cu. yd.? in 2 cu. yd.?  
 12. How many square inches in 1 sq. ft.? in 10 sq. ft.?  
 in 100 sq. ft.?  
 13. If 1 sq. ft. of concrete flooring costs 8 ct., how much will 1 sq. yd. cost?

## 95. Reduction Ascending

Think of 48 in. as  $4\frac{1}{2}$  ft., or 4 ft. In the same way think of 245¢ as  $\$2\frac{1}{10}$ , or \$2.45.

*Reduce:*

- |                       |                                |
|-----------------------|--------------------------------|
| 1. 27 ft. to yards.   | 7. 120 in. to feet.            |
| 2. 60 in. to feet.    | 8. 360 sec. to minutes.        |
| 3. 12 pt. to quarts.  | 9. 160 oz. to pounds.          |
| 4. 24 qt. to gallons. | 10. 2100¢ to dollars.          |
| 5. 32 oz. to pounds.  | 11. 120 qt. to gallons.        |
| 6. 120 min. to hours. | 12. 18 in. to feet and inches. |
13. What part of a foot is 1 in.?  $\frac{1}{2}$  in.?  
 14. How many feet in 48 in.? How many yards?  
 15. If a milk man has 25 qt. of milk left from his day's sales, how many gallons has he left? Express the result as gallons and a fraction; as gallons and quarts.

## 96. Reduction

- |                               |                    |
|-------------------------------|--------------------|
| 1. 30 sec. = ? min.           | 9. 12 hr. = ? da.  |
| 2. $\frac{1}{2}$ hr. = ? min. | 10. 4 hr. = ? da.  |
| 3. 15 sec. = ? min.           | 11. 36 hr. = ? da. |
| 4. $\frac{1}{4}$ hr. = ? min. | 12. 48 hr. = ? da. |
| 5. 45 sec. = ? min.           | 13. 14 da. = ? wk. |
| 6. $\frac{3}{4}$ hr. = ? min. | 14. 21 da. = ? wk. |
| 7. 20 min. = ? hr.            | 15. 6 mo. = ? yr.  |
| 8. 15 min. = ? hr.            | 16. 18 mo. = ? yr. |

17. If I reach the station 15 min. before train time and the train is  $\frac{3}{4}$  hr. late, how long must I wait?

18. If school closes in 4 wk., how many days will this be? How many school days?

19. If we recite  $\frac{1}{2}$  hr., how many minutes is this? After half the time is gone, how many minutes remain?

## 97. Reduction

- |                               |                               |
|-------------------------------|-------------------------------|
| 1. 1 yr. = ? da.              | 6. 4 mo. = ? yr.              |
| 2. 1 yr. = ? wk.              | 7. 8 mo. = ? yr.              |
| 3. 1 yr. = ? mo.              | 8. 18 mo. = ? yr.             |
| 4. $\frac{1}{2}$ yr. = ? mo.  | 9. $\frac{1}{2}$ yr. = ? wk.  |
| 5. $1\frac{1}{2}$ yr. = ? mo. | 10. $\frac{1}{4}$ yr. = ? wk. |

11. Allowing 30 da. to the month, how many days in 6 mo.? in 12 mo.? How many days are there really in a year?

12. How many days has February in an ordinary year? in a leap year? How many days has March? How many days in February and March together?

13. How many days from May 10 to June 10? from June 10 to July 10?

14. How many days from February 5 to March 5 in an ordinary year? in a leap year?

## 98. Reduction

*Express as inches :*

- |          |                |                       |                |
|----------|----------------|-----------------------|----------------|
| 1. 3 ft. | 3. 10 ft.      | 5. $2\frac{1}{2}$ ft. | 7. 2 yd.       |
| 2. 4 ft. | 4. 2 ft. 4 in. | 6. $\frac{1}{2}$ yd.  | 8. 1 yd. 4 in. |

*Express as feet or as feet and fractions :*

- |            |            |            |                        |
|------------|------------|------------|------------------------|
| 9. 24 in.  | 11. 5 yd.  | 13. 48 in. | 15. $\frac{1}{2}$ yd.  |
| 10. 36 in. | 12. 18 in. | 14. 30 in. | 16. $2\frac{1}{2}$ yd. |

*Express as yards or as yards and fractions :*

- |            |            |           |                         |
|------------|------------|-----------|-------------------------|
| 17. 36 in. | 18. 18 in. | 19. 9 ft. | 20. $10\frac{1}{2}$ ft. |
|------------|------------|-----------|-------------------------|
21. Express 32 oz. as pounds ; also 24 oz.  
 22. Express 8 oz. as a fraction of a pound ; also 12 oz.  
 23. Express 20 pk. as bushels ; 20 bu. as pecks.

## 99. Fractions of Denominate Numbers

- Express  $\frac{1}{10}$  of 20 ft. as feet ; as inches.
- Express  $\frac{1}{5}$  of 50 lb. as pounds ; as ounces.
- Express  $\frac{1}{4}$  of 40 yd. as yards ; as feet.
- Express  $\frac{1}{3}$  of 36 in. as inches ; as feet.
- Express  $\frac{1}{2}$  of 40 bu. as bushels ; as pecks.
- Express  $\frac{1}{2}$  of 60 gal. as gallons ; as quarts.
- Express  $\frac{3}{4}$  of 48 ft. as feet ; as yards.
- Express  $\frac{2}{3}$  of 20 yd. as yards ; as feet.
- Express  $\frac{2}{3}$  of 48 oz. as ounces ; as pounds.
- Express the sum of 3 ft. and 1 ft. 6 in. as feet and inches ; as feet and a fraction ; as inches.
- Express  $4 \times 8$  oz. as ounces ; as pounds. Also express  $4 \times 2$  lb. 8 oz. as pounds.
- Express  $45$  yd.  $\div 9$  as yards ; as feet. Also express  $90$  yd.  $\div 9$  as yards ; as feet ; as inches.

## 100. Review

1. A farmer wishes to fill in a piece of low land having an area of 2700 sq. ft., raising the level on an average of 1 ft. How many loads (cubic yards) of earth will it take?

2. In Ex. 1 suppose the low land had an area of 8100 sq. ft. How many loads would it take?

3. A farmer who had a large poultry yard fed his hens 168 lb. of corn in April. How many bushels did he feed them, at 56 lb. to the bushel?

4. A farmer has a 20-acre meadow from which he cut last year  $2\frac{3}{4}$  tons of hay to the acre. How many tons of hay did he cut?

5. A farmer had a field of 35 acres from which he cut 3 tons to the acre. How many tons of hay did he cut?

6. A farmer sows 10 acres of oats, using  $2\frac{1}{4}$  bu. to the acre. How many bushels of seed does he use? What is it worth at \$1 a bushel?

7. A farmer uses 40 lb. of seed per acre for a 20-acre meadow, of which one fifth by weight is red clover. How many pounds of red clover will he need in all?

8. For a meadow of 30 acres a farmer uses 43 lb. of seed to the acre. How many pounds does he use?

9. A farmer has a piece of pasture land 40 rd. by 20 rd. How many acres are there in this pasture?

10. A farmer has a 10-acre lot of corn that yielded 32 bu. to the acre. This he sold at 60¢ a bushel. How much did he receive for the corn?

11. A farmer has 25 cows worth \$60 each. How much are they all worth? How much would they all be worth at \$64 each?

12. A farmer has a rectangular field that contains 25 acres. It is 80 rd. long. How wide is it? What is the perimeter of the field?

13. Last year a gardener had 3 acres of potatoes and raised 200 bu. to the acre. How many bushels did he raise in all?

14. If he sold these potatoes at 60¢ a bushel, how much did he get for them all?

15. Potatoes weigh 60 lb. to the bushel. What was the weight of his potato crop?

16. For spraying his potato plants he uses 1 lb. of Paris green to 100 gal. of water. Since 1 gal. of water weighs 8.3 lb., the weight of the Paris green is what part of the weight of water?

17. He soaked his seed potatoes in a solution of 1 pt. of formalin to 25 gal. of water, to keep off the potato scab. What part of the solution is formalin?

18. If  $\frac{3}{4}$  of the weight of potatoes is water, and if a bushel of potatoes weighs 60 lb., what is the weight of water in a bushel of potatoes?

19. He had 2 acres of celery, and the yield was 1550 doz. heads to the acre. How many dozen did he have in all?

20. He bought seed for 1000 celery plants at 24¢ an ounce. Allowing an ounce of seed to 2000 plants, how much did the seed cost?

21. When wheat costs \$1.12 $\frac{1}{2}$  a bushel, how much will 100 bu. cost? 1000 bu.? 2000 bu.?

22. If wheat is worth \$1 a bushel, how much will the yield of a 100-acre field be worth if the average yield is 25 bu. per acre?

23. If wheat is worth \$1.10 a bushel, how much will the yield of a 50-acre field be worth if the average yield is 20 bu. per acre?

24. If wheat is worth \$1.12 $\frac{1}{2}$  a bushel, how much will the yield of 80 acres be worth if the average yield is 25 bu. per acre?



## CHAPTER III

### I. FUNDAMENTAL OPERATIONS

#### 1. Reading Numbers

*Read the following :*

- |               |                    |            |
|---------------|--------------------|------------|
| 1. 0.123.     | 5. 0.245.          | 9. XLI.    |
| 2. 100.023.   | 6. 200.045.        | 10. XLIX.  |
| 3. 0.0004.    | 7. 0.1204.         | 11. CCXIX. |
| 4. 1,244,244. | 8. 31,000,000,000. | 12. DCXC.  |
| 13. DCXCIX.   | 15. MCMXII.        |            |
| 14. CDXCIX.   | 16. MDCCCXII.      |            |

The forms in Exercises 15 and 16 are both allowed.

17. What do you mean by a *decimal point*?
18. What is the difference between an *order* and a *period*?

#### 2. Various Units

1. What is the unit when you are counting dollars? cents? dozens? fourths?

2. Count from  $\frac{1}{10}$  to 1, using  $\frac{1}{10}$  as the unit.

3. If you use 1 ft. as the unit, how many units in 2 ft.?  
If you use 1 in. as the unit, how many units in 2 ft.?

4. State four units of length; four units of capacity.

5. State four units of area; four units of cubic measure.

6. Taking the dozen as the unit, how many such units in 72? in 144?

7. What is meant by a *unit fraction*? Give three illustrations.

## 3. Addition of Integers

*Add the following:*

1. $\begin{array}{r} 28 \\ 22 \\ \hline \end{array}$	4. $\begin{array}{r} 39 \\ 32 \\ \hline \end{array}$	7. $\begin{array}{r} 57 \\ 24 \\ \hline \end{array}$	10. $\begin{array}{r} 77 \\ 36 \\ \hline \end{array}$	13. $\begin{array}{r} 127 \\ 36 \\ \hline \end{array}$
--	--	--	---	--

2. $\begin{array}{r} 28 \\ 29 \\ \hline \end{array}$	5. $\begin{array}{r} 42 \\ 29 \\ \hline \end{array}$	8. $\begin{array}{r} 56 \\ 38 \\ \hline \end{array}$	11. $\begin{array}{r} 83 \\ 48 \\ \hline \end{array}$	14. $\begin{array}{r} 132 \\ 49 \\ \hline \end{array}$
--	--	--	---	--

3. $\begin{array}{r} 37 \\ 26 \\ \hline \end{array}$	6. $\begin{array}{r} 46 \\ 37 \\ \hline \end{array}$	9. $\begin{array}{r} 74 \\ 28 \\ \hline \end{array}$	12. $\begin{array}{r} 88 \\ 35 \\ \hline \end{array}$	15. $\begin{array}{r} 258 \\ 37 \\ \hline \end{array}$
--	--	--	---	--

16. If the sides of a triangle are 27 in., 36 in., 33 in., what is the perimeter? How many feet?

17. If I make purchases amounting to \$1.25, 55¢, and 20¢, what is the total amount I spend?

## 4. Addition of Decimals

*Add the following:*

1. $\begin{array}{r} 3.8 \\ .9 \\ \hline \end{array}$	4. $\begin{array}{r} 4.5 \\ 2.6 \\ \hline \end{array}$	7. $\begin{array}{r} .72 \\ .6 \\ \hline \end{array}$	10. $\begin{array}{r} .78 \\ .38 \\ \hline \end{array}$	13. $\begin{array}{r} 9.36 \\ 6. \\ \hline \end{array}$
---	--	---	---	---

2. $\begin{array}{r} 3.8 \\ 1.9 \\ \hline \end{array}$	5. $\begin{array}{r} 7.3 \\ 4.8 \\ \hline \end{array}$	8. $\begin{array}{r} .34 \\ .17 \\ \hline \end{array}$	11. $\begin{array}{r} 1.24 \\ .09 \\ \hline \end{array}$	14. $\begin{array}{r} 4.23 \\ .38 \\ \hline \end{array}$
--	--	--	--	--

3. $\begin{array}{r} 3.7 \\ 1.8 \\ \hline \end{array}$	6. $\begin{array}{r} .27 \\ .09 \\ \hline \end{array}$	9. $\begin{array}{r} .53 \\ .62 \\ \hline \end{array}$	12. $\begin{array}{r} 1.72 \\ .7 \\ \hline \end{array}$	15. $\begin{array}{r} .576 \\ .029 \\ \hline \end{array}$
--	--	--	---	---

16. Add 2.3 mi. and 7.9 mi.

17. Add \$2.75, \$4, and \$0.50.

18. Add 8.4 in., 6.2 in., and 5.4 in.

19. Add 14.9 in., 4.1 in., and 5 in. Express the sum as feet.

## 5. Addition of Common Fractions

- |                                  |                                  |                                    |                                     |
|----------------------------------|----------------------------------|------------------------------------|-------------------------------------|
| 1. $\frac{1}{8} + \frac{7}{8}$ . | 5. $\frac{1}{8} + \frac{3}{4}$ . | 9. $\frac{7}{8} + \frac{1}{2}$ .   | 13. $1\frac{1}{2} + \frac{3}{8}$ .  |
| 2. $\frac{3}{8} + \frac{5}{8}$ . | 6. $\frac{3}{8} + \frac{3}{4}$ . | 10. $\frac{7}{8} + \frac{3}{4}$ .  | 14. $2\frac{1}{8} + \frac{5}{16}$ . |
| 3. $\frac{1}{4} + \frac{1}{4}$ . | 7. $\frac{5}{8} + \frac{1}{4}$ . | 11. $\frac{1}{16} + \frac{1}{8}$ . | 15. $3\frac{3}{8} + \frac{3}{16}$ . |
| 4. $\frac{3}{4} + \frac{3}{4}$ . | 8. $\frac{5}{8} + \frac{1}{2}$ . | 12. $\frac{1}{16} + \frac{3}{8}$ . | 16. $4\frac{5}{8} + \frac{1}{16}$ . |

17. How much is  $5\frac{3}{8}$  in. and  $4\frac{1}{4}$  in.?

18. Express as feet  $9\frac{1}{2}$  in. +  $1\frac{7}{8}$  in. +  $11\frac{1}{8}$  in. +  $1\frac{1}{2}$  in.

19. A picture frame is  $8\frac{3}{8}$  in. by  $3\frac{1}{8}$  in. What length of molding does it contain?

20. A board is  $6\frac{1}{4}$  in. wide and  $\frac{7}{8}$  in. thick. What is the length of a string that will just reach around it?

21. If a room is  $28\frac{1}{2}$  ft. long and  $11\frac{1}{4}$  ft. wide, what is the perimeter?

22. If a cask contains  $2\frac{1}{2}$  gal. of sirup, and we add  $1\frac{3}{4}$  gal. and then add  $\frac{3}{4}$  gal., how much does it then contain?

## 6. Addition of Denominate Numbers

*Add the following:*

1. 32 ft. 8 in.	5. 15 lb. 10 oz.	9. 17 gal. 2 qt.
<u>6 5</u>	<u>7 9</u>	<u>9 3</u>

2. 38 ft. 4 in.	6. 26 lb. 14 oz.	10. 28 bu. 3 pk.
<u>7 9</u>	<u>3 7</u>	<u>6 3</u>

3. 29 ft. 3 in.	7. 32 yd. 2 ft.	11. 36 gal. 4 pt.
<u>7 11</u>	<u>8 2</u>	<u>8 5</u>

4. 9 ft. 8 in.	8. 27 yd. 29 in.	12. 25 gal. 3 qt.
<u>1 1</u>	<u>6 7</u>	<u>6 3</u>

13. 7 ft. 4 in. + 2 ft. 8 in. + 3 ft. 6 in.

**7. Review. Grocer's Problems**

Think of  $1750 + 375$  as  $2050 + 75$ , or  $2125$ . In general, in oral addition, it is more convenient to begin at the left.

1. A grocer paid \$2.44 for a dozen bottles of olives and \$14.20 for a gross of macaroni in packages. What was the amount of his bill?

2. He also bought \$18.60 worth of spice and \$4.80 worth of mustard. What did these cost?

3. He paid \$223.50 for a lot of tea and \$62.50 for some coffee. What did these cost?

4. He paid \$11.75 for a gross of gelatin in packages and \$44.25 for some prunes. What did these cost?

5. He bought \$42.60 worth of canned peaches, and \$40.50 worth of canned pears. What was his bill?

6. He bought 5 crates of eggs at \$8 and \$75 worth of butter. How much did he pay for both?

7. He paid \$72.75 for some honey and \$57 for some maple sirup. How much did he pay for both?

8. He bought 720 lb. of domino sugar and 490 lb. of maple sugar. What was the total weight?

9. If one box contains 196 oranges and another contains 180, how many oranges are there in the two boxes?

10. If the grocer has 27 qt. of strawberries, 16 qt. of raspberries, and 17 qt. of currants, how many quarts of berries has he in all?

11. If, in taking an inventory, he finds that he has on one shelf 29 bottles of cucumbers, 16 bottles of olives, and 35 bottles of pickled peaches, how many bottles has he of all three?

12. A grocer bought a quantity of sugar for  $4\frac{7}{8}$ ¢ a pound and sold it for  $5\frac{1}{8}$ ¢ a pound. How much did he gain on each pound? How much would he gain on 1000 lb.? How much would he gain on 2000 lb.?

## 8. Subtraction of Integers

*Subtract the following :*

1. $\begin{array}{r} 39 \\ \underline{16} \end{array}$	4. $\begin{array}{r} 42 \\ \underline{25} \end{array}$	7. $\begin{array}{r} 55 \\ \underline{28} \end{array}$	10. $\begin{array}{r} 65 \\ \underline{28} \end{array}$	13. $\begin{array}{r} 205 \\ \underline{90} \end{array}$
2. $\begin{array}{r} 36 \\ \underline{16} \end{array}$	5. $\begin{array}{r} 44 \\ \underline{28} \end{array}$	8. $\begin{array}{r} 57 \\ \underline{39} \end{array}$	11. $\begin{array}{r} 125 \\ \underline{18} \end{array}$	14. $\begin{array}{r} 204 \\ \underline{94} \end{array}$
3. $\begin{array}{r} 32 \\ \underline{16} \end{array}$	6. $\begin{array}{r} 54 \\ \underline{37} \end{array}$	9. $\begin{array}{r} 63 \\ \underline{26} \end{array}$	12. $\begin{array}{r} 125 \\ \underline{28} \end{array}$	15. $\begin{array}{r} 207 \\ \underline{98} \end{array}$

16. If a room 32 ft. long has a rug 18 ft. long on the floor, how much of the length is not covered ?

17. If a man having \$225 in the bank deposits \$65 to-day and draws out \$75 to-morrow, how much will be left ?

## 9. Subtraction of Decimals

*Subtract the following :*

1. $\begin{array}{r} 2.7 \\ \underline{.9} \end{array}$	4. $\begin{array}{r} 5.4 \\ \underline{3.5} \end{array}$	7. $\begin{array}{r} .47 \\ \underline{.28} \end{array}$	10. $\begin{array}{r} .70 \\ \underline{.29} \end{array}$	13. $\begin{array}{r} 30.2 \\ \underline{2.6} \end{array}$
2. $\begin{array}{r} 3.2 \\ \underline{1.6} \end{array}$	5. $\begin{array}{r} 7.5 \\ \underline{4.9} \end{array}$	8. $\begin{array}{r} .52 \\ \underline{.37} \end{array}$	11. $\begin{array}{r} 2.04 \\ \underline{.65} \end{array}$	14. $\begin{array}{r} .463 \\ \underline{.058} \end{array}$
3. $\begin{array}{r} 4.3 \\ \underline{2.8} \end{array}$	6. $\begin{array}{r} .32 \\ \underline{.09} \end{array}$	9. $\begin{array}{r} .66 \\ \underline{.48} \end{array}$	12. $\begin{array}{r} .208 \\ \underline{.072} \end{array}$	15. $\begin{array}{r} .090 \\ \underline{.018} \end{array}$

16. If I have \$3.06 and spend 88¢, how much is left ?

17. If the distance between two stations is 23.14 mi., and a train has gone 6.2 mi. from one station towards the other, what is the remaining distance ?

## 10. Subtraction of Common Fractions

- |                                  |                                   |                                    |                                    |
|----------------------------------|-----------------------------------|------------------------------------|------------------------------------|
| 1. $\frac{1}{2} - \frac{1}{8}$ . | 5. $\frac{5}{16} - \frac{1}{4}$ . | 9. $\frac{1}{8} - \frac{1}{16}$ .  | 13. $\frac{1}{8} - \frac{1}{32}$ . |
| 2. $\frac{7}{8} - \frac{1}{2}$ . | 6. $\frac{3}{4} - \frac{5}{16}$ . | 10. $\frac{3}{8} - \frac{3}{16}$ . | 14. $\frac{5}{8} - \frac{3}{32}$ . |
| 3. $\frac{5}{8} - \frac{1}{2}$ . | 7. $\frac{1}{2} - \frac{7}{16}$ . | 11. $\frac{5}{8} - \frac{7}{16}$ . | 15. $3\frac{1}{8} - \frac{1}{4}$ . |
| 4. $\frac{5}{8} - \frac{1}{4}$ . | 8. $\frac{7}{16} - \frac{1}{4}$ . | 12. $\frac{9}{16} - \frac{1}{2}$ . | 16. $7\frac{1}{4} - \frac{7}{8}$ . |

17. I have a piece of wood  $8\frac{1}{4}$  in. long, of which I need  $6\frac{7}{8}$  in. for a box I am making. How much of the length will be left?

18. I have a piece of wire  $\frac{1}{8}$  in. in diameter that I wish to file down to fit a hole  $\frac{3}{32}$  in. in diameter. How much must it be filed down?

19. In laying a tile floor with tile  $4\frac{1}{4}$  in. square a workman came to the edge where he needed a tile  $3\frac{7}{8}$  in. wide. How much must be chipped off from the tile to reduce it to this width?

## 11. Subtraction of Denominate Numbers

*Subtract the following:*

- |                                     |                                       |                                      |
|-------------------------------------|---------------------------------------|--------------------------------------|
| 1. 3 ft. 7 in.<br><u>      8</u>    | 4. 23 ft. 8 in.<br><u>      7 10</u>  | 7. 23 gal. 1 qt.<br><u>     17 2</u> |
| 2. 12 ft. 6 in.<br><u>      3 9</u> | 5. 36 rd. 10 ft.<br><u>      8 12</u> | 8. 46 bu. 2 pk.<br><u>     26 3</u>  |
| 3. 37 lb. 4 oz.<br><u>     27 6</u> | 6. 17 mi. 16 rd.<br><u>      8 36</u> | 9. 27 wk. 4 da.<br><u>     12 5</u>  |

10. If a carpenter saws 2 ft. 8 in. from a board 10 ft. 6 in. long, how much is left?

11. If a piece of flannel  $43\frac{1}{2}$  yd. long shrinks 22 in. in washing, how long is it then?

## 12. Review

1. After 87 days of an ordinary year have passed, how many days remain ?

2. A note having 120 days to run has already run 86 days. How many more days before it matures ?

3. If a man weighing  $164\frac{1}{4}$  lb. loses 8 lb. 12 oz., how much does he then weigh ?

4. A picture covering 1 sq. ft. is so framed that 6.5 sq. in. is covered by the molding. How much is not covered by the molding ?

5. The steam gauge of a boiler shows a pressure of 121 lb. If it is reduced 38 lb., what is the pressure then ?

6. A grindstone that had a radius of 13.4 in. has had 1.9 in. ground off. What is now its radius ?

7. If I have \$42 in the bank and deposit \$17 more and \$40 more, and the next day take out \$35, how much have I left ?

8. The perimeter of a triangle is 42 in., and two of the sides are 15 in. and 16 in. What is the length of the other side ?

9. If a dealer buys 14 qt. of berries from one man, 27 qt. from another, and 16 qt. from another, and sells 53 qt., how many quarts has he left ?

10. The distance from Chicago to Denver is 1083 mi., and from Chicago to Omaha it is 503 mi. How far is it from Omaha to Denver ?

11. If a milk dealer having 32 gal. of milk sells 5 gal. at a hotel, and 3 qt. at one house and 2 qt. at another, how much has he left ?

12. If a carpenter wishes to make a sill for a house, and splices together two pieces of timber 18 ft. long and 14 ft. long, losing  $1\frac{1}{2}$  ft. by splicing, and then saws off  $2\frac{1}{2}$  ft., what is the remaining length ?



## 13. Multiplication of Integers

- |                   |                   |                    |                    |
|-------------------|-------------------|--------------------|--------------------|
| 1. $3 \times 31.$ | 5. $3 \times 38.$ | 9. $5 \times 27.$  | 13. $8 \times 29.$ |
| 2. $2 \times 35.$ | 6. $3 \times 74.$ | 10. $6 \times 37.$ | 14. $8 \times 64.$ |
| 3. $4 \times 45.$ | 7. $4 \times 42.$ | 11. $7 \times 35.$ | 15. $9 \times 23.$ |
| 4. $2 \times 76.$ | 8. $4 \times 67.$ | 12. $7 \times 72.$ | 16. $9 \times 81.$ |
17. How many dimes in a dollar? in \$15?
18. How many inches in a yard? in 5 yd.?
19. How many square inches in 2 sq. ft.?
20. How many cubic feet in 2 cu. yd.?
21. How many pints in a quart? in a gallon? in 15 gal.? in 30 gal.?
22. How many pints in a quart? in a peck? in a bushel? in 6 bu.? in 10 bu.?
23. If each side of an octagon (8-sided figure) is 17 in., what is the perimeter?

## 14. Multiplication of Decimals

- |                          |                    |                     |               |
|--------------------------|--------------------|---------------------|---------------|
| 1. $6 \times 5\text{¢}.$ | 5. $2 \times .27.$ | 9. $5 \times .32.$  | 13. .2 of 20. |
| 2. $6 \times .05.$       | 6. $3 \times .32.$ | 10. $5 \times .37.$ | 14. .3 of 25. |
| 3. $7 \times .08.$       | 7. $4 \times .51.$ | 11. $6 \times 2.1.$ | 15. .4 of 32. |
| 4. $8 \times .06.$       | 8. $4 \times .53.$ | 12. $7 \times 2.2.$ | 16. .6 of 70. |
17. How much is .3 of 7?  $\frac{3}{10}$  of  $\frac{7}{10}$ ? .3 of .7?
18. How much is .3 of 9?  $\frac{3}{10}$  of  $\frac{9}{10}$ ? .3 of .9? .3 of .8?
19. .3 of .2.    21. .5 of .8.    23. .2 of .8.    25. .4 of .8.
20. .4 of .6.    22. .7 of .4.    24. .3 of .5.    26. .6 of .9.
27. Compare .2 of .7 of 100, and .7 of .2 of 100.
28. From a steel plate .17 in. thick 6 strips are cut and placed one on top of another. How high is the pile?
29. A gardener has .8 of an acre of land, .3 of which he devotes to onions. What part of an acre is devoted to onions? How much does this lack of being  $\frac{1}{4}$  of an acre? of being 1 acre?

## 15. Multiplication of Common Fractions

- |                              |                                      |   |                                       |
|------------------------------|--------------------------------------|---|---------------------------------------|
| 1. $\frac{3}{8}$ of 16.      | 6. $28 \times \frac{3}{4}$ .         | 11. $\frac{3}{8}$ of $\frac{4}{9}$ .            | 16. $\frac{5}{8}$ of .8.              |
| 2. $\frac{2}{3}$ of 36.      | 7. $\frac{2}{7}$ of $\frac{7}{5}$ .  | 12. $\frac{3}{10}$ of $\frac{5}{8}$ .           | 17. $\frac{1}{3}$ of $1\frac{5}{2}$ . |
| 3. $\frac{3}{5}$ of 25.      | 8. $\frac{5}{8}$ of $\frac{8}{9}$ .  | 13. $\frac{3}{8}$ of $1\frac{6}{5}$ .           | 18. $\frac{1}{3}$ of $7\frac{1}{2}$ . |
| 4. $\frac{5}{8}$ of 72.      | 9. $\frac{2}{3}$ of $\frac{3}{4}$ .  | 14. $\frac{7}{8}$ of $\frac{2}{3}\frac{4}{5}$ . | 19. $\frac{1}{4}$ of $1\frac{1}{3}$ . |
| 5. $15 \times \frac{3}{5}$ . | 10. $\frac{3}{4}$ of $\frac{2}{9}$ . | 15. $\frac{5}{8}$ of $\frac{8}{10}$ .           | 20. $\frac{3}{8}$ of $5\frac{1}{3}$ . |

21. Find  $\frac{1}{2}$  of  $\frac{2}{3}$  of  $\frac{3}{4}$  of  $\frac{4}{5}$  by rapid cancellation.

22.  $\frac{1}{2}$  of  $\frac{2}{3}$  of  $\frac{5}{8}$ .      23.  $\frac{2}{3}$  of  $\frac{3}{8}$  of 40.      24.  $\frac{1}{4}$  of  $\frac{1}{8}$  of 64.

25. If I need for a box cover a piece of wood  $\frac{3}{4}$  as thick as a  $\frac{7}{8}$ -in. board, how thick is the cover?

26. A box is  $\frac{1}{3}$  as wide as it is long, and  $\frac{1}{2}$  as deep as it is wide. It is 3 ft. long. How deep is it?

27. A carpenter in making a plan of a box represents a dimension by a line  $\frac{1}{3}$  of its original length. If the box is  $2\frac{2}{3}$  ft. long, how long is the drawing of it?

## 16. Multiplication of Denominate Numbers

- |                            |                                       |
|----------------------------|---------------------------------------|
| 1. $12 \times 2$ ft. 1 in. | 5. $16 \times 2$ gal. 1 qt.           |
| 2. $12 \times 3$ ft. 6 in. | 6. $25 \times 4$ ft. 1 in.            |
| 3. $20 \times 5$ lb. 1 oz. | 7. $2\frac{1}{2} \times 10$ mi. 4 rd. |
| 4. $16 \times 2$ lb. 2 oz. | 8. $3\frac{1}{2} \times 6$ ft. 2 in.  |

9. Express  $\frac{5}{8}$  of 16 qt. as gallons and quarts.

10. Express 24 times  $\frac{5}{8}$  bu. as bushels; as pecks.

11. At \$1.60 a yard, what will 27 in. of velvet cost?

12. At \$1.28 a yard, what will  $\frac{1}{8}$  yd. of silk cost?  $\frac{3}{8}$  yd.?

13. At \$75 an acre, what will  $\frac{1}{4}$  of an acre of land cost?

14. If a piece of work requires 4 wk. 5 da. and another requires twice as long, how much time does the second require, allowing 6 working days to the week?

15. If a piece of work requires 7 da. 5 hr. and another requires twice as long, how much time does the second require, allowing 8 hours to the working day?

## 17. Review

1. At 35¢ a pound, what will 9 lb. of butter cost?
2. At \$5 a barrel, what will 18 bbl. of flour cost?
3. At 15¢ a dozen, what will 8 doz. paper pads cost?
4. At \$7.25 a hundred, what will 300 lb. of meat cost?
5. At 20 bricks to the hod, how many bricks in 26 hods?
6. At 25 lb. each, what will 10 chests of tea weigh?  
11 chests?
7. At 24¢ a word, what will a 9-word telegram from London to New York cost?
8. At 200 lb. to the cubic foot, what will 0.2 cu. ft. of a certain kind of stone weigh?
9. A gallon contains 231 cu. in. How many cubic inches does 0.1 gal. contain? 0.2 gal.? 0.3 gal.?
10. If there are 34 pieces of cloth in a bale, how many pieces in 8 bales?
11. A farmer paid \$1.50 a rod for some ditching. How much did he pay for 9 rd.?
12. A train averages 40.7 mi. an hour for 3 hr. What is the distance covered in that time?
13. If sound travels 1120 ft. a second, how far will it travel in 2 sec.? in 0.1 sec.?
14. If a man's step in rapid walking averages 28 in., how many inches will he walk in taking 9 steps?
15. If you are in school 5 hours a day and 200 days in a year, how many hours are you in school in each year?
16. From Ex. 15, how many minutes are you in school in each year?
17. From Ex. 15, how many days of the year are you not in school?
18. From Ex. 15, how many days in 8 school years? How many minutes does a boy or girl spend in school in 8 years if there are no absences?

## 18. Division of Integers

- |                   |                    |                        |
|-------------------|--------------------|------------------------|
| 1. $48 \div 2$ .  | 7. $84 \div 4$ .   | 13. $\$636 \div 6$ .   |
| 2. $480 \div 2$ . | 8. $840 \div 4$ .  | 14. $\$726 \div 6$ .   |
| 3. $484 \div 2$ . | 9. $844 \div 4$ .  | 15. $\$637 \div 7$ .   |
| 4. $63 \div 3$ .  | 10. $95 \div 5$ .  | 16. $\$648 \div \$8$ . |
| 5. $630 \div 3$ . | 11. $950 \div 5$ . | 17. $\$576 \div \$8$ . |
| 6. $639 \div 3$ . | 12. $955 \div 5$ . | 18. $\$612 \div \$9$ . |

19. If 7 horses cost \$770, what is the average price?

20. If 7 horses cost \$805, what is the average price?

21. At \$7 each, how many writing desks can be bought for \$861?

22. If we divide 336 sq. rd. of land into 8 equal building lots, what is the area of each?

23. If \$1224 is divided equally among 9 men, what is the share of each?

## 19. Division of Integers

- |                    |                     |   |
|--------------------|---------------------|---|
| 1. $220 \div 10$ . | 6. $372 \div 12$ .  | 11. $340 \div 17$ .                       |
| 2. $220 \div 11$ . | 7. $260 \div 13$ .  | 12. $198 \div 18$ .                       |
| 3. $231 \div 11$ . | 8. $294 \div 14$ .  | 13. $150 \text{ ft.} \div 50$ .           |
| 4. $240 \div 12$ . | 9. $330 \div 15$ .  | 14. $200 \text{ yd.} \div 25$ .           |
| 5. $252 \div 12$ . | 10. $176 \div 16$ . | 15. $300 \text{ in.} \div 75 \text{ in.}$ |

*In each of the following express the quotient as an integer and a fraction:*

16.  $2001 \div 4$ .      18.  $3665 \div 6$ .      20.  $6484 \div 8$ .

17.  $2001 \div 5$ .      19.  $3516 \div 7$ .      21.  $6312 \div 9$ .

22. How many feet in 264 in.? in 270 in.?

23. How many pounds in 80 oz.? in 88 oz.?

24. How many yards in 396 in.? in 414 in.?

25. How many weeks in 154 da.? in 161 da.?

26. How many hours in 120 min.? in 150 min.?

## 20. Division of Decimals

- |                   |                     |   |
|-------------------|---------------------|---|
| 1. $16.4 \div 2.$ | 6. $.217 \div 7.$   | 11. $31.5 \div 15.$                               |
| 2. $1.71 \div 3.$ | 7. $33.6 \div 8.$   | 12. $.336 \div 16.$                               |
| 3. $14.4 \div 4.$ | 8. $40.5 \div 9.$   | 13. $6 \div 3; \$6 \div \$3.$                     |
| 4. $1.45 \div 5.$ | 9. $5.04 \div 9.$   | 14. $\frac{6}{10} \div \frac{3}{10}; .6 \div .3.$ |
| 5. $.144 \div 6.$ | 10. $1.21 \div 11.$ | 15. $33.3 \div .3.$                               |

Think of  $.63 \div .3$  as  $6.3 \div 3$ . That is, multiply both by 10 before dividing.

- |                     |                     |                     |
|---------------------|---------------------|---------------------|
| 16. $36.6 \div .6.$ | 18. $6.56 \div .8.$ | 20. $7.38 \div .9.$ |
| 17. $50.4 \div .7.$ | 19. $7.36 \div .8.$ | 21. $.828 \div .9.$ |

22. If the perimeter of a square is 28.8 in., what is the side?

23. If a man travels 1.32 mi. in 3 min. on his bicycle, what is his rate per minute?

## 21. Division of Decimals

Think of  $.064 \div .32$  as  $6.4 \div 32$ . That is, multiply both by 10 often enough to make the divisor integral.

- |                     |                     |   |
|---------------------|---------------------|---|
| 1. $1.44 \div .12.$ | 5. $3.25 \div .25.$ | 9. $73.5 \div .35.$                         |
| 2. $2.73 \div .13.$ | 6. $1.50 \div .75.$ | 10. $\$17.60 \div \$0.16.$                  |
| 3. $1.65 \div .15.$ | 7. $28.8 \div .12.$ | 11. $2.64 \text{ in.} \div .24 \text{ in.}$ |
| 4. $2.75 \div .25.$ | 8. $52.5 \div .25.$ | 12. $6.72 \text{ mi.} \div .32 \text{ mi.}$ |

13. Divide  $2 \times 4.5$  by 0.3.

14. If a train travels 0.99 mi. in 1.1 min., what is its rate per minute?

15. If a train is traveling at the rate of 0.8 mi. per minute, how long will it take it to go 2.4 mi.?

16. At 16¢ each, how many bottles of ink can be bought for \$1.44?

17. At 17¢ a yard, how many yards of cloth can be bought for \$3.40? for \$3.57?

## 22. Division of Common Fractions

1.  $\frac{6}{7} \div \frac{3}{7}$ .      4.  $\frac{3}{4} \div \frac{3}{8}$ .      7.  $\frac{15}{16} \div \frac{3}{16}$ .      10.  $\frac{5}{16} \div \frac{3}{32}$ .  
 2.  $\frac{8}{9} \div \frac{2}{9}$ .      5.  $\frac{1}{4} \div \frac{5}{8}$ .      8.  $\frac{21}{2} \div \frac{3}{32}$ .      11.  $\frac{3}{16} \div \frac{3}{4}$ .  
 3.  $\frac{3}{8} \div \frac{3}{4}$ .      6.  $\frac{2}{3} \div \frac{4}{5}$ .      9.  $\frac{5}{16} \div \frac{3}{16}$ .      12.  $\frac{3}{8} \div \frac{1}{8}$ .

13. How much is  $\frac{3}{2} \div \frac{3}{4}$ ?  $1\frac{1}{2} \div \frac{3}{4}$ ?  $1\frac{1}{2} \div 0.75$ ?  $1.5 \div 0.75$ ?

14. How much is  $42 \div 7$ ?  $4\frac{2}{8} \div \frac{7}{8}$ ?  $2\frac{1}{4} \div \frac{7}{8}$ ?  $5\frac{1}{4} \div \frac{7}{8}$ ?  
 $5.25 \div .87\frac{1}{2}$ ?

15. How many boards, each  $\frac{3}{8}$  in. thick, must be placed one on top of another to make a pile 3 in. high? 1 ft. high?

16. If a piece of cardboard is  $\frac{3}{32}$  in. thick, how many pieces are there in a pile 6 in. high?

17. If a strip of carpet is  $\frac{3}{4}$  yd. wide, how many strips will be needed for a room 6 yd. wide?

18. If a strip of wall paper is  $\frac{1}{2}$  yd. wide, how many strips will be needed for a space  $7\frac{1}{2}$  yd. wide?

## 23. Division of Denominate Numbers

1. 244 ft. 8 in.  $\div$  4.      5. 2 ft.  $\div$  8 in.  
 2. 372 gal. 6 pt.  $\div$  6.      6. 3 ft. 4 in.  $\div$  10 in.  
 3. 205 mi. 30 rd.  $\div$  5.      7. 1 yd. 14 in.  $\div$  5 in.  
 4. 355 ft. 9 in.  $\div$  3.      8. 2 lb. 8 oz.  $\div$  20 oz.

9. Divide the sum of 2 ft. 8 in. and 1 ft. 6 in. by 4.

10. If a train travels 2 mi. in 3 min. 10 sec., what is its time per mile?

11. If a train travels 1.8 mi. in 2 min., what is its rate per minute?

12. If a train travels 1.75 mi. in 2 min. 20 sec., what is its rate per minute? ( $1.75$  mi. =  $\frac{7}{4}$  mi.;  $2$  min.  $20$  sec. =  $2\frac{1}{3}$  min. or  $\frac{7}{3}$  min.)

13. Allowing 8 in. for the length of a brick and its mortar, how many lengths of brick in a wall that is 4 ft. long? 40 ft. long?

## 24. Review

1. At 60¢ a yard, what will  $\frac{3}{8}$  yd. of silk cost?
2. At \$1.40 a yard, what will  $2\frac{1}{2}$  yd. of velvet cost?
3. At \$1.10 a yard, what will  $10\frac{1}{2}$  yd. of carpet cost?
4. At \$1.20 a yard, what will 16 yd. of pongee cost?  
what will  $2\frac{1}{4}$  yd. of pongee cost?
5. At 32¢ a yard, what will 7 yd. of madras cost?  
what will  $7\frac{1}{2}$  yd. of madras cost?
6. I bought 32 yd. of cloth and have used  $\frac{2}{3}$  of it. How many yards have I used?
7. I bought 34 yd. of cloth and have used  $\frac{3}{4}$  of it. How many yards have I used?
8. I paid \$15 for some silk at \$1.25 a yard. How many yards did I buy? ( $\$6.00 \div \$\frac{5}{4}$ .)
9. I paid \$9 for some silk at \$1.12 $\frac{1}{2}$  a yard. How many yards did I buy?
10. If a piece of linen contains 52 yd., and a merchant has 7 pieces in stock, how many yards has he?
11. If a merchant has 9 pieces of a certain kind of cloth, each containing 41 yd., how many yards of this kind of cloth has he?
12. A merchant has a piece of cloth containing 48 yd. He sells  $\frac{1}{2}$  of it, and then  $\frac{3}{4}$  of the rest. What is the rest worth at \$1 a yard?
13. A merchant bought 1000 yd. of flannel at 48¢ a yard and sold it all at  $\frac{1}{8}$  more than he paid for it? How much did he gain?
14. A clothing manufacturer bought 3000 yd. of cloth at \$1.50 a yard and paid \$1000 down. How much did he still owe?
15. A manufacturer sold to a dealer 2500 yd. of cloth for \$1000, and the dealer sold it at 50¢ a yard. How much profit did he make?



## II. MEASURES

## 25. Reduction

*Reduce to inches :*

- |                        |                        |                 |                  |
|------------------------|------------------------|-----------------|------------------|
| 1. 9 ft.               | 4. 9 yd.               | 7. 9 ft. 6 in.  | 10. 9 yd. 6 in.  |
| 2. 11 ft.              | 5. 11 yd.              | 8. 11 ft. 8 in. | 11. 11 yd. 4 in. |
| 3. $10\frac{1}{2}$ ft. | 6. $10\frac{1}{2}$ yd. | 9. 1 yd. 1 ft.  | 12. 2 yd. 1 ft.  |

*Reduce to feet :*

- |             |             |            |                  |
|-------------|-------------|------------|------------------|
| 13. 60 in.  | 15. 132 in. | 17. 10 mi. | 19. 1 rd. 6 in.  |
| 14. 120 in. | 16. 27 yd.  | 18. 10 rd. | 20. 1 rd. 18 in. |

*Reduce to yards :*

- |  |            |           |           |
|--|------------|-----------|-----------|
| 21. 72 in.   | 22. 72 ft. | 23. 2 rd. | 24. 1 mi. |
| 25. Wall paper is $\frac{1}{2}$ yd. wide. How many inches? |            |           |           |

## 26. Reduction

*Reduce to ounces :*

- |           |           |                |                       |
|-----------|-----------|----------------|-----------------------|
| 1. 7 lb.  | 3. 9 lb.  | 5. 125 lb.     | 7. $3\frac{1}{2}$ lb. |
| 2. 11 lb. | 4. 25 lb. | 6. 2 lb. 8 oz. | 8. 3 lb. 2 oz.        |

*Reduce to pounds :*

- |           |            |                      |          |
|-----------|------------|----------------------|----------|
| 9. 48 oz. | 10. 40 oz. | 11. $\frac{3}{4}$ T. | 12. 3 T. |
|-----------|------------|----------------------|----------|

*Reduce to tons or fractions of a ton :*

- |  |                |              |              |
|--|----------------|--------------|--------------|
| 13. 4000 lb.   | 14. 60,000 lb. | 15. 1500 lb. | 16. 3500 lb. |
| 17. How much will 7 T. 500 lb. of coal cost at \$5 a ton?  |                |              |              |
| 18. If 50 lb. of candy is put up in 1-ounce packages, how many packages are there?   |                |              |              |
| 19. If a cooking recipe calls for 1 oz. of sugar to a person, how many pounds must be allowed in preparing the article for 40 persons? |                |              |              |

## 27. Review

When there is an operation like  $\frac{15 \times 12}{36}$ , do not multiply until you have canceled as much as possible. It is easier to reduce  $\frac{15}{3}$  than  $\frac{180}{36}$ , besides the saving in multiplication.

1. Half a dozen chairs are being upholstered, and each takes 30 in. of gimp. How many yards are needed?

2. A room is 16 ft. long and 12 ft. wide. How many yards of matting 1 yd. wide are required for the floor?

3. A room 16 ft. long and 12 ft. wide is to have a carpet with a border. How many yards in the border?

4. Some table doilies are 9 in. square, excluding the lace border. If  $4\frac{1}{2}$  in. extra are allowed for each corner, how many yards of lace are needed for a dozen doilies?

5. A carpet rug is 8 ft. long and 6 ft. wide, including the border. How many yards of border has it?

6. A housekeeper is making a dozen pairs of sheets, each requiring 7 ft. of material in length and two breadths of material in width. How many yards are needed?

7. Two chairs are being upholstered, and each has fringe around the bottom. The chairs are 2 ft. 6 in. on the front, and 20 in. on each of the other three sides. How many yards of fringe are needed for both chairs?

8. Some curtains 8 ft. long and a yard wide are to have a tassel fringe down one edge and across the bottom. There are six of these curtains in a room. How many yards of the fringe are needed?

9. Some window curtains are to hang 8 ft. 6 in., the bottoms being made of lace 9 in. wide, and the rest being curtain material bought by the yard. There are four windows in the room, and each has two curtains. How many yards of curtain material are needed for each window, aside from the lace? for all four windows?

## 28. Reduction

*Reduce to pints :*

- |            |                 |                        |                              |
|------------|-----------------|------------------------|------------------------------|
| 1. 25 qt.  | 3. 5 qt. 1 pt.  | 5. $3\frac{1}{2}$ qt.  | 7. 2 gal. $2\frac{1}{2}$ qt. |
| 2. 15 gal. | 4. 6 gal. 2 qt. | 6. $6\frac{1}{4}$ gal. | 8. $20\frac{1}{4}$ gal.      |

*Reduce to quarts :*

- |            |             |                          |                         |
|------------|-------------|--------------------------|-------------------------|
| 9. 28 pt.  | 12. 37 pt.  | 15. $12\frac{1}{2}$ gal. | 18. 22 pk.              |
| 10. 54 pt. | 13. 15 gal. | 16. $31\frac{1}{2}$ gal. | 19. $12\frac{1}{2}$ pk. |
| 11. 25 pt. | 14. 27 gal. | 17. 15 pk.               | 20. 5 pk. 2 qt.         |

*Reduce to gallons :*

- |            |            |            |            |
|------------|------------|------------|------------|
| 21. 64 pt. | 22. 80 pt. | 23. 64 qt. | 24. 80 qt. |
|------------|------------|------------|------------|

*Reduce to pecks :*

- |            |            |                         |             |
|------------|------------|-------------------------|-------------|
| 25. 15 bu. | 26. 64 qt. | 27. $25\frac{1}{2}$ bu. | 28. 100 qt. |
|------------|------------|-------------------------|-------------|

## 29. Reduction

*Reduce to square inches :*

- |              |                          |                           |               |
|--------------|--------------------------|---------------------------|---------------|
| 1. 2 sq. ft. | 2. $\frac{1}{2}$ sq. ft. | 3. $1\frac{1}{2}$ sq. ft. | 4. 10 sq. ft. |
|--------------|--------------------------|---------------------------|---------------|

*Reduce to square feet :*

- |              |                          |                |                           |
|--------------|--------------------------|----------------|---------------------------|
| 5. 5 sq. yd. | 6. $\frac{1}{3}$ sq. yd. | 7. 288 sq. in. | 8. $2\frac{1}{3}$ sq. yd. |
|--------------|--------------------------|----------------|---------------------------|

*Reduce to square yards :*

- |               |                 |                |                 |
|---------------|-----------------|----------------|-----------------|
| 9. 54 sq. ft. | 10. 108 sq. ft. | 11. 81 sq. ft. | 12. 180 sq. ft. |
|---------------|-----------------|----------------|-----------------|

*Reduce to acres :*

- |                 |                |                |                 |
|-----------------|----------------|----------------|-----------------|
| 13. 320 sq. rd. | 14. 80 sq. rd. | 15. 40 sq. rd. | 16. 640 sq. rd. |
|-----------------|----------------|----------------|-----------------|

*Reduce to cubic feet :*

- |                  |               |                |                |
|------------------|---------------|----------------|----------------|
| 17. 1728 cu. in. | 18. 2 cu. yd. | 19. 10 cu. yd. | 20. 11 cu. yd. |
|------------------|---------------|----------------|----------------|

## 30. Reduction

*Reduce to seconds :*

1. 2 min.      2.  $2\frac{1}{2}$  min.      3. 11 min.      4. 1 hr.

*Reduce to minutes :*

5. 180 sec.      6. 300 sec.      7. 2 hr.      8.  $2\frac{1}{2}$  hr.

*Reduce to hours :*

9. 240 min.      10. 420 min.      11. 90 min.      12. 4 da.

*Reduce to days :*

13. 48 hr.      14. 120 hr.      15. 12 wk.      16. 2 wk. 12 hr.

*Reduce to weeks :*

17. 49 da.      18. 2 yr.      19. 84 da.      20. 56 da.

## 31. Reduction

*Reduce to seconds :*

1. 3'.      2. 3' 30".      3. 9'.      4. 1°.

*Reduce to minutes :*

5. 3°.      6. 360".      7. 2° 30'.      8. 90°.

*Reduce to degrees :*

9. 120'.      10. 3600".      11. 540'.      12. 90'.

13. How many degrees in  $1\frac{1}{2}$  right angles ?

14. How many minutes in 1 right angle ?

15. How many degrees in half a right angle ?

16. How many degrees in half a circumference ?

17. How many degrees of latitude from the equator to the north pole ?

## 32. Review

1. How many years in 36 mo.? in 104 wk.?
2. How many months in 4 yr.? in 20 yr.?
3. How many days from February 7 to March 7?
4. How many days from March 7 to April 7? from March 7 to April 15?
5. If a recitation in arithmetic lasts 40 min., how many seconds does it last? What part of an hour?
6. How many degrees in  $\frac{1}{3}$  of a circumference? Express this in minutes.
7. If a train makes 1 mi. in 90 sec., how many minutes will it take to go 8 mi.?
8. Express the difference between  $9^\circ$  and  $520'$  in minutes; in a fraction of a degree.
9. At 3 o'clock how many degrees are there in the angle made by the two hands of a clock? How many at 4 o'clock? at 2 o'clock?
10. The sum of the three angles of a triangle is always equal to two right angles. In an equilateral triangle the angles are all equal. How many degrees in each?
11. If there are 200 school days in a school year, how many weeks is this, at 5 school days to the week? How many weeks does this leave for vacation?
12. When you walk diagonally across a square field, how many degrees in the angle that your path makes with the side of the field?
13. The sum of the angles of a quadrilateral (four-sided figure) is always  $360^\circ$ . Suppose three of these angles are  $80^\circ$ ,  $110^\circ$ , and  $70^\circ$ . What is the size of the fourth angle?
14. When the horizontal shadow of a tree is just as long as the height of the tree, how many degrees in the angle made by the shadow and a line drawn from its end to the top of the tree?

## 33. Perimeters

Find the perimeters of triangles whose sides are :

- |  |   |
|--|---|
| 1. 3 ft., 4 ft., 5 ft. <sup>12</sup>   | 4. $5\frac{5}{8}$ in., $3\frac{1}{4}$ in., $4\frac{1}{8}$ in. |
| 2. $3\frac{1}{2}$ ft., $3\frac{3}{8}$ ft., $3\frac{1}{8}$ ft. <sup>7 <math>\frac{3}{4}</math></sup>  | 5. 2 ft., 27 in., 3 ft.                                       |
| 3. $4\frac{1}{2}$ in., $4\frac{1}{4}$ in., $3\frac{3}{8}$ in. <sup>11 <math>\frac{7}{8}</math></sup> | 6. 2 yd., 5 ft., $1\frac{3}{4}$ yd.                           |

Find the perimeters of squares whose sides are :

- |                                    |                               |              |
|------------------------------------|-------------------------------|--------------|
| 7. 8 in. <sup>3</sup>              | 10. 3 ft. 6 in. <sup>14</sup> | 13. 2.2 in.  |
| 8. $1\frac{1}{4}$ ft. <sup>5</sup> | 11. 4 ft. 9 in.               | 14. 3.25 in. |
| 9. 2 ft. 3 in. <sup>9</sup>        | 12. 5 ft. 10 in.              | 15. 4.50 in. |

Find the perimeters of parallelograms two of whose sides are :

- |                                 |                        |                                |
|---------------------------------|------------------------|--------------------------------|
| 16. 4 in., 8 in. <sup>74</sup>  | 18. 18 in., 9 in.      | 20. $3\frac{1}{2}$ yd., 2 ft.  |
| 17. 5 in., 11 in. <sup>32</sup> | 19. 2 ft. 7 in., 5 in. | 21. 2 ft., $21\frac{1}{2}$ in. |

## 34. Rectangles

Find the areas of rectangles two of whose sides are :

- |   |                             |                         |
|---|-----------------------------|-------------------------|
| 1. 7 ft., 8 ft. <sup>56 <math>\checkmark</math></sup> | 5. $\frac{1}{4}$ mi., 5 mi. | 9. 10 in., 36 in.       |
| 2. 5 ft., 14 ft. <sup>70</sup>                        | 6. $\frac{3}{4}$ mi., 6 mi. | 10. 10 in., 1 yd.       |
| 3. 7 in., 13 in. <sup>91</sup>                        | 7. $\frac{1}{2}$ ft., 2 ft. | 11. 30 in., 10 in.      |
| 4. $\frac{1}{2}$ mi., $\frac{3}{4}$ mi. <sup>3</sup>  | 8. 6 in., 2 ft.             | 12. 2 ft. 6 in., 10 in. |

Find the areas of squares whose sides are :

- |                        |                 |                        |
|------------------------|-----------------|------------------------|
| 13. 30 in.             | 15. 2 ft. 6 in. | 17. $1\frac{2}{3}$ ft. |
| 14. $2\frac{1}{2}$ ft. | 16. 20 in.      | 18. 1 ft. 8 in.        |

Find the lengths of rectangles, with areas and widths as here given :

- |  |                                     |                                     |
|--|-------------------------------------|-------------------------------------|
| 19. 50 sq. in., 5 in. <sup>10</sup>  | 20. 51 sq. in., 3 in. <sup>17</sup> | 21. 77 sq. ft., 11 ft. <sup>7</sup> |
| 22. If the perimeter of a square is 36 in., how long is each side? What is the area? |                                     |                                     |

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## 35. Rectangles

*Find the areas of the following rectangles in acres :*

- |                    |                                 |
|--------------------|---------------------------------|
| 1. 1 ch. by 10 ch. | 6. 8 ch. by 15 ch.              |
| 2. 6 ch. by 10 ch. | 7. 10 rd. by 16 rd.             |
| 3. 5 ch. by 8 ch.  | 8. 20 rd. by 32 rd.             |
| 4. 5 ch. by 12 ch. | 9. $2\frac{1}{2}$ ch. by 4 ch.  |
| 5. 6 ch. by 15 ch. | 10. $7\frac{1}{2}$ ch. by 8 ch. |
11. How many square yards in a rectangle 6 ft. by 12 ft. ?  
 12. What is a field worth that is 5 ch. long and 4 ch. wide, at \$65 an acre ?  
 13. What is a field worth that is 40 rd. long and 12 rd. wide, at \$70 an acre ?  
 14. Two fields have equal perimeters, 40 ch. each. One field is a square and the other is a rectangle 12 ch. long. What is the area of each field ?

## 36. Rectangles

*Find the lengths of rectangles, with areas and widths as here given :*

- |                        |                                   |
|------------------------|-----------------------------------|
| 1. 56 sq. in., 7 in.   | 5. 12 sq. yd., 9 ft.              |
| 2. 154 sq. in., 11 in. | 6. 1 sq. rd., $16\frac{1}{2}$ ft. |
| 3. 2 A., 4 ch.         | 7. 1 sq. yd., 18 in.              |
| 4. 1 sq. ft., 8 in.    | 8. $\frac{1}{2}$ sq. ft., 9 in.   |

*Find the widths of rectangles, with areas and lengths as here given :*

- |                         |                         |
|-------------------------|-------------------------|
| 9. 90 sq. in., 10 in.   | 12. 144 sq. in., 16 in. |
| 10. 320 sq. rd., 20 rd. | 13. 288 sq. rd., 32 rd. |
| 11. 540 sq. yd., 27 yd. | 14. 640 sq. yd., 32 yd. |
15. Which has the greater area, a square whose perimeter is 36 in. or a rectangle 7 in. by 12 in. ?



## 37. Parallelograms

*Find the areas of parallelograms, with bases and altitudes as here given :*

- |                  |                              |                              |
|------------------|------------------------------|------------------------------|
| 1. 3 ft., 7 ft.  | 4. $7\frac{1}{2}$ ft., 2 ft. | 7. $4\frac{1}{4}$ ft., 4 ft. |
| 2. 3 in., 17 in. | 5. $6\frac{1}{2}$ ft., 4 ft. | 8. $5\frac{1}{4}$ ft., 2 ft. |
| 3. 28 ft., 3 ft. | 6. 6 ft. 6 in., 4 ft.        | 9. 5 ft. 3 in., 2 ft.        |

*Find the altitudes of parallelograms, with areas and bases as here given :*

- |                       |                        |                        |
|-----------------------|------------------------|------------------------|
| 10. 18 sq. in., 9 in. | 12. 25 sq. ft., 10 ft. | 14. 51 sq. in., 17 in. |
| 11. 18 sq. in., 4 in. | 13. 36 sq. in., 9 in.  | 15. 69 sq. in., 23 in. |

*Find the bases of parallelograms, with areas and altitudes as here given :*

- |                        |                        |                                    |
|------------------------|------------------------|------------------------------------|
| 16. 144 sq. in., 1 ft. | 18. 288 sq. in., 4 ft. | 20. 5 sq. in., $2\frac{1}{2}$ in.  |
| 17. 288 sq. in., 1 ft. | 19. 38 sq. in., 19 in. | 21. 11 sq. in., $5\frac{1}{2}$ in. |

## 38. Triangles

*Find the areas of triangles whose bases and altitudes are :*

- |                  |                             |   |
|------------------|-----------------------------|---|
| 1. 4 in., 8 in.  | 5. 5 ft., 14 ft.            | 9. $\frac{1}{4}$ mi., $\frac{1}{2}$ mi. |
| 2. 5 in., 6 in.  | 6. 3 ft., 27 ft.            | 10. 12 in., 20 in.                      |
| 3. 5 in., 3 in.  | 7. $\frac{1}{2}$ mi., 1 mi. | 11. 1 ft., 20 in.                       |
| 4. 3 ft., 12 ft. | 8. $\frac{1}{2}$ mi., 3 mi. | 12. 1 ft., 1 ft. 8 in.                  |

*Find the bases of triangles, with areas and altitudes as here given :*

- |                       |                        |
|-----------------------|------------------------|
| 13. 4 sq. ft., 2 ft.  | 16. 5 sq. mi., 2 mi.   |
| 14. 8 sq. in., 8 in.  | 17. 7 sq. yd., 14 yd.  |
| 15. 15 sq. yd., 6 yd. | 18. 35 sq. ft., 10 ft. |

19. A triangle has an area of 12 sq. in. and a base of 1 ft. What is the altitude ?

## 39. Review

1. What is the altitude of a triangle with area 1 sq. in. and base 1 in. ?
2. What is the altitude of a triangle with area  $1\frac{1}{2}$  sq. in. and base 3 in. ?
3. What is the base of a triangle with area 10 sq. ft. and altitude 2 ft. ?
4. The gable of a house is a triangle with base 35 ft. and altitude 10 ft. What is the area of the gable ?
5. An equilateral triangular flower bed has an area of 173 sq. ft. The perimeter is 60 ft. What is the altitude ?
6. In laying out a triangular flower bed the sides are all made equal, and the perimeter is found to be 30 ft. and the altitude 8.6 ft. What is the area ?
7. The four sides of the roof of a church spire are triangles, each with base 20 ft. and altitude 50 ft. How many square feet in each triangle? <sup>500</sup> in the whole roof? <sup>2000</sup>
8. A man buys a 3-acre lot that is a parallelogram in shape. The frontage along the road is 100 rd. What is the distance to the rear line ?
9. For the panels of a staircase 20 marble slabs are needed. They are parallelograms, each with a base 1 ft. 6 in. and an altitude 4 ft. What is the area of all the slabs ?
10. A marble floor is made of 1000 equilateral triangles, each with base 10 in. and altitude 8.6 in. What is the area of the floor space in square inches ?
11. A corner lot, where two streets do not meet at right angles, is a parallelogram in shape. Its length along one street is 60 ft., and the distance from that front to the side parallel to it is 100 ft. What is its area ?
12. A triangle, a square, a rectangle, and a parallelogram all have the same base and the same altitude. The side of the square is 4 in. What is the area of each ?

## 40. Rectangular Solids

Find the volumes of solids of the following dimensions :

- |  |   |
|--|---|
| 1. $2'' \times 3'' \times 4''$ . <sup>24</sup>       | 9. $3'' \times 5'' \times 6''$ . <sup>90</sup>          |
| 2. $2'' \times 4'' \times 5''$ . <sup>40</sup>       | 10. $3'' \times 6'' \times 7''$ .                       |
| 3. $2'' \times 5'' \times 6''$ . <sup>60</sup>       | 11. $4' \times 5' \times 10'$ . <sup>200</sup>          |
| 4. $2'' \times 6'' \times 7''$ . <sup>84</sup>       | 12. $4' \times 6' \times 10'$ . <sup>240</sup>          |
| 5. $2'' \times 7'' \times 8''$ . <sup>112</sup>      | 13. $5' \times 6' \times 11'$ .                         |
| 6. $2'' \times 8'' \times 9''$ .                     | 14. $5' \times 6' \times 12'$ .                         |
| 7. 3 rd. $\times$ 4 rd. $\times$ 5 rd. <sup>60</sup> | 15. 5 yd. $\times$ 7 yd. $\times$ 10 yd. <sup>350</sup> |
| 8. 3 rd. $\times$ 4 rd. $\times$ 6 rd. <sup>72</sup> | 16. 6 yd. $\times$ 7 yd. $\times$ 11 yd.                |
17. At 50¢ a cubic yard, how much will it cost to excavate a cellar containing 320 cu. yd. ?
18. At \$2.25 a cubic yard, how much will it cost to dig a trench 3 ft. deep, 18 in. wide, and 20 yd. long ?

## 41. Rectangular Solids

Given the following volumes of boxes, and the breadths and lengths, find the depths :

- |                              |                                |
|------------------------------|--------------------------------|
| 1. 40 cu. in. ; 2 in., 4 in. | 6. 60 cu. in. ; 3 in., 5 in.   |
| 2. 90 cu. in. ; 5 in., 6 in. | 7. 240 cu. in. ; 4 in., 6 in.  |
| 3. 42 cu. in. ; 3 in., 7 in. | 8. 120 cu. in. ; 5 in., 6 in.  |
| 4. 72 cu. in. ; 4 in., 9 in. | 9. 160 cu. in. ; 5 in., 8 in.  |
| 5. 90 cu. in. ; 5 in., 6 in. | 10. 180 cu. in. ; 4 in., 5 in. |
- ✓ 11. If a box contains 54 cu. in., and the area of the base is 27 sq. in., what is the depth ? <sup>2</sup>
- ✓ 12. If a box contains 72 cu. in., and the depth is 3 in., what is the area of the base ? <sup>24</sup>
13. If a box contains 84 cu. ft., and the length is 7 ft. and the width 4 ft., what is the depth ?
- ✓ 14. If a box contains 81 cu. in. and the base contains 27 sq. in., how deep is it ? <sup>3</sup>

**42. Rectangular Solids**

1. How many cubic feet in a bin  $3' \times 4' \times 6'$ ?
2. How many cubic feet in a room  $15' \times 20' \times 10'$ ?
3. How many cubic inches in an aquarium  $5'' \times 8'' \times 12''$ ?
4. Allowing 231 cu. in. to a gallon, how many quarts of water will an aquarium  $3'' \times 7'' \times 11''$  contain?
5. Suppose the aquarium described in Ex. 4 was twice as wide, twice as deep, and twice as long, how many quarts would it then hold?
6. If water weighs  $62\frac{1}{2}$  lb. per cubic foot, what will be the weight of the water that fills a rectangular tank 5 ft. long, 2 ft. wide, and 1 ft. deep?
7. A tank can be so placed in a house that its base has 24 sq. ft. How high must it be made that it may contain 96 cu. ft.?
8. A bin is 8 ft. long and 5 ft. wide. How deep must the grain be in order that there shall be 120 cu. ft.? 160 cu. ft.? 140 cu. ft.?
9. How many bars of soap, each  $2'' \times 3'' \times 4''$ , can be packed in a box  $8'' \times 12'' \times 16''$ ? (In such cases always cancel mentally before multiplying.)
10. Allowing 550 cu. ft. of clover hay to the ton, how many tons will it take to fill a space  $10' \times 10' \times 11'$ ?
11. A schoolroom is 40 ft. long, 20 ft. wide, and 10 ft. high. How many cubic feet of air must be changed per minute in order to change it all in 20 min.?
12. A schoolroom is 50 ft. long, 40 ft. wide, and 15 ft. high. How many cubic feet does it contain?
13. A schoolroom is 40 ft. wide and  $1\frac{1}{2}$  times as long as it is wide. What is the floor area? If the room is 20 ft. high, what is its volume?
14. A schoolroom has a capacity of 18,000 cu. ft. It is 15 ft. high. What is the floor area?

## 43. Review

1. A dealer has 2 gal. of cream that he sells at 10¢ per half pint. How much does he receive?

2. Allowing 6 plates of ice cream to a quart, how many gallons should be allowed for 48 persons?

3. Hogsheads vary in size, but allowing 63 gal. to a hogshead, how many quarts does it contain?

4. A man has a 10-quart pail. How many pailfuls of water must he take to fill a 30-gallon barrel?

5. Allowing  $4\frac{1}{2}$  cu. ft. to a barrel, how many barrels of water will a cistern of 29 cu. ft. contain? of 58 cu. ft.?

6. Allowing  $7\frac{1}{2}$  gal. to a cubic foot, how many gallons of water will a cistern of 100 cu. ft. contain?

7. Allowing 500 cu. ft. to a ton of hay, how many tons will it take to fill a haymow 60 ft. by 30 ft. by 10 ft.?

8. How many loads (cubic yards) of earth must be removed in digging a cellar 21 ft. by 30 ft. by 6 ft.?

9. If a man has a piece of meadow land 80 rd. long and 20 rd. wide, how many acres does it contain?

10. Allowing  $31\frac{1}{2}$  gal. to a barrel, how many gallons in 4 bbl.?

11. Allowing  $24\frac{3}{4}$  cu. ft. to a perch of masonry, how many cubic feet in 4 perches?

12. If it takes 35 cu. ft. of a certain kind of hard coal to weigh a ton, how many cubic feet in 5 tons? How many cubic feet in 20 tons?

13. Allowing 22 bricks, including the mortar, to a cubic foot, how many bricks are there in a brick wall that contains 300 cu. ft.?

14. A boy has an aquarium that contains 1728 cu. in. Allowing  $7\frac{1}{2}$  gal. to a cubic foot, how many gallons of water will it hold? Suppose he had one containing 864 cu. in., how many gallons would that hold?

## III. LONGITUDE AND TIME

## 44. Longitude to Time

*Given the following differences in longitude, find the corresponding differences in local time:*

1. $1^\circ$ .	6. 2'.	11. 7''.	16. $90^\circ$ .
2. 1'.	7. 2''.	12. $45^\circ$ .	17. $75^\circ$ .
3. 1''.	8. $30^\circ$ .	13. $7\frac{1}{2}^\circ$ .	18. $105^\circ$ .
4. $15^\circ$ .	9. 5'.	14. 15'.	19. $120^\circ$ .
5. $2^\circ$ .	10. 6'.	15. 15''.	20. $180^\circ$ .

21. Two ships are  $20^\circ$  of longitude apart. What is the difference in time?

22. A lighthouse in  $15^\circ$  W. telegraphs at 9 A.M., on a direct wire to Greenwich, the sighting of a ship. At what time does the message reach Greenwich?

## 45. Time to Longitude

*Given the following differences in local time, find the corresponding differences in longitude:*

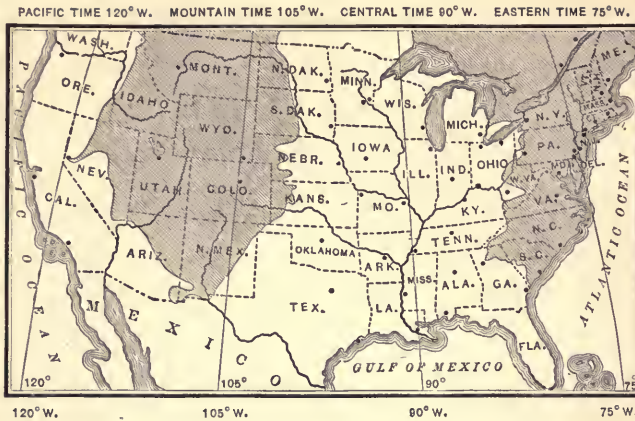
1. 1 hr.	6. 8 min.	11. 20 min.	16. $1\frac{1}{2}$ hr.
2. 4 min.	7. 16 min.	12. 40 min.	17. 6 hr.
3. 1 min.	8. 32 min.	13. 4 hr.	18. 7 hr.
4. 30 min.	9. 3 hr.	14. 5 hr.	19. 8 hr.
5. 2 hr.	10. 2 min.	15. 30 min.	20. 12 hr.

21. When it is noon at Greenwich, where is it midnight? In what part of the world is it forenoon? In what part of the world is it afternoon?

22. When it is noon at Greenwich, where is it 11 A.M.? 1 P.M.? 2 P.M.? 3 P.M.? 6 P.M.?

23. When it is noon, local time, at our school, how many degrees from here, and in which direction, is it 10 A.M., local time?





#### 46. Standard Time

1. When it is 10 A.M. by Eastern Time, what is it by Central Time? by Mountain Time? by Pacific Time?
2. When it is 2 P.M. by Central Time, what is it by Eastern Time? by Mountain Time? by Pacific Time?
3. When it is noon by Mountain Time, what is it by Eastern Time? by Central Time? by Pacific Time?
4. When it is midnight by Pacific Time, what is it by Eastern Time? by Central Time? by Mountain Time?
5. When it is 1 P.M. by Eastern Time, what is it by Central Time? by Mountain Time? by Pacific Time?
6. When it is 6 P.M. by Central Time, what is it by Pacific Time? by Eastern Time? by Mountain Time?
7. When you begin school in the morning what time is it in each of the other Standard Time sections of this country?
8. When it is noon at Greenwich, what is it by Eastern Time? by Central Time? by Mountain Time? by Pacific Time?



**47. Standard Time**

1. When it is 9 A.M. in New York, what time is it in Wisconsin? in Missouri? in Wyoming?

2. When it is 6 A.M. in Alabama, what time is it in Louisiana? in Arkansas? in Colorado? in Delaware?

3. When it is midnight in Utah, what time is it in California? in Iowa? in Mississippi? in Maryland?

4. When it is noon in Michigan, what time is it in Memphis? in New Orleans? in eastern Texas? in western Oregon?

5. When it is 2 P.M. in Massachusetts, what time is it in Maine? in Vermont? in Lincoln, Nebraska? in Guthrie, Oklahoma? in Seattle?

6. When it is 7 P.M. in Florida, what time is it in New Hampshire? in Connecticut? in Savannah? in Louisville?

7. When it is 8.30 A.M. in Butte, what time is it in Chicago? in Cleveland? in Portland, Oregon? in Portland, Maine?

8. When it is midnight in Greenwich, England, what time is it in New York? in Chicago? in Denver? in San Francisco? where you live (by Standard Time)?

9. What time is it now in your school? in Rhode Island? in Cincinnati? in New Orleans? in Galveston? in Salt Lake City? in Los Angeles?

10. Great Britain uses Greenwich time and Central Europe uses that of 15° E. When it is noon in London, what time is it in Berlin? in Milwaukee?

11. When it is noon in Venice (15° E.), what time is it in Edinburgh? in Munich? in London? in Berlin? where you live?

12. When you go away from school in the afternoon (Standard Time), what time is it in Greenwich, England? in Central Europe?

## IV. PERCENTAGE

## 48. Expressing Per Cents

To express  $\frac{1}{2}$  as per cent, think of it as  $\frac{50}{100}$  and say "50 per cent." We may read 1.50 as "1 and 50 hundredths," "150 hundredths," or "150 per cent."

*Express as per cents:*

- |                       |                    |                        |           |                        |
|-----------------------|--------------------|------------------------|-----------|------------------------|
| 1. $\frac{25}{100}$ . | 5. .75.            | 9. $.12\frac{1}{2}$ .  | 13. 1.25. | 17. $.66\frac{2}{3}$ . |
| 2. .25.               | 6. .20.            | 10. $.33\frac{1}{3}$ . | 14. 1.50. | 18. 3.20.              |
| 3. $\frac{1}{4}$ .    | 7. $\frac{1}{5}$ . | 11. $.16\frac{2}{3}$ . | 15. 2.75. | 19. 4.75.              |
| 4. $\frac{3}{4}$ .    | 8. .12.            | 12. $.06\frac{1}{4}$ . | 16. 0.99. | 20. 5.50.              |

21. A man loans some money and receives  $\frac{1}{20}$  of the amount each year as interest. What per cent is this?

22. Some damaged goods are sold at  $\frac{1}{10}$  less than they cost. This is what per cent less than they cost?

## 49. Expressing Per Cents

*Express as per cents:*

- |                     |                     |                       |                        |                       |
|---------------------|---------------------|-----------------------|------------------------|-----------------------|
| 1. $\frac{1}{2}$ .  | 5. $1\frac{3}{4}$ . | 9. $11\frac{1}{8}$ .  | 13. $\frac{3}{5}$ .    | 17. $\frac{2}{10}$ .  |
| 2. $\frac{1}{4}$ .  | 6. $\frac{1}{8}$ .  | 10. $13\frac{1}{8}$ . | 14. $1\frac{3}{8}$ .   | 18. $\frac{5}{20}$ .  |
| 3. $\frac{3}{4}$ .  | 7. $\frac{3}{8}$ .  | 11. $\frac{1}{5}$ .   | 15. $1\frac{1}{5}$ .   | 19. $1\frac{4}{5}$ .  |
| 4. $1\frac{1}{4}$ . | 8. $\frac{5}{8}$ .  | 12. $\frac{2}{5}$ .   | 16. $\frac{20}{100}$ . | 20. $1\frac{7}{25}$ . |

21. A quart is what part of a gallon? what per cent of a gallon?

22. If  $\frac{1}{4}$  of a farm is wooded, and  $\frac{1}{2}$  of this is a grove of pine trees, what per cent of the farm is this grove?

23. If  $\frac{1}{2}$  of the pupils in a school are boys, and  $\frac{1}{10}$  of these are in the sixth grade, the boys in the sixth grade are what per cent of all the pupils in the school?

24. If a boy picks 300 apples and sells 150 of them, what per cent does he sell? What per cent has he left?

## 50. Per Cents as Fractions

To express 75% as a common fraction, think of it as  $\frac{75}{100}$  reduced to lowest terms, or  $\frac{3}{4}$ .

*Express as common fractions :*

1. 10%.  $\frac{1}{10}$     3. 25%.  $\frac{1}{4}$     5. 40%.  $\frac{2}{5}$     7. 60%.    9. 80%.  
 2. 20%.  $\frac{1}{5}$     4. 30%.  $\frac{3}{10}$     6. 45%.    8. 85%.    10. 125%.  $\frac{5}{4}$

11. Which is the greater, 20% or  $\frac{1}{4}$ ? 25% or  $\frac{1}{5}$ ? 50% or  $\frac{1}{2}$ ?

*Learn the following important per cents :*

12. 50% =  $\frac{1}{2}$ .    16.  $33\frac{1}{3}\%$  =  $\frac{1}{3}$ .    20. 20% =  $\frac{1}{5}$ .  
 13. 25% =  $\frac{1}{4}$ .    17.  $66\frac{2}{3}\%$  =  $\frac{2}{3}$ .    21.  $37\frac{1}{2}\%$  =  $\frac{3}{8}$ .  
 14.  $12\frac{1}{2}\%$  =  $\frac{1}{8}$ .    18.  $16\frac{2}{3}\%$  =  $\frac{1}{6}$ .    22.  $62\frac{1}{2}\%$  =  $\frac{5}{8}$ .  
 15.  $6\frac{1}{4}\%$  =  $\frac{1}{16}$ .    19.  $8\frac{1}{3}\%$  =  $\frac{1}{12}$ .    23.  $87\frac{1}{2}\%$  =  $\frac{7}{8}$ .

## 51. Per Cents as Fractions

*Express as common fractions or mixed numbers :*

1. 35%.    5. 1.25.    9. .32.    13. 60%.    17.  $33\frac{1}{3}\%$ .  
 2. .35.    6. 75%.    10. 2.20.    14. .60.    18.  $66\frac{2}{3}\%$ .  
 3. 24%.    7. .75.    11. 40%.    15. 3.60.    19.  $37\frac{1}{2}\%$ .  
 4. .24.    8. 32%.    12. .40.    16.  $12\frac{1}{2}\%$ .    20.  $137\frac{1}{2}\%$ .

21. What is a short way of finding  $12\frac{1}{2}\%$  of a number?  
 What is  $12\frac{1}{2}\%$  of 88?

22. What is a short way of finding  $37\frac{1}{2}\%$  of a number?  
 What is  $37\frac{1}{2}\%$  of 88?

23. What is a short way of finding  $87\frac{1}{2}\%$  of a number?  
 What is  $87\frac{1}{2}\%$  of 16?

24. Express 125% in three other ways. You might use hundredths, or an improper common fraction, or a mixed number, or a mixed decimal.

## 52. Per Cents of Numbers

Think of 50% as  $\frac{1}{2}$ , 25% as  $\frac{1}{4}$ ,  $12\frac{1}{2}\%$  as  $\frac{1}{8}$ . This makes the finding of these per cents much more simple.

Find the values of the following :

- |                |                 |                               |
|----------------|-----------------|-------------------------------|
| 1. 50% of 36.  | 7. 25% of 20.   | 13. $12\frac{1}{2}\%$ of 8.   |
| 2. 50% of 48.  | 8. 25% of 48.   | 14. $12\frac{1}{2}\%$ of 32.  |
| 3. 50% of 120. | 9. 25% of 100.  | 15. $12\frac{1}{2}\%$ of 48.  |
| 4. 50% of 25.  | 10. 25% of 5.   | 16. $12\frac{1}{2}\%$ of 64.  |
| 5. 50% of \$5. | 11. 25% of 21.  | 17. $12\frac{1}{2}\%$ of 72.  |
| 6. 50% of 500. | 12. 25% of 240. | 18. $12\frac{1}{2}\%$ of 160. |
19. In a box of 200 oranges 25% are "blood" oranges. How many are "blood" oranges?
20. If there are 52 pupils in a class and 50% are boys, how many boys are there?

## 53. Per Cents of Numbers

Think of 20% as  $\frac{1}{5}$ ,  $33\frac{1}{3}\%$  as  $\frac{1}{3}$ ,  $66\frac{2}{3}\%$  as  $\frac{2}{3}$ ,  $6\frac{1}{4}\%$  as  $\frac{1}{16}$ .

Find the values of the following :

- |                   |                                  |                                |
|-------------------|----------------------------------|--------------------------------|
| 1. 20% of 50.     | 7. $33\frac{1}{3}\%$ of 15.      | 13. $6\frac{1}{4}\%$ of 16.    |
| 2. 20% of 35.     | 8. $33\frac{1}{3}\%$ of 33.      | 14. $6\frac{1}{4}\%$ of 32.    |
| 3. 20% of 45.     | 9. $33\frac{1}{3}\%$ of 27.      | 15. $6\frac{1}{4}\%$ of 160.   |
| 4. 20% of 75.     | 10. $33\frac{1}{3}\%$ of 60.     | 16. $66\frac{2}{3}\%$ of 30.   |
| 5. 20% of 150.    | 11. $33\frac{1}{3}\%$ of 150.    | 17. $66\frac{2}{3}\%$ of 33.   |
| 6. 20% of \$5.50. | 12. $33\frac{1}{3}\%$ of \$3.30. | 18. $66\frac{2}{3}\%$ of \$60. |
19. 20% of 25% of 400.      20.  $33\frac{1}{3}\%$  of 50% of 60.
21. If 20% of a shipment of \$500 of freight is destroyed in a railway accident, what is the value of the freight destroyed?
22. If  $33\frac{1}{3}\%$  of a man's income is spent for rent and clothes, and his income is \$90 a month, how much does he spend for these purposes each month?

**54. Per Cents of Numbers**

Think of 5% of 200 as  $5 \times 1\%$  of 200, or  $5 \times 2$ . That is, first find 1% of the number, and then the required per cent.

*Find the values of the following :*

- |               |               |                |
|---------------|---------------|----------------|
| 1. 1% of 500. | 5. 4% of 300. | 9. 9% of 600.  |
| 2. 2% of 100. | 6. 6% of 200. | 10. 1% of 250. |
| 3. 2% of 200. | 7. 7% of 300. | 11. 2% of 250. |
| 4. 3% of 200. | 8. 8% of 400. | 12. 3% of 110. |

13. A dealer bought \$300 worth of goods, but by prompt payment was allowed to have them for 5% less. How much did he gain in this way ?

14. An orchard that produced 600 bu. of apples last year produced 8% more this year. What was the gain in bushels ? What was the number of bushels this year ?

**55. Per Cents of Numbers**

- |                |                 |                 |
|----------------|-----------------|-----------------|
| 1. 1% of 600.  | 7. 10% of 70.   | 13. 25% of 400. |
| 2. 2% of 700.  | 8. 20% of 65.   | 14. 25% of 72.  |
| 3. 5% of 900.  | 9. 20% of 85.   | 15. 25% of 500. |
| 4. 8% of 500.  | 10. 20% of 155. | 16. 50% of 700. |
| 5. 9% of 400.  | 11. 20% of 75.  | 17. 50% of 900. |
| 6. 6% of \$40. | 12. 20% of 305. | 18. 75% of 480. |
19. How much is 25% profit on goods that cost \$2400 ?
20. How much is 6% loss on goods that cost \$700 ? on goods that cost \$1200 ?
21. How much is 10% discount on \$1650 worth of goods ? on \$2775 worth of goods ?
22. How much is 75% fire loss on property valued at \$3200 ?
23. If some goods are marked at \$800, and a dealer sells them for  $12\frac{1}{2}\%$  less, for how much less does he sell them ?

## 56. Per Cents of Numbers

1.  $12\frac{1}{2}\%$  of 16.
  2.  $12\frac{1}{2}\%$  of 72.
  3.  $12\frac{1}{2}\%$  of 168.
  4.  $33\frac{1}{3}\%$  of 15.
  5.  $33\frac{1}{3}\%$  of 42.
  6.  $33\frac{1}{3}\%$  of 249.
  7.  $66\frac{2}{3}\%$  of 12.
  8.  $66\frac{2}{3}\%$  of 33.
  9.  $66\frac{2}{3}\%$  of 150.
  10.  $16\frac{2}{3}\%$  of 18.
  11.  $16\frac{2}{3}\%$  of 72.
  12.  $16\frac{2}{3}\%$  of 300.
  13.  $37\frac{1}{2}\%$  of 16.
  14.  $37\frac{1}{2}\%$  of 40.
  15.  $62\frac{1}{2}\%$  of 800.
16. A merchant did \$16,000 worth of business one year and  $12\frac{1}{2}\%$  more the next year. Express the increase in dollars.
17. A school that had an enrollment of 320 last year has an enrollment  $6\frac{1}{4}\%$  greater this year. How many more pupils has it now?
18. A cattle dealer bought some cattle for \$2700 and after fattening them he sold them for  $33\frac{1}{3}\%$  more than he paid. What was the selling price?

## 57. Finding the Rate

To find what per cent 24 is of 400, think of it as  $\frac{24}{400}$  of 400, or  $\frac{6}{100}$  of it, or 6%. The *per cent* is then 6, or the *rate* is 6%.

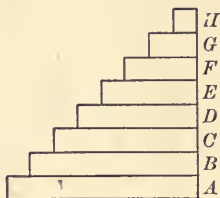
*Find what per cent the first number is of the second:*

1. 7, 100.
  2. 16, 100.
  3.  $33\frac{1}{3}$ , 100.
  4. 6, 200.
  5. 10, 200.
  6. 16, 200.
  7. 6, 300.
  8. 12 ft., 300 ft.
  9. 24, 300.
  10. \$8, \$400.
  11. 15 ft., 500 ft.
  12. 63 in., 900 in.
13. How much is a year's interest on \$1000 at 6%?
14. If you miss 1 question out of 25, what per cent do you miss?
15. If you lose 5 ft. from 50 ft. of fishing line, what per cent do you lose?
16. If a merchant gains \$30 by selling \$300 worth of goods, what is his per cent of gain?



## 58. Finding Per Cents

1.  $H$  is what part as large as  $G$  in this picture?
2. Then  $H$  is what part of  $G$ ?  $G$  is what part of  $E$ ?
3.  $G$  is how many times as large as  $H$ ? Then what per cent is  $G$  of  $H$ ?
4.  $H$  is what part as large as  $F$ ? what per cent of  $F$ ?  $F$  is what per cent of  $H$ ?
5.  $H$  is what part as large as  $E$ ? what per cent of  $E$ ?  $E$  is what per cent of  $H$ ?



*Tell the relation by a fraction or integer, and then the per cent relation of:*

- |                  |                  |                  |
|------------------|------------------|------------------|
| 6. $G$ to $E$ .  | 11. $F$ to $E$ . | 16. $C$ to $E$ . |
| 7. $E$ to $A$ .  | 12. $E$ to $F$ . | 17. $C$ to $A$ . |
| 8. $H$ to $A$ .  | 13. $E$ to $D$ . | 18. $G$ to $A$ . |
| 9. $G$ to $F$ .  | 14. $D$ to $E$ . | 19. $F$ to $C$ . |
| 10. $F$ to $G$ . | 15. $E$ to $C$ . | 20. $C$ to $F$ . |
21. If  $A$  in the picture represents \$1000, which one of the rectangles represents 50% of it? How much is this?
  22. If  $E$  in the picture represents \$400, which one of the rectangles represents 25% of it? How much is this?
  23. If  $F$  in the picture represents \$600, which one of the rectangles represents  $66\frac{2}{3}\%$  of it? How much is this?
  24. If  $A$  in the picture represents \$800, which one of the rectangles represents  $12\frac{1}{2}\%$  of it? How much is this? How much is 25% of it? 50%?
  25. If  $H$  in the picture represents \$500, which one of the rectangles represents 200% of it? How much is this?
  26. If  $E$  in the picture represents 40 tons, which one of the rectangles represents 125% of it? Which one represents 150% of it?



## 59. Per Cents of Numbers

Find 125% of (or  $1\frac{1}{4}$  times) the following :

- |           |           |           |             |
|-----------|-----------|-----------|-------------|
| 1. 36.    | 4. \$160. | 7. 72 ft. | 10. 88.     |
| 2. 64.    | 5. 28.    | 8. \$360. | 11. 60 ft.  |
| 3. 80 ft. | 6. 32.    | 9. 80.    | 12. \$2.40. |

Find 150% of the following :

- |            |            |            |             |
|------------|------------|------------|-------------|
| 13. 40.    | 16. \$220. | 19. 90 yd. | 22. 52.     |
| 14. 30.    | 17. 70.    | 20. \$150. | 23. 62 rd.  |
| 15. 60 in. | 18. 25.    | 21. 38.    | 24. \$1.20. |
25. If a man sells \$2400 worth of goods at 25% profit, what is the selling price ?
26. If a manufacturer spent \$50,000 in advertising and increased this 50%, how much did he then spend ?

## 60. Per Cents of Numbers

Find  $133\frac{1}{3}\%$  of the following :

- |        |           |        |            |
|--------|-----------|--------|------------|
| 1. 36. | 3. 60 A.  | 5. 51. | 7. 90 min. |
| 2. 48. | 4. \$150. | 6. 57. | 8. \$2.70. |

Find  $116\frac{2}{3}\%$  of the following :

- |         |            |         |             |
|---------|------------|---------|-------------|
| 9. 36.  | 11. 30 yd. | 13. 54. | 15. 84 rd.  |
| 10. 48. | 12. \$360. | 14. 72. | 16. \$2.40. |

Find  $112\frac{1}{2}\%$  of the following :

- |         |            |         |             |
|---------|------------|---------|-------------|
| 17. 32. | 19. 56 ft. | 21. 72. | 23. 88 yd.  |
| 18. 48. | 20. \$640. | 22. 96. | 24. \$1.44. |
25. Goods costing \$2400 are sold at  $16\frac{2}{3}\%$  above cost. What is the selling price ?
26. Goods costing \$2700 are damaged to the extent of  $33\frac{1}{3}\%$ . What is the loss ?

## 61. Review

✓ 1. In a school of 300 pupils 9% were in the seventh grade. How many were in that grade?

✓ 2. In a school of 200 pupils 11% were in the third grade and 14% were in the first grade. How many were in each of these grades?

3. Of 300 pupils, 5% have been tardy or absent this month. How many have not been tardy or absent?

✓ 4. In a school of 300 pupils, if there should be an increase of  $3\frac{1}{3}\%$  next year, how many pupils would there then be?

5. In a school of 250 pupils there were 10% less pupils four years ago. How many were there then?

6. If  $16\frac{2}{3}\%$  of the pupils in a school of 240 pupils were not in the school last year, how many new ones are there this year?

✓ 7. If 20% of the pupils in a school of 250 pupils are in the seventh and eighth grades, how many are in those grades?

8. If 25% of the pupils of a school of 300 pupils are in the first and second grades, how many are in those grades? in all the other grades?

9. If 55% of the pupils in a school of 300 pupils are girls, how many girls in the school? How many boys?

10. What must be added to 250 ft. to increase it 50%? to increase it 100%?

11. What must be added to 240 lb. to make it 125% of the present weight?

12. A column of mercury in a thermometer is 6 in. high. If it increases  $16\frac{2}{3}\%$  in height, how high is it?

13. A rectangle 4 in. long and 3 in. wide is increased 50% in length and  $33\frac{1}{3}\%$  in width. What was the original area and what is the area now?

## 62. Finding the Rate

To find what per cent 15 is of 25, think of  $\frac{15}{25}$  of 25, or  $\frac{60}{100}$  of 25, and state the result, 60%.

*Find what per cent the first number is of the second:*

- |             |             |                   |
|-------------|-------------|-------------------|
| 1. 5, 10.   | 6. 40, 200. | 11. 11, 50.       |
| 2. 10, 20.  | 7. 7, 20.   | 12. 150, 50.      |
| 3. 50, 100. | 8. 9, 20.   | 13. \$2, \$10.    |
| 4. 6, 25.   | 9. 15, 300. | 14. 3 ft., 20 ft. |
| 5. 7, 25.   | 10. 9, 50.  | 15. \$30, \$50.   |

16. A man's income is \$1000 a year and he saves \$250.

What per cent does he save?

17. A man's income is \$1500 a year and he saves \$600.

What per cent does he save? ( $\frac{6}{15}$  = how many fifths? then how many hundredths?)

## 63. Finding the Rate

- 2 is what part of 4? what per cent of 4?
- 3 is what part of 12? what per cent of 12?
- 5 is what part of 40? what per cent of 40?
- 7 is what part of 21? what per cent of 21?
- 9 is what part of 45? what per cent of 45?

*Find what per cent the first number is of the second:*

- |                          |   |             |              |
|--------------------------|---|-------------|--------------|
| 6. 30, 60. <sup>50</sup> | 9. 15, 45. <sup>33<math>\frac{1}{3}</math></sup>  | 12. 12, 96. | 15. 50, 25.  |
| 7. 20, 80. <sup>40</sup> | 10. 30, 45. <sup>66<math>\frac{2}{3}</math></sup> | 13. 16, 40. | 16. 25, 20.  |
| 8. 12, 60. <sup>5</sup>  | 11. 66, 88. <sup>75</sup>                         | 14. 72, 72. | 17. 52, 156. |

18. An income of \$400 on \$8000 is what per cent?

19. If a man gains \$600 on an investment of \$12,000, what is his rate of gain?

20. If a dealer loses \$200 on goods that cost \$1200, what is his per cent of loss?

## 64. Finding the Rate

*Find what per cent the first of these numbers is greater than the second :*

- |            |            |            |             |
|------------|------------|------------|-------------|
| 1. 60, 40. | 3. 60, 48. | 5. 88, 66. | 7. 63, 56.  |
| 2. 54, 36. | 4. 75, 60. | 6. 64, 48. | 8. 110, 66. |

*Find what per cent the first of these numbers is less than the second :*

- |             |             |             |               |
|-------------|-------------|-------------|---------------|
| 9. 35, 70.  | 11. 50, 75. | 13. 54, 60. | 15. 25, 40.   |
| 10. 48, 64. | 12. 42, 48. | 14. 56, 70. | 16. 100, 150. |

*Find what per cent the first of these numbers is greater than the second ; the second what per cent less than the first :*

- |             |             |             |             |
|-------------|-------------|-------------|-------------|
| 17. 15, 10. | 18. 25, 20. | 19. 40, 30. | 20. 75, 25. |
|-------------|-------------|-------------|-------------|

## 65. Finding the Base

To find of what number 25 is 5%, think that if 5% of the number is 25, 1% of it is 5, and 100% of the number is 500. Or 25 may be thought of as  $\frac{1}{20}$  of the number ; hence the number is  $20 \times 25$ , or 500.

*Find the numbers of which the following are the given per cents :*

- |            |             |                   |
|------------|-------------|-------------------|
| 1. 30, 6%. | 5. 35, 7%.  | 9. \$20, 4%.      |
| 2. 36, 6%. | 6. 49, 7%.  | 10. \$50, 5%.     |
| 3. 35, 5%. | 7. 50, 25%. | 11. \$63, 7%.     |
| 4. 45, 5%. | 8. 75, 25%. | 12. 250 ft., 25%. |

13. Some men at work in a ditch have dug 24 ft. of it to-day, which is 8% of the total length. What is the total length ?

14. A school has 20% of its pupils in the sixth grade, which numbers 40. How many pupils in the school ? How many pupils in grades other than the sixth ?

## 66. Review

1. If a man loans \$250 and receives \$10 interest for a year, what is the rate?
2. If a man borrows \$300 and pays \$18 interest for a year, what is the rate?
3. If a salesman receives a commission of \$15 on a sale amounting to \$750, what is his rate of commission?
4. If a dairyman keeps 60 cattle this year and kept 48 last year, what is the increase per cent?
5. If the taxes of a certain village were \$8000 last year and \$7000 this year, what is the decrease per cent?
6. If the rainfall in a certain place was 7.2 in. in April and 6 in. in March, what was the per cent of increase?
7. If the seventh grade devotes 45 min. a day to arithmetic and the sixth grade 40 min., what is the per cent of increase?
8. If a dealer sold daily 150 qt. of milk last month and 180 qt. this month, what was the rate of increase?
9. If a class had 25 examples on Monday and 28 on Tuesday, what was the rate of increase?
10. If you have read 75 pages in a book of 300 pages, what per cent have you read?
11. If the last chapter of a book is numbered XXXII and you have finished Chapter XXIV, what per cent of the chapters have you read?
12. If you have read 60 pages of a book, and this is 25% of the book, how many pages are there in all? How many pages have you still to read?
13. A piece of cork is pushed down below the surface of a full glass of water, and the water that runs over is weighed. The cork is then weighed and is found to weigh 1.2 oz., while the water weighed 5 oz. Cork is what per cent as heavy as an equal volume of water?

## 67. Finding the Base

To find of what number 9 is 25%, think of 9 as  $\frac{1}{4}$  of it; therefore  $\frac{4}{1}$  of it is  $4 \times 9$ , or 36. Compare, also, Exercise 65.

*Find the numbers of which the following are the given per cents:*

- |            |                           |                             |
|------------|---------------------------|-----------------------------|
| 1. 4, 25%. | 5. 6, 50%.                | 9. 25, 25%.                 |
| 2. 5, 25%. | 6. 8, 50%.                | 10. 25, 10%.                |
| 3. 7, 10%. | 7. 8, $12\frac{1}{2}\%$ . | 11. 60, 50%.                |
| 4. 9, 10%. | 8. 7, $12\frac{1}{2}\%$ . | 12. 20, $12\frac{1}{2}\%$ . |

13. State of what amount \$200 is  $12\frac{1}{2}\%$ .

14. The width of a brick is 50% of its length. If it is 4 in. wide, how long is it?

15. The thickness of a brick is 25% of its length. If it is 2 in. thick, how long is it?

## 68. Finding the Base

*Find the numbers of which the following are the given per cents:*

- |                            |             |            |
|----------------------------|-------------|------------|
| 1. 4, $33\frac{1}{3}\%$ .  | 4. 3, 20%.  | 7. 2, 5%.  |
| 2. 7, $33\frac{1}{3}\%$ .  | 5. 8, 20%.  | 8. 3, 5%.  |
| 3. 12, $33\frac{1}{3}\%$ . | 6. 11, 20%. | 9. 10, 5%. |

10. The thickness of a board is  $12\frac{1}{2}\%$  of its width. The board is 1 in. thick. How wide is it?

11. A man pays  $33\frac{1}{3}\%$  of a mortgage on his farm. He pays \$1500. How much was the mortgage?

12. If a dealer sold  $33\frac{1}{3}\%$  of his stock during the holidays, and received \$2000, what was the selling price of all of his stock before the holidays?

13. If 20% of the pupils in a school are in the first grade, and there are 40 in that grade, how many pupils are there in the whole school?

## 69. Finding the Base

To find of what number \$30 is 150%, think that  $1\frac{1}{2} \times$  some number is \$30; so the number is  $\$30 \div 1\frac{1}{2}$ , or  $\$30 \div \frac{3}{2}$ , or  $\frac{2}{3}$  of \$30, or \$20.

*Find the number represented by  $x$ :*

- |                                    |                       |
|------------------------------------|-----------------------|
| 1. $1\frac{1}{2}$ times $x$ is 9.  | 5. 150% of $x$ is 6.  |
| 2. $1\frac{1}{4}$ times $x$ is 10. | 6. 125% of $x$ is 15. |
| 3. $1\frac{3}{4}$ times $x$ is 14. | 7. 175% of $x$ is 21. |
| 4. $1\frac{1}{3}$ times $x$ is 12. | 8. 120% of $x$ is 18. |
9.  $133\frac{1}{3}\%$  of what number is 200?
10. If you have 50% more money than you had last week, you have what per cent as much as you had then? Suppose you have 15¢ now, what did you have then?
11. If a man has 125% as much money in the bank this week as he had last week, and has \$1250 now, what did he have then?

## 70. Finding the Base

If 75% of some number is 60, then  $\frac{3}{4}$  of it is 60,  $\frac{1}{4}$  of it is 20, and  $\frac{1}{4}$  of it is 80.

*Find the number represented by  $x$ :*

- |                                |                      |
|--------------------------------|----------------------|
| 1. $\frac{1}{4}$ of $x$ is 7.  | 5. 25% of $x$ is 9.  |
| 2. $\frac{1}{2}$ of $x$ is 8.  | 6. 50% of $x$ is 13. |
| 3. $\frac{3}{4}$ of $x$ is 12. | 7. 75% of $x$ is 15. |
| 4. $\frac{4}{5}$ of $x$ is 24. | 8. 80% of $x$ is 36. |
9. If I take 20% of a number, what per cent is left?
10. After decreasing a number 20% there remains 48. What is the number?
11. After decreasing a number 25% there remains 45. What is the number?
12. After drawing out 10% of his money a man still has \$180 in the bank. How much had he at first?



## 71. Finding the Base

1. 30 is  $\frac{1}{2}$  of what number? 50% of what number?
2. 30 is  $\frac{1}{3}$  of what number?  $33\frac{1}{3}\%$  of what number?
3. 30 is  $\frac{1}{4}$  of what number? 25% of what number?

*The following numbers are the given per cents of what other numbers?*

- |            |                             |                             |
|------------|-----------------------------|-----------------------------|
| 4. 7, 1%.  | 9. 18, 6%.                  | 14. 33, $33\frac{1}{3}\%$ . |
| 5. 8, 2%.  | 10. 19, 10%.                | 15. 22, $66\frac{2}{3}\%$ . |
| 6. 6, 3%.  | 11. 21, 20%.                | 16. 72, 50%.                |
| 7. 8, 4%.  | 12. 20, $12\frac{1}{2}\%$ . | 17. 60, 75%.                |
| 8. 15, 5%. | 13. 32, 25%.                | 18. 16, 80%.                |
19. At 6%, \$18 is the interest on what sum for a year?
  20. At 5%, \$60 is the interest on what sum for a year?
  21. At 4%, \$40 is the interest on what sum for a year?

## 72. Finding the Base

If 360 is  $112\frac{1}{2}\%$  of some number, 360 is  $\frac{2}{3}$  of it. Hence  $\frac{1}{3}$  of it is 40, and  $\frac{2}{3}$  of it is 320.

*The following numbers are the given per cents of what other numbers?*

- |                                |                                  |                                   |
|--------------------------------|----------------------------------|-----------------------------------|
| 1. \$240, 150%.                | 5. \$180, 120%.                  | 9. 450 ft., 125%.                 |
| 2. \$200, 125%.                | 6. \$270, $112\frac{1}{2}\%$ .   | 10. 9000 ft., 75%.                |
| 3. \$240, $133\frac{1}{3}\%$ . | 7. 540 ft., $112\frac{1}{2}\%$ . | 11. 3500 mi., 50%.                |
| 4. \$145, 200%.                | 8. 420 ft., 120%.                | 12. 1200 yd., $33\frac{1}{3}\%$ . |
13. A boy loses 60 ft. of his kite string, which is 20% of it. What was the original length?
  14. A man spends \$900 of his income, which is 75% of it. What is his income?
  15. If a man has added 10% to the size of his farm and now has 220 acres, how much did he have at first?

## 73. Discount

Think of 10% discount on \$75 as  $\frac{1}{10}$  of \$75, or \$7.50; and, in general, use common fractions for mental work in such cases.

*Find the discounts on the following amounts at the rates specified:*

- |               |               |                 |
|---------------|---------------|-----------------|
| 1. \$80, 10%. | 5. \$40, 25%. | 9. \$120, 10%.  |
| 2. \$25, 10%. | 6. \$88, 25%. | 10. \$150, 20%. |
| 3. \$50, 20%. | 7. \$60, 50%. | 11. \$160, 25%. |
| 4. \$25, 20%. | 8. \$90, 50%. | 12. \$250, 50%. |

13. If a dealer offers me an 80¢ book at a discount of 25%, this is how many cents below the regular price?

14. If a merchant buys \$800 worth of goods, and is allowed 10% discount if he pays for them at once, how much does he gain by prompt payment?

## 74. Net Prices

Think of \$80 less 10% discount as \$80 — \$8, or \$72.

*Find the amounts remaining after deducting the discounts:*

- |               |               |                 |
|---------------|---------------|-----------------|
| 1. \$60, 10%. | 5. \$25, 20%. | 9. \$80, 25%.   |
| 2. \$50, 10%. | 6. \$75, 20%. | 10. \$40, 50%.  |
| 3. \$70, 10%. | 7. \$16, 25%. | 11. \$70, 50%.  |
| 4. \$50, 20%. | 8. \$40, 25%. | 12. \$120, 50%. |

13. If some goods are marked \$20, and 10% discount is allowed, what is the selling price?

14. If a dealer sells some goods marked \$500 for 20% less than the marked price, how much does he receive?

15. At a bargain sale a set of furniture marked \$44 is sold at 25% discount. What is the selling price?

16. If at a bargain sale a fifteen-dollar rug is offered at 20% discount, what is the net price?

## 75. Single Discounts

Think of  $33\frac{1}{3}\%$  off as  $\frac{1}{3}$  off. If goods marked \$6 are sold at  $33\frac{1}{3}\%$  off, the net price is \$6 -  $\frac{1}{3}$  of \$6, or \$4.

Given the marked prices and rates of discount, find the net prices:

- |                              |   |  |
|------------------------------|---|--|
| 1. \$1, 10%. <sup>90</sup>   | 7. \$4, 25%. <sup>3</sup>                   | 13. \$8, $12\frac{1}{2}\%$ . <sup>7</sup>    |
| 2. \$3, 10%. <sup>2.70</sup> | 8. \$8, 25%. <sup>6</sup>                   | 14. \$4, $12\frac{1}{2}\%$ . <sup>3.50</sup> |
| 3. \$7, 10%. <sup>6.30</sup> | 9. \$24, 25%. <sup>18</sup>                 | 15. \$24, $12\frac{1}{2}\%$ . <sup>21</sup>  |
| 4. \$1, 20%. <sup>.80</sup>  | 10. \$9, $33\frac{1}{3}\%$ . <sup>6</sup>   | 16. \$12, 50%. <sup>6</sup>                  |
| 5. \$5, 20%. <sup>4.00</sup> | 11. \$6, $33\frac{1}{3}\%$ . <sup>4</sup>   | 17. \$20, 10%. <sup>18</sup>                 |
| 6. \$15, 20%. <sup>12</sup>  | 12. \$24, $33\frac{1}{3}\%$ . <sup>16</sup> | 18. \$25, 20%. <sup>20</sup>                 |

19. How much is \$7.50 less  $33\frac{1}{3}\%$ ?

20. If goods marked \$400 are sold to a dealer at a discount of 20%, what do they cost him?

## 76. Double Discounts

Think of \$50 less 10%, 10%, as \$50 less 10%, and this also less 10%; or as \$50 - \$5, and this as \$45 - \$4.50, leaving \$40.50.

Given the marked prices and rates of discount, find the net prices:

- |                   |                     |
|-------------------|---------------------|
| 1. \$1, 10%, 10%. | 6. \$10, 10%, 10%.  |
| 2. \$1, 20%, 10%. | 7. \$20, 20%, 10%.  |
| 3. \$1, 20%, 20%. | 8. \$40, 20%, 20%.  |
| 4. \$1, 20%, 25%. | 9. \$80, 20%, 25%.  |
| 5. \$1, 50%, 10%. | 10. \$60, 50%, 20%. |

11. If goods are marked \$500 and are sold to a dealer at 20%, 10% discount, what do they cost him?

12. What is the net price of goods marked \$100 and sold at a discount of 20%, 20%? Suppose, instead, they had been sold at a discount of 40%, what would have been the net price?

## 77. Profits

Think of 10% more than \$2.50 as \$2.50 + \$0.25, or \$2.75.

*Add the following per cents to the amounts given :*

- |              |                              |                               |
|--------------|------------------------------|-------------------------------|
| 1. \$1, 10%. | 6. \$20, 20%.                | 11. \$9, 33 $\frac{1}{3}$ %.  |
| 2. \$2, 10%. | 7. \$1, 25%.                 | 12. \$36, 33 $\frac{1}{3}$ %. |
| 3. \$6, 10%. | 8. \$2, 25%.                 | 13. \$4, 12 $\frac{1}{2}$ %.  |
| 4. \$1, 20%. | 9. \$36, 25%.                | 14. \$2, 12 $\frac{1}{2}$ %.  |
| 5. \$2, 20%. | 10. \$3, 33 $\frac{1}{3}$ %. | 15. \$80, 12 $\frac{1}{2}$ %. |

16. A merchant pays \$75 for some goods and sells them at a profit of 20%. What is the selling price?

17. A merchant buys some goods for \$400 and sells them at a profit of 25%. What is the selling price?

18. A merchant buys \$2000 worth of goods and sells them at 125% of their cost. What is the selling price?

## 78. Losses

*Subtract the following per cents from the amounts given :*

- |              |              |                               |
|--------------|--------------|-------------------------------|
| 1. \$5, 10%. | 5. \$4, 20%. | 9. \$20, 20%.                 |
| 2. \$9, 10%. | 6. \$3, 25%. | 10. \$40, 25%.                |
| 3. \$8, 10%. | 7. \$5, 25%. | 11. \$12, 33 $\frac{1}{3}$ %. |
| 4. \$5, 20%. | 8. \$6, 50%. | 12. \$40, 12 $\frac{1}{2}$ %. |

13. Some goods costing \$90 were damaged and were then sold at a loss of 33 $\frac{1}{3}$ %. What was the loss?

14. Some fruit costing \$150 was damaged and was then sold at a loss of 20%. What was the loss?

15. Some goods left over from the holiday trade were sold at a loss of 20%. They cost \$150. What was the selling price?

16. A dealer who was overstocked with shoes sold \$400 worth at a loss of 12 $\frac{1}{2}$ %. How much did he lose, and what was the selling price?

**79. Commission**

*Find the commissions on the following amounts at the given rates:*

- |             |             |                |
|-------------|-------------|----------------|
| 1. \$5, 1%. | 5. \$5, 3%. | 9. \$500, 3%.  |
| 2. \$7, 1%. | 6. \$7, 4%. | 10. \$700, 4%. |
| 3. \$9, 1%. | 7. \$9, 5%. | 11. \$900, 5%. |
| 4. \$8, 6%. | 8. \$9, 7%. | 12. \$800, 8%. |

13. What is the commission on \$2000 at  $2\frac{1}{2}\%$ ?

14. If you bought \$8 worth of berries for a grocer, and received 5% commission, how much did you make?

15. If a salesman sells \$800 worth of goods and receives 4% commission, how much does he make?

16. If a wholesale dealer gives a salesman 3% commission on \$2000 worth of goods, what is the commission?

**80. Commission**

*Find the amounts after adding the following commissions:*

- |             |                            |                              |
|-------------|----------------------------|------------------------------|
| 1. \$5, 2%. | 4. \$8, 9%.                | 7. \$500, 5%.                |
| 2. \$8, 5%. | 5. \$8, $1\frac{1}{2}\%$ . | 8. \$600, 8%.                |
| 3. \$7, 3%. | 6. \$8, $2\frac{1}{2}\%$ . | 9. \$800, $1\frac{1}{2}\%$ . |

10. A dealer paid \$500 for some goods, and 2% to the agent who bought them for him. What was the total cost?

11. A dealer received \$500 for some goods, but had to pay his salesman 2% for selling them. What was his net income?

12. A merchant sold \$2000 worth of goods, but paid a commission of 1% on the sale. What was his net income?

13. A real estate broker charged  $2\frac{1}{2}\%$  for selling some land for \$3000. How much was his commission?

14. A traveling salesman received  $3\frac{1}{2}\%$  commission for selling \$10,000 worth of goods. How much was his commission?

## 81. Finding Interest

Find the interest for 1 yr. at the given rates :

- |               |                |                 |
|---------------|----------------|-----------------|
| 1. \$100, 4%. | 6. \$600, 4%.  | 11. \$700, 6%.  |
| 2. \$100, 3%. | 7. \$200, 5%.  | 12. \$900, 6%.  |
| 3. \$300, 3%. | 8. \$600, 5%.  | 13. \$100, 2½%. |
| 4. \$250, 3%. | 9. \$800, 5%.  | 14. \$200, 2½%. |
| 5. \$250, 4%. | 10. \$400, 6%. | 15. \$400, 4½%. |
16. What is the interest for 1 yr. on \$200 at 6% ? at 5% ? at 4% ? at 4½% ?
17. What is the interest for 1 yr. on \$400 at 3% ? on \$300 at 4% ?
18. What is the interest for 1 yr. on \$2000 at 5% ? at 6% ? at 4½% ?
19. What is the interest on \$1000 at 6% for 1 yr. ? for ½ yr. ? for ¼ yr. ? for 3 mo. ? for ⅓ yr. ? for 4 mo. ?

## 82. Finding Interest

Find the interest for  $\frac{1}{2}$  yr. at the given rates per year :

- |               |   |               |    |               |    |
|---------------|---|---------------|----|---------------|----|
| 1. \$200, 4%. | 4 | 3. \$700, 4%. | 14 | 5. \$600, 5%. | 15 |
| 2. \$300, 4%. | 6 | 4. \$400, 5%. | 10 | 6. \$700, 6%. | 21 |

Find the interest for  $\frac{3}{4}$  yr. at the given rates per year :

- |               |   |                |                |    |
|---------------|---|----------------|----------------|----|
| 7. \$300, 4%. | 4 | 9. \$800, 6%.  | 11. \$800, 3%. | 8  |
| 8. \$400, 5%. |   | 10. \$400, 2%. | 12. \$600, 6%. | 12 |

Find the interest for  $\frac{1}{3}$  yr. at the given rates per year :

- |                |                |                |   |                |
|----------------|----------------|----------------|---|----------------|
| 13. \$300, 5%. | 15. \$700, 6%. | 17. \$500, 6%. |   |                |
| 14. \$600, 4%. | 6              | 16. \$600, 2%. | 3 | 18. \$300, 6%. |
19. What is the interest on \$2000 at 6% for 1 yr. ?
20. What is the interest on \$4000 at 5% for 1 yr. ? for 6 mo. ? for 3 mo. ? for 1½ mo. ?



## 83. Finding Interest

Find the interest on the following :

- |                     |                       |
|---------------------|-----------------------|
| 1. \$100, 6%, 1 yr. | 10. \$500, 6%, 6 mo.  |
| 2. \$400, 6%, 1 yr. | 11. \$300, 5%, 4 mo.  |
| 3. \$200, 5%, 1 yr. | 12. \$900, 6%, 4 mo.  |
| 4. \$900, 5%, 1 yr. | 13. \$200, 6%, 3 mo.  |
| 5. \$400, 4%, 1 yr. | 14. \$900, 4%, 3 mo.  |
| 6. \$700, 4%, 1 yr. | 15. \$400, 6%, 1 mo.  |
| 7. \$300, 3%, 1 yr. | 16. \$900, 4%, 1 mo.  |
| 8. \$800, 3%, 1 yr. | 17. \$200, 2½%, 6 mo. |
| 9. \$200, 6%, 6 mo. | 18. \$400, 4½%, 6 mo. |
19. What is the interest on \$100, at 6%, for 1 yr.? for 2 yr.?  
 20. What is the interest on \$200, at 6%, for 1 yr.? for 2 yr.?  
 21. What is the interest on \$500, at 4%, for 1½ yr.? for 1¼ yr.?  
 22. What is the interest on \$2000, at 6%, for 1 yr. 3 mo.?

## 84. Finding Interest

Find the interest for 1 yr. at the given rates :

- |              |              |               |
|--------------|--------------|---------------|
| 1. \$12, 6%. | 4. \$80, 5%. | 7. \$300, 6%. |
| 2. \$25, 6%. | 5. \$60, 4%. | 8. \$500, 5%. |
| 3. \$15, 5%. | 6. \$90, 4%. | 9. \$800, 4%. |

Find the interest on the following for 2 yr.:

- |               |               |                |
|---------------|---------------|----------------|
| 10. \$40, 6%. | 12. \$70, 5%. | 14. \$200, 6%. |
| 11. \$50, 6%. | 13. \$90, 5%. | 15. \$800, 5%. |

Find the interest on the following for 6 mo.:

- |               |               |               |
|---------------|---------------|---------------|
| 16. \$80, 6%. | 17. \$80, 5%. | 18. \$70, 4%. |
|---------------|---------------|---------------|

Find the interest on the following for 1 yr. 6 mo.:

- |               |               |               |
|---------------|---------------|---------------|
| 19. \$50, 6%. | 20. \$60, 5%. | 21. \$75; 4%. |
|---------------|---------------|---------------|



## 85. Finding Interest

Find the amount of principal and interest for 1 yr.:

- |              |              |               |
|--------------|--------------|---------------|
| 1. \$90, 6%. | 3. \$80, 5%. | 5. \$700, 6%. |
| 2. \$80, 6%. | 4. \$90, 4%. | 6. \$900, 5%. |

Find the amount of principal and interest for 2 yr.:

- |              |              |                |
|--------------|--------------|----------------|
| 7. \$70, 6%. | 8. \$50, 6%. | 9. \$2000, 5%. |
|--------------|--------------|----------------|

Find the amount of principal and interest for 1 yr. 6 mo.:

- |               |                |                 |
|---------------|----------------|-----------------|
| 10. \$40, 6%. | 11. \$300, 6%. | 12. \$4000, 5%. |
|---------------|----------------|-----------------|

Find the amount of principal and interest for 2 yr. 4 mo.:

- |               |                |                 |
|---------------|----------------|-----------------|
| 13. \$50, 6%. | 14. \$100, 6%. | 15. \$6000, 5%. |
|---------------|----------------|-----------------|

## 86. Finding Interest

Find the interest on the following:

- |                                  |                                  |
|----------------------------------|----------------------------------|
| 1. \$200, 6%, 2 yr.              | 6. \$300, 6%, $1\frac{1}{2}$ yr. |
| 2. \$200, 6%, 3 yr.              | 7. \$500, 3%, $1\frac{1}{3}$ yr. |
| 3. \$300, 5%, 4 yr.              | 8. \$400, 4%, $1\frac{1}{4}$ yr. |
| 4. \$500, 4%, 7 yr.              | 9. \$800, 5%, 2 yr. 6 mo.        |
| 5. \$400, 5%, $1\frac{1}{2}$ yr. | 10. \$800, 5%, 2 yr. 3 mo.       |

11. How does the income on \$1500 at 6% compare with that on \$3000 at 3%?

12. How does the income on \$2000 at 5% compare with that on \$1500 at 6%?

13. How does the income on \$1200 at 4% compare with that on \$1000 at 5%?

Find the amount of principal and interest for 2 yr. 3 mo.:

- |               |                |                 |
|---------------|----------------|-----------------|
| 14. \$50, 6%. | 15. \$100, 4%. | 16. \$4000, 5%. |
|---------------|----------------|-----------------|

**87. Six Per Cent Method**

As the rate for 1 yr. is 6%, for 60 da. it is 1%. Therefore the interest on \$448 for 60 da. at 6% is \$4.48; for 30 da., half that, or \$2.24; for 90 da., the sum of these, or \$6.72; for 15 da., half of \$2.24; and so for other periods.

*Find the interest at 6% for 60 da. on the following:*

- |           |           |           |           |             |
|-----------|-----------|-----------|-----------|-------------|
| 1. \$725. | 3. \$500. | 5. \$385. | 7. \$750. | 9. \$2500.  |
| 2. \$675. | 4. \$950. | 6. \$530. | 8. \$235. | 10. \$3750. |

*Find the interest at 6% for 30 da. on the following:*

- |            |            |            |            |             |
|------------|------------|------------|------------|-------------|
| 11. \$800. | 12. \$640. | 13. \$480. | 14. \$360. | 15. \$1600. |
|------------|------------|------------|------------|-------------|

*Find the interest at 6% for 90 da. on the following:*

- |            |            |            |            |             |
|------------|------------|------------|------------|-------------|
| 16. \$600. | 17. \$440. | 18. \$820. | 19. \$300. | 20. \$2000. |
|------------|------------|------------|------------|-------------|

**88. Six Per Cent Method**

*Find the amount of principal and interest, at 6%, for 60 da., on the following:*

- |           |           |           |           |            |
|-----------|-----------|-----------|-----------|------------|
| 1. \$950. | 2. \$730. | 3. \$650. | 4. \$870. | 5. \$2500. |
|-----------|-----------|-----------|-----------|------------|

*Find the amount at 6% for 30 da. on the following:*

- |           |           |           |           |             |
|-----------|-----------|-----------|-----------|-------------|
| 6. \$200. | 7. \$300. | 8. \$500. | 9. \$840. | 10. \$2000. |
|-----------|-----------|-----------|-----------|-------------|

*Find the amount at 6% for 90 da. on the following:*

- |            |            |            |            |             |
|------------|------------|------------|------------|-------------|
| 11. \$800. | 12. \$240. | 13. \$400. | 14. \$600. | 15. \$4000. |
|------------|------------|------------|------------|-------------|

*Find the amount at 6% for 10 da. on the following:*

- |            |            |            |            |             |
|------------|------------|------------|------------|-------------|
| 16. \$600. | 17. \$540. | 18. \$360. | 19. \$420. | 20. \$2400. |
|------------|------------|------------|------------|-------------|

*Find the interest at 6% for 63 da. on the following:*

- |            |            |            |            |             |
|------------|------------|------------|------------|-------------|
| 21. \$400. | 22. \$800. | 23. \$200. | 24. \$600. | 25. \$2000. |
|------------|------------|------------|------------|-------------|

## 89. Interest

- ✓ 1. A note is dated March 10 and is due on May 9. How many days has it to run?
- ✓ 2. The note in Ex. 1 is for \$1250 at 6% interest. What is the amount of principal and interest on May 9?
- Tue* 3. A note is dated March 10 and is due on June 8. How many days has it to run?
- ✓ 4. The note in Ex. 3 is for \$1250 at 6% interest. What is the amount of principal and interest on June 8?
- ✓ 5. A jeweler can buy \$1225 worth of plated ware on 60 days' credit, or he can get the goods for \$1200 in cash, which he can borrow for the 60 days at 6%. By which plan will he gain the more, and how much will he gain?
- Tues* → 6. A farmer owes \$1500 on his farm. He keeps the interest paid up, and pays \$650 on the principal one year and \$700 the next year. He finds that he then needs only 60 days to pay the balance. How much will this balance be, with interest for the 60 da. at 6%?
- Tues* 7. On November 2 a manufacturing company finds that it needs \$2500 until January 1. On December 2 it finds that it must have \$1000 more. It borrows this money at 6% and pays it when due. What is the amount of interest on both loans?
8. A bank loans the following amounts for 60 da. at 6% : \$500, \$250, \$750, \$400, \$600. How much interest does it receive on all these loans together? How much does it receive on each?
- ✓ 9. A bank loans to a merchant \$650 for 60 da. and \$400 for 30 da., both at 6%. How much interest must the merchant pay on both notes?
- ✓ 10. A merchant borrows \$1500 from a bank for 60 da. at 6%. He pays the interest in advance. How much is then left from the \$1500?

## 90. Finding the Rate

If the interest on \$300 for 6 mo. is \$7.50, for 1 yr. it is \$15. \$15 is  $\frac{15}{300}$  of \$300 or  $\frac{5}{100}$  of it. Hence the rate is 5%.

*Given the principal, interest, and time, find the rate :*

- |                          |                          |
|--------------------------|--------------------------|
| 1. \$300, \$5, 4 mo.     | 8. \$600, \$6, 2 mo.     |
| 2. \$300, \$4.50, 3 mo.  | 9. \$700, \$84, 2 yr.    |
| 3. \$400, \$10, 6 mo.    | 10. \$700, \$56, 2 yr.   |
| 4. \$400, \$2, 1 mo.     | 11. \$800, \$120, 3 yr.  |
| 5. \$500, \$5, 3 mo.     | 12. \$1000, \$240, 4 yr. |
| 6. \$500, \$12.50, 6 mo. | 13. \$1000, \$110, 2 yr. |
| 7. \$600, \$10, 4 mo.    | 14. \$2000, \$180, 2 yr. |

15. \$10 is what per cent of \$250 ?

16. At what rate must \$3000 be loaned to produce an income of \$150 a year ?

## 91. Finding the Time

If the interest on \$300 at 5% is \$7.50 for a certain time, then since the interest for 1 yr. is \$15, the time must be  $\frac{7.50}{15}$  of 1 yr., or  $\frac{1}{2}$  yr.

*Given the principal, interest, and rate, find the time :*

- |                     |                       |
|---------------------|-----------------------|
| 1. \$100, \$10, 5%. | 6. \$600, \$3, 6%.    |
| 2. \$200, \$6, 6%.  | 7. \$700, \$84, 6%.   |
| 3. \$300, \$3, 4%.  | 8. \$800, \$20, 5%.   |
| 4. \$400, \$4, 3%.  | 9. \$900, \$180, 4%.  |
| 5. \$500, \$5, 4%.  | 10. \$1000, \$10, 3%. |

11. How long will it take \$200 to gain \$48 at 6% ?

12. How long will it take \$750 to gain \$7.50 at 6% ?

13. How long will it take \$400 to amount to \$500 with interest at 5% ?

14. How long will it take \$100 to double itself at 5% ?

How long will it take \$200 to double itself at 5% ?

## 92. Review

1. How long must a man have \$500 invested at 6% so that the amount of principal and interest may be \$650?

2. A man borrowed \$6000 in the East at 5% and invested it in the West at 8%. How much did he make per year by the transaction?

3. What sum must be invested at 6% so that at the end of three years the interest may be \$90?

4. At what rate must \$1000 be invested so that at the end of two years the amount of principal and interest may be \$1090?

5. A man having \$4000 invested at 5% reinvests half of it at 6% and the other half at 4%. What, if any, is the difference in income?

6. A man having \$10,000 invested at 5½% reinvests half of it at 6% and leaves the rest as before. What is the increase in income?

7. During the year a merchant borrows at various times \$500, \$700, \$1300, \$1500, each time for 60 da. at 6%. How much interest does he pay?

8. A bank loans \$400 at 6% and receives \$6 interest (bank discount). Required the time.

9. A bank loans \$600 for 60 da. and receives \$5 interest. Required the rate.

10. A bank loans some money for 60 da. at 6% and receives \$5 interest. How much is the amount of the loan?

11. A man borrows \$1000 for 1 year at 6%. When it becomes due he finds that he needs 60 da. more time to pay the principal and interest. The lender agrees to this if the borrower will pay interest for the 60 da. on the amount of principal and interest for the year. How much must the borrower pay at the end of 60 da.?

## V. RATIO AND PROPORTION

## 93. Finding Ratios

The ratio of 8 to 10 is  $\frac{8}{10}$  or  $\frac{4}{5}$ .

*Find the ratio of the first number to the second:*

- |          |           |            |                  |
|----------|-----------|------------|------------------|
| 1. 2, 4. | 5. 5, 15. | 9. 7, 49.  | 13. 2 ft., 4 ft. |
| 2. 4, 2. | 6. 5, 25. | 10. 8, 50. | 14. 4 in., 6 in. |
| 3. 2, 8. | 7. 6, 36. | 11. 9, 36. | 15. 6 yd., 9 yd. |
| 4. 8, 2. | 8. 9, 12. | 12. 6, 21. | 16. \$8, \$9.    |

17. What is the ratio of 4 to 6? 4 ft. to 6 ft.? 4% to 6%?

18. What is the ratio of 6 to 8? 6 mo. to 8 mo.? \$6 to \$8?

19. If a blackboard is 20 ft. long and 5 ft. high, what is the ratio of height to length? of length to height?

20. If a schoolroom is 40 ft. long and 25 ft. wide, what is the ratio of width to length? of length to width?

## 94. Finding a Ratio Term

If the ratio  $\frac{x}{2}$  equals 10, the  $x$  must stand for the number that, divided by 2, equals 10. Therefore  $x$  must stand for 20.

*Find the number represented by  $x$ :*

- |                       |                                 |                                 |                                   |
|-----------------------|---------------------------------|---------------------------------|-----------------------------------|
| 1. $\frac{x}{2} = 4.$ | 4. $\frac{x}{5} = 5.$           | 7. $\frac{x}{8} = \frac{3}{4}.$ | 10. $\frac{x}{12} = \frac{2}{3}.$ |
| 2. $\frac{x}{3} = 4.$ | 5. $\frac{x}{6} = \frac{1}{2}.$ | 8. $\frac{x}{9} = \frac{1}{3}.$ | 11. $\frac{x}{16} = \frac{3}{4}.$ |
| 3. $\frac{x}{4} = 3.$ | 6. $\frac{x}{7} = \frac{1}{7}.$ | 9. $\frac{x}{6} = \frac{1}{3}.$ | 12. $\frac{x}{15} = \frac{4}{5}.$ |

13. What number has to 18 the ratio  $\frac{2}{3}$ ?

14. The ratio of the height of a schoolroom to its width is  $\frac{3}{5}$ . The width is 20 ft. What is the height?

15. The ratio of the length of a window pane to its width is  $\frac{3}{2}$ . The width is 12 in. What is the length?



## 95. Finding the Missing Term

Think of the proportion  $x:3 = 8:12$  in the more familiar form of equal fractions,  $\frac{x}{3} = \frac{8}{12}$ . Multiply both by 3, and  $x = \frac{3 \times 8}{12}$ , or 2.

Find the value of  $x$ :

- |                                   |                                   |                                   |                                   |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1. $\frac{x}{2} = \frac{2}{4}$ .  | 4. $\frac{x}{6} = \frac{6}{18}$ . | 7. $\frac{x}{9} = \frac{2}{3}$ .  | 10. $\frac{x}{3} = \frac{1}{4}$ . |
| 2. $\frac{x}{3} = \frac{4}{6}$ .  | 5. $\frac{x}{7} = \frac{6}{21}$ . | 8. $\frac{x}{10} = \frac{3}{5}$ . | 11. $\frac{x}{4} = \frac{2}{5}$ . |
| 3. $\frac{x}{5} = \frac{2}{10}$ . | 6. $\frac{x}{8} = \frac{1}{2}$ .  | 9. $\frac{x}{2} = \frac{1}{3}$ .  | 12. $\frac{x}{5} = \frac{5}{6}$ . |

13. What number has to 3 the ratio of 8 to 6?

14. The last three terms of a proportion are 2, 4, 8. What is the first term?

15. What number has to 30 the ratio of 5 to 6?

## 96. Finding the Missing Term

Think of the proportion  $5:x = 15:18$  as  $\frac{5}{x} = \frac{15}{18}$ ; then see that  $\frac{x}{5} = \frac{18}{15}$ , and  $x = \frac{5 \times 18}{15} = 6$ .

Find the value of  $x$ :

- |                                  |                                    |                                  |                                     |
|----------------------------------|------------------------------------|----------------------------------|-------------------------------------|
| 1. $\frac{1}{x} = \frac{3}{4}$ . | 4. $\frac{4}{x} = \frac{2}{3}$ .   | 7. $\frac{7}{x} = \frac{1}{2}$ . | 10. $\frac{10}{x} = \frac{5}{3}$ .  |
| 2. $\frac{2}{x} = \frac{4}{6}$ . | 5. $\frac{5}{x} = \frac{10}{20}$ . | 8. $\frac{8}{x} = \frac{4}{3}$ . | 11. $\frac{11}{x} = \frac{22}{4}$ . |
| 3. $\frac{3}{x} = \frac{1}{2}$ . | 6. $\frac{6}{x} = \frac{3}{2}$ .   | 9. $\frac{9}{x} = \frac{3}{7}$ . | 12. $\frac{12}{x} = \frac{6}{7}$ .  |

13. To what number has 5 the ratio of 1 to 3?

14. To what number has 15 the ratio of 3 to 4?

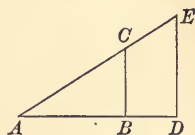


97. Similar Figures

1. In this figure, if  $AB$  represents 2 in.,  $AD$  3 in., and  $BC$  1 in., what does  $DE$  represent?

2. If  $AB$  represents 1 in.,  $BC$   $\frac{3}{4}$  in., and  $DE$  3 in., what does  $AD$  represent?

3. If  $AC$  represents 2 in.,  $AE$  3 in., and  $AB$  1 in., what does  $AD$  represent?



4. If when the diameter of a circle is 100 in. the circumference is 314 in. (as it is nearly), what is the circumference when the diameter is 10 in.? 50 in.?

5. If when the side of an equilateral triangle is 20 in. the height is 17.3 in. (as it is nearly), what is the height when the side is 100 in.?

6. If a box is to be made 10 in. long, and is to have the same proportions as another box that is 4 in. wide and 5 in. long, how wide must the new box be?

98. Review

1. If a pound of grass contains 11 oz. of water, how much water will 7 lb. contain?

2. If 2 packages of paper cost 60¢, what will 7 packages cost?

3. If 2 cu. ft. of water weigh 125 lb., what is the weight of 20 cu. ft.? of 10 cu. ft.?

4. If 3 bu. of beans weigh 180 lb., what is the weight of 1 bu.? of 2 bu.?

5. If 5 bu. of dried apples weigh 130 lb., what is the weight of 10 bu.? of 1 bu.?

6. If 10 bu. of oats weigh 320 lb., what is the weight of 1 bu.? of 5 bu.?

7. If 1 cu. ft. of sulphur weighs 125 lb., what is the weight of 4 cu. ft.? of 5 cu. ft.?

## 99. Review

1. What is the perimeter of a square 5 ft. 9 in. on a side?
2. At 28¢ a dozen, what will  $1\frac{1}{2}$  doz. eggs cost?
3. At 16¢ a pound, what will  $1\frac{3}{4}$  lb. of meat cost?
4. If you buy  $1\frac{1}{2}$  doz. eggs at 30¢ a dozen, what change should you receive from 50¢?
5. If you buy  $2\frac{1}{2}$  lb. of figs at 18¢ a pound, what change should you receive from \$1?
6. If you buy  $12\frac{1}{2}$  yd. of velvet at \$2 a yard, what change should you receive from \$30?
7. If you buy 15 lb. of sugar at 6¢ a pound, and a 10¢ can of tomatoes, should you receive any change from \$1?
8. What is the ratio of the perimeter of a triangle  $1\frac{2}{3}$  ft. on each side to that of a square  $2\frac{1}{2}$  ft. on a side? to that of a square 5 ft. on a side?

## 100. Review

1. Find the perimeter of a square 1 ft. 9 in. on a side.
2. Find the perimeter of a parallelogram two of whose sides are 3 ft. 4 in. and 2 ft. 2 in.
3. If the perimeter of a square is 9 ft. 4 in., how long is its side?
4. If the perimeter of an equilateral (equal-sided) triangle is 6 ft. 9 in., how long is each side?
5. Into how many parts, each  $\frac{3}{4}$  in. long, can I divide a line that is  $3\frac{3}{4}$  in. long?
6. If a box is 8 in. long, 2 in. high, and 4 in. wide, what is the sum of all its 12 edges?
7. If the circumference of a circle is  $3\frac{1}{7}$  times its diameter, what is the diameter when the circumference is  $12\frac{4}{7}$  in.?
8. If two sides of a triangle are 3 ft. 7 in. and 3 ft. 9 in., and the perimeter is 10 ft. 8 in., what is the third side?

## CHAPTER IV

### I. FUNDAMENTAL OPERATIONS. BUSINESS PROBLEMS

#### 1. Addition

1.  $70 + 50$ . 120    7.  $4.8 + 2.2$ . 7    13.  $125 + 60$ . 185  
2.  $75 + 50$ . 125    8.  $4.8 + 2.7$ . 7.5    14.  $125 + 65$ . 190  
3.  $75 + 55$ . 130    9.  $.73 + .27$ . 1.0    15.  $125 + 67$ . 192  
4.  $75 + 57$ . 132    10.  $.73 + .29$ . 1.02    16.  $1.45 + .37$ . 1.82  
5.  $2.7 + 3.3$ . 6    11.  $.85 + .67$ . 1.52    17.  $2.25 + .75$ . 3.  
6.  $2.7 + 3.8$ . 6.5    12.  $.94 + .78$ . 1.72    18.  $3.45 + .55$ . 4
19. Find the sum of 165 and 39; of 16.5 ft. and 3.9 ft.

#### 2. Addition

1. 12 ft. 7 in. + 6 ft. 9 in.    5. 27 gal. 2 qt. + 17 gal. 3 qt.  
2. 5 lb. 10 oz. + 3 lb. 8 oz.    6. 7 mi. 126 ft. + 3 mi. 75 ft.  
3. 15 yd. 8 in. + 9 yd. 30 in.    7. 17 rd. 12 ft. + 15 rd. 4½ ft.  
4. 8 bu. 2 pk. + 15 bu. 3 pk.    8. 25 wk. 6 da. + 17 wk. 5 da.
9. Find the sum of 8 lb. 9 oz. and 9 lb. 8 oz.
10. The three sides of a triangle are 7 ft. 3 in., 6 ft. 4 in., and 6 ft. 8 in. What is the perimeter?
11. The four sides of a field are 25 rd. 6 ft., 32 rd., 25 rd. 10½ ft., and 32 rd. What is the perimeter?
12. A lady buys 27¾ yd. of cloth and finds that she needs 30 in. more. How much cloth did she need in all?
13. If I pay \$2.75 for groceries and 85¢ for meat, how much do I pay for both? -

**3. Bank Accounts**

*Find the sums of the following deposit-slip items :*

1. Bills \$50, silver \$35, checks \$70.
2. Bills \$75, silver \$40, checks \$50.
3. Bills \$80, silver \$30, checks \$75.
4. Bills \$60, silver \$20, checks \$85.
5. Bills \$125, silver \$25, checks \$92.
6. Bills \$160, silver \$35, checks \$87.
7. Bills \$270, silver \$40, checks \$190.
8. Bills \$250, silver \$20, checks \$245.
9. Bills \$275, silver \$40, checks \$250.
10. Bills \$300, silver \$50, checks \$475.
11. Bills \$250, gold \$100, silver \$40, checks \$310.
12. Bills \$500, gold \$250, silver \$30, checks \$120.

**4. Bank Accounts**

*Find the sums of the following deposit-slip items :*

1. Bills \$375, gold \$125, silver \$75, checks \$475.
2. Bills \$450, gold \$100, silver \$50, checks \$375.50.
3. Bills \$575, gold \$125, silver \$50, checks \$455.75.
4. Checks for \$52.40, \$2.60, \$5, \$40, \$100.
5. Checks for \$25, \$35, \$40, \$22.30, \$2.70; \$75 in bills.
6. Checks for \$22, \$37, \$60, \$40.50, \$28.50; \$50 in bills.
7. Checks for \$42, \$51, \$67, \$50, \$100, \$35.25; \$25 in bills.
8. Checks for \$125, \$250, \$300, \$50, \$75, \$125.50; \$100 in bills.
9. Checks for \$25, \$50, \$120, \$240, \$65, \$500, \$1000; \$100 in bills.

5. Addition of Common Fractions

- |                                  |                                    |                                    |                                    |
|----------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 1. $\frac{1}{2} + \frac{3}{4}$ . | 6. $\frac{1}{4} + \frac{3}{8}$ .   | 11. $\frac{1}{4} + \frac{5}{16}$ . | 16. $\frac{5}{8} + \frac{7}{16}$ . |
| 2. $\frac{1}{2} + \frac{3}{8}$ . | 7. $\frac{3}{4} + \frac{5}{8}$ .   | 12. $\frac{3}{4} + \frac{7}{16}$ . | 17. $\frac{1}{2} + \frac{1}{32}$ . |
| 3. $\frac{1}{2} + \frac{5}{8}$ . | 8. $\frac{3}{4} + \frac{7}{8}$ .   | 13. $\frac{1}{8} + \frac{1}{16}$ . | 18. $\frac{1}{4} + \frac{1}{32}$ . |
| 4. $\frac{1}{2} + \frac{7}{8}$ . | 9. $\frac{1}{16} + \frac{1}{2}$ .  | 14. $\frac{3}{8} + \frac{3}{16}$ . | 19. $\frac{1}{8} + \frac{3}{32}$ . |
| 5. $\frac{1}{4} + \frac{1}{8}$ . | 10. $\frac{1}{2} + \frac{3}{16}$ . | 15. $\frac{3}{8} + \frac{5}{16}$ . | 20. $\frac{7}{8} + \frac{1}{32}$ . |

21. If a veneer of  $\frac{1}{16}$  in. is put on a  $\frac{7}{8}$ -in. board, how thick is the board with the veneer?

22. If a publisher decides to change a book margin of  $\frac{2}{3}$  in. by increasing it  $\frac{1}{12}$  in., what will the margin then be?

23. If a cylindrical iron rod  $\frac{3}{4}$  in. thick is covered with brass  $\frac{1}{32}$  in. thick, what is then the thickness of the rod?

24. If the thickness of a book, without the cover, is  $\frac{5}{8}$  in., and if each of the cover boards is  $\frac{1}{8}$  in. thick, how thick is the bound book?

6. Addition of Mixed Numbers

- |                                    |                                      |                                       |
|------------------------------------|--------------------------------------|---------------------------------------|
| 1. $2\frac{1}{2} + 3\frac{1}{4}$ . | 6. $5\frac{2}{3} + 2\frac{1}{3}$ .   | 11. $24\frac{3}{4} + 6\frac{1}{2}$ .  |
| 2. $3\frac{1}{2} + 5\frac{7}{8}$ . | 7. $6\frac{3}{4} + 5\frac{1}{3}$ .   | 12. $33\frac{1}{3} + 12\frac{1}{2}$ . |
| 3. $7\frac{1}{4} + 6\frac{7}{8}$ . | 8. $7\frac{2}{3} + 5\frac{1}{4}$ .   | 13. $66\frac{2}{3} + 12\frac{1}{2}$ . |
| 4. $3\frac{5}{8} + 2\frac{1}{4}$ . | 9. $8\frac{1}{6} + 7\frac{1}{4}$ .   | 14. $16\frac{2}{3} + 66\frac{2}{3}$ . |
| 5. $4\frac{7}{8} + 6\frac{1}{4}$ . | 10. $22\frac{1}{2} + 5\frac{7}{8}$ . | 15. $87\frac{1}{2} + 33\frac{1}{3}$ . |

16. If a skirt  $28\frac{1}{2}$  in. long has a ruffle  $3\frac{7}{8}$  in. wide sewed on, how long is the skirt?

17. If a curtain  $23\frac{3}{8}$  in. wide has a lace edge  $2\frac{1}{8}$  in. wide sewed down one side, what is then the width?

18. If a carpet rug  $3\frac{3}{4}$  yd. wide without the border has a border  $\frac{3}{4}$  yd. wide sewed around it, how wide is the rug then?

19. If a picture is framed so as to show  $15\frac{3}{4}$  in. in width, and if the frame is  $2\frac{1}{8}$  in. wide, what is the total width of picture and frame?

## 7. Review. Interest

*Find the interest on the following for the time and the rate specified:*

- |                       |                         |
|-----------------------|-------------------------|
| 1. \$200, 5 yr., 6%.  | 6. \$800, 3 mo., 6%.    |
| 2. \$300, 6 mo., 6%.  | 7. \$400, 2 yr., 5%.    |
| 3. \$400, 2½ yr., 6%. | 8. \$1200, 2½ yr., 5%.  |
| 4. \$250, 4 yr., 6%.  | 9. \$2000, 1 yr., 4½%.  |
| 5. \$500, 4 yr., 6%.  | 10. \$4000, 1 yr., 5½%. |

*Find the amount of principal and interest:*

- |                       |                        |
|-----------------------|------------------------|
| 11. \$100, 2 yr., 6%. | 16. \$600, 8 mo., 6%.  |
| 12. \$200, 3 mo., 6%. | 17. \$700, 6 mo., 6%.  |
| 13. \$300, 3 yr., 6%. | 18. \$800, 10 mo., 6%. |
| 14. \$400, 1 mo., 6%. | 19. \$900, 2 yr., 5%.  |
| 15. \$500, 2 mo., 6%. | 20. \$1000, 3 yr., 5%. |

## 8. Review. Interest

*Compute the interest in the following cases:*

- |                      |                      |
|----------------------|----------------------|
| 1. \$400, 5 yr., 6%. | 4. \$500, 6 yr., 4%. |
| 2. \$400, 6 yr., 5%. | 5. \$600, 4 yr., 5%. |
| 3. \$500, 4 yr., 6%. | 6. \$600, 5 yr., 4%. |

7. What is the compound interest on \$100 for 2 yr. at 3%, the interest being compounded annually?

8. A man gives his note for \$300 for 1 yr. at 6%. At the end of the year he pays the interest and \$100 of the principal, and the time is extended on the balance a year. How much is due at the end of the second year?

9. A man gives his note for \$500 for two years at 6%. At the end of the two years he pays \$260 and the time is extended on the balance. How much is due at the end of the next year?

## 9. Subtraction

1.  $60 - 37$ .
2.  $52 - 28$ .
3.  $41 - 26$ .
4.  $62 - 36$ .
5.  $71 - 27$ .
6.  $64 - 39$ .
7.  $52 - 27$ .
8.  $48 - 29$ .
9.  $81 - 56$ .
10.  $84 - 45$ .
11.  $93 - 64$ .
12.  $121 - 67$ .
13.  $.98 - .49$ .
14.  $.45 - .26$ .
15.  $9.6 - 2.8$ .
16.  $23.3 - 7.5$ .
17.  $6.5 - 2.7$ .
18.  $8.7 - 2.9$ .
19.  $4.1 - 2.5$ .
20.  $.125 - .06$ .
21. How much must be added to \$250 to make \$1100?
22. How much more is 21.7 mi. than 9.2 mi.?
23. If I buy goods for \$1.25 and 80¢, how much change should I receive from \$5?
24. If a farmer sells produce to a grocer for \$5.50 and \$6.25, and buys groceries costing \$1.75, how much balance is due him?
25. If a man buys goods to the amount of \$640, and pays \$180 down, how much is still due? If he pays \$460 more, how much is then due?

## 10. Subtraction

1. 12 ft. 4 in. — 3 ft. 8 in.
2. 32 ft. 6 in. — 12 ft. 9 in.
3. 62 rd. 12 ft. — 28 rd. 6 ft.
4. 3 yr. 6 mo. — 1 yr. 8 mo.
5. 32 gal. 2 qt. — 15 gal. 3 qt.
6. 4 yr. 6 mo. 15 da. — 8 mo. 10 da.
7. 42 bu. 1 pk. — 12 bu. 2 pk.
8. 125 lb. 6 oz. — 24 lb. 10 oz.
9. A box 2 ft. 2 in. long and 1 ft. 10 in. wide is how much longer than wide?
10. A note made September 20, due in one year, has a payment the following July 12. How long has it then to run?
11. How long is it from 5 min. past 6 P.M. to 15 min. past 4 A.M. of the next day?



## 11. Bank Balances

1. A man's balance in the bank yesterday was \$635. To-day he gives a check for \$75. What will be his balance after the check is cashed?

2. A man's balance in the bank yesterday was \$800. To-day his checks for \$25 and \$160 are cashed. What will be his balance to-night?

*The first of these amounts is a man's balance in the bank yesterday, and the second is the amount checked out to-day. Find the balance to-night:*

- |                 |                  |                  |
|-----------------|------------------|------------------|
| 3. \$250, \$75. | 7. \$350, \$35.  | 11. \$730, \$45. |
| 4. \$420, \$30. | 8. \$560, \$70.  | 12. \$810, \$60. |
| 5. \$250, \$45. | 9. \$575, \$90.  | 13. \$830, \$80. |
| 6. \$280, \$75. | 10. \$620, \$80. | 14. \$850, \$65. |

## 12. Bank Balances

1. A man's balance in the bank yesterday was \$750. To-day he deposits \$150, and his checks for \$50 and \$125 are cashed. What will be his balance to-night?

*Given the following balances yesterday and the checks of to-day, find the balances to-night:*

2. Balance, \$500; checks, \$50, \$25, \$75.
3. Balance, \$600; checks, \$100, \$50, \$25.
4. Balance, \$800; checks, \$250, \$10, \$40.
5. Balance, \$1250; checks, \$150, \$75, \$25.
6. Balance, \$1525; checks, \$50, \$12.50, \$37.50.
7. Balance, \$1100; checks, \$100, \$75, \$25, \$200.
8. Balance, \$750; checks, \$10, \$30, \$50, \$100, \$10.
9. Balance, \$1475; checks, \$75, \$30, \$20, \$75, \$275, \$500, \$100.

## 13. Subtraction of Common Fractions

- |                                   |                                    |                                    |                                     |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|
| 1. $\frac{1}{2} - \frac{1}{4}$ .  | 6. $\frac{1}{4} - \frac{1}{12}$ .  | 11. $\frac{3}{4} - \frac{5}{16}$ . | 16. $\frac{5}{6} - \frac{7}{24}$ .  |
| 2. $\frac{1}{2} - \frac{3}{8}$ .  | 7. $\frac{1}{8} - \frac{1}{16}$ .  | 12. $\frac{3}{4} - \frac{7}{16}$ . | 17. $\frac{5}{24} - \frac{1}{48}$ . |
| 3. $\frac{3}{4} - \frac{5}{8}$ .  | 8. $\frac{3}{8} - \frac{1}{16}$ .  | 13. $\frac{5}{6} - \frac{5}{12}$ . | 18. $\frac{7}{24} - \frac{1}{48}$ . |
| 4. $\frac{7}{8} - \frac{3}{4}$ .  | 9. $\frac{1}{2} - \frac{1}{16}$ .  | 14. $\frac{5}{6} - \frac{7}{12}$ . | 19. $\frac{5}{24} - \frac{5}{48}$ . |
| 5. $\frac{1}{2} - \frac{1}{12}$ . | 10. $\frac{1}{4} - \frac{1}{16}$ . | 15. $\frac{5}{6} - \frac{1}{24}$ . | 20. $\frac{1}{24} - \frac{5}{48}$ . |

21. How much thicker is a  $\frac{7}{8}$ -inch board than a  $\frac{1}{2}$ -inch board?

22. How much longer is a  $\frac{2}{3}\frac{3}{4}$ -inch line than a  $\frac{1}{2}$ -inch line?

23. How much thicker is a  $\frac{1}{4}$ -inch veneer than one that is  $\frac{1}{16}$  in. thick?

24. If the perimeter of a triangle is  $\frac{3}{4}$  mi., and two sides are .3 mi. and .2 mi., what is the length of the third side?

25. If a field is  $\frac{3}{8}$  mi. long and  $\frac{3}{16}$  mi. wide, the length is how much greater than the width?

## 14. Subtraction of Mixed Numbers

- |                                      |                                       |   |
|--------------------------------------|---------------------------------------|---|
| 1. $35\frac{1}{2} - 17\frac{1}{4}$ . | 6. $51\frac{3}{8} - 30\frac{1}{4}$ .  | 11. $78\frac{2}{3} - 38\frac{1}{2}$ .   |
| 2. $66\frac{2}{3} - 33\frac{1}{3}$ . | 7. $55\frac{5}{8} - 35\frac{1}{2}$ .  | 12. $125\frac{1}{2} - 50\frac{1}{4}$ .  |
| 3. $25\frac{1}{2} - 12\frac{1}{2}$ . | 8. $63\frac{7}{8} - 22\frac{1}{4}$ .  | 13. $116\frac{2}{3} - 33\frac{1}{3}$ .  |
| 4. $42\frac{3}{4} - 20\frac{1}{8}$ . | 9. $68\frac{7}{8} - 35\frac{1}{2}$ .  | 14. $122\frac{1}{8} - 32\frac{1}{16}$ . |
| 5. $47\frac{1}{4} - 22\frac{1}{8}$ . | 10. $75\frac{1}{2} - 25\frac{1}{3}$ . | 15. $157.5 - 27\frac{1}{4}$ .           |

16. What must be subtracted from 0.75 to make  $\frac{1}{8}$ ?

17. What must be added to  $0.12\frac{1}{2}$  to make  $\frac{3}{4}$ ? to make 1?

18. If a book page is 7.25 in. long and  $4\frac{3}{4}$  in. wide, its length is how much greater than its width?

19. If a book page is  $4\frac{3}{4}$  in. wide, and if the inner margin is  $\frac{1}{2}$  in. and the outer one  $\frac{3}{4}$  in., what is the width of the printed part?

20. If a flower bed  $27\frac{3}{4}$  ft. long and  $12\frac{1}{4}$  ft. wide has a walk 3 ft. wide around it on the outside, how long and how wide is the bed with the walk?

## 15. Review

1. From 1 take the sum of  $\frac{1}{4}$  and  $\frac{1}{16}$ .
2. If  $\frac{3}{4}$  of a man's property is invested in business,  $\frac{3}{16}$  in bonds, and the rest in banks, what part is in banks?
3. If a man divides his bank deposits among three banks so that the first receives  $\frac{1}{2}$  of the deposits and the second  $\frac{1}{3}$ , what part does the third receive?
4. A merchant reinvests  $\frac{3}{8}$  of his year's income in his business, spends  $\frac{7}{8}$  of it, and saves the balance. What part of his income does he save?
5. The net income from a certain business amounted to \$3200 the first half of last year and \$2400 the second half. It was agreed between the two partners that the first should have  $\frac{5}{8}$  of the income and the second the balance. What was the income of the second for the whole year?

## 16. Review

1. A firm has \$4800 in the bank at the close of a week's business. During the following week it deposited \$700 and checked out \$1100. What was its balance at the close of that week?
2. A firm takes in during a day \$720. It pays out during the day \$35 for help, \$200 for new goods, \$100 for the week's rent, and deposits the rest in the bank. How much does it deposit?
3. A dealer in cattle buys six cows, paying for them \$55, \$60, \$65, \$45, \$50, and \$70 respectively. How much does he pay for all?
4. A man earned \$3.75 on Monday, \$2.50 on Tuesday, \$4.50 on Wednesday, and \$3.25 on Thursday. How much did he earn on all four days? How much more must he earn to make the total \$20?

## 17. Multiplication

Think of  $11 \times 32$  as  $320 + 32$ , or  $352$ ; and of  $11 \times 6.1$  as  $61 + 6.1$ , or  $67.1$ .

- |                    |                      |                      |                      |
|--------------------|----------------------|----------------------|----------------------|
| 1. $2 \times 75$ . | 6. $4 \times 73$ .   | 11. $7 \times 82$ .  | 16. $9 \times .92$ . |
| 2. $2 \times 86$ . | 7. $5 \times 92$ .   | 12. $7 \times 8.2$ . | 17. $11 \times 63$ . |
| 3. $3 \times 64$ . | 8. $5 \times 88$ .   | 13. $8 \times 72$ .  | 18. $11 \times 72$ . |
| 4. $3 \times 77$ . | 9. $6 \times 42$ .   | 14. $8 \times .72$ . | 19. $20 \times 35$ . |
| 5. $4 \times 56$ . | 10. $6 \times 4.2$ . | 15. $9 \times 92$ .  | 20. $30 \times 72$ . |
21. At  $11\text{¢}$  each, what will 2 doz. slates cost?  
 22. At  $35\text{¢}$  each, what will 11 arithmetics cost?  
 23. At  $20\text{¢}$  a dozen, what will 15 doz. pencils cost?  
 24. At  $30\text{¢}$  a dozen, what will a gross of pencils cost?  
 25. At  $24\text{¢}$  a yard, what will 6 yd. of cloth cost?  $6\frac{1}{2}$  yd.?  
 26. At  $50\text{¢}$  a yard, what will 65 yd. of matting cost?  
 27. At  $60\text{¢}$  a yard, what will 45 yd. of carpet cost?

## 18. Multiplication

Think of  $11 \times 12$  ft. 2 in. as  $120$  ft. +  $12$  ft. and  $20$  in. +  $2$  in., or  $132$  ft.  $22$  in., or  $133$  ft.  $10$  in.

- |  |                              |
|--|------------------------------|
| 1. $6 \times 3$ ft. 8 in.              | 7. $6 \times 12$ gal. 1 pt.  |
| 2. $4 \times 8$ ft. 6 in.              | 8. $8 \times 15$ gal. 2 qt.  |
| 3. $3 \times 6$ rd. $5\frac{1}{2}$ ft. | 9. $8 \times 22$ lb. 2 oz.   |
| 4. $5\frac{1}{2} \times 4$ rd. 1 yd.   | 10. $11 \times 14$ lb. 1 oz. |
| 5. $7 \times 8$ yd. 6 in.              | 11. $12 \times 30$ lb. 3 oz. |
| 6. $8 \times 9$ yd. $4\frac{1}{2}$ in. | 12. $25 \times 44$ lb. 1 oz. |
13. What is the perimeter of a square that is 6 rd.  $4\frac{1}{8}$  ft. on a side?  
 14. The sides of a triangular lot are each 12 rd.  $5\frac{1}{2}$  ft. What is the perimeter?  
 15. A certain pump raises 100 cu. ft. of water a minute. Water weighing  $62\frac{1}{2}$  lb. per cubic foot, what is the weight of the water raised per minute?

**19. Review. Bank Discount**

*Find the discount on the following notes :*

- |                      |                                 |
|----------------------|---------------------------------|
| 1. \$85, 2 mo., 6%.  | 7. \$800, 3 mo., 6%.            |
| 2. \$90, 2 mo., 6%.  | 8. \$1400, 3 mo., 6%.           |
| 3. \$350, 2 mo., 6%. | 9. \$1800, 2 mo., 4%.           |
| 4. \$775, 2 mo., 6%. | 10. \$2400, 2 mo., 5%.          |
| 5. \$400, 1 mo., 6%. | 11. \$1200, 3 mo., 6%; also 5%. |
| 6. \$500, 1 mo., 6%. | 12. \$2400, 3 mo., 6%; also 5%. |
13. A man gave a note for \$500 to run from January 10 to February 9. What was the discount at 6%?
14. How much is the discount on a note of \$1000, at 6%, from July 6 to September 4? from July 6 to August 5?
15. How much is the discount on a note of \$3000, at 6%, from October 3 to November 2? to December 2?

**20. Review. Bank Discount**

*Find the proceeds on the following notes :*

- |                     |                        |
|---------------------|------------------------|
| 1. \$70, 2 mo., 6%. | 7. \$120, 1 mo., 6%.   |
| 2. \$75, 2 mo., 6%. | 8. \$120, 1 mo., 5%.   |
| 3. \$80, 2 mo., 6%. | 9. \$400, 1 mo., 6%.   |
| 4. \$85, 2 mo., 6%. | 10. \$1200, 1 mo., 5%. |
| 5. \$60, 1 mo., 6%. | 11. \$3000, 2 mo., 5%. |
| 6. \$60, 1 mo., 5%. | 12. \$3600, 2 mo., 4%. |
13. How much are the proceeds on a note of \$500, due in 60 days without interest, discounted at 6%?
14. If I have a note for \$80 due in 90 days without interest, and I discount it at 6% to-day, what are the proceeds?
15. A note of \$1200, due in 30 days without interest, is discounted at 6%. What are the proceeds? What would be the proceeds if the note were discounted at 5%?

**21. Multiplication of Common Fractions**

- |                              |                               |                                      |                                       |
|------------------------------|-------------------------------|--------------------------------------|---------------------------------------|
| 1. $8 \times \frac{3}{4}$ .  | 7. $32 \times \frac{7}{16}$ . | 13. $\frac{3}{16}$ of 32.            | 19. $\frac{5}{8}$ of $\frac{3}{4}$ .  |
| 2. $4 \times \frac{7}{8}$ .  | 8. $64 \times \frac{9}{16}$ . | 14. $\frac{5}{32}$ of 64.            | 20. $\frac{7}{8}$ of $\frac{2}{3}$ .  |
| 3. $2 \times \frac{3}{8}$ .  | 9. $\frac{2}{3}$ of 36.       | 15. $\frac{5}{12}$ of 60.            | 21. $\frac{5}{8}$ of $\frac{3}{8}$ .  |
| 4. $5 \times \frac{2}{3}$ .  | 10. $\frac{3}{4}$ of 3.6.     | 16. $\frac{7}{12}$ of 7.2.           | 22. $\frac{3}{16}$ of $\frac{8}{9}$ . |
| 5. $15 \times \frac{4}{5}$ . | 11. $\frac{4}{5}$ of 35.      | 17. $\frac{2}{3}$ of $\frac{3}{4}$ . | 23. $\frac{5}{12}$ of $\frac{4}{5}$ . |
| 6. $16 \times \frac{3}{4}$ . | 12. $\frac{5}{8}$ of 4.8.     | 18. $\frac{3}{8}$ of $\frac{1}{2}$ . | 24. $\frac{7}{12}$ of $\frac{3}{4}$ . |

25. How much is  $\frac{2}{3}$  of half an inch?

26. How much is  $\frac{3}{5}$  of 0.15 mi.?

27. Express  $\frac{1}{2}$  of 0.5 mi. as a common fraction.

28. Express  $\frac{3}{4}$  of 0.75 mi. as a common fraction.

29. Express  $\frac{5}{8}$  of 0.4 mi. as a decimal fraction; as a common fraction.

30. Express  $\frac{7}{8}$  of 0.16 mi. as a decimal fraction; as a common fraction.

**22. Multiplication of Mixed Numbers**

- |                                |                                 |                                 |
|--------------------------------|---------------------------------|---------------------------------|
| 1. $5 \times 15\frac{2}{3}$ .  | 7. $9 \times 11\frac{1}{3}$ .   | 13. $12 \times 12\frac{1}{2}$ . |
| 2. $4 \times 20\frac{1}{2}$ .  | 8. $4 \times 12\frac{1}{2}$ .   | 14. $20 \times 12\frac{1}{2}$ . |
| 3. $6 \times 12\frac{1}{2}$ .  | 9. $2 \times 45\frac{3}{4}$ .   | 15. $30 \times 20\frac{1}{5}$ . |
| 4. $6 \times 16\frac{2}{3}$ .  | 10. $10 \times 37\frac{1}{2}$ . | 16. $16\frac{2}{3} \times 60$ . |
| 5. $3 \times 33\frac{1}{3}$ .  | 11. $10 \times 87\frac{1}{2}$ . | 17. $33\frac{1}{3} \times 90$ . |
| 6. $12 \times 11\frac{3}{4}$ . | 12. $11 \times 22\frac{1}{2}$ . | 18. $66\frac{2}{3} \times 30$ . |

19. How much is  $1\frac{1}{2} \times 0.5$ ?

20. How much is  $2\frac{1}{4} \times 0.4$ ?

21. How much is  $\frac{1}{2}$  of  $\frac{3}{4}$  of 0.8?

22. Express  $2\frac{1}{4} \times \frac{2}{3}$  as a common fraction; as a decimal fraction.

23. What is the perimeter of a triangle  $16\frac{2}{3}$  in. on each side?

24. What is the perimeter of a square each side of which is  $17\frac{1}{3}$  in.?



**23. Partial Payments**

1. A note for \$100, at 6%, has a payment of \$6 indorsed annually for 2 years, and a payment of \$56 at the end of the third year. How much is then due?

2. A note for \$200, at 6%, has a payment of \$12 indorsed at the end of the first year and \$112 at the end of the second year. How much is then due?

3. A note for \$500, at 6%, has a payment of \$430 indorsed at the end of the first year. No payments are made the second or third years. How much is due at the end of the fourth year?

4. A note for \$1000, at 5%, has a payment of \$50 indorsed at the end of the first year, \$50 at the end of the second year, and nothing during the third year. How much is due at the end of the third year?

**24. Partial Payments**

1. A note for \$2500, at 4%, has \$100 a year indorsed for the first, second, and third years. At the end of the fourth year \$600 is indorsed. How much is due at the end of the fifth year?

2. A note for \$3000, at 4%, has \$1120 indorsed at the end of the first year, and \$1080 at the end of the second year. How much is due at the end of the third year?

3. A note for \$2000, at 5%, has \$1100 indorsed at the end of the first year, and \$550 at the end of the second year. How much is due at the end of the second year? at the end of the third year?

4. A note for \$4000, at 6%, has \$240 indorsed at the end of the first year, \$240 at the end of the second year, and \$3240 at the end of the third year. How much is due at the end of the fourth year?



## 25. Division

- |                   |                    |                    |                     |
|-------------------|--------------------|--------------------|---------------------|
| 1. $78 \div 2$ .  | 6. $8.1 \div 3$ .  | 11. $65 \div 4$ .  | 16. $134 \div 5$ .  |
| 2. $9.6 \div 2$ . | 7. $76 \div 3$ .   | 12. $123 \div 4$ . | 17. $9.6 \div 6$ .  |
| 3. $65 \div 2$ .  | 8. $101 \div 3$ .  | 13. $8.5 \div 5$ . | 18. $.91 \div 7$ .  |
| 4. $109 \div 2$ . | 9. $7.6 \div 4$ .  | 14. $91 \div 5$ .  | 19. $.96 \div 8$ .  |
| 5. $72 \div 3$ .  | 10. $9.2 \div 4$ . | 15. $63 \div 5$ .  | 20. $.126 \div 9$ . |

21. If one dictionary costs \$6, how many dictionaries can be bought for \$96?

22. If a dozen copies of a certain book cost \$6.60, how much does each copy cost?

23. If a perimeter of a polygon, each of whose sides is 13 ft., is 78 ft., how many sides are there?

24. If a man buys 4 Texas saddle horses, paying \$90, \$100, \$110, and \$160 for them, what is the total cost? What is the average price?

## 26. Division

- |  |  |
|--|--|
| 1. 18 ft. 8 in. $\div$ 2.              | 7. 19 lb. 2 oz. $\div$ 6.              |
| 2. 19 ft. 8 in. $\div$ 2.              | 8. 22 lb. 5 oz. $\div$ 7.              |
| 3. 22 ft. 3 in. $\div$ 3.              | 9. 17 bu. 2 pk. $\div$ 8.              |
| 4. 34 ft. 8 in. $\div$ 4.              | 10. 37 bu. $\frac{1}{2}$ pk. $\div$ 9. |
| 5. 31 yd. 4 in. $\div$ 5.              | 11. 2 ft. 6 in. $\div$ 1 ft. 3 in.     |
| 6. 26 rd. $3\frac{1}{2}$ ft. $\div$ 5. | 12. 2 ft. 8 in. $\div$ 1 ft. 4 in.     |

13. If the perimeter of an equilateral triangle is 4 ft. 9 in., how long is each side?

14. If the perimeter of a square is 6 ft. 4 in., how long is each side?

15. A box is 2 ft. 3 in. long and 9 in. wide. Its length is how many times its width?

16. There being 16 ft. 6 in. in a rod, how many rods in 33 ft.? in 49 ft. 6 in.? in 66 ft.? in 82 ft. 6 in.? in 99 ft.? in 115 ft. 6 in.? in 132 ft.?

## 27. Review. Trade Discount

When a bill of goods listed at \$100 is discounted at 10%, 20%, the 10% is first deducted, leaving \$90, and 20% of \$90 is then deducted, leaving \$72. Instead of taking 10%, we may take 90% at once, and instead of taking off 20% we may take 80% at once.

*Find the cost of goods listed as follows, less the discount :*

- |                              |                                     |
|------------------------------|-------------------------------------|
| 1. \$500, 5%.                | 7. \$600, 16 $\frac{2}{3}$ % , 4%.  |
| 2. \$800, 6%.                | 8. \$900, 33 $\frac{1}{3}$ % , 10%. |
| 3. \$300, $\frac{1}{2}$ off. | 9. \$1500, 20% , 10%.               |
| 4. \$600, $\frac{1}{8}$ off. | 10. \$1000, 20% , 10%.              |
| 5. \$200, 10%.               | 11. \$2000, 20% , 2%.               |
| 6. \$750, 2%.                | 12. \$5000, 20% , 5%.               |
13. What is the discount on \$650 at 5% ?
14. How much will \$1000 worth of hardware cost at 20% and 10% discount ?

## 28. Review. Trade Discount

*Find the cost of goods listed as follows, less the discount :*

- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| 1. \$250, 4% , 10%.                 | 5. \$3000, 33 $\frac{1}{3}$ % , 10%. |
| 2. \$100, 10% , 5%.                 | 6. \$6000, 16 $\frac{2}{3}$ % , 10%. |
| 3. \$300, 10% , 1%.                 | 7. \$4000, 12 $\frac{1}{2}$ % , 10%. |
| 4. \$800, 12 $\frac{1}{2}$ % , 10%. | 8. \$5000, 2% , 1%.                  |
9. How much will goods cost if marked \$1000 and sold at a discount of  $\frac{1}{5}$ ,  $\frac{1}{4}$  ?
10. A dealer buys \$1200 worth of watches subject to a discount of 6% for cash. How much does he gain by taking the discount ? How much does he pay for the watches ?
11. A dealer can buy \$5000 worth of goods on 60 da. credit, or he can get a discount of 10% for cash. How much is the discount ? What is the net cost if he pays for them immediately ?

## 29. Division of Common Fractions

- |                           |                                       |                            |                                      |
|---------------------------|---------------------------------------|----------------------------|--------------------------------------|
| 1. $\frac{1}{8} \div 2$ . | 6. $\frac{1}{6} \div 10$ .            | 11. $8 \div \frac{4}{3}$ . | 16. $10 \div \frac{4}{5}$ .          |
| 2. $\frac{3}{8} \div 3$ . | 7. $\frac{6}{3\frac{1}{2}} \div 4$ .  | 12. $9 \div \frac{3}{8}$ . | 17. $\frac{2}{3} \div \frac{1}{3}$ . |
| 3. $\frac{5}{8} \div 4$ . | 8. $\frac{1}{3}\frac{5}{2} \div 10$ . | 13. $6 \div \frac{4}{3}$ . | 18. $\frac{2}{3} \div \frac{3}{4}$ . |
| 4. $\frac{5}{6} \div 4$ . | 9. $3 \div \frac{1}{2}$ .             | 14. $8 \div \frac{3}{4}$ . | 19. $\frac{3}{4} \div \frac{3}{5}$ . |
| 5. $\frac{1}{6} \div 5$ . | 10. $6 \div \frac{3}{4}$ .            | 15. $9 \div \frac{3}{4}$ . | 20. $\frac{5}{8} \div \frac{3}{4}$ . |

21. How many sixths of a mile are there in  $\frac{3}{8}$  mi.?
22. If, in making a drawing to scale, we have to divide  $\frac{3}{4}$  in. into 6 equal parts, what is the length of each part?
23. In drawing a map it becomes necessary to divide  $\frac{5}{8}$  in. into 10 equal parts. What is the length of each part?
24. In planning some trimming a girl needs to divide  $\frac{3}{4}$  yd. into 6 equal parts. What is the length of each part?
25. A man has to walk  $\frac{7}{5}$  mi. to his work. How much farther must he walk when he has walked  $\frac{2}{5}$  of the way?

## 30. Division of Mixed Numbers

- |                            |                             |  |  |
|----------------------------|-----------------------------|--|--|
| 1. $\frac{5}{2} \div 5$ .  | 6. $3\frac{3}{8} \div 9$ .  | 11. $7 \div 2\frac{1}{3}$ .            | 16. $5\frac{1}{3} \div 1\frac{1}{3}$ . |
| 2. $2\frac{1}{2} \div 5$ . | 7. $4\frac{3}{8} \div 5$ .  | 12. $11 \div 3\frac{2}{3}$ .           | 17. $6\frac{1}{4} \div 1\frac{1}{4}$ . |
| 3. $3\frac{3}{4} \div 3$ . | 8. $4\frac{3}{8} \div 7$ .  | 13. $\frac{9}{2} \div \frac{9}{4}$ .   | 18. $4\frac{1}{2} \div 2\frac{1}{4}$ . |
| 4. $3\frac{3}{4} \div 5$ . | 9. $5 \div \frac{5}{2}$ .   | 14. $4\frac{1}{2} \div 1\frac{1}{8}$ . | 19. $7\frac{1}{5} \div 1\frac{1}{5}$ . |
| 5. $4\frac{1}{8} \div 3$ . | 10. $5 \div 2\frac{1}{2}$ . | 15. $4\frac{1}{2} \div 1\frac{1}{2}$ . | 20. $8\frac{1}{6} \div 1\frac{1}{6}$ . |

21. If I divide  $3\frac{1}{8}$  in. into 5 equal parts, what is the length of each part?
22. If the perimeter of an equilateral triangle is  $25\frac{1}{2}$  in., what is the length of each side?
23. A room is 11 ft. 3 in. or  $3\frac{3}{4}$  yd. wide. How many breadths of carpet, each 27 in. or  $\frac{3}{4}$  yd. wide, will it take to cover it?
24. Wall paper is  $\frac{1}{2}$  yd. wide. How many strips will it take to cover a space  $5\frac{1}{2}$  yd. wide? to cover a space  $15\frac{1}{2}$  yd. wide?

**31. Simple Accounts**

1. A man's receipts in one day are \$10, \$2.50, \$3.50, \$7, \$2. What is the total?
2. His expenses have been \$3, \$7, \$2.75, \$1.75, \$5.50. What is the total?
3. By how much do his receipts exceed his expenses?
4. If he began last week with cash on hand amounting to \$125, and his receipts were \$150 and his expenses \$110, what was his cash on hand at the end of the week?
5. If his average receipts for each of 3 days are \$25 and his average expenses are \$16, how much are his net receipts for the three days?
6. If he began last year with cash on hand amounting to \$500, and if his receipts were \$7450 and his total expenses were \$5200, how much had he at the end of the year?

**32. Review**

1. A fruit grower has 2000 trees that he sprays twice in a season, using 5 gal. to a tree each time. Allowing 20¢ per 100 gal. for the Paris green, what will this cost for all the trees?
2. In making 15 lb. of grafting wax the weight of the resin is 60% of the total weight. How many pounds of resin are used?
3. A farmer needs 500 lb. of nitrate of soda in making a fertilizer. How much will this cost at \$52 a ton?
4. In shipping peaches a fruit grower used a crate  $8'' \times 12\frac{1}{2}'' \times 22''$ . How many cubic inches in each crate? How many cubic inches in 10 crates?
5. A Florida fruit grower had 11 acres of pineapples. He sold the pineapples and averaged \$450 to an acre. How much did he receive?

**33. Separating Numbers**

*Separate into two parts having the given ratio :*

- |               |                |                   |
|---------------|----------------|-------------------|
| 1. 27, 1 : 2. | 7. 27, 4 : 5.  | 13. \$180, 1 : 2. |
| 2. 36, 1 : 2. | 8. 36, 4 : 5.  | 14. \$200, 2 : 3. |
| 3. 51, 1 : 2. | 9. 81, 4 : 5.  | 15. \$140, 3 : 4. |
| 4. 25, 2 : 3. | 10. 26, 5 : 8. | 16. \$270, 4 : 5. |
| 5. 35, 2 : 3. | 11. 28, 5 : 9. | 17. \$330, 4 : 7. |
| 6. 75, 2 : 3. | 12. 30, 3 : 7. | 18. \$240, 5 : 7. |

19. If we divide 44¢ between two boys in the ratio of 5 to 6, how much does each receive?

20. If we divide 1000 ft. of kite string in the ratio of 2 to 3, how long is each part?

21. If we divide 57 acres in the ratio of 9 : 10, how many acres are there in each part?

**34. Partners**

*Divide between two partners in the ratio specified :*

- |                             |                             |
|-----------------------------|-----------------------------|
| 1. \$3500, ratio of 2 to 3. | 5. \$3300, ratio of 4 to 7. |
| 2. \$6300, ratio of 4 to 5. | 6. \$7000, ratio of 3 to 7. |
| 3. \$2200, ratio of 5 to 6. | 7. \$3500, ratio of 2 to 5. |
| 4. \$3600, ratio of 5 to 7. | 8. \$2600, ratio of 5 to 8. |

9. Divide the sum of \$900 and \$400 in the ratio of 5 to 8.

10. If the ratio of gravel to clay in a load (cubic yard) of earth is 4 : 5, how many cubic feet are there of each?

11. If two farmers together pay \$70 irrigation taxes, and one has 150 acres and the other 200 acres, what is the share that each should pay?

12. If the income from a partnership was \$2250 last month, and the expenses were \$1000, and the balance was divided equally between two partners, what was the share of each?

## II. EXCHANGE

## 35. Bank Drafts

*Find the cost of drafts for the following amounts at the given premium or discount :*

- |                                      |                                     |
|--------------------------------------|-------------------------------------|
| 1. \$100, 0.1% premium.              | 6. \$2500, $\frac{1}{8}$ % premium. |
| 2. \$200, 0.1% premium.              | 7. \$300, 0.1% discount.            |
| 3. \$400, 0.1% premium.              | 8. \$500, 0.1% discount.            |
| 4. \$750, 0.1% premium.              | 9. \$1000, 0.1% discount.           |
| 5. \$5000, $\frac{1}{8}$ % premium.  | 10. \$5000, 0.1% discount.          |
| 11. \$2500, 40¢ premium per \$1000.  |                                     |
| 12. \$4000, 75¢ premium per \$1000.  |                                     |
| 13. \$5000, 50¢ discount per \$1000. |                                     |
14. A draft for \$3000 cost a man \$3001.50. How much premium did he pay per \$1000 ?

## 36. Commercial Drafts

*Drafts for the following amounts are drawn by wholesale merchants upon their customers. The banks charge the given per cents for collection. Find the net proceeds :*

- |                             |                             |                               |
|-----------------------------|-----------------------------|-------------------------------|
| 1. \$100, 0.1%.             | 6. \$1000, 0.1%.            | 11. \$250, 0.3%.              |
| 2. \$200, 0.1%.             | 7. \$200, 0.2%.             | 12. \$1000, 0.3%.             |
| 3. \$500, 0.1%.             | 8. \$300, 0.2%.             | 13. \$4000, $\frac{1}{8}$ %.  |
| 4. \$600, 0.1%.             | 9. \$2000, 0.2%.            | 14. \$6000, $\frac{1}{10}$ %. |
| 5. \$800, 0.1%.             | 10. \$100, 0.3%.            | 15. \$8000, $\frac{1}{10}$ %. |
| 16. \$750, 40¢ per \$1000.  | 19. \$1500, 80¢ per \$1000. |                               |
| 17. \$800, 50¢ per \$1000.  | 20. \$2500, 80¢ per \$1000. |                               |
| 18. \$7500, 80¢ per \$1000. | 21. \$3000, 75¢ per \$1000. |                               |
22. W. H. Jackson owes \$500, less 20%, for some goods bought of The Roberts Manufacturing Co. The company draws on him for the amount due. What is the net amount received, less 0.1% for collecting ?



## 37. English Money

*Express as pence :*

- |        |         |         |        |              |
|--------|---------|---------|--------|--------------|
| 1. 1s. | 3. 6s.  | 5. 20s. | 7. £1. | 9. 2s. 6d.   |
| 2. 4s. | 4. 10s. | 6. 40s. | 8. £2. | 10. 10s. 8d. |

*Express as shillings :*

- |          |          |           |         |             |
|----------|----------|-----------|---------|-------------|
| 11. 24d. | 12. 60d. | 13. 240d. | 14. £3. | 15. £4 10s. |
|----------|----------|-----------|---------|-------------|

*Express as pounds, or as pounds and shillings :*

- |          |          |           |          |          |
|----------|----------|-----------|----------|----------|
| 16. 40s. | 17. 80s. | 18. 480d. | 19. 30s. | 20. 50s. |
|----------|----------|-----------|----------|----------|

*Perform the operations indicated :*

- |                        |  |
|------------------------|--|
| 21. £10 12s. + £5 8s.  | 25. $2 \times \text{£}2\ 10\text{s.}$            |
| 22. £8 15s. + £9 15s.  | 26. $4 \times \text{£}2\ 5\text{s. } 3\text{d.}$ |
| 23. £15 10s. - £4 15s. | 27. $\text{£}5\ 4\text{s.} \div 4.$              |
| 24. £24 4s. - £3 6s.   | 28. $\text{£}5 \div \text{£}2\ 10\text{s.}$      |

## 38. English Money

*Taking 1d. as 2¢, express in United States money :*

- |        |        |         |         |          |
|--------|--------|---------|---------|----------|
| 1. 7d. | 2. 9d. | 3. 17d. | 4. 37d. | 5. 240d. |
|--------|--------|---------|---------|----------|

*Taking 2¢ as 1d., express in English money :*

- |         |         |         |         |          |
|---------|---------|---------|---------|----------|
| 6. 50¢. | 7. 70¢. | 8. \$1. | 9. 10¢. | 10. 25¢. |
|---------|---------|---------|---------|----------|

*Taking 1s. as 24¢, express in United States money :*

- |         |         |         |          |          |
|---------|---------|---------|----------|----------|
| 11. 2s. | 12. 6s. | 13. 5s. | 14. 10s. | 15. 15s. |
|---------|---------|---------|----------|----------|

*Taking 24¢ as 1s., express in English money :*

- |          |             |          |          |             |
|----------|-------------|----------|----------|-------------|
| 16. 72¢. | 17. \$1.20. | 18. 36¢. | 19. \$1. | 20. \$1.50. |
|----------|-------------|----------|----------|-------------|

*Taking £1 as \$4.87, express in United States money :*

- |          |           |         |            |          |
|----------|-----------|---------|------------|----------|
| 21. £10. | 22. £100. | 23. £2. | 24. £1000. | 25. 10s. |
|----------|-----------|---------|------------|----------|

*Taking \$5 as £1, express in English money :*

- |           |           |            |            |            |
|-----------|-----------|------------|------------|------------|
| 26. \$25. | 27. \$75. | 28. \$125. | 29. \$350. | 30. \$575. |
|-----------|-----------|------------|------------|------------|



## 39. French Money

*Express as centimes :*

1. 2 fr.    2. 7 fr.    3. 65 fr.    4. 250 fr.    5. 5 fr. 10 c.

*Express as francs :*

6. 200 c.    7. 500 c.    8. 700 c.    9. 900 c.    10. 2000 c.

*Express as francs and centimes :*

11. 250 c.    12. 725 c.    13. 645 c.    14. 875 c.    15. 2550 c.

*Perform the operations indicated :*

- |                                 |                                |
|---------------------------------|--------------------------------|
| 16. 7 fr. 60 c. + 6 fr. 40 c.   | 21. 25 fr. 50 c. - 4 fr. 75 c. |
| 17. 8 fr. 90 c. + 7 fr. 60 c.   | 22. $2 \times 25$ fr. 50 c.    |
| 18. 8.50 fr. + 1.50 fr. + 5 fr. | 23. $5 \times 20$ fr. 40 c.    |
| 19. 7.60 fr. + 40 c. + 12 fr.   | 24. $35$ fr. 75 c. $\div 5$ .  |
| 20. 15 fr. 50 c. - 5 fr. 50 c.  | 25. $31$ fr. 20 c. $\div 3$ .  |

## 40. French Money

*Taking the common equivalent, 1 fr. = 20¢, or  $\frac{1}{5}$  \$, express in United States money :*

- |           |           |            |           |             |
|-----------|-----------|------------|-----------|-------------|
| 1. 7 fr.  | 3. 15 fr. | 5. 250 fr. | 7. 72 fr. | 9. 130 fr.  |
| 2. 35 fr. | 4. 75 fr. | 6. 18 fr.  | 8. 36 fr. | 10. 650 fr. |

*Taking the more exact equivalent, 1 fr. = 19.3¢, express in United States money :*

11. 10 fr.    12. 5 fr.    13. 20 fr.    14. 100 fr.    15. 1000 fr.

*Taking \$1 = 5 fr., express in French money :*

- |           |             |             |             |             |
|-----------|-------------|-------------|-------------|-------------|
| 16. \$4.  | 18. \$2.50. | 20. \$50.   | 22. \$3.50. | 24. \$2.25. |
| 17. \$13. | 19. \$7.50. | 21. \$2.80. | 23. \$1.25. | 25. \$3.75. |

*Taking the more exact equivalent, \$1 = 5.18 fr., express in French money :*

26. \$10.    27. \$100.    28. \$2.    29. \$20.    30. \$1000.

## 41. German Money

*Express as pfennigs :*

1. 1 M. 2. 7 M. 3.
- $2\frac{1}{2}$
- M. 4. 3 M. 60 pf. 5. 150 pf.

*Express as marks :*

6. 200 pf. 7. 400 pf. 8. 900 pf. 9. 1200 pf. 10. 7500 pf.

*Express as marks and pfennigs :*

11. 125 pf. 12. 230 pf. 13. 350 pf. 14. 640 pf. 15. 1275 pf.

*Perform the operations indicated :*

- |                                 |                                   |
|---------------------------------|-----------------------------------|
| 16. 7 M. 80 pf. + 2 M. 20 pf.   | 21. $3 \times 41$ M. 25 pf.       |
| 17. 25 M. 50 pf. + 30 M. 75 pf. | 22. $5 \times 40$ M. 40 pf.       |
| 18. 32 M. 75 pf. - 1 M. 60 pf.  | 23. $\frac{1}{2}$ of 40 M. 75 pf. |
| 19. 75 M. 20 pf. - 4 M. 70 pf.  | 24. $\frac{2}{3}$ of 80 M. 40 pf. |
| 20. 18 M. 10 pf. - 9 M. 80 pf.  | 25. 44 M. 22 pf. $\div 6$ .       |

## 42. German Money

*Taking the common equivalent, 1 M. = 24¢, express in United States money :*

1. 2 M. 3. 5 M. 5. 5 M. 50 pf. 7. 11 M. 9. 25 M.
- 
2. 3 M. 4.
- $5\frac{1}{2}$
- M. 6. 10 M. 8. 20 M. 10. 10 M. 50 pf.

*Taking the more exact equivalent, 1 M. = 23.8¢, express in United States money :*

11. 10 M. 12. 20 M. 13. 2 M. 14. 100 M. 15. 1000 M.

*Taking \$1 as equal to 4 M. 20 pf., express in U. S. money :*

16. 8 M. 40 pf. 17. 21 M. 18. 42 M. 19. 420 M. 20. 840 M.

*Taking the rough approximation, \$1 = 4 M., express in United States money :*

21. 100 M. 23. 60 M. 25. 200 M. 27. 360 M. 29. 1000 M.
- 
22. 240 M. 24. 80 M. 26. 480 M. 28. 840 M. 30. 4000 M.

**43. Foreign Exchange**

*Exchange being \$4.84 to the pound, find the cost of drafts for the following amounts:*

1. £2.    2. £5.    3. £10.    4. £100.    5. £1 10s.

*Also for the following, exchange being \$4.80 to £1:*

6. £5.    7. £25.    8. £100.    9. £1000.    10. £1 10s.

*At \$4.78 to £1, find the face of a draft costing:*

11. \$47.80.    12. \$478.    13. \$4780.    14. \$2.39.    15. \$23.90.

16. If an importer buys goods in London to the value of £1000, how much will a draft for this amount cost, exchange being quoted at 4.83½?

17. An importer paid \$482.25 for a draft on London, exchange being quoted at 4.82¼. What was the face?

**44. Foreign Exchange**

*Exchange being 94½¢ to 4 M., find the cost of drafts for:*

1. 40 M.    3. 400 M.    5. 4000 M.    7. 20 M.  
2. 80 M.    4. 800 M.    6. 8000 M.    8. 200 M.

*Exchange being 24¢ to 1 M., find the cost of drafts for:*

9. 10 M.    11. 200 M.    13. 300 M.    15. 500 M.  
10. 100 M.    12. 2000 M.    14. 3000 M.    16. 5000 M.

*Exchange being 5.14 fr. to \$1, find the cost of drafts for:*

17. 51 fr. 40 c.    19. 5140 fr.    21. 257 fr.    23. 15.42 fr.  
18. 514 fr.    20. 51,400 fr.    22. 2570 fr.    24. 1542 fr.

*Exchange being 19.7¢ to 1 fr., find the cost of drafts for:*

25. 100 fr.    27. 1000 fr.    29. 10,000 fr.    31. 10 fr.  
26. 200 fr.    28. 2000 fr.    30. 20,000 fr.    32. 30 fr.

## III. METRIC SYSTEM

## 45. Length

*Express as millimeters :*

1. 2 cm.    2. 50 cm.    3. 4.25 m.    4. 3.8 cm.    5. 1 km.

*Express as centimeters :*

6. 4 m.    7. 20 m.    8. 20 mm.    9. 100 m.    10.
- $3\frac{1}{4}$
- m.

*Express as decimeters :*

11. 2 m.    12. 50 cm.    13. 60 m.    14. 1 km.    15. 500 mm.

*Express as meters :*

16. 2 km.    17. 3.5 km.    18. 70 dm.    19. 600 cm.    20. 7000 mm.

*Express as kilometers :*

21. 5000 m.    22. 2500 m.    23. 2575 m.    24. 600,000 cm.

## 46. Length

*Taking 1 cm. = 0.4 in., express as inches :*

1. 10 cm.    2. 2 cm.    3. 20 cm.    4. 2.5 cm.    5. 5 cm.

*Taking 1 dm. = 3.9 in., express as inches :*

6. 2 dm.    7. 10 dm.    8. 5 dm.    9. 3 dm.    10. 4 dm.

*Taking 1 m. = 39.37 in., express as inches :*

11. 10 m.    12. 0.1 m.    13. 100 m.    14. 0.01 m.    15. 1 km.

*Taking 1 m. =  $3\frac{1}{4}$  ft., express as feet :*

16. 10 m.    18. 400 m.    20. 72 m.    22. 15 m.    24. 25 m.

17. 4 m.    19. 8 m.    21. 20 m.    23. 60 m.    25. 1 km.

*Taking 1 km. = 0.6 mi., express as miles :*

26. 10 km.    27. 2 km.    28. 20 km.    29.
- $5\frac{1}{2}$
- km.    30. 15 km.

## 47. Square Measure

*Express as square meters:*

1. 1 sq. km.    2. 3 sq. km.    3.  $5\frac{1}{2}$  sq. km.    4. 200 sq. dm.

*Express as hektares (square hektometers):*

5. 20,000 sq. m.    6. 2 sq. km.    7. 5 sq. km.    8. 10 sq. km.

*Express as square meters:*

9. 6 square dekameters.    10. 3 square hektometers.

*Taking 1 ha. =  $2\frac{1}{2}$  A., express as hektares:*

11.  $7\frac{1}{2}$  A.    12. 10 A.    13.  $12\frac{1}{2}$  A.    14. 15 A.    15. 250 A.

*Express as acres:*

16. 2 ha.    17. 10 ha.    18. 5 ha.    19. 8 ha.    20. 80 ha.

## 48. Review

1. A certain tower is 100 m. high. How many feet?
2. A certain distance is 200 km. How many miles?
3. A certain mountain is 4000 m. high. How many feet?
4. If a train is traveling 2 km. a minute, what is its rate in miles?
5. If a train is traveling 0.9 mi. a minute, what is its rate in kilometers?
6. Taking the distance across the Atlantic as about 3000 mi., how many kilometers is this?
7. Taking the distance around the world at a certain latitude as 40,000 km., how many miles is this?

*Taking 1 ha. = 2.47 A., express as acres:*

8. 10 ha.    10. 2 ha.    12. 200 ha.    14. 10,000 ha.  
 9. 100 ha.    11. 20 ha.    13. 2000 ha.    15. 20,000 ha.

## 49. Cubic Measure

*Express as cubic meters :*

- |                 |                   |            |
|-----------------|-------------------|------------|
| 1. 2.5 st.      | 3. 4000 cu. dm.   | 5. 35 st.  |
| 2. 2000 cu. dm. | 4. 10,000 cu. dm. | 6. 625 st. |

*Express as cubic decimeters :*

- |             |                 |                        |
|-------------|-----------------|------------------------|
| 7. 8 cu. m. | 9. 7000 cu. cm. | 11. $6\frac{1}{2}$ st. |
| 8. 15 st.   | 10. 27 cu. m.   | 12. 50,000 cu. cm.     |

*Express as cubic centimeters :*

- |               |                |                    |
|---------------|----------------|--------------------|
| 13. 1 cu. m.  | 15. 1 cu. dm.  | 17. 2000 cu. mm.   |
| 14. 50 cu. m. | 16. 15 cu. dm. | 18. 10,000 cu. mm. |

*Express as cubic kilometers :*

- |                             |                          |
|-----------------------------|--------------------------|
| 19. 3000 cubic hektometers. | 20. 4,000,000,000 cu. m. |
|-----------------------------|--------------------------|

## 50. Review

1. A pile of wood is 1 m.  $\times$  2 m.  $\times$  8 m. How many steres does it contain?
2. A tank is 5 m.  $\times$  2 m.  $\times$  3 m. How many cubic meters does it contain?
3. A box is 2 m. long, 1.5 m. wide, and 50 cm. deep. How many cubic meters does it contain?
4. A room is 6 m. long, 5 m. wide, and 3 m. high. How many steres of wood would it take to fill it?
5. An aquarium is 50 cm. long, 25 cm. wide, and 20 cm. deep. How many cubic centimeters does it contain?
6. A chest is 1.5 m. long, 0.5 m. wide, and 0.2 m. deep. What part of a cubic meter does it contain?
7. A block of stone is 2 m. long, 0.25 m. thick, and 0.5 m. wide. What part of a cubic meter does it contain? How many cubic decimeters?

## 51. Weight

*Express as grams:*

- |            |             |             |              |
|------------|-------------|-------------|--------------|
| 1. 2 kg.   | 4. 25 kg.   | 7. 0.3 kg.  | 10. 275 cg.  |
| 2. 7 kg.   | 5. 635 kg.  | 8. 0.45 kg. | 11. 680 cg.  |
| 3. 1.5 kg. | 6. 47.5 kg. | 9. 150 cg.  | 12. 7250 mg. |

*Express as centigrams:*

- |            |           |            |              |
|------------|-----------|------------|--------------|
| 13. 250 g. | 14. 7 kg. | 15. 15 kg. | 16. 7500 mg. |
|------------|-----------|------------|--------------|

*Express as milligrams:*

- |           |                       |            |            |
|-----------|-----------------------|------------|------------|
| 17. 50 g. | 18. $2\frac{1}{2}$ g. | 19. 5.4 g. | 20. 65 cg. |
|-----------|-----------------------|------------|------------|

*Express as kilos (kilograms):*

- |             |             |               |           |
|-------------|-------------|---------------|-----------|
| 21. 2000 g. | 23. 5250 g. | 25. 27,500 g. | 27. 25 t. |
| 22. 6000 g. | 24. 7750 g. | 26. 30,000 g. | 28. 50 t. |

## 52. Weight

1. If a traveler's trunks weigh 220 lb., how many kilos do they weigh, allowing 2.2 lb. to the kilo?

2. If two travelers together are allowed 50 kg. of free baggage, how many pounds are they allowed?

3. If 1 cu. m. of water weighs 1 t., what will be the weight of the water that fills a tank 3 m.  $\times$  3 m.  $\times$  1.5 m.?

4. If granite is 2.7 times as heavy as water, what will 0.5 cu. m. of granite weigh?

5. If you weigh 110 lb., how many kilograms do you weigh?

6. If two boys together weigh 100 kg., how many pounds do they weigh?

7. A 5-cent piece weighs 5 g. How many will it take to weigh half a kilo? How much will \$5 in nickels weigh? How much will \$20 in nickels weigh?



## 53. Capacity

*Express as liters :*

1. 4 hl.      2.  $8\frac{1}{2}$  hl.      3. 75 hl.      4. 6.25 hl.

*Express as hektoliters :*

5. 750 l.      6. 275 l.      7. 625 l.      8. 3500 l.

*Taking 1 l. = 1 qt., express as quarts :*

9. 7 hl.      10. 65 hl.      11. 9.5 l.      12. 725 hl.

*Express as liters (cubic decimeters) :*

13. 9 cu. dm.    14. 0.3 cu. dm.    15. 1 cu. m.    16. 0.5 cu. m.

17. Knowing that 1 l. of water weighs 1 kg., what is the weight of 35 l. of water? of 72.25 l.? of 67.5 hl.? of 10 cu. m.?

## 54. Review

1. Taking alcohol as 0.83 times as heavy as water, how many kilos does 10 l. of alcohol weigh?

2. Taking gold as 19.3 times as heavy as water, and 1 cu. cm. of water weighing 1 g., how much does 10 cu. cm. of gold weigh?

3. Taking silver as 10.5 times as heavy as water, how much does 2 cu. cm. of silver weigh?

4. A tank is 4 m. long, 3 m. wide, and 3 m. deep. How many metric tons of water will it take to fill it? How many kilos?

5. Taking a quart as nearly the same as a liter, how many kilos will 1 gal. of water weigh? 10 gal. of water? How many pounds will 10 gal. of water weigh?

6. How much will the water weigh that fills an aquarium 0.5 m. by 0.4 m. by 0.2 m.?

## IV. TAXES

## 55. Duties on Imports

*Find the duty on each of the following invoices of goods at the rate specified:*

- |                |                |                  |
|----------------|----------------|------------------|
| 1. \$200, 25%. | 5. \$225, 50%. | 9. \$480, 25%.   |
| 2. \$250, 20%. | 6. \$300, 35%. | 10. \$630, 40%.  |
| 3. \$300, 15%. | 7. \$700, 60%. | 11. \$660, 15%.  |
| 4. \$600, 40%. | 8. \$840, 25%. | 12. \$1200, 45%. |
13. 700 bu. barley, duty 30¢ a bushel.
  14. 1200 gal. olive oil, duty 50¢ a gallon.
  15. 1600 lb. snuff, duty 55¢ a pound.
  16. 2500 lb. tobacco, duty \$2 a pound.
  17. 6400 T. iron ore, duty 15¢ a ton.
  18. 3200 bu. potatoes, duty 25¢ a bushel.

## 56. Duties on Imports

1. Allowing \$4.80 to the pound sterling, how much more does a man have to pay for English books that cost £100 in London, on which the duty is 25%, than he would if there were no duty?

2. How much more does a man have to pay for a painting that cost \$300 in Paris, the duty being 15%, than he would if there were no duty?

*Find the duty on each of the following invoices of goods at the rate specified:*

3. \$4000 worth of automobiles, 45%.
4. \$800 worth of English books, 25%.
5. \$200 worth of perfumery, 50%.
6. \$2000 worth of musical instruments, 45%.
7. \$600 worth of paintings, 15%.
8. \$160 worth of earthenware, 25%.

## 57. Local Taxes

*Find the tax on each of the following :*

- |                                     |                                       |
|-------------------------------------|---------------------------------------|
| 1. \$1000 at 6 mills.               | 11. \$1000 at $4\frac{1}{4}$ mills.   |
| 2. \$1000 at 4 mills.               | 12. \$4000 at $4\frac{1}{4}$ mills.   |
| 3. \$3000 at 6 mills.               | 13. \$8000 at $4\frac{1}{2}$ mills.   |
| 4. \$2000 at 5 mills.               | 14. \$4000 at $4\frac{1}{2}$ mills.   |
| 5. \$2500 at 4 mills.               | 15. \$4000 at $6\frac{1}{2}$ mills.   |
| 6. \$7500 at 4 mills.               | 16. \$8000 at $6\frac{1}{4}$ mills.   |
| 7. \$3400 at 5 mills.               | 17. \$4000 at $6\frac{3}{4}$ mills.   |
| 8. \$4800 at 5 mills.               | 18. \$8000 at $6\frac{1}{8}$ mills.   |
| 9. \$1000 at $5\frac{1}{2}$ mills.  | 19. \$10,000 at $5\frac{1}{4}$ mills. |
| 10. \$2000 at $5\frac{1}{2}$ mills. | 20. \$20,000 at $5\frac{3}{4}$ mills. |
21. What is the tax on \$5000 at 8.2 mills?
22. What is the tax on \$4000 worth of real estate and \$5000 worth of personal property, the tax rate being 7 mills?

## 58. Local Taxes

*Given the following assessed valuations and tax levies, find the tax per dollar :*

- |                           |                             |
|---------------------------|-----------------------------|
| 1. \$1,000,000, \$5000.   | 9. \$4,000,000, \$26,000.   |
| 2. \$2,000,000, \$10,000. | 10. \$6,000,000, \$33,000.  |
| 3. \$4,000,000, \$16,000. | 11. \$8,000,000, \$42,000.  |
| 4. \$5,000,000, \$20,000. | 12. \$7,000,000, \$28,000.  |
| 5. \$3,000,000, \$18,000. | 13. \$2,500,000, \$10,000.  |
| 6. \$7,000,000, \$35,000. | 14. \$2,300,000, \$11,500.  |
| 7. \$2,000,000, \$11,000. | 15. \$3,400,000, \$17,000.  |
| 8. \$4,000,000, \$18,000. | 16. \$12,000,000, \$60,000. |
17. A city has to raise \$100,000 by tax. If the assessed valuation is \$10,000,000, what is the rate?
18. A town has to raise by tax \$1800 for one purpose and \$8200 for another. The assessed valuation being \$1,000,000, what is the rate?

## V. INSURANCE

## 59. Fire Insurance

*Find the premiums on the following policies at the rates specified :*

- |                               |                               |                               |
|-------------------------------|-------------------------------|-------------------------------|
| 1. \$1000, 1%.                | 4. \$2000, $1\frac{1}{2}\%$ . | 7. \$2500, $1\frac{1}{2}\%$ . |
| 2. \$1000, $1\frac{1}{4}\%$ . | 5. \$2000, $1\frac{1}{4}\%$ . | 8. \$3000, $1\frac{1}{4}\%$ . |
| 3. \$1000, $\frac{3}{4}\%$ .  | 6. \$2000, $1\frac{3}{4}\%$ . | 9. \$4000, $1\frac{3}{4}\%$ . |
10. At \$1.15 per thousand, what is the premium on a \$3000 policy ?
11. At \$1.65 per thousand, what is the premium on a \$2000 policy ?
12. A building worth \$9000 is insured for  $\frac{2}{3}$  of its value at 2%. What is the premium? What would be the premium if it were insured for  $\frac{1}{2}$  of its value ?

## 60. Fire Insurance

*Find the premiums on the following policies at the rates specified :*

- |                |                               |                               |
|----------------|-------------------------------|-------------------------------|
| 1. \$2250, 2%. | 4. \$2000, $2\frac{1}{4}\%$ . | 7. \$4000, $2\frac{3}{4}\%$ . |
| 2. \$3750, 2%. | 5. \$3200, $2\frac{1}{4}\%$ . | 8. \$8000, $2\frac{1}{2}\%$ . |
| 3. \$7500, 2%. | 6. \$4800, $2\frac{1}{4}\%$ . | 9. \$2500, $2\frac{1}{5}\%$ . |
10. A 3-year policy for \$4000 costs \$90. What is the rate of premium per year ?
11. A 3-year policy for \$5000 costs \$150. What is the rate per thousand per year ?
12. A man insured his stock of goods, valued at \$16,000, for  $\frac{7}{8}$  of its value, at \$2 per thousand. What was the premium ?
13. A store worth \$4000, containing \$12,000 worth of goods, is insured for  $\frac{3}{4}$  of the value of the store and goods at  $1\frac{1}{2}\%$ . What is the premium ?

**61. Life Insurance**

*Find the premiums on the following policies, the premiums on \$1000 being given :*

- |                  |                  |                      |
|------------------|------------------|----------------------|
| 1. \$3000, \$27. | 5. \$2500, \$25. | 9. \$2500, \$28.     |
| 2. \$4000, \$26. | 6. \$3500, \$24. | 10. \$8000, \$28.    |
| 3. \$5000, \$23. | 7. \$8000, \$25. | 11. \$2000, \$25.50. |
| 4. \$2500, \$24. | 8. \$7000, \$25. | 12. \$4000, \$25.25. |

13. What premium must a man pay on an endowment policy for \$5000 at \$104.20 per thousand ?

14. A man takes out a \$5000 20-payment policy at \$28 per-thousand. What does he pay each year ? in 20 years ?

15. A man takes out a \$15,000 20-payment policy at \$30 per thousand. What does he pay each year ? What does he pay in 20 years ?

**62. Life Insurance**

*Find the premiums on the following policies, the premiums on \$1000 being given :*

- |                  |                    |                        |
|------------------|--------------------|------------------------|
| 1. \$4000, \$27. | 5. \$8000, \$26.   | 9. \$5000, \$26.40.    |
| 2. \$3000, \$28. | 6. \$6000, \$25.   | 10. \$4000, \$25.20.   |
| 3. \$6000, \$29. | 7. \$15,000, \$28. | 11. \$2500, \$28.80.   |
| 4. \$7500, \$30. | 8. \$16,000, \$25. | 12. \$25,000, \$32.40. |

13. A man takes out a \$2000 policy in one company at \$28 a thousand, and a \$3000 policy in another at \$25 a thousand. What are his annual premiums ?

14. A man takes out a policy for \$8000, on which he pays an annual premium of \$240. What is the premium per thousand ?

15. A man takes out a policy on which he pays an annual premium of \$84, the premium per thousand being \$28. What is the face of the policy ?

## VI. CORPORATIONS

## 63. Shares

*At \$100 a share, find the number of shares in companies with the following capitals:*

1. \$50,000. 2. \$75,000. 3. \$125,000. 4. \$5,000,000.

*Also with the following capitals at \$50 a share:*

5. \$25,000. 6. \$30,000. 7. \$75,000. 8. \$2,000,000.

*Also with the following capitals at \$25 a share:*

9. \$50,000. 10. \$60,000. 11. \$35,000. 12. \$1,000,000.

13. If a man owns 300 shares of stock worth \$112 a share, what is the value of his stock?

## 64. Dividends

*Allowing \$100 to a share in this exercise, find the dividends due to holders of the following number of shares at the rates specified:*

1. 10, 4%. 4. 30, 6%. 7. 75, 5%. 10. 200, 8%.  
 2. 20, 5%. 5. 40, 5½%. 8. 80, 7%. 11. 250, 8%.  
 3. 25, 8%. 6. 60, 4½%. 9. 100, 7½%. 12. 600, 5%.

13. A company with \$200,000 capital divides \$10,000 in dividends. What is the rate of dividend?

14. A company with \$75,000 capital declares a 4% dividend. How much does it divide in dividends?

15. A company with \$50,000,000 capital declares a 6% dividend. How much does it divide in dividends?

16. A company divides \$40,000 in dividends, and stockholders receive 8% on their stock. What is the capital of the company?



## 65. Buying Stocks

Following the business custom, add  $\frac{1}{8}$  to the following newspaper quotations, as brokerage, in buying stocks. Thus 10 shares, of \$100 each, quoted at  $91\frac{7}{8}$  cost  $10 \times \$92$ , or \$920.

*Find the cost of 10 shares of stock quoted as follows :*

- |                      |                       |                      |                      |                       |
|----------------------|-----------------------|----------------------|----------------------|-----------------------|
| 1. $75\frac{7}{8}$ . | 3. $99\frac{7}{8}$ .  | 5. $72\frac{1}{8}$ . | 7. $78\frac{5}{8}$ . | 9. $127\frac{3}{8}$ . |
| 2. $92\frac{7}{8}$ . | 4. $112\frac{7}{8}$ . | 6. $83\frac{3}{8}$ . | 8. $83\frac{5}{8}$ . | 10. $92\frac{3}{8}$ . |

*Find the cost of 100 shares quoted as follows :*

- |                       |                       |                        |                       |                       |
|-----------------------|-----------------------|------------------------|-----------------------|-----------------------|
| 11. $73\frac{1}{4}$ . | 13. $87\frac{1}{4}$ . | 15. $143\frac{1}{4}$ . | 17. $85\frac{1}{2}$ . | 19. $34\frac{3}{4}$ . |
| 12. $82\frac{1}{4}$ . | 14. $96\frac{1}{4}$ . | 16. $126\frac{3}{4}$ . | 18. $78\frac{1}{2}$ . | 20. $52\frac{3}{4}$ . |

*Adding brokerage as above, find the cost of :*

- |                                    |                                     |
|------------------------------------|-------------------------------------|
| 21. 25 shares at $79\frac{7}{8}$ . | 22. 50 shares at $123\frac{7}{8}$ . |
|------------------------------------|-------------------------------------|

## 66. Selling Stocks

Following the business custom, subtract  $\frac{1}{8}$  from the following quotations, as brokerage, in selling stocks. Thus 10 shares, of \$100 each, quoted at  $91\frac{7}{8}$  will bring  $10 \times \$91\frac{3}{4}$ , or \$917.50.

*Find the amount received from the sale of 10 shares of stock quoted as follows :*

- |                      |                       |                      |                      |                       |
|----------------------|-----------------------|----------------------|----------------------|-----------------------|
| 1. $92\frac{1}{8}$ . | 3. $85\frac{3}{8}$ .  | 5. $83\frac{5}{8}$ . | 7. $73\frac{5}{8}$ . | 9. $150\frac{7}{8}$ . |
| 2. $96\frac{1}{8}$ . | 4. $127\frac{3}{8}$ . | 6. $67\frac{5}{8}$ . | 8. $42\frac{5}{8}$ . | 10. $37\frac{7}{8}$ . |

*Also from 100 shares quoted as follows :*

- |                       |                        |                       |                       |                        |
|-----------------------|------------------------|-----------------------|-----------------------|------------------------|
| 11. $87\frac{1}{4}$ . | 13. $82\frac{1}{4}$ .  | 15. $73\frac{1}{2}$ . | 17. $85\frac{3}{4}$ . | 19. $130\frac{3}{4}$ . |
| 12. $75\frac{1}{4}$ . | 14. $125\frac{1}{2}$ . | 16. $96\frac{1}{2}$ . | 18. $98\frac{3}{4}$ . | 20. $88\frac{3}{4}$ .  |

21. What will a man receive from selling 1000 shares of stock when it is quoted at  $94\frac{7}{8}$  ?

22. What will a man gain by buying 100 shares of stock quoted at  $92\frac{7}{8}$ , and selling when quoted at  $101\frac{1}{8}$  ?



## 67. Bonds

*Find the income on bonds of the following amounts, at the rates specified:*

- |                |                              |                                 |
|----------------|------------------------------|---------------------------------|
| 1. \$7000, 5%. | 5. \$4000, $4\frac{1}{2}$ %. | 9. \$15,000, 5%.                |
| 2. \$7500, 5%. | 6. \$6000, $4\frac{1}{2}$ %. | 10. \$25,000, 4%.               |
| 3. \$8000, 4%. | 7. \$9000, 3%.               | 11. \$80,000, $4\frac{1}{2}$ %. |
| 4. \$8500, 4%. | 8. \$8000, $3\frac{1}{2}$ %. | 12. \$40,000, $5\frac{1}{2}$ %. |

To find the cost of bonds, add  $\frac{1}{8}$  to the quotation, as with stocks, to pay the broker for buying. Thus, \$2000 in bonds quoted at  $103\frac{5}{8}$  cost  $20 \times \$103.75$ , or \$2075.

*Find the cost of bonds for the following amounts:*

- |                                |                                |                                  |
|--------------------------------|--------------------------------|----------------------------------|
| 13. \$2000, $103\frac{7}{8}$ . | 16. \$4000, $102\frac{1}{8}$ . | 19. \$6000, $100\frac{7}{8}$ .   |
| 14. \$3000, $101\frac{3}{8}$ . | 17. \$8000, 110.               | 20. \$10,000, $102\frac{3}{8}$ . |
| 15. \$7500, $99\frac{7}{8}$ .  | 18. \$5000, $109\frac{7}{8}$ . | 21. \$12,000, $109\frac{7}{8}$ . |

## 68. Stocks and Bonds

Take the par value of one share of stock as \$100.

1. What is the income on \$8000 of 5% stock?
2. What is the income on 50 shares of stock paying 4%?
3. What is the income on 100 shares of stock paying  $4\frac{1}{2}$ %?
4. If a man buys 100 shares of stock when quoted at  $96\frac{7}{8}$  and sells it when quoted at  $98\frac{1}{8}$ , how much does he gain?
5. If a man buys a \$1000 bond when quoted at  $102\frac{7}{8}$  and sells it when quoted at  $100\frac{1}{8}$ , how much does he lose?
6. If an investor receives \$6 on every \$120 invested, what is his rate of income? If a purchaser buys a 6% stock when quoted at  $119\frac{7}{8}$ , what is his rate of income?
7. If an investor buys a 7% stock when quoted at  $139\frac{7}{8}$ , what is his rate of income? ( $\frac{7}{140} =$  what per cent?)

## 69. Review

1. A man buys 300 shares of Pennsylvania R. R. stock when quoted at  $134\frac{7}{8}$ , and sells it when quoted at  $135\frac{1}{8}$ . Does he gain or lose? (Remember the  $\frac{1}{8}$  for brokerage.)

2. An investor buys 50 shares of Union Pacific stock when quoted at  $112\frac{3}{8}$ , and sells it when quoted at  $114\frac{5}{8}$ . How much does he gain on a share? on the 50 shares?

3. An investor buys 100 shares of Illinois Central stock when quoted at  $132\frac{7}{8}$ , and sells it when quoted at  $130\frac{1}{8}$ . How much does he lose on a share? on the 100 shares?

4. If a man receives \$5 on every \$125 invested, what per cent does he receive? If he buys a 5% stock when quoted at  $124\frac{7}{8}$ , what per cent does he receive?

5. If an investor buys an 8% stock when quoted at  $\$159\frac{7}{8}$ , what per cent does he receive? ( $\frac{8}{100}$  is what per cent?)

## 70. Review

1. How much does a grocer pay a bottle for olives that cost him \$14.40 a gross?

2. How much does a grocer pay a bottle for mustard that costs him \$1.80 a dozen?

3. If a grocer pays \$12 for 300 lb. of sugar, how much does it cost him a pound?

4. If a grocer buys soap at \$3 a box of 60 cakes, what must be the selling price per cake to allow him to make 20%? to make 40%?

5. If a grocer buys canned fruit at \$1.92 a dozen, what does he pay per can?

6. If a grocer buys 25 lb. of honey for \$3.75, what does he pay a pound?

7. At what price per pound must the grocer sell the honey mentioned in Ex. 6 in order to make  $33\frac{1}{3}\%$ ?

## VII. POWERS AND ROOTS

## 71. Powers

$2^2 = 2 \times 2 = 4$ ;  $2^3 = 2 \times 2 \times 2 = 8$ ;  $2^4 = 2^2 \times 2^2 = 4 \times 4 = 16$ ;  $2^5 = 2^2 \times 2^3 = 4 \times 8 = 32$ ;  $2^6 = 2^3 \times 2^3 = 8 \times 8 = 64$ ; and so on.

*Find the values of the following:*

- |            |              |               |              |              |
|------------|--------------|---------------|--------------|--------------|
| 1. $3^2$ . | 8. $10^2$ .  | 15. $100^2$ . | 22. $9^3$ .  | 29. $10^4$ . |
| 2. $4^2$ . | 9. $11^2$ .  | 16. $3^3$ .   | 23. $10^3$ . | 30. $20^4$ . |
| 3. $5^2$ . | 10. $12^2$ . | 17. $4^3$ .   | 24. $12^3$ . | 31. $2^5$ .  |
| 4. $6^2$ . | 11. $20^2$ . | 18. $5^3$ .   | 25. $20^3$ . | 32. $3^5$ .  |
| 5. $7^2$ . | 12. $30^2$ . | 19. $6^3$ .   | 26. $2^4$ .  | 33. $2^6$ .  |
| 6. $8^2$ . | 13. $40^2$ . | 20. $7^3$ .   | 27. $3^4$ .  | 34. $2^7$ .  |
| 7. $9^2$ . | 14. $70^2$ . | 21. $8^3$ .   | 28. $5^4$ .  | 35. $10^5$ . |
36. Which is greater,  $2^3$  or  $3^2$ ? How much greater?  
 37. Which is greater,  $2^4$  or  $4^2$ ? How much greater?

## 72. Squares and Cubes

The square of  $t + u$  is  $t^2 + 2 \times t \times u + u^2$ . So  $13^2 = 10^2 + 2 \times 10 \times 3 + 3^2 = 100 + 60 + 9 = 169$ .

*Square the following:*

- |        |        |         |         |          |
|--------|--------|---------|---------|----------|
| 1. 11. | 3. 14. | 5. 31.  | 7. 1.2. | 9. 102.  |
| 2. 12. | 4. 21. | 6. 1.1. | 8. 101. | 10. 103. |

*Find the areas of squares with sides as follows:*

- |           |             |             |             |             |
|-----------|-------------|-------------|-------------|-------------|
| 11. 7 ft. | 12. 0.5 in. | 13. 1.2 ft. | 14. 0.7 in. | 15. 2.5 yd. |
|-----------|-------------|-------------|-------------|-------------|

*Find the volumes of cubes with edges as follows:*

- |             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|
| 16. 3 in.   | 18. 12 in.  | 20. 10 in.  | 22. 0.3 in. | 24. 20 in.  |
| 17. 0.4 in. | 19. 1.2 in. | 21. 0.5 in. | 23. 0.9 in. | 25. 100 in. |
26. A field is 40 rd. square. How many acres does it contain?

## 73. Square Root

To find the square root of 4900 mentally, separate it into two equal groups of factors, thus:  $4900 = (10 \times 7) \times (10 \times 7) = 70^2$ .

*Find the square roots of the following :*

- |                    |         |                     |           |           |
|--------------------|---------|---------------------|-----------|-----------|
| 1. $\frac{1}{4}$ . | 4. 25.  | 7. 36.              | 10. 900.  | 13. 0.16. |
| 2. 16.             | 5. 400. | 8. $\frac{1}{16}$ . | 11. 0.04. | 14. 2500. |
| 3. $\frac{1}{9}$ . | 6. 4.   | 9. $\frac{1}{25}$ . | 12. 0.36. | 15. 6400. |
16. What are the two equal factors of 144 ?  
 17. What are the two equal factors of 196 ?  
 18. What is that number which multiplied by itself is equal to 121 ?  
 19. The square root of 130 lies between what two integers ?  
 20. The square root of a number between 100 and 10,000 lies between what two powers of 10 ?

## 74. Square Root

*Find the sides of squares whose areas are as follows :*

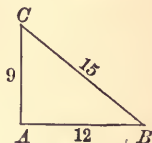
- |               |                 |                           |
|---------------|-----------------|---------------------------|
| 1. 9 sq. ft.  | 4. 25 sq. ft.   | 7. $\frac{1}{16}$ sq. in. |
| 2. 4 sq. in.  | 5. 0.04 sq. in. | 8. 2500 sq. in.           |
| 3. 16 sq. mi. | 6. 4900 sq. in. | 9. 6400 sq. ft.           |

*Find the perimeters of squares whose areas are :*

- |                            |                  |                  |
|----------------------------|------------------|------------------|
| 10. $\frac{1}{16}$ sq. ft. | 12. 0.25 sq. in. | 14. 8100 sq. ft. |
| 11. $\frac{1}{25}$ sq. in. | 13. 0.49 sq. ft. | 15. 3600 sq. yd. |
16. A square floor has an area of 25 sq. yd. Find its side.  
 17. A square lot has an area of 14,400 sq. ft. How long is each side ? How long is the perimeter ?  
 18. A square flower bed in a park has an area of 12,100 sq. ft. What is each side ? What is the perimeter ? How does the area compare with that of a rectangle of the same perimeter but 100 ft. wide ?

## 75. Square Root

The square on the hypotenuse of a right triangle equals the sum of the squares on the other two sides. Thus in this triangle  $9^2 + 12^2 = 15^2$ , for  $81 + 144 = 225$ . So if  $AB$  and  $AC$  are known,  $BC = \sqrt{AB^2 + AC^2}$ .



1. How long is the hypotenuse of a right triangle whose other sides are 3 in. and 4 in.?

2. How long is the hypotenuse of a right triangle whose other sides are 6 ft. and 8 ft.?

3. How long is the hypotenuse of a right triangle whose other sides are 5 ft. and 12 ft.?

4. One side of a right triangle is 9 ft., and the other is  $33\frac{1}{3}\%$  longer. Required the length of the hypotenuse.

5. How long is the hypotenuse of a right triangle whose other sides are  $1\frac{1}{2}$  in. and 2 in.?

## 76. Square Root

1. The hypotenuse is 5 ft. and one other side is 4 ft. Required the third side.

2. The hypotenuse is 10 ft. and one other side is 6 ft. Required the third side.

3. The hypotenuse is 15 ft. and one other side is 12 ft. Required the other side.

4. The hypotenuse is 13 ft. and one other side is 12 ft. Required the third side.

5. What is the square of 25 and also the square root of 25?

6. State some number less than 10 whose square equals its square root.

7. A ladder 20 ft. long just reaches the sill of a window 16 ft. from the ground. How far from the house is the foot of the ladder? ( $16^2 = 256$ .)

## 77. Cube Root

To find the cube root of 27,000 mentally, separate it into 3 groups of factors, thus :  $27,000 = (10 \times 3) \times (10 \times 3) \times (10 \times 3) = 30^3$ .

*Find the cube roots of the following :*

1. 27.    3.  $\frac{1}{27}$ .    5. 1000.    7.  $\sqrt[3]{1000}$ .    9.  $\frac{1}{2}\frac{2}{3}$ .  
 2. 64.    4.  $\frac{1}{64}$ .    6. 64,000.    8.  $\sqrt[3]{\frac{8}{25}}$ .    10. 1,000,000.

11. What is the edge of a cube that contains 125 cu. in.?

12. A tank that is 6 ft. long, 3 ft. wide, and 1 ft. 6 in. deep is filled with water. This water is then emptied into a cubical tank and exactly fills it. What is the edge of the cubical tank?

13. What is the edge of a cube that has the same volume as a box that is 8 in. long, 4 in. wide, and 2 in. deep? of a box that is 10 in. by 5 in. by  $2\frac{1}{2}$  in.?

## 78. Review of Roots.

1. What is the side of the square that has the same area as a rectangle that is 4 in. by 16 in.?

2. What is the perimeter of the square that has the same area as a rectangle that is 3 in. by 27 in.?

3. A cube contains 27 cu. in. How many square inches in its entire surface?

4. The entire surface of a cube is 96 sq. in. What is the area of each face? the length of each edge? the volume?

5. The volume of a cube is 1 cu. in. What is the length of each edge? the area of each face? the entire surface? the combined length of all the edges?

6. A tank 25 ft. long, 5 ft. wide, and 1 ft. deep has the same capacity as a certain cubical tank. This cubical tank is lined on four sides and on the bottom with sheet lead. How many square feet of sheet lead are required to line it?

## VIII. MENSURATION

## 79. Squares

*Find the areas of squares with sides as given :*

- |           |                       |                |                 |
|-----------|-----------------------|----------------|-----------------|
| 1. 11 in. | 4. 40 in.             | 7. 2 ft. 6 in. | 10. 3 ft. 4 in. |
| 2. 15 in. | 5. $1\frac{1}{2}$ ft. | 8. 10 ch.      | 11. 3 yd. 1 ft. |
| 3. 25 in. | 6. 1 ft. 6 in.        | 9. 20 ch.      | 12. 100 ft.     |

*Find the sides of squares with areas as given :*

13. 10 acres. 14. 40 acres. 15. 36 sq. mi. 16. 144 sq. rd.  
 17. Find the side of a square whose area is 900 sq. ft.  
 18. How many inches in the side of a square whose area is 1 sq. ft. 25 sq. in. ?  
 19. How many feet in the perimeter of a square whose area is 2 sq. yd. 7 sq. ft. ?

## 80. Rectangles

*Find the areas of rectangles with dimensions as given :*

- |                              |                              |                       |
|------------------------------|------------------------------|-----------------------|
| 1. 5 ft., 37 ft.             | 4. 8 ft., 61 ft.             | 7. 7 yd., 34 yd.      |
| 2. 6 in., 42 in.             | 5. 9 rd., 23 rd.             | 8. 4 rd., 80 rd.      |
| 3. 2 ft., $3\frac{1}{4}$ ft. | 6. 3 ft., $2\frac{1}{3}$ ft. | 9. 6 ft., 7 ft. 2 in. |

*Find the bases of rectangles with areas and altitudes as given :*

10. 144 sq. in., 6 in. 13. 639 sq. in., 9 in.  
 11. 135 sq. ft., 9 ft. 14. 2 sq. yd. 2 sq. ft., 1 yd. 1 ft.  
 12. 510 sq. in., 3 in. 15. 65 sq. in., 1 ft. 1 in.  
 16. What is the perimeter of a rectangle 9 in. by 16 in., and of a square of the same area ?  
 17. A rectangle 40 ft. long has the same area as a square 20 ft. on a side. What is the width of the rectangle ? How does its perimeter compare with that of the square ?



## 81. Parallelograms

If a rectangle is 2 ft. 1 in. long and 4 in. wide, its area is  $4 \times 25$  sq. in., or 100 sq. in. The area of a parallelogram is equal to the area of a rectangle of the same base and altitude.

*Find the areas of parallelograms with bases and altitudes as given, using the most convenient unit:*

- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| 1. 1 ft. 1 in., 1 ft. 1 in.         | 4. 1 rd. $13\frac{1}{2}$ ft., 20 ft. |
| 2. 1 yd. 2 ft., 1 yd. 1 ft.         | 5. 1 yd. 4 in., 11 in.               |
| 3. 1 rd. $3\frac{1}{2}$ ft., 10 ft. | 6. 2 yd. 8 in., 25 in.               |

*Find the bases of parallelograms with areas and altitudes as given:*

- |                                |                                       |
|--------------------------------|---------------------------------------|
| 7. 5 sq. yd. 5 sq. ft., 5 ft.  | 10. 3 sq. yd. 8 sq. ft., 1 yd. 2 ft.  |
| 8. 2 sq. yd. 2 sq. ft., 2 ft.  | 11. 1 sq. ft. 6 sq. in., 10 in.       |
| 9. 1 sq. yd. 1 sq. ft., 24 in. | 12. 1 sq. ft. 56 sq. in., 1 ft. 8 in. |

## 82. Triangles

The area of a triangle is equal to half the area of a rectangle of the same base and altitude.

*Find the areas of triangles with bases and altitudes as given, using the most convenient unit:*

- |                       |                                    |
|-----------------------|------------------------------------|
| 1. 1 ft. 8 in., 1 ft. | 4. 1 yd. 1 ft., 10 in.             |
| 2. 2 ft. 6 in., 6 in. | 5. 1 rd. $3\frac{1}{2}$ ft., 6 in. |
| 3. 3 ft. 4 in., 8 in. | 6. 1 yd. 14 in., 1 ft. 8 in.       |

*Find the bases of triangles with areas and altitudes as given:*

- |                       |                                |
|-----------------------|--------------------------------|
| 7. 288 sq. in., 1 ft. | 10. 630 sq. in., 7 in.         |
| 8. 165 sq. ft., 1 rd. | 11. 810 sq. ft., 3 yd.         |
| 9. 640 sq. in., 8 in. | 12. 1 sq. yd. 3 sq. ft., 1 yd. |
13. The hypotenuse of a right triangle is 10 in. and one of the other sides is 6 in. What is the third side?

## 83. Circles

The circumference of a circle equals  $2 \times 3\frac{1}{7} \times$  the radius, or  $3\frac{1}{7} \times$  the diameter, nearly. For nearer approximations mathematicians use 3.14159 or 3.1416 instead of  $3\frac{1}{7}$ , but for mental work  $3\frac{1}{7}$  or  $\frac{22}{7}$  should be used.

*Find the circumferences of circles with these diameters:*

- |           |           |            |             |
|-----------|-----------|------------|-------------|
| 1. 7 in.  | 3. 21 in. | 5. 210 in. | 7. 420 in.  |
| 2. 14 in. | 4. 56 in. | 6. 350 in. | 8. 0.35 in. |
9. What is the circumference of a water pipe that is 7 in. in diameter?
10. What is the circumference of a water tank that is 49 ft. in diameter?
11. What is the circumference of a circular tent that is 7 ft. across? 14 ft. across? 21 ft. across?

## 84. Circles

*Find the circumferences of circles with these radii:*

- |           |           |           |           |
|-----------|-----------|-----------|-----------|
| 1. 7 in.  | 3. 21 in. | 5. 42 in. | 7. 56 in. |
| 2. 14 in. | 4. 35 in. | 6. 49 in. | 8. 63 in. |
9. If the diameter of a circle is 0.7 in., what is the circumference?
10. What is the circumference of a circular flower bed laid out with a radius 7 ft. long?
11. The radius of a circular race track is  $\frac{7}{8}$  mi. How far is it around the track?
12. What is the circumference of a circle whose diameter is 700 ft.?
13. A lady making a drawing for a dress ornament describes a circle with a pair of compasses the points of which are  $3\frac{1}{2}$  in. apart. How much braid must she allow to go around the circle?

## 85. Circles

The area of a circle equals  $\frac{1}{2} \times$  the radius  $\times$  the circumference; the area of a circle also equals  $\frac{2}{7} \times$  the square of the radius.

*Find the areas of circles with the following radii and circumferences :*

1. 7 ft., 44 ft.    2. 0.7 in., 4.4 in.    3. 0.07 ft., 0.44 ft.

*Find the areas of circles with the following radii :*

4. 1 in.    5. 7 in.    6. 0.7 in.    7. 0.07 ft.    8. 14 in.  
 9. What is the area of a circular flower bed whose radius is 7 ft.?  
 10. What is the area of the cross section of a water pipe 1 in. in diameter?  
 11. What is the radius of a circle whose area is 154 sq. in.?  
 12. Find the circumference of a circle with area 154 sq. in.

## 86. Circles

1. What is the area of the cross section of a pipe that has a radius of  $\frac{1}{2}\frac{1}{2}$  ft.?  
 2. What is the circumference of a circular flower bed that has a radius of 3 ft. 6 in.?  
 3. What is the area of the flower bed of Ex. 2?  
 4. How long is the equator on a globe that is 14 in. in diameter?  
 5. What is the area of a small circular table top that is 14 in. in diameter?  
 6. What is the area of a circular flower bed that has a radius of  $2\frac{1}{3}$  yd.?  
 7. The radius of a circle is 1 ft. What is the length of the circumference?  
 8. The diameter of a circle is  $\frac{7}{2}$  ft. What is the length of the circumference?

## 87. Cubes

*Find the volumes of cubes with the following edges :*

- |          |           |                      |
|----------|-----------|----------------------|
| 1. 4 in. | 4. 7 in.  | 7. 1.2 in.           |
| 2. 5 in. | 5. 9 in.  | 8. $\frac{1}{3}$ in. |
| 3. 6 in. | 6. 12 in. | 9. 1 yd. 1 ft.       |

*Find the edges of cubes with the following volumes :*

10. 8000 cu. in.      11.  $\frac{1}{64}$  cu. in.      12. 2 cu. yd. 10 cu. ft.

*Find the surfaces of cubes with the following volumes :*

13. 8 cu. ft.      14. 64 cu. ft.      15. 125 cu. in.  
 16. The surface of a cube is 24 cu. ft. What is the volume?  
 17. The inside of a cubical tank, but not the top, is to be lined with zinc. The tank contains 60 gal. Allowing  $7\frac{1}{2}$  gal. to 1 cu. ft., how many square feet of zinc will be needed?

## 88. Rectangular Solids

*Find the volumes of rectangular solids as follows :*

- |                        |                                     |
|------------------------|-------------------------------------|
| 1. 2 ft., 3 ft., 4 ft. | 6. 7 ft., 8 ft., 9 ft.              |
| 2. 3 ft., 4 ft., 5 ft. | 7. 8 ft., 9 ft., 10 ft.             |
| 3. 4 ft., 5 ft., 6 ft. | 8. 9 ft., 10 ft., 11 ft.            |
| 4. 5 ft., 6 ft., 7 ft. | 9. 2 ft., 6 in., $2\frac{1}{2}$ ft. |
| 5. 6 ft., 7 ft., 8 ft. | 10. 2 ft., 10 in., 5 in.            |

*Find the volumes of rectangular solids with bases and altitudes as follows :*

- |                       |                        |
|-----------------------|------------------------|
| 11. 36 sq. in., 7 in. | 13. 72 sq. in., 9 in.  |
| 12. 48 sq. in., 6 in. | 14. 81 sq. in., 11 in. |

*Find the altitudes of rectangular solids with volumes and bases as follows :*

- |                            |                             |
|----------------------------|-----------------------------|
| 15. 60 cu. in., 20 sq. in. | 16. 189 cu. in., 63 sq. in. |
|----------------------------|-----------------------------|

## 89. Prisms

*Find the volumes of prisms with bases and altitudes as follows:*

- |                       |                                     |
|-----------------------|-------------------------------------|
| 1. 78 sq. in., 6 in.  | 5. 100 sq. in., 1 ft. 1 in.         |
| 2. 84 sq. in., 7 in.  | 6. 27 sq. ft., 1 yd. 1 ft.          |
| 3. 65 sq. in., 9 in.  | 7. 3 sq. yd. 3 sq. ft., 1 yd. 2 ft. |
| 4. 52 sq. in., 11 in. | 8. 1 sq. ft. 6 sq. in., 11 in.      |
9. How many loads (cubic yards) of earth in an excavation 30 ft. long, 24 ft. wide, and 6 ft. deep?
10. How many cubic feet of air in a schoolroom 30 ft. long, 20 ft. wide, and 10 ft. high?
11. A building, 100 ft. high, on a corner in a city has a base that is a triangle 100 ft. on one side and 50 ft. in altitude. How many cubic feet of space does it occupy?

## 90. Prisms

*Find the bases of prisms with volumes and altitudes as follows:*

- |                                      |   |
|--------------------------------------|---|
| 1. 750 cu. in., 25 in.               | 4. 125 cu. ft., 12 ft. 6 in.            |
| 2. 825 cu. in., 25 in.               | 5. 20,000 cu. ft., 33 $\frac{1}{3}$ ft. |
| 3. 200 cu. ft., 12 $\frac{1}{2}$ ft. | 6. 23,000 cu. ft., 33 ft. 4 in.         |
7. A prism with a square base a foot on a side is 8 in. higher than it is thick. What is its volume?
8. A prism having a volume of 133 cu. in. is 7 in. high. How many square inches in the base?
9. A prism having a volume of 6 cu. ft. is 1 yd. high. How many square inches in the base?
10. A prism that is 75 in. high has a volume 3000 cu. in. How many square inches in the base?
11. A prism that is 48 in. high has a volume of 2 $\frac{2}{3}$  cu. ft. How many square feet in the base?

## 91. Cylinders

*Find the volumes of cylinders with bases and altitudes as follows :*

- |                      |                                    |
|----------------------|------------------------------------|
| 1. 11 sq. in., 8 in. | 5. 43 sq. in., 5 in.               |
| 2. 25 sq. in., 7 in. | 6. 48 sq. in., $12\frac{1}{2}$ in. |
| 3. 30 sq. in., 6 in. | 7. 63 sq. in., $33\frac{1}{3}$ in. |
| 4. 32 sq. in., 9 in. | 8. 800 sq. in., 75 in.             |

9. What is the volume of a cylindrical water tank with base of 1200 sq. ft. and height of 40 ft. ?

10. How many cubic inches of water in a pipe 50 ft. long, the area of the interior cross section being 2 sq. in. ?

11. A cylindrical water tank has a base of 2000 sq. ft. and a height of 50 ft. Allowing  $7\frac{1}{2}$  gal. to 1 cu. ft., how many gallons will it contain ?

## 92. Cylinders

The area of the curved surface of a cylinder equals the product of the height and the circumference, all considered as abstract numbers.

*Find the areas of the curved surfaces of cylinders with heights and circumferences as follows :*

- |                                |                                |
|--------------------------------|--------------------------------|
| 1. 25 in., 40 in.              | 5. $16\frac{2}{3}$ in., 42 in. |
| 2. $12\frac{1}{2}$ in., 32 in. | 6. $66\frac{2}{3}$ in., 33 in. |
| 3. $33\frac{1}{3}$ in., 96 in. | 7. 50 ft., 124 ft.             |
| 4. 75 in., 400 in.             | 8. $37\frac{1}{2}$ ft., 80 ft. |

9. A water tank 50 ft. high and 126 ft. in circumference is to be painted on the outside. How many square feet of surface must be covered ?

10. In Ex. 9 how many square yards must be covered ?

11. A tank 25 ft. high and 220 ft. in circumference has what diameter ? how many square feet of curved surface ? What is the radius of the base ?

## 93. Pyramids

The volume of a pyramid equals one third the product of its base and altitude.

*Find the volumes of pyramids with bases and altitudes as follows:*

- |                       |                        |
|-----------------------|------------------------|
| 1. 63 sq. ft., 7 ft.  | 5. 81 sq. yd., 8 yd.   |
| 2. 90 sq. in., 13 in. | 6. 84 sq. yd., 30 ft.  |
| 3. 72 sq. ft., 6 ft.  | 7. 93 sq. in., 9 in.   |
| 4. 69 sq. in., 9 in.  | 8. 810 sq. ft., 12 yd. |

9. If the base of a pyramid is a square 3 yd. on a side, and if the pyramid is 3 ft. high, what is the volume? What would the volume be if the pyramid was 3 yd. high?

10. The base of a pyramid is a right triangle whose sides are 6 in., 8 in., and 10 in., and the altitude of the pyramid equals the hypotenuse of the base. What is the volume?

## 94. Pyramids

*Find the bases of pyramids with volumes and altitudes as follows:*

- |                      |                        |
|----------------------|------------------------|
| 1. 50 cu. ft., 5 ft. | 5. 48 cu. yd., 4 yd.   |
| 2. 36 cu. ft., 4 ft. | 6. 34 cu. in., 2 in.   |
| 3. 60 cu. ft., 5 ft. | 7. 124 cu. in., 4 in.  |
| 4. 70 cu. ft., 5 ft. | 8. 200 cu. in., 10 in. |

*Find the altitudes of pyramids with volumes and bases as follows:*

- |                             |                               |
|-----------------------------|-------------------------------|
| 9. 220 cu. in., 22 sq. in.  | 11. 1050 cu. in., 210 sq. in. |
| 10. 750 cu. in., 75 sq. in. | 12. 510 cu. in., 170 sq. in.  |

13. A pyramid with a triangular base has each of its edges 7 in. long. What is the sum of the edges?

14. If the base of a pyramid is a square and if the pyramid is 10 in. high and has a volume of 30 cu. in., how long is each side of the base?



## 95. Cones

The volume of a cone equals one third the product of its base and altitude.

*Find the volumes of cones with bases and altitudes as follows:*

- |                      |                                   |
|----------------------|-----------------------------------|
| 1. 30 sq. in., 7 in. | 4. 48 sq. in., $2\frac{1}{2}$ in. |
| 2. 36 sq. in., 8 in. | 5. 60 sq. in., $7\frac{1}{2}$ in. |
| 3. 42 sq. in., 6 in. | 6. 90 sq. in., 15 in.             |

*Find the altitudes of cones with volumes and bases as follows:*

- |                            |                             |
|----------------------------|-----------------------------|
| 7. 90 cu. ft., 30 sq. ft.  | 9. 30 cu. ft., 30 sq. ft.   |
| 8. 100 cu. ft., 30 sq. ft. | 10. 125 cu. ft., 25 sq. ft. |
11. A conical pile of dirt covers a base of 54 sq. ft. It is 3 ft. high. How many loads (cubic yards) does it contain?

## 96. Cones

The lateral area (curved surface) of a right circular cone equals the circumference of the base multiplied by half of the slant height.

*Find the lateral areas of right circular cones with circumferences and slant heights as follows:*

- |                  |                                |                                |
|------------------|--------------------------------|--------------------------------|
| 1. 33 in., 8 in. | 4. 30 in., $10\frac{1}{2}$ in. | 7. 75 in., 24 in.              |
| 2. 37 in., 8 in. | 5. 40 in., 12 in.              | 8. $33\frac{1}{3}$ in., 9 in.  |
| 3. 28 in., 9 in. | 6. 50 in., 1 ft.               | 9. 32 in., $12\frac{1}{2}$ in. |
10. A cone has a lateral area of 217 sq. in. The slant height is 7 in. What is the circumference of the base?
11. A certain cone has a circular base whose radius is 7 in. The altitude of the cone is 30 in. What is the area of the base? What is the volume of the cone?
12. A paper cornucopia has an altitude of 9 in. The area of the open top is  $6\frac{2}{3}$  sq. in. What is the volume? What would be the volume if the altitude was 3 in.?

## 97. Spheres

The area of a sphere equals  $4 \times r^2 \times$  the square of the radius.

*Find the areas of spheres with radii as follows:*

- |          |                      |                      |
|----------|----------------------|----------------------|
| 1. 1 in. | 3. 0.1 in.           | 5. $\frac{1}{4}$ in. |
| 2. 7 in. | 4. $\frac{1}{2}$ in. | 6. 0.7 in.           |

The volume of a sphere equals  $\frac{4}{3} \times r^3 \times$  the cube of the radius.

*Find as fractions, without reducing, the volumes of spheres with radii as follows:*

- |          |           |            |
|----------|-----------|------------|
| 7. 1 in. | 8. 10 in. | 9. 0.1 in. |
|----------|-----------|------------|

10. The diameter of one sphere is 1 in. and the diameter of another sphere is 2 in. How do the surfaces compare? How do the volumes compare?

## 98. Review

1. If a cubic foot of granite weighs 165 lb., what is the weight of a block 5 ft. long, and 2 ft. square on the end?

2. If a kettle is in the form of a hemisphere with radius of 1 ft., how many cubic feet does it contain?

3. If a cubic foot of water weighs  $62\frac{1}{2}$  lb., what will be the weight of water necessary to fill a cylindrical tank 2 ft. 6 in. high, the base being 4 sq. ft.?

4. If a cubic foot of marble weighs 173 lb., what is the weight of a marble pyramid whose base is a square 3 ft. on a side and whose height is 3 ft. 4 in.?

5. If a ball 2 in. in diameter has an area of  $12\frac{1}{2}$  sq. in., what is the area of a ball 4 in. in diameter?

6. If a ball 2 in. in diameter has a volume of  $4\frac{2}{3}$  cu. in., what is the volume of a ball 4 in. in diameter? If you double the diameter, what effect does this have on the volume?

## 99. Review

1. If 8 notebooks cost \$1.04, what does 1 book cost?
2. If 9 lb. of walnuts cost \$1.62, what does 1 lb. cost?
3. What do 6 doz. rulers cost at 55¢ a dozen?
4. Multiply 1640 by 25 in the shortest way.
5. The three sides of a triangular lot are 128 ft., 140 ft., 120 ft. What is the perimeter?
6. The four sides of a quadrilateral field are 540 ft., 460 ft., 350 ft., 450 ft. What is the perimeter?
7. The Danube is 1750 mi. long and the Rhine 960 mi. long. How much longer is the Danube than the Rhine?
8. What will a railway ticket for 148 mi. cost at 2¢ a mile?
9. If 7 boys can pull 665 lb., what is the average pull?

## 100. Review

1. The product of two numbers is 156 and one of them is 12. What is the other number?
2. The sum of two numbers is 341 and one of them is 107. What is the other number?
3. The quotient of two numbers is 10 and one of them is 40. The other may be either of what two numbers?
4. The difference between two numbers is 10 and one of them is 34. The other may be either of what two numbers?
5. Can a line 1 ft. long be divided exactly into equal lengths each  $\frac{3}{8}$  in. long? If so, how many such lengths are there?
6. At \$125 each, how much will 64 horses cost? What is the shortest way of getting the result?
7. At \$375 each, how much will 24 building lots cost? What is the shortest way of getting the result?



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