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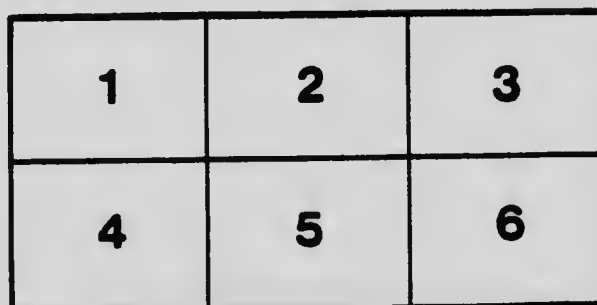
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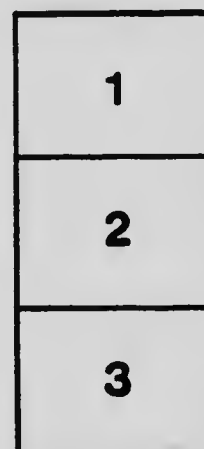
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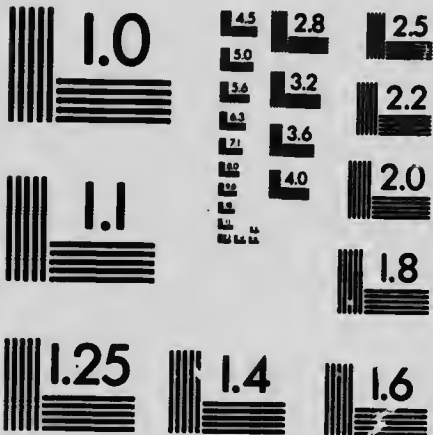
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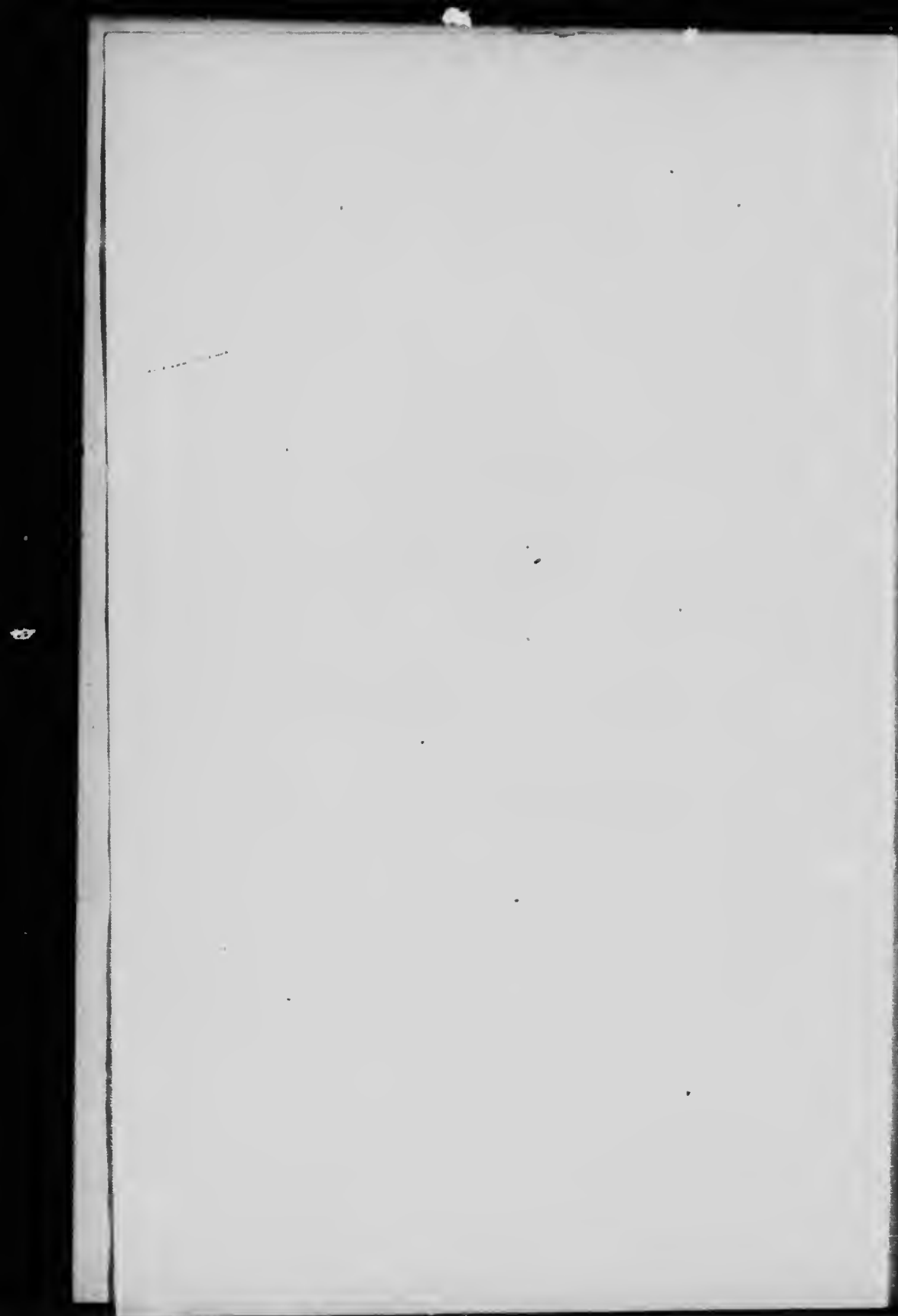
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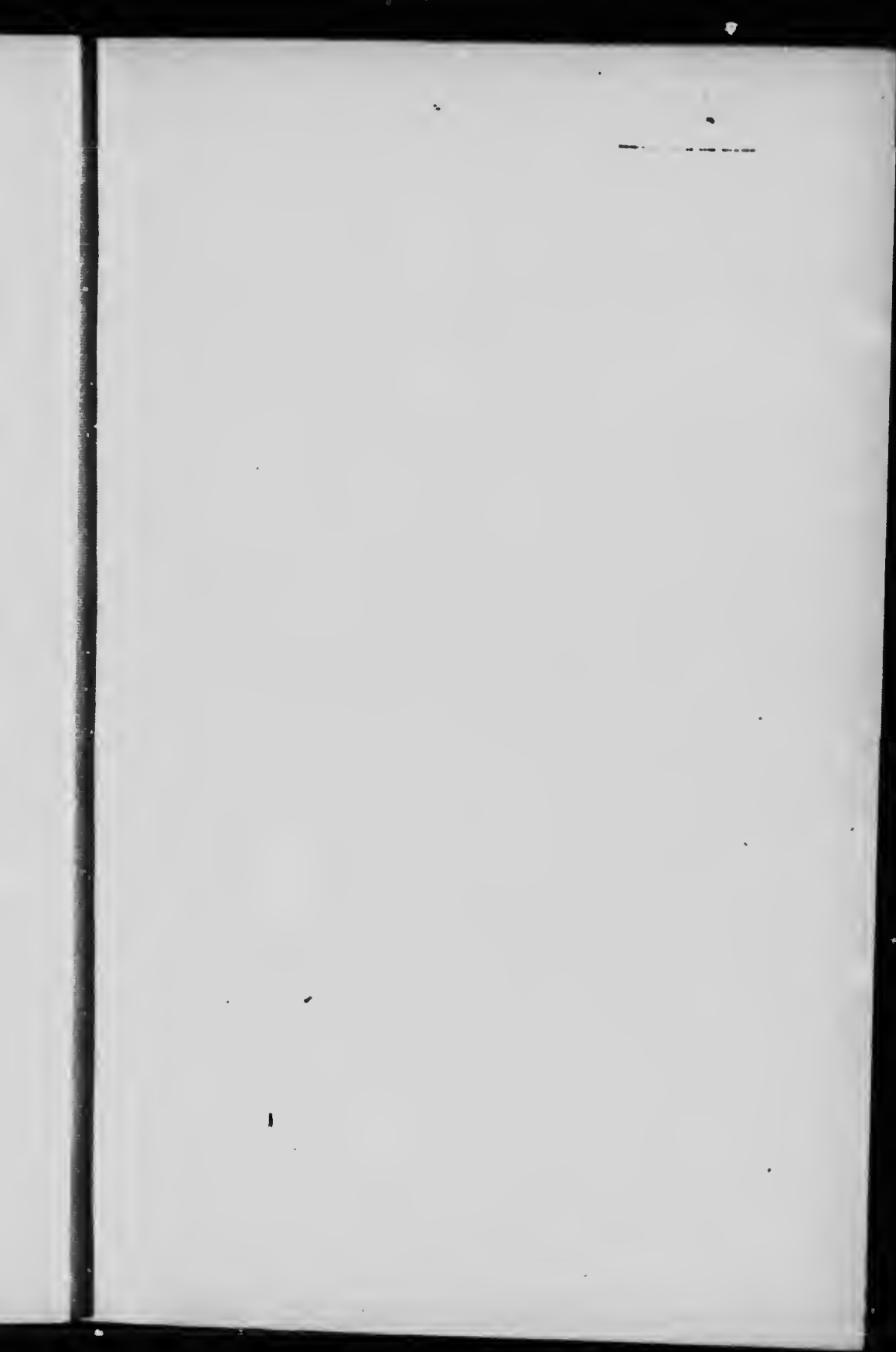


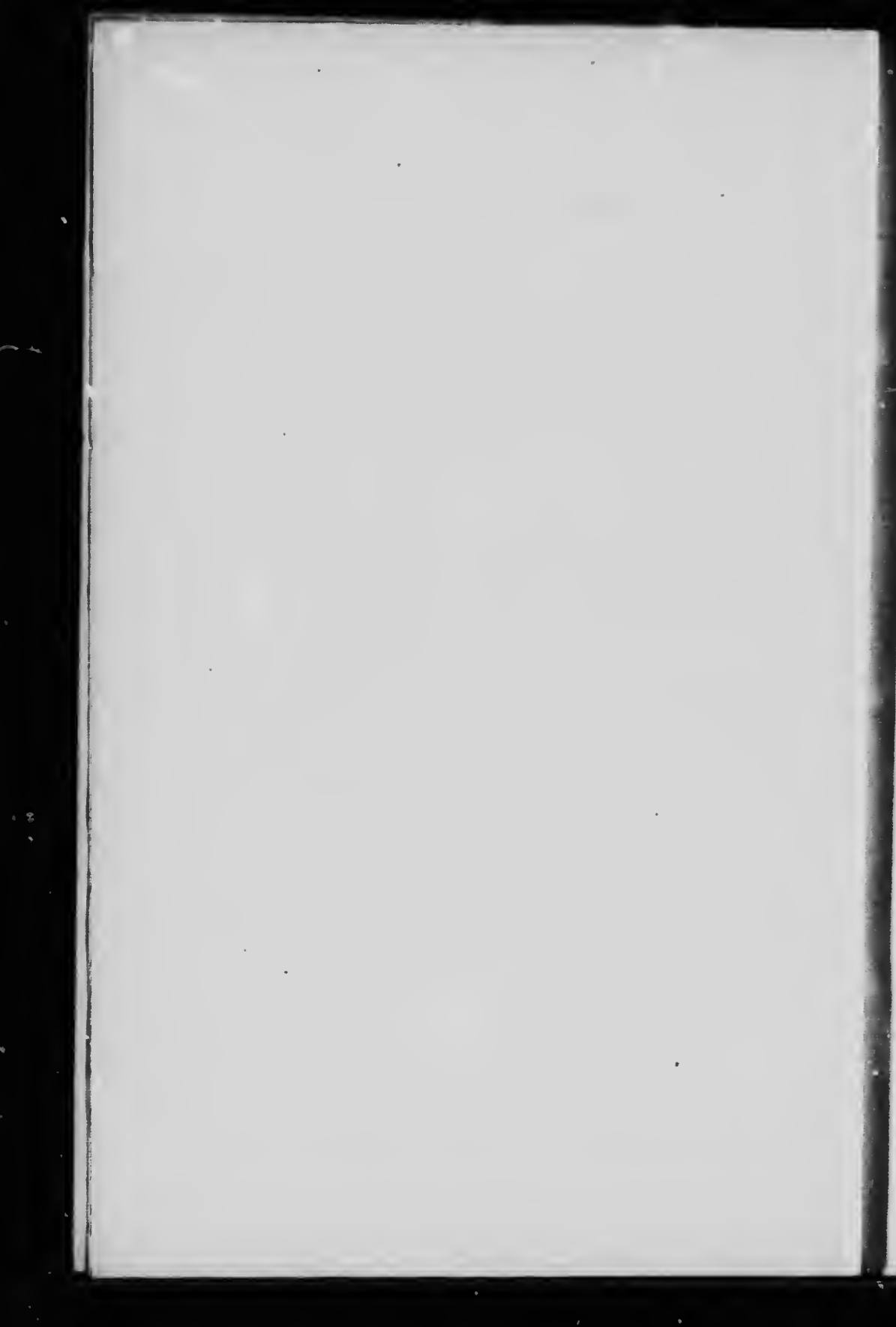
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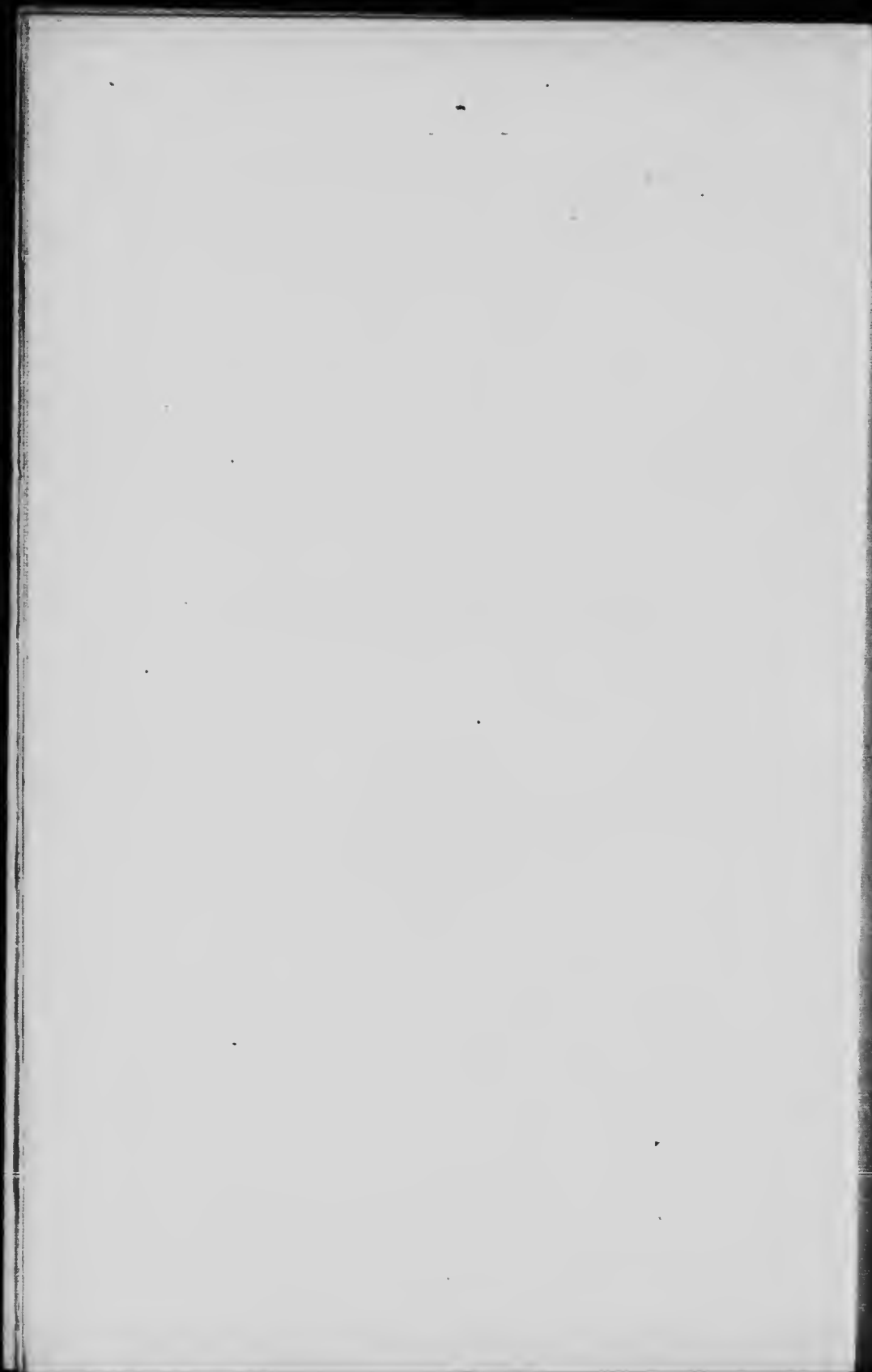
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SCHOOL ARITHMETIC

**IN COMPLIANCE WITH THE
PROGRAM OF PUBLIC INSTRUCTION**

by

E. ROBERT, c. s. v.

ELEMENTARY COURSE



Price : 30 cents

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School Arithmetic. — Elementary Course.

PREFACE.

This text book was prepared especially for the pupils of Third and Fourth Years, conformably to the programme of Public Instruction for the Province of Quebec.

Through the Principles of Analysis the pupil is introduced, in one chapter, to many of the terms and underlying principles that are brought out fully in each succeeding chapter.

This same logical sequence is obtained through the analysis of numbers and of operations, and through a liberal, concrete development of the properties of numbers.

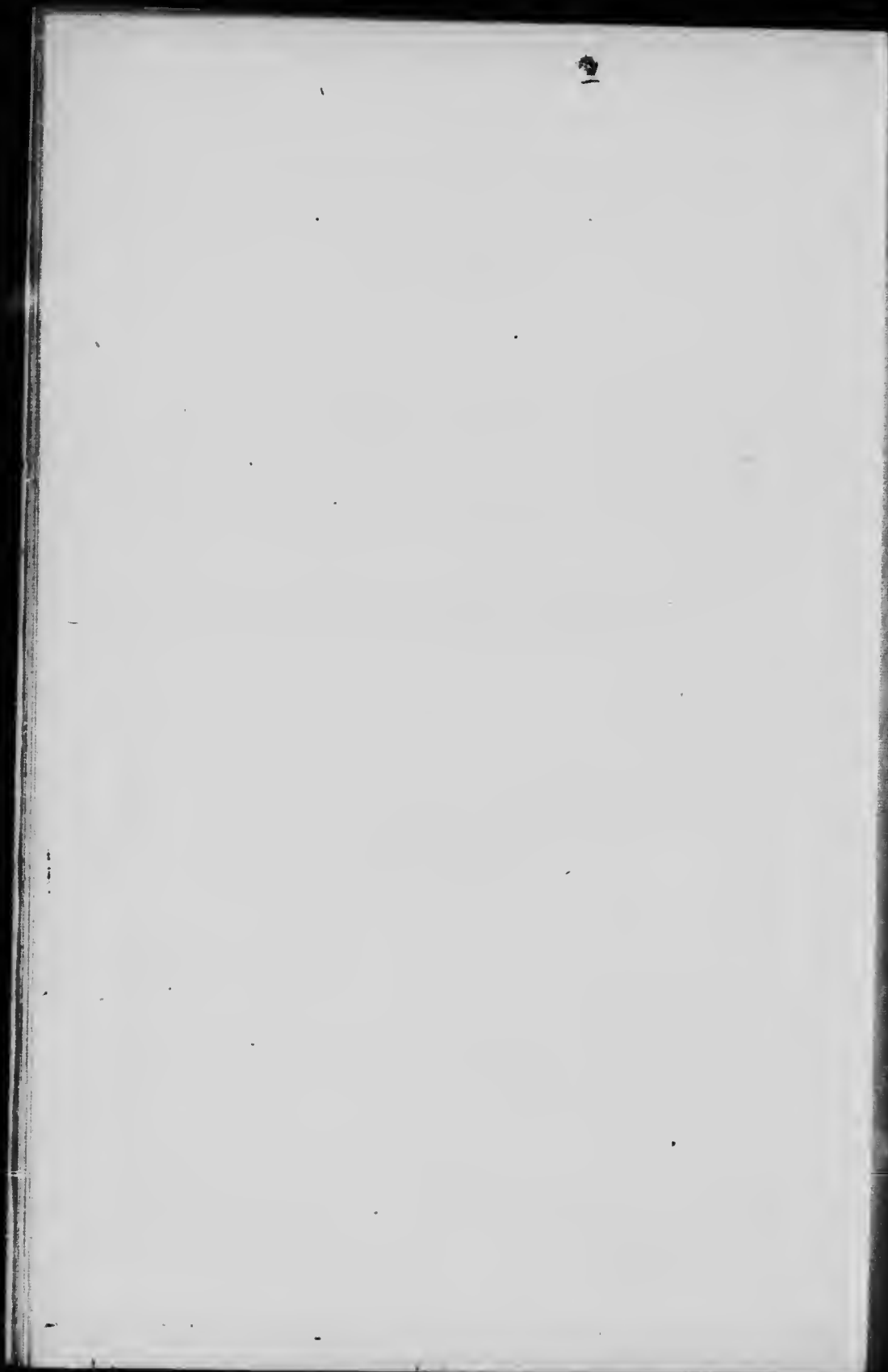
Many of the 3 400 well-graded problems given are as recommendable for their educative value as the others are for their practical nature.

By frequently inserting the names of eminent men and the glorious facts of our history, and by disseminating throughout the work problems drawn from the official statistics of our country or containing geographical facts about Canada, we hope to stimulate patriotism.

A large number of problems relating to economy, anti-alcoholism, benevolent works, agriculture, etc., should assist in developing an esteem of farming, a spirit of thrift, temperance, and charity.

The other problems may be appreciated chiefly for their practical nature, relating to commerce, industry, rural and domestic economy.

Other noteworthy advantages which this manual presents are oral exercises preceding each series of problems, and two reviews for each chapter, one of which is for the pupils of the Third Year, and the other for those of the Fourth.



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SCHOOL ARITHMETIC

ELEMENTARY COURSE

PRELIMINARY NOTIONS

1. To **count** is to find how many objects we have by taking them one by one.
2. The **unit** is one of the objects counted.
3. The **number** is what indicates how many units have been counted.
4. **Arithmetic** is the science of numbers.
5. There are *three* kinds of numbers: the *integer* or *whole number*, the *fraction*, and the *mixed number*.
6. The **whole number** is composed of entire units: *five trees, ten tables*.
7. A **fraction** is composed of one or several parts of the unit: *a quarter* of a yard, *three fifths* of a mile.
8. A **mixed number** is formed of whole units and one or several parts of a unit: *three yards and a half, four pounds and three quarters*.
9. Numbers are *concrete* or *abstract*.
10. A number is *concrete* when the kind of its units is known: *four pencils, twenty pens*.
11. A number is *abstract* when the kind of its units is unknown: *five, twelve*.

NUMERATION

12. **Numeration** is the art of naming or reading written numbers.

13. The art of writing numbers is called *Notation*.

14. Numeration teaches how to name all the numbers with very few words.

15. **Units.** — The *unit* is the first number; it is called *one*. By adding the unit to itself we have the number *two*. The latter, increased by a unit, gives *three*, and we thus successively obtain *four*, *five*, *six*, *seven*, *eight*, *nine*. These first nine numbers are called *simple units* or *units of the first order*.

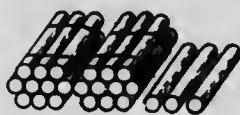
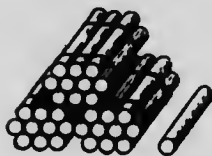
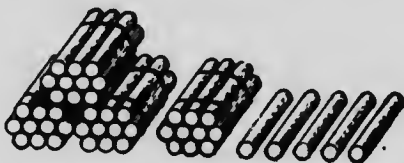
16. **Tens.** — By adding the unit to nine, we have the number *ten*, or the *unit of the second order*.



ten units



one ten

two tens and
three unitsthree tens and
one unit

four tens and five units

We count by tens as we count by simple units, and we say:

One ten, or *ten*.

Two tens, or *twenty*.

Three tens, or *thirty*.

Four tens, or *forty*.

Five tens, or *fifty*.

Six tens, or *sixty*.

Seven tens, or *seventy*.

Eight tens, or *eighty*.

Nine tens, or *ninety*.

To name the numbers between two consecutive tens, we add the names of the first nine numbers to the name of each ten, and we should say:

Ten-one, ten-two, ten-three, ten-four, etc.

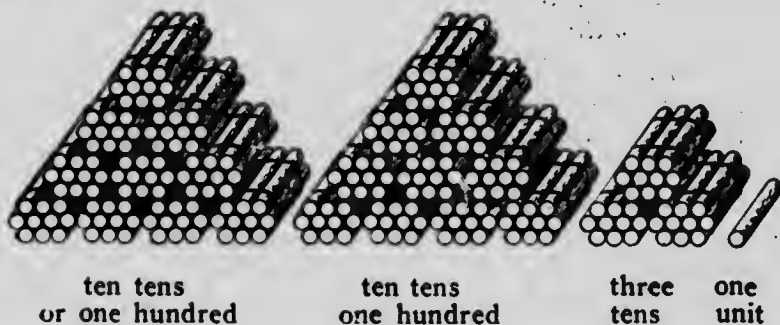
Twenty-one, twenty-two, . . . twenty-nine.

Thirty-one, . . . ninety-nine.

Between ten and twenty, however, custom has replaced these names by simple words: *eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, and nineteen.*

17 Hundreds. — By adding a unit to ninety-nine we obtain a union of ten tens that is called *hundred* or the *unit of the third order*.

The first three orders form a class called *class of the simple units*.



We count by hundreds as we do by units and by tens, thus: *One hundred, two hundred, three hundred, . . . nine hundred.*

To name the numbers between two consecutive hundreds, we add the names of the first ninety-nine numbers, thus: A hundred and one, a hundred and two, a hundred and three, . . . two hundred and one, . . . three hundred and forty-six, . . . nine hundred and ninety-nine.

18. Thousands. — Nine hundred and ninety-nine and one make nine hundred plus one hundred, or ten hundred, which is called *thousand* and is a *unit of the fourth order*.

We count by thousands, by tens of thousands and by hundreds of thousands, as we count by units, by tens and by hundreds. Thus we say: One thousand, two thousand, fifty thousand, ninety-nine thousand, one hundred thousand, five hundred thousand, etc.; thus we arrive at the number nine hundred and ninety-nine thousand nine hundred and ninety-nine.

Therefore the thousand forms the *unit of the fourth order*; the tens of thousands, the *unit of the fifth order*; the hundreds of thousands, the *unit of the sixth order*.

These last three orders form a second class, called *class of the thousands*.

19. Millions. — By adding one to nine hundred and ninety-nine thousand nine hundred and ninety-nine, we have ten hundred thousand which is a *unit of the seventh order*, called *million*.

We count by millions as we count by thousands: thus we place after each principal unit the numbers which are inferior to it, and we form in this way the millions, the tens of millions, and the hundreds of millions; that is to say, the units of the *seventh, eighth and ninth orders*. These three orders form the third class, called *class of the millions*.

We form in like manner the *billions*, the *trillions*, the *quadrillions*, etc.

20. Fundamental principle. — Numeration is based on the following principle: *Ten units of any order equal one unit of the next higher order*.

21. NOTE. — We see by what precedes that the different orders of units are divided into different classes: the class of the simple units, the class of the thousands, the class of the millions, etc.; and besides, that each class comprises three orders: the order of the units, the order of the tens, and the order of the hundreds. But, in the first class, they are the units, the tens, the hundreds of the simple units; in the second class, they are the units, the tens, the hundreds of the thousands, and so forth.

Summary of Numeration.

5 th CLASS			4 th CLASS			3 rd CLASS			2 nd CLASS			1 st CLASS		
Trillions			Billions			Millions			Thousands			Units		
15 th order	14 th order	13 th order	12 th order	11 th order	10 th order	9 th order	8 th order	7 th order	6 th order	5 th order	4 th order	3 rd order	2 nd order	1 st order
Hundreds of trillions	Tens of trillions	Units of trillions	Hundreds of billions	Tens of billions	Units of billions	Hundreds of millions	Tens of millions	Units of millions	Hundreds of thousands	Tens of thousands	Units of thousands	Hundreds of units	Tens of units	Units of units

The Reading of Whole Numbers.

22. Rule. — *To read a whole number containing more than three figures, we separate it into periods of three figures each; beginning at the left we read each period separately with the name of the class that it represents.*

Ex.—4 037 402 is read: four million thirty-seven thousand four hundred and two units.

23. Note. — The whole number or left-hand period may contain less than three figures.

Read the following numbers:

35	299	1 233	778
64	398	4 348	891
142	472	5 605	941
175	573	5 001	975
248	692	9 449	2 340

6 810	12 840	1 000 041	60 400
7 915	25 303	4 429 921	880 849
8 783	60 040	7 836 489	4 832 501
9 575	97 641	9 264 301	5 043 212
9 999	243 643	983 141	48 304 101
10 413	428 101	28 122	2 004 000
18 041	644 782	678 341	3 827 500
15 470	740 001	78 301	60 401 500
33 412	804 084	5 005	30 146 439
41 042	980 099	14 808	93 758 426

NOTATION.

24. **Notation** is the method of writing numbers.

Arabic notation is the method of writing numbers by means of *figures*.

25. There are ten figures, namely:

Form: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.
Name: one, two, three, four, five, six, seven, eight, nine, zero.

The first nine figures represent the numbers the names of which they bear. They are called *significant figures*.

The *zero*, or naught, represents no value by itself; it is destined to replace the different orders that are lacking in a number.

26. **Fundamental principle.** — *Any figure placed at the left of another represents the units of the next higher order, that is to say the units ten times higher.*

By means of this convention, we can represent all the numbers, for if the first figure to the right represents the units, the second represents the tens, the third represents the hundreds, etc.

27. It follows that figures have two values called an *absolute value* and a *relative value*.

28. The **absolute value** of a figure is its value when standing alone, or when used as the right-hand figure of a number.

The **relative value** of a figure is its value arising from the place in which it stands.

Thus, in 4852, the third figure's absolute value is 8 *simple units*, and its relative value is 8 *hundred simple units*.

The Writing of Whole Numbers.

29. **Rule.** — *To write in figures a whole number, from left to right we write the hundreds, the tens, and the units of the highest class; then the hundreds, the tens, and the units of the following inferior class; and so forth to the simple units.*

The orders that lack in the number are replaced by naughts.

EXAMPLES. — The number five hundred and four is written 504; the number five hundred and two thousand and forty-two units, 502 042; the number five hundred and three million three hundred and eight, 503 000 308.

Write in figures the following numbers:

1. Forty-eight.
2. Sixty-three.
3. Ninety.
4. Two hundred and eight.
5. Four hundred and thirty-three.
6. Seven hundred and twenty four.
7. Eight hundred and thirty-six.
8. Nine hundred and two.
9. Three hundred and twenty-seven.
10. Five hundred and forty-nine.
11. Seven hundred and eighty-five.
12. Nine hundred and ninety-two.
13. Seven thousand two hundred and three units.
14. Fifty-eight thousand and three units.

15. Ninety-nine thousand five hundred units.
16. Four thousand six hundred and fifty-two units.
17. Thirty-three thousand six hundred and four units.
18. Two hundred and thirty-nine thousand two hundred and two units.
19. Six thousand and six units.
20. Eight hundred and four thousand and three units.
21. Four hundred and thirty thousand and one units.
22. Three million three hundred thousand and two hundred units.
23. Fifty-four million sixty thousand and four units.
24. Seventy-eight million one hundred and eight thousand and sixteen units.
25. Three million and nine units.
26. Fifteen million seven thousand and five units.
27. Nine hundred and forty-seven thousand and two units.
28. Thirty million forty thousand and fifty units.
29. Four hundred and three million nine hundred and four thousand and eight units.
30. Nine hundred and nine million two thousand and thirty-eight units.
31. Eight hundred and thirty-two million and three units.
32. Fifty-seven thousand and twenty-three units.
33. Thirty-six billion twenty-two thousand units.
34. Six hundred and four billion three million and forty units.
35. Nine hundred and eight billion four thousand and seventeen units.

Roman Notation.

30. **Roman notation** consists in representing numbers with letters called *Roman characters*.

31. There are *seven* of these characters, viz.:

Form:	I	V	X	L	C	D	M
Value:	1,	5,	10,	50,	100,	500,	1 000.

32. **NOTE.** — Roman notation is still used to mark the hours on dials, to number the important divisions of a book, to indicate dates on monuments, etc.

33. The formation of numbers is based on three principles:

1^o *All characters placed at the right of another which represents an equal or greater value, are added to the latter.*

Ex. — VI represents $5 + 1$ or 6; XXX represents $10 + 10 + 10$ or 30.

2^o *All characters placed at the left of another which represents a greater value, are subtracted from the latter.*

Ex. — IV represents $5 - 1$ or 4; XL represents $50 - 10$ or 40.

3^o *All characters placed between two higher ones are subtracted from the right one.*

Ex. — XIV represents $10 + 5 - 1$ or 14.

Roman Notation Table.

I	1	XI	11	XXX	30	CD	400
II	2	XII	12	XL	40	D	500
III	3	XIII	13	L	50	DC	600
IV	4	XIV	14	LX	60	CM	900
V	5	XV	15	LXX	70	M	1 000
VI	6	XVI	16	LXXX	80	MD	1 500
VII	7	XVII	17	XC	90	MCMIX	1 909
VIII	8	XVIII	18	XCIX	99	MCM	1 900
IX	9	XIX	19	C	100	MM	2 000
X	10	XX	20	CC	200	MMIV	2004

The following rule will greatly help the pupil in writing Roman numbers:

Rule. — *Resolve the number into its different orders, then successively write them, beginning by the highest order.*

EXAMPLE. — Write 2 689 in Roman characters.

$$2689 = 2000 + 600 + 80 + 9.$$

$$2000 = \text{MM}.$$

$$600 = \text{DC}.$$

$$80 = \text{LXXX}.$$

$$9 = \text{IX}.$$

$$2689 = \text{MMDCLXXXIX}.$$

Write in Arabic figures the following numbers:

- | | | |
|-------------|--------------|-------------|
| 1. VII | 28. CCIV | 55. MDLVI |
| 2. XIV | 29. CCCIX | 56. MCCCIV |
| 3. XX | 30. CCCXXIX | 57. MDCCIX |
| 4. LII | 31. CCCXLIX | 58. MDIX |
| 5. LXI | 32. CCCLXXIV | 59. MCXVI |
| 6. LXX | 33. CCXXIX | 60. MXCVI |
| 7. XCIX | 34. LXXXIV | 61. MCDXCII |
| 8. XXI | 35. CCXVIII | 62. MDXXXIV |
| 9. XLIX | 36. CCCXCIV | 63. MDLVII |
| 10. XIX | 37. DV | 64. MDCVIII |
| 11. XLIV | 38. CDLIX | 65. MDCXL |
| 12. XXXV | 39. DLXIII | 66. MDCLIX |
| 13. LXIX | 40. DLXXIX | 67. MDCCI |
| 14. XXXVI | 41. DCLXIV | 68. MDCXLVI |
| 15. CXI | 42. DCCVIII | 69. MDCCLX |
| 16. XLV | 43. DCCCLXXI | 70. MDCLXIV |
| 17. CXV | 44. DCCCXXX | 71. MDCCXCI |
| 18. XCV | 45. DLXI | 72. MDCCCXL |
| 19. LXXXIX | 46. DCLXXXIX | 73. MDCCLV |
| 20. CXLIV | 47. MLIH | 74. MCMIX |
| 21. XCIII | 48. MDVI | 75. MCMVIII |
| 22. XCVII | 49. CM | 76. MM |
| 23. CXCIX | 50. CMVII | 77. MMXC |
| 24. CCVI | 51. CMLXXVI | 78. MCMLV |
| 25. CXXI | 52. CMLXVII | 79. MMCCXIV |
| 26. LXXVIII | 53. MCVIII | 80. MMCDVII |
| 27. CCLXII | 54. MCCIX | 81. MMDXXI |

Write in Roman characters the following numbers :

1. 15	15. 147	29. 505	43. 1 567
2. 19	16. 169	30. 558	44. 1 609
3. 23	17. 184	31. 563	45. 1 745
4. 27	18. 199	32. 674	46. 1 893
5. 34	19. 209	33. 708	47. 1 010
6. 36	20. 214	34. 725	48. 1 806
7. 43	21. 245	35. 804	49. 1 900
8. 54	22. 288	36. 812	50. 2 004
9. 59	23. 299	37. 910	51. 2 540
10. 62	24. 308	38. 929	52. 2 319
11. 77	25. 419	39. 935	53. 2 570
12. 83	26. 426	40. 1 001	54. 2 783
13. 90	27. 484	41. 1 123	55. 2 909
14. 125	28. 493	42. 1 234	56. 2 922

OPERATIONS ON WHOLE NUMBERS

34. **Operations** in arithmetic are modifications which numbers undergo in changing their value or form.

35. There are four fundamental operations: *addition*, *subtraction*, *multiplication*, and *division*.

36. The **proof** is an operation we perform to test the correctness of some other operation.

ADDITION

PROBLEM.—I had *two* apples; my brother gave me *three* apples; how many apples had I then? To know it, I may unite all these apples and count them. I then find I have *five* apples. This operation is an *addition*.



2 apples and 3 apples are 5 apples.

37. **Addition** is the operation of *uniting* into one number several like numbers.

It is also the *augmenting* of a number by others of the same kind.

38. The result of an addition is called the **sum**, *total*, or *amount*.

39. The **sign** of addition is $+$, and is read *plus*. It is placed between the numbers to be added.

The sign $=$ marks equality, and is read *equals*.

Thus, $4 + 5 = 9$ is read: 4 plus 5 equals 9.

40. Add 635, 759, and 543.

OPERATION.

ANALYSIS.

635 =

6 hundreds + 3 tens + 5 units:

759 =

7 hundreds + 5 tens + 9 units;

543 =

5 hundreds + 4 tens + 3 units.

1 937 =

18 hundreds + 12 tens + 17 units;

1 937 = 1 thousand + 9 hundreds + 3 tens + 7 units.

41. **Rule.** — 1° Place the numbers to be added under one another so that like units shall stand in the same column.

2° Find the sum of the simple units; then write the units' figure under the units and, when necessary, carry the ten or tens to the next column, to be added with the other tens.

3° Operate thus with the tens, hundreds, etc.

4° Write the last result under the last column, without change.

42. **Proof of addition.**—To prove an addition, begin the operation again by adding in the opposite direction.

Written Exercises.

Add the following:

$$\begin{array}{r} 1. \quad 33 \\ 75 \\ \hline 41 \end{array}$$

$$\begin{array}{r} 2. \quad 72 \\ 27 \\ \hline 43 \end{array}$$

$$\begin{array}{r} 3. \quad 28 \\ 71 \\ \hline 14 \end{array}$$

$$\begin{array}{r} 4. \quad 21 \\ 49 \\ \hline 65 \end{array}$$

$$\begin{array}{r} 5. \quad 68 \\ 35 \\ \hline 52 \end{array}$$

$$\begin{array}{r} 6. \quad 77 \\ 38 \\ \hline 68 \end{array}$$

$$\begin{array}{r} 7. \quad 92 \\ 88 \\ \hline 65 \end{array}$$

$$\begin{array}{r} 8. \quad 54 \\ 89 \\ \hline 78 \end{array}$$

$$\begin{array}{r} 9. \quad 90 \\ 77 \\ \hline 83 \end{array}$$

$$\begin{array}{r} 10. \quad 36 \\ 98 \\ \hline 89 \end{array}$$

$$\begin{array}{r} 11. \quad 372 \\ 813 \\ \hline 128 \end{array}$$

$$\begin{array}{r} 12. \quad 483 \\ 384 \\ \hline 695 \end{array}$$

$$\begin{array}{r} 13. \quad 217 \\ 904 \\ \hline 483 \end{array}$$

$$\begin{array}{r} 14. \quad 918 \\ 947 \\ \hline 938 \end{array}$$

$$\begin{array}{r} 15. \quad 825 \\ 920 \\ \hline 577 \end{array}$$

$$\begin{array}{r} 16. \quad 689 \\ 895 \\ \hline 647 \end{array}$$

$$\begin{array}{r} 17. \quad 899 \\ 758 \\ \hline 804 \end{array}$$

$$\begin{array}{r} 18. \quad 944 \\ 790 \\ \hline 541 \end{array}$$

$$\begin{array}{r} 19. \quad 898 \\ 781 \\ \hline 767 \end{array}$$

$$\begin{array}{r} 20. \quad 976 \\ 984 \\ \hline 991 \end{array}$$

$$\begin{array}{r} 21. \quad 981 \\ 426 \\ 549 \\ \hline 387 \end{array}$$

$$\begin{array}{r} 22. \quad 276 \\ 369 \\ 548 \\ \hline 463 \end{array}$$

$$\begin{array}{r} 23. \quad 457 \\ 25 \\ 9 \\ \hline 362 \end{array}$$

$$\begin{array}{r} 24. \quad 119 \\ 2068 \\ 24 \\ \hline 649 \end{array}$$

$$\begin{array}{r} 25. \quad 5287 \\ 286 \\ 3164 \\ \hline 54 \end{array}$$

$$26. \quad 705 + 12 + 219 + 15.$$

$$27. \quad 341 + 8 + 648 + 7.$$

$$28. \quad 932 + 36 + 6 + 712.$$

$$29. \quad 8 + 864 + 989 + 45.$$

$$30. \quad 712 + 8562 + 40.$$

$$31. \quad 3237 + 6 + 4269.$$

$$32. \quad 8004 + 723 + 217.$$

$$33. \quad 609 + 3470 + 52.$$

$$34. \quad 328 + 9423 + 997.$$

$$35. \quad 976 + 9945 + 623.$$

$$36. \quad 968 + 3 + 54 + 594.$$

$$37. \quad 355 + 569 + 9192.$$

$$38. \quad 29 + 694 + 9273.$$

$$39. \quad 43617 + 743 + 84.$$

$$40. \quad 7683 + 4783 + 77.$$

$$41. \quad 108 + 3407 + 186.$$

$$42. \quad 493 + 9926 + 999.$$

$$43. \quad 3064 + 43 + 9285.$$

$$44. \quad 237 + 8349 + 823.$$

$$45. \quad 8209 + 7948 + 99.$$

46. $4\,247 + 356 + 28 + 4\,230 + 97 + 1\,259.$
47. $425 + 3\,742 + 4\,236 + 39 + 847.$
48. $4\,000 + 623 + 976 + 45 + 7\,288.$
49. $97\,623 + 5\,260 + 2\,407 + 86 + 800.$
50. $41\,537 + 9\,215 + 48 + 6\,077 + 2\,413.$
51. $9\,253 + 384 + 189 + 567 + 1\,278.$
52. $9\,140 + 49 + 257 + 6 + 428.$
53. $6\,843 + 4\,297 + 326 + 52 + 7\,008.$
54. $8\,604 + 4\,007 + 5\,290 + 3\,046 + 7\,269.$
55. $1\,000\,001 + 207 + 346\,274 + 74\,259.$
56. $389 + 75 + 467 + 679 + 213 + 34 + 200.$
57. $82\,435 + 4\,691 + 385 + 92\,567.$
58. $56\,834 + 25\,572 + 37 + 17\,248.$
59. $7\,696 + 2\,274 + 8\,790 + 2\,653 + 3\,564.$
60. $9\,876 + 7\,654 + 3\,210 + 5\,432 + 1\,098.$
61. $52\,364 + 1\,798 + 1\,119 + 158 + 47\,625.$
62. $29\,746 + 37 + 109 + 3\,169 + 949 + 457 + 28.$
63. $423 + 779 + 7\,428 + 8\,102 + 9\,873.$
64. $9\,271 + 7\,185 + 135 + 27 + 5\,690 + 4\,789.$
65. $1\,351 + 92\,973 + 117\,064 + 827\,569.$
66. $7\,384 + 6\,780 + 326 + 576 + 7\,653.$
67. $8\,842 + 31\,887 + 113\,214 + 887\,319.$
68. $413 + 33\,335 + 112\,817 + 385\,842.$
69. $8\,730 + 3\,021 + 879 + 785 + 92 + 46.$
70. $46\,843 + 3\,754 + 321 + 52 + 3\,252.$
71. $7\,538 + 504 + 387 + 13 + 1\,054 + 11.$
72. $7\,564 + 3\,846 + 9\,770 + 4\,321 + 19.$
73. $74\,127 + 21\,094 + 2\,947 + 674 + 85.$
74. $92\,864 + 79 + 784 + 4\,759 + 28\,936 + 68\,532.$
75. $9\,947\,621 + 704\,126 + 81\,267 + 9\,241.$

76. $\begin{array}{r} \$45.45 \\ 2.04 \\ \hline 16.30 \end{array}$	77. $\begin{array}{r} \$204.05 \\ 48.35 \\ \hline 743.09 \end{array}$	78. $\begin{array}{r} \$780.79 \\ 475.43 \\ \hline 28.10 \end{array}$	79. $\begin{array}{r} \$4\,321.40 \\ 375.48 \\ \hline 1\,436.12 \end{array}$
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80. $\begin{array}{r} \$208.72 \\ 169.08 \\ 71.36 \\ \hline 714.39 \end{array}$	81. $\begin{array}{r} \$769.28 \\ 41.07 \\ 184.36 \\ \hline 869.36 \end{array}$	82. $\begin{array}{r} \$1\,843.21 \\ 36.07 \\ 978.89 \\ \hline 362.48 \end{array}$	83. $\begin{array}{r} \$409.05 \\ 110.00 \\ 105.20 \\ \hline 1\,000.65 \end{array}$
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84. $\$52.74 + \$2.06 + \$0.87$. 89. $\$3.07 + \$0.09 + \$8.43$.
 85. $\$1.32 + \$38.18 + \$0.07$. 90. $\$1.02 + \$0.95 + \$9.10$.
 86. $\$9.72 + \$9.80 + \$0.89$. 91. $\$15 + \$8.50 + \$6.75$.
 87. $\$0.34 + \$48 + \$6.75$. 92. $\$9.21 + \$0.48 + \$1.01$.
 88. $\$3.46 + \$46.82 + \$0.64$. 93. $\$0.04 + \$0.40 + \$0.99$.

94. $\$32.13 + \$35.62 + \$45.72 + \$42.07 + \$32.00$.
 95. $\$31.23 + \$2.04 + \$365.12 + \$305. + \$1\ 234.57$.
 96. $\$607. + \$24.73 + \$105.72 + \$8\ 765. + \$7\ 520.75$.
 97. $\$21\ 875.87 + \$30\ 572 + \$2\ 075.62 + \174.73 .
 98. $\$82. + \$3.72 + \$281. + \$287.93 + \$8\ 767.89$.
 99. $\$7\ 520.75 + \$8\ 765 + \$105.72 + \$24.73 + \$0.58$.
 100. $\$6\ 234 + \$3\ 287 + \$60.75 + \$28\ 705.72$.
 101. $\$3.12 + \$2.46 + \$0.67 + \$25.78 + \$3\ 516.70$.
 102. $\$5\ 162 + \$87\ 520.79 + \$12\ 573.21 + \670 .
 103. $\$8\ 756 + \$34.08 + \$137.67 + \$8\ 708.23 + \$387$.
 104. $\$76\ 543.01 + \$8\ 761.20 + \$7\ 234.56 + \313.09 .
 105. $\$48.71 + \$9.78 + \$1\ 091.26 + \$394\ 127.67$.

43. Principles of Analysis relating to Addition:

1. I add because I wish to find the *sum* of.....
2. I add because..... (what is asked) is *more than*..... (what is given).
3. I add because I wish to find how many there are *in all* or *together*.

44 NOTE. — Give constant attention to the key-words: *the sum of, more than, in all, together*.

Principle 2 would analyze problems 106, 109, 111, and 112, of the following exercises.

Principle 3 would analyze problems 107, 108, 110, 113, 114, and 115.

Oral Exercises.

106. The Island of Orleans is 20 miles long; the Island of Montreal is 12 miles longer. How long is the latter?

107. Charles had 34 cents in the School Savings Bank; he has deposited 9 cents more. How much has he now?

108. What sum will it require to buy a 5-cent copy book, a pen worth 3 cents, and a book worth 25 cents?

109. If George had 8 good marks less, he would have 43. How many has he?

110. Viator gave 12 cents to a lame man, 18 cents to a blind man, and had 30 cents left. What sum had he at first?

111. At Boston the tide rises 9 feet high; in the Bay of Fundy it rises 54 feet higher. How high is the tide in the Bay of Fundy?

112. An elm is 28 feet high. How high is a poplar which is 15 feet higher than the elm?

113. Each jawbone of a man has 4 incisive teeth, 2 canine and 10 molar. How many teeth has a man?

114. A gardener picked 38 barrels of apples in one orchard, 22 in a second and 20 in a third. How many barrels did he pick in all?

115. At the market a farmer's wife sold 13 ducks, 37 pigeons, 40 chickens, and 22 geese. How many fowls did she sell?

PROBLEMS ON ADDITION.

First Series.

116. Bishop Laval was born in the year 1622 and lived 86 years. In what year did he die?

117. From Duluth to the Strait of Belle-Isle it is 2 384 miles, and from this to Liverpool, 2 234 miles. What is the distance from Duluth to Liverpool?

118. A boy had a deposit of \$4.73 in the School Savings Bank; he deposits first 47 cents, then 55 cents. How much has he on deposit?

119. Noah was 600 years old when he entered the ark. He lived 350 years longer. At what age did he die?

120. Mount Aconcagua (South America), 23 500 feet high, is 5 502 feet less than Mount Everest (Asia). What is the height of the latter?

121. The Chaudière River is 120 miles long; the St. Maurice, 325; the Richelieu, 210; the Ottawa, 685 miles. What is the total length of these four rivers?

122. By the Canadian Pacific, the distance from Montreal to Rigaud is 41 miles; from Rigaud to Plantagenet, 34 miles; from Plantagenet to Ottawa, 41 miles. What is the distance from Montreal to Ottawa?

123. How many volcanoes are there on the surface of the globe, if there are 123 in America, 57 in Asia, 113 in Oceania, 15 in Europe, and 15 in Africa?

124. By the Canadian Pacific, it is 59 miles from Montreal to Berthier, 37 miles from Berthier to Three Rivers, and 77 miles from Three Rivers to Quebec. What is the distance from Montreal to Quebec?

125. With the naked eye we can see 20 stars of the first magnitude, 68 of the second, 192 of the third, 420 of the fourth, 1 100 of the fifth, and 3 200 of the sixth. How many can we see in all?

126. The civil list in England is \$2 350 000; in Austria-Hungary, \$3 875 000; in Italy, \$2 858 000; in Bavaria, \$1 623 000; in Prussia, \$3 846 000. Find the sum.

127. Lake Mistassini has an area of 975 square miles; Lake Melville, 1 298 square miles; Lake Temiskaming, 117 square miles. What is the total area of the three lakes?

128. How many lighthouses are there in our country, if the Province of Quebec has 169; Ontario, 226; Nova Scotia, 228; New Brunswick, 109; British Columbia, 47; Prince Edward Island, 41; and Manitoba, 5?

129. In 1755, in the district of Minas, Colonel Winslow had 255 houses burnt, plus 276 barns and 167 other buildings. Find the number of buildings destroyed.

130. A shoemaker sold a family 3 pair of shoes for \$8.75, 3 pair of slippers for \$3.75, 5 pair of laces for 15 cents, 3 pair of rubbers for \$2.70; he also did mending to the amount of \$4.10. How much does the family owe him?

131. In 5 months, my cows gave: 8 752 pounds of milk the first month; 8 323 pounds the second; 7 943 pounds the

third; 7 168 pounds the fourth; 6 329 pounds the fifth. How many pounds in all did they give?

132. Find the sum of two thousand one hundred and two, five thousand seven hundred and thirty-four, two thousand two hundred and ninety-one, and six thousand eight hundred and thirty-eight.

133. Add six thousand one hundred and fifteen, seven thousand and thirty-six, five thousand nine hundred and fourteen, and four thousand eight hundred and thirteen.

134. Write in Arabic figures and add: $XXIV + IX + XLVIII + XIX + XXXVII + XLI$.

135. Write in Arabic figures and add: $XVIII + XXV + XXXVII + XL + LIII + LIX + LXXVII + LXXXIV$.

136. A mail carrier distributed 25 letters and 48 post cards to 28 people, 36 letters and 25 post cards to 47 other people. How many letters and post cards did he distribute in all? To how many people?

137. A merchant sold 72 yards of cloth for \$288, 38 yards for \$76, and 143 yards for \$228. How many yards did he sell, and what sum did he receive?

138. During an agricultural exhibition, three hotelkeepers sold respectively 2 340, 3 992 and 5 812 glasses of whiskey. Their receipts were \$121.40, \$210.50 and \$299.75. Find the number of glasses sold, and the sum of money spent for no profit.

139. The St. Lawrence is 2 200 miles long; the Amazon, 3 596; the Mississippi, 2 616, and the Missouri, 2 908. What is the total length of these rivers?

140. Find the total number of Indians in Montcalm's army on the 29th of July, 1757, if there were 47 Algonquins, 245 Abenakis, 363 Iroquois, 52 Hurons, 337 Ottawas, and 755 from other tribes.

141. Find the total area of the Great Lakes, if Lake Superior has an area of 31 420 square miles; Lake Michigan, 25 590; Lake Huron, 23 780; Lake Erie, 10 030; and Lake Ontario, 7 330.

142. The Acadians of Grand Pré had, in 1755, 1 269 oxen, 6 564 cows and calves, 493 horses, 8 690 sheep, 4 197 pigs. How many animals did they have in all?

143. A workman spent \$3.45 on Saturday night at the tavern; he lost his watch estimated at \$6.50; on Monday he was of -k, thus losing \$1.40. How much did his fatal passion cost him?

Second Series.

144. Henry is 45 years old, and James, 17 years older. Find the sum of their ages.

145. A workman earned \$53.40, another one, \$20.65 more than the first. What sum is required to pay them?

146. Find the total deaths in New York in 1908, if there were 28 625 among the women and 3 951 more among the men.

147. Your father has three farms. The first has an area of 34 acres; the second, 27 acres more than the first; the third equals the two others together. What is the total area of the three farms?

148. I have three purses: the first contains \$4.50; the second, \$3.17 more than the first; the third, \$1.89 more than the two others together. How much money have I?

149. How much money did a man borrow who repaid \$293 at first, then \$598 as a second remittance, if he still owes \$745?

150. At Fort Oswego, Montcalm took from the English 2 980 cannon balls and 450 bombs, at Fort William Henry, 2 582 cannon balls and 545 bombs. Find the total number of projectiles taken.

151. Find the sum of thirty-seven thousand five hundred and four, five hundred and sixty thousand seven hundred and seventy-five, one hundred thousand three hundred and thirty-seven, ninety-one thousand and six, and fifteen hundred and seven.

152. A trader buys two horses at \$120 each; he sells one at a profit of \$20, and the other at cost. How much does he receive for both?

153. Write in Arabic figures and add: DCCCXCVI + MDCLXV + MDCCXXV + CDXCVI.

154. Write in Arabic figures and add: MDCCXLV + CCLXIV + DCXLIII + MDCLIX.

155. In 1902 Canada exported 27 855 978 pounds of butter; in 1903, 34 100 000 pounds; in 1904, 24 568 001 pounds; in 1905, 31 764 303 pounds; in 1906, 34 031 525 pounds. How many pounds were exported during the five years?

156. A certain sum is divided among three men. The first receives \$75.83; the second, \$20 more than the first; the third, \$28.34 more than the other two together. Find the sum divided.

157. A fruit merchant receives 4 cases of apples. The first case contains 60; the second, 12 more than the first; the third, 10 more than the second; the fourth, as many as the first and third together. How many apples do the four cases contain?

158. The first of the four falls of the Manicouagan River has a force of 331 456 horse power; the second, 575 000; the third, 265 000; and the fourth, 20 000. Find the total.

159. In 1903, 128 364 immigrants came to Canada; in 1904, 130 330; in 1905, 146 266; in 1906, 189 064; in 1907, 252 038; in 1908, 262 469. How many immigrants in all came during that period?

160. The Experimental Farm of Ottawa distributed in 1906, 13 880 samples of oats, 4 229 samples of barley, 9 959 samples of wheat, 17 samples of peas, 1 116 samples of Indian corn, and 13 736 samples of potatoes. How many samples did it distribute in all?

161. On Monday a traveller goes 28 miles; on Tuesday, 13 miles more than on Monday; on Wednesday, 16 miles more than on Tuesday. How far did he go in three days?

162. A clock strikes only the hour. How many strokes will it strike in a day of 24 hours?

163. On the 29th of July, 1757, Montcalm's army consisted of 2 570 foot soldiers, 3 470 sailors, 180 gunners, and 1 799 Indians. Find the effective force of the army.

164. Find the number of miles of railway in Canada in 1907, the Province of Quebec possessing 3 515; Alberta, 1 323; British Columbia, 1 685; Manitoba, 3 074; New Brunswick, 1 503; Nova Scotia, 1 329; Ontario, 7 638; Prince Edward Island, 268; Saskatchewan, 2 025; Yukon Territory, 90.

165. In 1906, the fisheries of the Province of Quebec gave the following receipts: the fish, \$772 000; the lobster, \$212 159; the salmon, \$158 000, the herring, \$156 000; the mackerel, \$35 321; the other fish, \$798 973; fish oil, \$42 547. What were the total receipts?

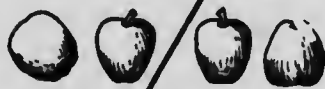
166. A dictionary comprises 7 volumes. The first volume contains 1 067 pages; the second, 1 156; the third, 1 096; the fourth, 1 196; the fifth, 1 196; the sixth, 1 254; the seventh, 1 232. How many pages in the dictionary?

SUBTRACTION

PROBLEM.—Yvonne had *eight* apples and she gave *three*



to Josie: how many has she left? After giving one, she had seven left; after giving another, she had six left; finally, after giving another, she had *five* left.



This operation is a *subtraction*.

45. Subtraction is the operation of taking one number from another of the same kind.

46. The bigger number is called the *minuend*; the smaller, the *subtrahend*; the result is called the *remainder* or *difference*.

The sign of subtraction is — and is read *minus*.

It is placed between the numbers to be subtracted, the larger number being placed before this sign and the smaller, after it.

Ex. — $12 - 5 = 7$ is read. 12 minus 5 equals 7.

EXAMPLE. — Subtract 5 847 from 8 573.

OPERATION.

ANALYSIS.

$$\begin{array}{rcl} 8\ 573 & = & 8\ \text{thousands} + 5\ \text{hundreds} + 7\ \text{tens} + 3\ \text{units;} \\ 5\ 847 & = & 5\ \text{thousands} + 8\ \text{hundreds} + 4\ \text{tens} + 7\ \text{units;} \\ \hline 2\ 726 & = & 2\ \text{thousands} + 7\ \text{hundreds} + 2\ \text{tens} + 6\ \text{units.} \end{array}$$

47. Rule. — 1^o Place the smaller number under the greater, so that like units shall stand under one another.

2^o Take away the units' figure of the subtrahend from the units' figure of the minuend and write the remainder as the units' figure of the answer.

3^o Operate thus with the tens, hundreds, etc.

4^o When any figure in the subtrahend is greater than the corresponding figure in the minuend, mentally add 10 to the latter before subtracting; and before subtracting the next term, take away 1 from the figure of the minuend.

48. Proof of subtraction.—To prove a subtraction, add the remainder or difference to the subtrahend, and their sum should equal the minuend.

Written Exercises.

Subtract the following:

1.
$$\begin{array}{r} 84 \\ - 32 \\ \hline \end{array}$$

2.
$$\begin{array}{r} 97 \\ - 63 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 99 \\ - 48 \\ \hline \end{array}$$

4.
$$\begin{array}{r} 66 \\ - 21 \\ \hline \end{array}$$

5.
$$\begin{array}{r} 143 \\ - 120 \\ \hline \end{array}$$

6.
$$\begin{array}{r} 245 \\ - 224 \\ \hline \end{array}$$

7.
$$\begin{array}{r} 328 \\ - 216 \\ \hline \end{array}$$

8.
$$\begin{array}{r} 548 \\ - 321 \\ \hline \end{array}$$

9.
$$\begin{array}{r} 675 \\ - 312 \\ \hline \end{array}$$

10.
$$\begin{array}{r} 642 \\ - 521 \\ \hline \end{array}$$

11.
$$\begin{array}{r} 476 \\ - 272 \\ \hline \end{array}$$

12.
$$\begin{array}{r} 938 \\ - 735 \\ \hline \end{array}$$

SUBTRACTION

23

13. $\begin{array}{r} 6\ 874 \\ 3\ 542 \\ \hline \end{array}$	14. $\begin{array}{r} 8\ 579 \\ 5\ 424 \\ \hline \end{array}$	15. $\begin{array}{r} 5\ 767 \\ 5\ 434 \\ \hline \end{array}$	16. $\begin{array}{r} 6\ 842 \\ 5\ 442 \\ \hline \end{array}$
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17. $\begin{array}{r} 3\ 886 \\ 2\ 889 \\ \hline \end{array}$	18. $\begin{array}{r} 7\ 204 \\ 128 \\ \hline \end{array}$	19. $\begin{array}{r} 5\ 840 \\ 3\ 978 \\ \hline \end{array}$	20. $\begin{array}{r} 9\ 086 \\ 7\ 398 \\ \hline \end{array}$
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21. $\begin{array}{r} 5\ 200 \\ 709 \\ \hline \end{array}$	22. $\begin{array}{r} 2\ 001 \\ 1\ 003 \\ \hline \end{array}$	23. $\begin{array}{r} 1\ 002 \\ 509 \\ \hline \end{array}$	24. $\begin{array}{r} 4\ 010 \\ 2\ 409 \\ \hline \end{array}$
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25. 784—348.	30. 5 400—4 567.	35. 3 264—1 006.
26. 836—499.	31. 2 345—670.	36. 7 654—6 765.
27. 948—730.	32. 1 234—567.	37. 4 265—3 266.
28. 790—639.	33. 8 000—7 201.	38. 2 654—1 576.
29. 941—592.	34. 3 456—701.	39. 3 652—2 741.

40. $\begin{array}{r} \$57.14 \\ 27.84 \\ \hline \end{array}$	41. $\begin{array}{r} \$72.03 \\ 48.15 \\ \hline \end{array}$	42. $\begin{array}{r} \$571.23 \\ 278.51 \\ \hline \end{array}$	43. $\begin{array}{r} \$605.32 \\ 518.18 \\ \hline \end{array}$
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44. $\begin{array}{r} \$657.00 \\ 472.82 \\ \hline \end{array}$	45. $\begin{array}{r} \$804.08 \\ 393.85 \\ \hline \end{array}$	46. $\begin{array}{r} \$600.01 \\ 390.42 \\ \hline \end{array}$	47. $\begin{array}{r} \$900.40 \\ 21.08 \\ \hline \end{array}$
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48. 65 725—21 634.	63. \$4 613.78—\$496.
49. \$5 435.48—\$748.	64. 37 842—7 698.
50. \$987—\$2.09.	65. \$864.78—\$7.26.
51. \$839.04—\$399.78.	66. \$7 194—\$32.14.
52. 29 260—10 750.	67. \$704.09—\$38.74.
53. \$43 685—\$417.62.	68. 6 593—1 707.
54. 85 637—812.	69. \$173.80—\$34.17.
55. \$740.01—\$17.47.	70. \$2 341—\$99.70.
56. \$6 194—\$544.18.	71. 80 014—43 190.
57. 9 082—3 749.	72. \$19 700—\$13 611.11.
58. \$1 943.18—\$421.34.	73. 941 000—5 007.
59. \$947—\$728.36.	74. \$7 673.40—\$5 039.
60. 3 804—2 948	75. 5 010 198—4 926 899.
61. 493 000—93 249	76. \$1 000—\$98.75.
62. \$7 845—\$3 754.29.	77. 489 431—385 208.

- | | |
|----------------------------|-----------------------------|
| 78. \$7 624.65—\$2 061.05. | 83. \$7 042.79—\$2 859.99. |
| 79. \$885 926—\$10 789.53. | 84. 490 048—7 548. |
| 80. 3 886 732—135 011. | 85. 8 048—3 249. |
| 81. 563 181—32 040. | 86. \$10 220.07—\$9 597.16. |
| 82. \$7 845.98—\$6 828. | 87. \$10 420.21—\$9 099.87. |

Review Exercises.

- | | |
|---------------------------|-----------------------------|
| 83. $(780 + 310) - 615$. | 93. $(8\,542 + 98) - 999$. |
| 89. $(243 + 848) - 739$. | 94. $(79 + 9\,846) - 798$. |
| 93. $(728 - 519) + 613$. | 95. $673 + (728 - 349)$. |
| 91. $(338 - 229) + 995$. | 96. $921 - (328 + 438)$. |
| 92. $(810 + 247) - 949$. | 97. $4\,356 + (423 - 98)$. |
-
- | |
|------------------------------------|
| 98. $(723 + 475) - (328 + 613)$. |
| 99. $(875 - 378) + (875 - 628)$. |
| 100. $(619 + 328) - (375 - 219)$. |
| 101. $(472 - 241) + (617 - 325)$. |
| 102. $(470 + 312) - (472 - 328)$. |

4). Principles of Analysis relating to Subtraction:

4. I subtract because I wish to find the *difference* between..... and.....

5. I subtract because I wish to find *what is left* or *what remains*.

6. I subtract because..... (what is asked) is *less than*..... (what is given).

50. NOTES. — I. Give constant attention to the key-words: *difference between, what is left, what remains, less than*.

II. The *difference* is how much one quantity is greater than, or less than another.

III. Principle 4 would analyze problems 111, 113, 114, 115, of the following exercises.

Principle 5, problems 103, 104, 106, 108, 109, 110, 112.

Principle 6, problems 105, 107, 116.

Oral Exercises.

103. The sum of the ages of John and Arthur is 33 years. John is 12 years old. How old is Arthur?

104. A child had 25 cents and he gave 18 to the poor. How many has he left?

105. My brother is 25 years old, and I am 12 years less than he. What is my age?

106. Out of a flock of 37 plovers, George killed 13. How many escaped?

107. Champlain died at the age of 68 years, or 27 years after founding Quebec. How old was he when he founded the city?

108. Viator received 18 cents from his uncle and 12 from his aunt; but he spent 15 cents. How much has he left?

109. Peter had 74 marbles; he won 6 and then lost 20. How many has he now?

110. How much is still due to a workman who has made a cupboard worth \$18, and a table worth \$12, if he has already received

111. Henry bought 2 balls for \$1.25; he sells one for 70 cents and the other for 80 cents. What does he gain?

112. A boy who earns \$4.50 a week spends 50 cents gambling, 35 cents in cigarettes, and 15 cents in candy. How much has he remaining?

Problems on Subtraction.

113. Bishop Laval died in 1708 and Bishop Plessis in 1825. How many years between the deaths of these two prelates?

114. In 1625, Father Brebeuf arrived in Canada; he was martyred by the Iroquois in 1649. How many years did he live in Canada?

115. Certain trees of California are 425 feet high; the highest of British Columbia are 295 feet. How much higher are the former than the latter?

116. William said to Leo: "Let some one give me \$3.18 more and I shall have \$25 in the School Savings Bank." How much has William on deposit?

117. A certain number has been taken from 847 and the remainder is 298. Find the number taken away.

118. In 1889, Canada had 13 324 miles of railway; in 1905, it had 19 587. What was the increase?

119. London, the most populous city in the world, has 5 869 taverns; and New York, which holds the second rank by its population, has 10 821. How many more taverns has New York than London?

120. The St. Lawrence River is about 2 250 miles long and the Mississippi, 2 616 miles. What is their difference in length?

121. Gold melts at a temperature of 2 518 Fahrenheit degrees, and silver, at 1 832 degrees. Find the difference between the two temperatures.

122. The altitude of Chimborazo, in Ecuador, is 21 420 feet, and that of Mount Logan, in Canada, is 19 519. Find the difference.

123. What is the remainder in subtracting seventy-two thousand four hundred dollars from eighty-two thousand six hundred and six dollars?

124. Before the battle of Ste. Foy, Lévis had 6 910 men; after the battle, 5 911 answered the call. How many men did he lose?

125. In Alaska snow ceases to melt at an altitude of 4 800 feet. Mount St. Elias arising 18 024 feet, what height of this peak is always covered with snow?

126. A farmer's wife had 240 chickens, 53 ducks and 28 geese. She lost 76 chickens, 13 ducks and 5 geese. How many remain of each kind?

127. A hatter sold 880 hats, 3 980 caps, and 28 callots last year. This year he sold only 772 hats, 3 740 caps, and 13 callots. How many less of each kind did he sell this year?

128. In a certain country, out of 81 772 condemnations, 34 753 were for drunkenness. How many were caused by other offences?

ADDITION AND SUBTRACTION.

First Review.

1. In cutting a stone, 87 pounds are taken off, and it still weighs 389 pounds. What was the weight of the stone?

2. In one class, there are 35 pupils; in another, 38, and in a third one, 40. How many pupils are there in the three classes?

3. A clerk earns \$950 a year; he spends \$425. How much has he left?

4. How much must be added to 998 to have 3 000?

5. A mason in drinking spent 55 cents on Monday, \$1.05 on Tuesday, 35 cents on Wednesday, \$1.10 on Thursday, 80 cents on Friday, and \$2.80 on Saturday. How much did he spend while ruining his health?

6. A father was 38 years old when his son was born. What will be the son's age when the father is 65 years old?

7. Michael is reading a book of 340 pages. He is over to page 128. How many pages remain to be read?

8. What must be added to one hundred and three thousand one hundred and three to have two hundred and two thousand two hundred and two?

9. A man buys a house for \$8 783, and sells it for \$9 890. How much does he gain?

10. A man has a farm that cost \$15 800. For how much must he sell it, if he wishes to gain \$3 450?

11. If Leo should deposit \$1.72 more in the School Savings Bank, he would have \$20. How much has he on deposit?

12. A merchant bought \$875 worth of cloth, \$270 worth of velvet, \$318 worth of cotton, and \$412 worth of other goods. What sum did he spend?

13. Write in Arabic figures and add: CCXLIX + DLXXXIV + DCCCIV + MDCIV + MDCCCLXXI + MLIX.
14. If I add 355 to the number of my good marks, I shall have 1 423. How many marks have I?
15. A city had a population of 358 550. What is its present population, if at first it increased 13 400, and then 17 943?
16. I owed \$375.48 and I paid \$170.50. How much do I still owe?
17. Peter has a farm valued at \$10 300; he has \$4 475 in the bank and another property worth \$5 470. What is his fortune?
18. Two boats leave Quebec; one goes 75 miles down the river and the other, 93 miles up the river. How far apart are they now?
19. A real estate agent wishes to gain \$375 on a house for which he paid \$4 820. How much must he sell it for?
20. What must be taken from 8 839 to have 5 943?
21. Printing was invented in the year 1450. How many years between that date and 1910?
22. Henry spent \$145 and has left \$420. How much had he at first?
23. The difference between two numbers is 7 834; the larger is 12 448. What is the smaller?
24. James buys a property for \$12 400; he pays \$1 500 for improvements and sells it at a profit of \$880 on the total cost. How much does he sell it for?
25. A car loaded with coal weighs 128 378 pounds; the car alone weighs 39 549 pounds. What is the weight of the coal?
26. A charitable person dying, leaves \$74 385. Of that sum he gives by will \$65 600 to his family, and the rest to a hospital. What sum will the hospital receive?
27. I have just lost \$1.28. If I had lost \$2.30 more, I should have \$4.28 left. How much had I at first?

28. How much must be added to 89 476 to have 97 342?
29. In 1673, there were 6 705 souls in New France, and in 1720, there were 17 729 more. What was the population in 1720?
30. A clerk sells goods for \$12.75 to one family, and for \$3.39 to another. What is the amount of the two invoices?
31. A long addition was divided into two partial additions, one of which gave the sum of 47 327, and the other, 59 743. What was the grand total?
32. A man owes \$843.70 and he has only \$719.75. How much does he lack to pay his debt?
33. Joseph made two deposits in the School Savings Bank, together amounting to \$1.89. If the first deposit was 97 cents, what was the second?
34. Gold weighs 1 212 pounds a cubic foot, lead, 709 pounds. Find the difference between the two weights.
35. To pay a debt of \$7 438.23 I had to borrow \$880. How much had I at first?
36. A man was married at 24 years of age; he became a widower 30 years later, and outlived his wife 22 years. How old was he when he died?
37. In 1901, according to the census of the Province of Quebec, the country population was 992 667 inhabitants, and the city population was 656 231. Find the difference.
38. 543 cords of maple were sold for \$2 172; 672 cords of wild cherry, for \$2 362; 474 cords of beech, for \$1 422; and 358 cords of oak, for \$894. How many cords of wood were sold? What sum was received?
39. Henry buys a pair of trousers for \$4.50, a vest for \$5.25, a pair of boots for \$3.25, and a hat for \$3. He has \$34 left. How much had he at first?
40. John spent \$143.43 to cultivate a garden which brought him in \$286. What is his profit?
41. The distance from Quebec to Liverpool is 2 625 miles, and from Quebec to Havana (Cuba), 2 340 miles. What is the difference?

42. If 5 523 is added to a certain number, the sum equals 8 379. What is the number?
43. What sum must Peter ask of his parents to buy a suit worth \$18.50, if he already has \$9.85?
44. In 1906, what was the total number of miles of railroad in the five parts of the world, if America had 285 957 miles; Europe, 192 521; Asia, 50 593; Africa, 16 538; and Oceania, 17 441?
45. What is the difference between twenty-four million and thirty-six, and thirty-three million sixteen thousand and nineteen?
46. In 1896, Canada exported Canadian products to the amount of \$105 378 752; in 1906, to the amount of \$235 - 483 956. What was the increase?
47. A hospital has 475 beds. At present 240 men, 97 women, and 56 children are being cared for. How many beds are unoccupied?
48. A grocer paid \$12.50 for coffee, \$5.50 for tea, \$16.50 for sugar, and \$15.25 for flour. By gaining \$3.50 on the coffee, \$2.75 on the tea, \$4.50 on the sugar, and \$5.75 on the flour, what is the total sum received?
49. A man has \$128.85. How much does he lack to have \$400?
50. The pupils of a school subscribe \$25 to assist a young unhappy comrade. The oldest students give \$12.40; the middle-aged, \$7.60. What sum do the youngest give to complete the \$25?
51. A merchant had 1 200 plates in his store; he sold 72 to one woman, and 648 to another. How many has he left?
52. It is 333 miles from Montreal to Toronto, 173 miles from Toronto to Sarnia, and 338 miles from Sarnia to Chicago. What is the distance from Montreal to Chicago?
53. At the battle of Waterloo, Wellington had 72 000 men under his orders. Of that number 23 185 were killed or wounded. How many men came out of the battle safe and sound?

Second Review.

54. A workman spends Saturday evening at the tavern and wastes \$2.80. Besides, he buys \$1.45 worth of alcohol. He is sick on Monday and loses his day, say \$2.25. How much has the vice of drunkenness made him lose during these three days?

55. How many years passed since the founding of Rome in the year 753 before the Christian era, to the founding of Toronto in the year 1794 of our era?

56. Travelling by water, it is 154 miles from Montreal to Kingston; passing by Kingston, it is 297 miles from Montreal to Toronto. What is the distance from Kingston to Toronto?

57. How much does 104 840 exceed 92 734?

58. From 1871 to 1906, in the whole world, 2 267 937 patent rights were given. In the United States, 729 182 were given. How many were granted by the other countries?

59. From Montreal to Lévis it is 163 miles; from Lévis to Rimouski, 180 miles; from Rimouski to St. John (N.B.), 397 miles. What is the distance from Montreal to St. John?

60. To pay his debt, George gave a note for \$1 000 and a check for \$1 588; but the creditor had to return \$174. What was the amount of the debt?

61. A tailoress bought thread for \$1.25, silk for \$4.30, needles for 25 cents, cotton for 45 cents. After paying for the purchases she had \$3.75 left. How much money had she at first?

62. Three evening parties were given in favor of the poor. The first brought in \$145; the second, \$175; and the third, \$225. How much will be received if the expenses are \$32.75?

63. Andrew has \$24.12 in the School Savings Bank. He makes three other deposits, the first of \$2.10, the second of \$1.44, and the third of \$4.12. If he takes out \$5.15, how much remains on deposit?

64. The sum of three numbers is 3 548 324. If two of the numbers united equal 2 989 798, what is the third?
65. A regiment was composed of 3 400 soldiers. It lost 428 of its men in the first battle and 148 in the second; 248 others died in the hospital. How many men remain?
66. After having earned \$55 a young man spent successively \$8.45, \$8.70, \$9.30, and \$6.20. How much has he left?
67. A dealer bought a hogshead of molasses for \$34. He sold part of it for \$16.50. How much must he receive for the rest to gain \$12 on the whole?
68. John had \$78.45 on deposit in the Hochelaga Bank; he makes a further deposit of \$34.38, then he takes \$67.50 out, and later on, \$42.75. How much has he remaining in the bank?
69. Daniel bought potatoes for \$38.40, flour for \$8.50, and spices for \$5.40. He gives in payment three 20-dollar bank bills; how much is to be returned to him?
70. In 1692, the population of New France was 12 431 souls; in 1706, it had increased 4 086. What was the population in 1760, if there were 53 483 souls more than in 1706?
71. A father is 28 years older than his son, who is 16 years old. Find the sum of their ages.
72. A workman earns \$615 a year; he spends \$188 for his board, \$53 for clothes, and \$125 for other ends. How much has he left?
73. Arthur owes me \$135.48, and Henry, \$214.70. The former gives me \$131, and the latter, \$148.90. Find the sum of what they still owe me.
74. After having sold 158 sheep, a trader bought 97 others, and then had 120. How many had he at first?
75. I bought a farm for \$2 240, and I had a house built on it which cost \$8 427. I sold the property for \$15 640. What was my gain?
76. In one month three cows gave 445 gallons of milk; one of them gave 155 gallons; another, 140. How many gallons did the third one give?

77. Ernest threw a ball 108 feet, and Patrick threw another 25 feet farther. How many feet must Patrick walk to fetch his ball back to the place it was thrown from?

78. A man buys a bedstead for \$8.25, drawers for \$13.50, a cupboard for \$22.75, and a food safe for \$14.50; he gives a 75-dollar bill. How much change is returned?

79. Three cases respectively contain 216, 237, and 358 oranges. If 163 are spoiled, how many are sound?

80. A clerk who earns \$900 a year spends \$290 for board and clothing, \$50 for lodging, and \$12 for an insurance. How much can he save?

81. A pedestrian leaving Montreal walks 25 miles on Monday, 28 on Tuesday, 30 on Wednesday. On Thursday he turns back, walking 33 miles towards Montreal. How far is he from the city Thursday evening?

82. A man owes \$3843. He makes two instalments, one of \$883, and the other of \$739; but then his debt increased \$672. How much does he then owe?

83. Into an oil tank that holds 8500 gallons, a man pours successively 840, 783, 2866 and 3286 gallons. How many more gallons must be poured in to fill the tank?

84. A cask of wine cost \$47.50; the freight cost \$3.78, and it cost 50 cents to put it into the cellar. What did the wine cost, if the empty cask is worth \$1.50?

85. A train has 948 passengers; it stops three times on the way. At the first stop, 58 passengers get off; at the second, 183; and at the third, 98. How many passengers make the whole journey?

86. John, who had \$8.38, spent \$4.80. James who had \$3.28, earned \$2.85. Which one has the more now, and how much more?

87. A telephone company bought 48500 poles; it received 8500, then 12900 and 24200. How many more has it to receive?

88. A manufacturer has 12480 gallons of oil. He sells 508 gallons for \$355, 869 gallons for \$560 and 8368 gallons for \$4805. How many gallons has he left? How much

must he receive for the remainder that the total receipts amount to \$8 680?

89. If Arthur were born 12 years sooner he would have been 25 years in 1910. In what year was he born?

90. The sum of the ages of a father and of his son is 127. The father is 87 years old. How many years older than his son is he?

91. Joseph's and Philip's ages together equal 106 years. Joseph, who was born in 1846, is 64 years old. In what year was Philip born?

92. A merchant buys a cupboard for \$26 and a table for \$12.50. In selling them he gains \$12.25 on the cupboard and loses \$4.75 on the table. How much did he receive for the two pieces of furniture?

93. The smaller of two numbers is 7 845, and their sum is 18 329. What is the larger?

94. Subtract the difference between 25 048 and 21 949 from the difference between 738 237 and 604 309.

95. The larger of two numbers is 3 472 348, and their difference is 470 415. How much more than 1 438 420 is the smaller number?

96. From the sum of 3 843 and 2 194 take their difference.

97. If I had gained \$25 on my house which cost me \$570, I should have sold it for \$50 more than I did. How much did I sell it for?

98. Francis has \$8.43 in the School Savings Bank; Peter, \$7.28; and James, \$5.72. How much did Ernest deposit, if his deposit added to that of his three comrades gives the sum of \$31.45?

99. A certain sum is divided among three persons. The first receives \$310; the second, \$60 more than the first, and the third, \$80 less than the two others together. Find the sum divided.

100. An elm is 35 feet high, and an oak, 17 feet shorter. What is the height of a poplar that is 25 feet higher than the oak?

101. A father when dying left \$25 000 to his three sons: the first received \$10 000; the second, \$3 000 less than the first; and the third, the rest. How much did each of the last two receive?

102. From the difference between 2 092 and 1 319 subtract the difference between 5 824 and 5 241.

103. A merchant received \$220 on Monday; \$30 less on Tuesday; on Wednesday, \$80 less than on Monday and Tuesday together. How much did he receive on Thursday, if his total receipts for the four days were \$990?

104. What is the number which added to the difference between 1 604 and 1 468 gives 4 020?

105. Herman has 34 marbles more than Cletus, who has only 5; but Cletus wins 13 of Herman's. How many more has Herman than Cletus now?

106. Joseph has 125 good marks, Henry has 27 more than Joseph, and Ernest has 112 less than the two first. How many have the three together?

107. A basket contains apples, bananas and oranges, the total number of which is 847. The sum of the apples and bananas equals 640; that of the bananas and oranges, 560. Find the difference between the number of bananas and that of the apples.

108. Two brothers bought a horse for \$125; the older gave \$83. How much more than the younger did he give?

Examination Problems.

1. A man bought a piano for \$350; seeing he paid cash, they took off \$35. How much did the piano cost him, if he paid \$8.75 for the transport?

2. A cashier had \$245.65, and received \$385.80; but he paid \$261.50, then \$192.25. How much cash had he left on hand?

3. I received two cases of oranges; in one there were 155 oranges, and in the other, 47 more. How many did the two cases contain?

4. A farmer had 567 sheep after having sold 248. He bought 324. How many has he now?
5. The sum of three numbers is 13 130; the first is 1 126; the second, 4 718. What is the third?
6. Two workmen received \$225 for a job. The first received \$120; how much more than the other did he earn?
7. Add the difference between 38 423 and 29 941 with the difference between 37 647 and 22 833.
8. Three boys divided among themselves a certain number of marbles: the first took 78; the second, 20 more than the first; and the third, the 68 that were left. What was the number of marbles divided?
9. Peter and Paul started off for town together. Peter had \$58. When one of the two had spent \$38, and the other, \$36, the two together had \$44 left. Find the sum that Paul had when he started for town.
10. Two associates bought a store for \$25 700; one paid \$15 825. How much more than the other did he pay?

MULTIPLICATION

PROBLEM.—I had *three* pears, and *three* others were given to me. How many have I now?



Grouping the pears, I say: "Two times three are six". I may also say: "Three times two are six". When I act thus, *without adding*, I make a *multiplication*.



51. Multiplication is an operation by which a number is repeated as many times as there are units in another number.

52. The number repeated is called the *multiplicand*; and the number which indicates how many times it is to be repeated is called *multiplier*.

53. The result of a multiplication is called the **product**.
The multiplicand and the multiplier are called the **factors** of the product.

To multiply with ease, it is necessary to know the following table by heart.

Multiplication Table.

Twice	Three times	Four times	Five times	Six times	Seven times
1 are 2	1 are 3	1 are 4	1 are 5	1 are 6	1 are 7
2 .. 4	2 .. 6	2 .. 8	2 .. 10	2 .. 12	2 .. 14
3 .. 6	3 .. 9	3 .. 12	3 .. 15	3 .. 18	3 .. 21
4 .. 8	4 .. 12	4 .. 16	4 .. 20	4 .. 24	4 .. 28
5 .. 10	5 .. 15	5 .. 20	5 .. 25	5 .. 30	5 .. 35
6 .. 12	6 .. 18	6 .. 24	6 .. 30	6 .. 36	6 .. 42
7 .. 14	7 .. 21	7 .. 28	7 .. 35	7 .. 42	7 .. 49
8 .. 16	8 .. 24	8 .. 32	8 .. 40	8 .. 48	8 .. 56
9 .. 18	9 .. 27	9 .. 36	9 .. 45	9 .. 54	9 .. 63
10 .. 20	10 .. 30	10 .. 40	10 .. 50	10 .. 60	10 .. 70
11 .. 22	11 .. 33	11 .. 44	11 .. 55	11 .. 66	11 .. 77
12 .. 24	12 .. 36	12 .. 48	12 .. 60	12 .. 72	12 .. 84

Eight times	Nine times	Ten times	Eleven times	Twelve times
1 are 8	1 are 9	1 are 10	1 are 11	1 are 12
2 .. 16	2 .. 18	2 .. 20	2 .. 22	2 .. 24
3 .. 24	3 .. 27	3 .. 30	3 .. 33	3 .. 36
4 .. 32	4 .. 36	4 .. 40	4 .. 44	4 .. 48
5 .. 40	5 .. 45	5 .. 50	5 .. 55	5 .. 60
6 .. 48	6 .. 54	6 .. 60	6 .. 66	6 .. 72
7 .. 56	7 .. 63	7 .. 70	7 .. 77	7 .. 84
8 .. 64	8 .. 72	8 .. 80	8 .. 88	8 .. 96
9 .. 72	9 .. 81	9 .. 90	9 .. 99	9 .. 108
10 .. 80	10 .. 90	10 .. 100	10 .. 110	10 .. 120
11 .. 88	11 .. 99	11 .. 110	11 .. 121	11 .. 132
12 .. 96	12 .. 108	12 .. 120	12 .. 132	12 .. 144

NOTE. — Say: 3 ones are 3, 3 twos are 6, etc.

54. The sign of multiplication is \times , and it reads *multiplied by*. The multiplicand is placed before the sign and the multiplier, after it.

Ex. — $7 \times 5 = 35$ is read: 7 multiplied by 5 equals 35.

55. 1st case. — To multiply a number of several figures by a multiplier of but one figure.

EXAMPLE. — Multiply 478 by 7.

OPERATION.

$$\begin{array}{r} 478 = \\ 7 = \end{array}$$

$$4 \text{ h.} + 7 \text{ t.} + 8 \text{ u.}$$

ANALYSIS.

$$400 \text{ u.} \times 7 = 2800 \text{ u.}$$

$$70 \text{ u.} \times 7 = 490 \text{ u.}$$

$$8 \text{ u.} \times 7 = 56 \text{ u.}$$

$$\begin{array}{r} 3346 = \\ = 3 \text{ th.} + 3 \text{ h.} + 4 \text{ t.} + 6 \text{ u.} \end{array}$$

$$478 \text{ u.} \times 7 = 3346 \text{ u.}$$

56. Rule. — Multiply successively from right to left all the figures of the multiplicand by the multiplier; write each product in the order of the figures of the multiplicand; if any of these products be more than 9, write the units and carry the tens to be added to the following product.

57. 2nd case. — To multiply a number of several figures by a multiplier of several figures.

EXAMPLE. — Multiply 4763 by 574.

OPERATION.

ANALYSIS.

4763	= multiplicand	} = factors.	
574	= multiplier		
19052	= product of 4763 by 4 units		= 19052 u.
3341	= product of 4763 by 7 tens		= 33341 t.
23815	= product of 4763 by 5 hundreds		= 23815 h.
<u>2733962</u>	= total product		= <u>2733962</u>

58. Rule. — Multiply all the figures of the multiplicand by each significant figure of the multiplier, writing the first, or right-hand figure, of each partial product under the figure of the multiplier used. Add the partial products.

59. Proof of Multiplication. — To prove a multiplication, we may multiply the multiplier by the multiplicand, and if the product is the same, the work is correct.

Written Exercises.

Multiply the following:

- | | | |
|-----------------------|----------------------|----------------------|
| 1. 214×5 . | 33. 32×23 . | 65. 88×63 . |
| 2. 649×8 . | 34. 24×24 . | 66. 43×48 . |
| 3. 770×9 . | 35. 32×32 . | 67. 39×28 . |
| 4. 729×8 . | 36. 54×14 . | 68. 36×41 . |
| 5. 641×9 . | 37. 56×15 . | 69. 49×26 . |
| 6. 810×8 . | 38. 57×16 . | 70. 41×39 . |
| 7. 708×7 . | 39. 54×17 . | 71. 75×21 . |
| 8. 849×9 . | 40. 52×18 . | 72. 83×35 . |
| 9. 2604×6 . | 41. 61×13 . | 73. 72×48 . |
| 10. 3248×7 . | 42. 55×13 . | 74. 76×42 . |
| 11. 4561×8 . | 43. 55×21 . | 75. 74×74 . |
| 12. 8504×9 . | 44. 72×17 . | 76. 55×91 . |
| 13. 9043×9 . | 45. 81×17 . | 77. 44×22 . |
| 14. 9898×8 . | 46. 33×26 . | 78. 32×32 . |
| 15. 7987×9 . | 47. 27×32 . | 79. 24×25 . |
| 16. 14×12 . | 48. 45×33 . | 80. 99×92 . |
| 17. 14×13 . | 49. 44×34 . | 81. 69×96 . |
| 18. 16×13 . | 50. 45×35 . | 82. 59×84 . |
| 19. 18×13 . | 51. 41×41 . | 83. 98×93 . |
| 20. 23×13 . | 52. 43×42 . | 84. 97×97 . |
| 21. 14×14 . | 53. 56×43 . | 85. 54×91 . |
| 22. 23×14 . | 54. 65×44 . | 86. 37×73 . |
| 23. 32×15 . | 55. 78×45 . | 87. 94×68 . |
| 24. 43×16 . | 56. 36×41 . | 88. 92×92 . |
| 25. 45×16 . | 57. 51×43 . | 89. 83×97 . |
| 26. 61×14 . | 58. 65×61 . | 90. 77×75 . |
| 27. 55×14 . | 59. 81×71 . | 91. 37×74 . |
| 28. 15×21 . | 60. 81×52 . | 92. 72×77 . |
| 29. 24×21 . | 61. 86×53 . | 93. 63×88 . |
| 30. 62×21 . | 62. 82×54 . | 94. 72×62 . |
| 31. 44×22 . | 63. 66×55 . | 95. 95×95 . |
| 32. 48×22 . | 64. 72×62 . | 96. 83×28 . |

OPERATIONS ON WHOLE NUMBERS

97. 35×27 .	115. 398×84 .	133. $9\,064 \times 84$.
98. 49×99 .	116. 918×61 .	134. $7\,492 \times 56$.
99. 75×83 .	117. 869×89 .	135. $1\,924 \times 53$.
100. 76×79 .	118. 334×87 .	136. $7\,122 \times 33$.
101. 88×88 .	119. 325×92 .	137. $1\,999 \times 85$.
102. 99×99 .	120. 998×90 .	138. $1\,467 \times 29$.
103. 76×97 .	121. $5\,975 \times 69$.	139. $5\,786 \times 21$.
104. 39×38 .	122. $2\,185 \times 52$.	140. $3\,311 \times 90$.
105. 97×98 .	123. $7\,999 \times 75$.	141. $1\,879 \times 80$.
106. 322×15 .	124. $3\,231 \times 54$.	142. $4\,375 \times 60$.
107. 216×28 .	125. $9\,567 \times 87$.	143. $8\,590 \times 95$.
108. 343×38 .	126. $2\,042 \times 51$.	144. $5\,080 \times 28$.
109. 204×49 .	127. $2\,661 \times 55$.	145. $3\,210 \times 40$.
110. 402×56 .	128. $5\,369 \times 43$.	146. $4\,820 \times 43$.
111. 123×67 .	129. $8\,978 \times 37$.	147. $4\,056 \times 36$.
112. 203×78 .	130. $4\,636 \times 42$.	148. $4\,009 \times 98$.
113. 412×86 .	131. $3\,777 \times 67$.	149. $9\,090 \times 90$.
114. 502×98 .	132. $8\,442 \times 59$.	150. $8\,900 \times 89$.

151. $3\,259 \times 414$.	166. $31\,764 \times 234$.
152. $3\,845 \times 236$.	167. $43\,940 \times 513$.
153. $4\,873 \times 273$.	168. $97\,386 \times 226$.
154. $7\,186 \times 314$.	169. $15\,431 \times 437$.
155. $3\,259 \times 497$.	170. $80\,575 \times 946$.
156. $31\,346 \times 216$.	171. $5\,647 \times 234$.
157. $42\,670 \times 523$.	172. $8\,645 \times 427$.
158. $10\,301 \times 312$.	173. $9\,275 \times 731$.
159. $18\,178 \times 242$.	174. $7\,319 \times 394$.
160. $33\,472 \times 316$.	175. $3\,186 \times 839$.
161. $5\,327 \times 420$.	176. $58\,943 \times 119$.
162. $6\,873 \times 530$.	177. $47\,657 \times 431$.
163. $4\,769 \times 344$.	178. $75\,324 \times 523$.
164. $2\,918 \times 364$.	179. $57\,145 \times 746$.
165. $8\,462 \times 820$.	180. $83\,145 \times 746$.

181. $\$0.23 \times 217$.	186. $\$1.14 \times 72$.	191. $\$0.08 \times 243$.
182. $\$0.27 \times 306$.	187. $\$1.34 \times 73$.	192. $\$0.07 \times 370$.
183. $\$0.28 \times 407$.	188. $\$2.30 \times 19$.	193. $\$4.77 \times 480$.
184. $\$0.36 \times 614$.	189. $\$3.09 \times 37$.	194. $\$5.46 \times 963$.
185. $\$0.46 \times 630$.	190. $\$4.50 \times 49$.	195. $\$1.46 \times 631$.

- | | |
|-------------------------------|-------------------------------|
| 196. 384×46 . | 206. $\$40.04 \times 909$. |
| 197. 601×54 . | 207. $\$0.64 \times 122$. |
| 198. $\$5.56 \times 63$. | 208. $\$49 \times 400$. |
| 199. $1\ 263 \times 36$. | 209. $3\ 259 \times 497$. |
| 200. $\$0.54 \times 5\ 613$. | 210. 803×904 . |
| 201. $\$74.95 \times 65$. | 211. $\$9 \times 278$. |
| 202. $\$5.01 \times 5\ 060$. | 212. $\$70.60 \times 269$. |
| 203. $\$84.08 \times 490$. | 213. $3\ 264 \times 648$. |
| 204. $8\ 099 \times 408$. | 214. $\$6.25 \times 3\ 297$. |
| 205. $3\ 186 \times 839$. | 215. $3\ 926 \times 849$. |

Review Exercises.

- | | |
|--------------------------------------|--|
| 216. $(8-3) \times 2$. | 226. $(\$85 + \$39) \times 76$. |
| 217. $(4+7) \times 5$. | 227. $(43+51) \times (15+21)$. |
| 218. $4 \times (4+16)$. | 228. $(13 \times 23) - (13 \times 14)$. |
| 219. $(3+4) \times (8-5)$. | 229. $(\$1.23 \times 84) + (\$13 \times 61)$. |
| 220. $(7+5) \times (7+3)$. | 230. $(\$0.23 \times 32) + (\$3.23)$. |
| 221. $\$0.14 \times (16+25)$. | 231. $(\$16 \times 152) - \11.32 . |
| 222. $(18 \times 13) - 156$. | 232. $16 \times (152+132)$. |
| 223. $(28-8) \times 25$. | 233. $(\$1.52 \times 12) + \18.24 . |
| 224. $(\$0.65 \times 13) + \1.65 . | 234. $(284 \times 42) + (18 \times 11)$. |
| 225. $(789-65) \times 24$. | 235. $284 \times (42+18) \times 11$. |

60. Principles of Analysis relating to Multiplication:

7. I multiply because I wish to find the *product* of..... by.....

8. I multiply because having the *value of one object* and the *number of objects*, I wish to find the *total value*.

9. I multiply because I wish to find..... *times as much* as what I have.

NOTE. — In the following exercises, principle 9 will analyze problems 245 and 250; principle 8 will analyze the others.

In problem 236, 12 is the value of each dozen, which must be repeated 6 times.

Oral Exercises.

236. How many oranges are there in a case that contains 6 dozen?
237. Four quarts make a gallon. How many quarts are there in 20 gallons?
238. In an ear of wheat there are 15 kernels. How many kernels are there in 5 ears?
239. If a traveler goes 25 miles a day, how far will he go in 3 days?
240. When one yard of linen costs 40 cents, how much do 9 yards cost?
241. One pound of butter is worth 22 cents. What are 20 pounds worth?
242. If a press prints 20 sheets a minute, how many will it print in an hour?

Problems on Multiplication.

243. In New York, in 1906, there was a saloon for every 317 persons, and there were 10821 saloons. What was the population of the city then?
244. A capital brought in \$34.75 interest during one month. What was the interest for a year?
245. Through the air, sound travels 1142 feet a second. What is its speed through steel, if it travels 15 times as fast?
246. A company of fishermen caught 86 whales. What was the total value, if each whale was valued at \$280?
247. What would 45 miles of railroad cost, if it costs \$67380 to build one mile?
248. When a man is in good health his pulse beats 70 times a minute. How many times does his pulse beat in a day?
249. In 1771, the plague infested Moscow during 32 weeks, causing 392 deaths daily. Find the number of victims.

250. In 1905, the post offices of Canada sent out 315 482 - 379 letters and post cards, and those of the United States sent out 39 times as many. How many did the United States post offices send out?

ADDITION, SUBTRACTION, AND MULTIPLICATION.

First Review.

1. In 1890, the mines of Canada produced 10 500 pounds of lead, and in 1892, nearly 70 000 pounds. Find the increase.
2. In 1907, Canada received 252 038 immigrants, of whom 120 779 came from the British Isles, and 74 607 from the United States. How many came from other countries?
3. Find the approximative number of hairs on a man's head, if the scalp is about 119 square inches in surface, and we count 1 060 hairs for each square inch?
4. Charles owes \$12.46 to one person and \$23.97 to another. He pays \$34.88. How much does he still owe?
5. Montcalm's army at Carillon was of 3 506 men. During the battle 104 were killed and 248 wounded. How many able-bodied men were left after the victory?
6. Write in Arabic figures the following numbers and find their product: MCCLXXXII and LXIX.
7. A merchant received two cases of plates; one contained 84 plates, 3 of which were broken; and the other, 96 plates, 4 of which were broken. How many plates were left unbroken in all?
8. What was the population of the Province of Quebec in 1901, if the 65 deputies returned to the House of Commons then represented 25 367 inhabitants on an average.
9. A man spends each day 35 cents for cigars and 40 cents for alcoholic liquors. At that rate how much does he spend in a year?
10. In the Province of Quebec it rains about 88 days a year and snows about 56 days a year. How many fine days are there in a year?

11. A merchant bought 12 dozen sticks of candy for 87 cents, and sold them at one cent each. How much did he gain?
12. If I sell for \$66 goods that cost \$49, and for \$76 other goods that cost \$83, what is my net gain?
13. 75 barrels of coal oil, each containing 50 gallons, were emptied into a tank. If 1 348 gallons were drawn out, how many gallons are left in the tank?
14. I bought a house for \$3 800. The buying charges were \$152. It cost me \$1 875 to repair the house. For how much should I sell it to gain \$190?
15. Four boys deposited respectively in the School Savings Bank \$12.40, \$14.22, \$16.04, and \$17.03. How much is still lacking that the sum of these deposits may amount to \$70?
16. A dealer bought 215 head of cattle at \$21 each; he sold them at \$32 each. Find his total profit.
17. In 1906, the total harvest of Saskatchewan, Alberta, and Manitoba was 102 256 531 bushels. Saskatchewan produced 37 040 098 bushels, and Alberta, 3 956 020. What was the production of Manitoba?
18. One transatlantic ship runs 24 miles an hour and another, 19 miles. How far ahead of the second will the first be after 5 days?
19. A reservoir already contained 3 422 gallons of water; a faucet giving 3 gallons a minute was allowed to run into it during 2 hours. How many gallons did the reservoir then contain?
20. If a man breathes 19 times a minute, how many times does he breathe during a month of 31 days?
21. George said: "If I had \$7.35 more, I could buy a vest for \$3.50, a coat for \$12.40, a pair of trousers for \$10, and an overcoat for \$20." How much did George possess?
22. Joseph bought every day 25 cents worth of cigars and spent 45 cents in liquor. How much has he spent uselessly since he was 25 years of age, if he is to-day 33 years old?

23. If I had \$704 more, I could buy 48 acres of land at \$98 an acre. How much have I?
24. A man had \$6 830 in the bank. He withdrew first \$1 200, then 3 times this sum. How much has he still left in the bank?
25. There were 176 trees in a public park; 14 rows of 27 trees each were added. How many trees are now in the park?
26. Seventy-five acres of land gave 24 bushels of wheat each, and the wheat is valued at 92 cents a bushel. What is the net profit, if the cost of the work is \$775?
27. Victoria Bridge, that crosses the St. Lawrence opposite Montreal, contains 24 arches of 264 feet each, and a central arch 368 feet long. What is the length of the bridge?
28. A clock strikes each hour. How many strokes does it strike during 7 days?
29. My land produced 16 bushels of barley to the acre. My neighbor had fertilized his field and harvested 37 bushels to the acre. How much more than I did he get out of 8 acres?
30. A stock farmer sold 30 head of oxen at \$36 each and 28 others at \$34. How much did he receive in all?
31. The proprietor of a livery stable bought 3 loads of hay, the respective gross weights of which are 2 540, 2 400, and 2 640 pounds. If each wagon when empty weighs 800 pounds, how many pounds of hay did he buy?
32. An acre gave 275 bushels of potatoes of which 73 were not fit for sale. How many bushels could a farmer sell, who plants 12 acres of potatoes?
33. A workman has the bad habit of drinking every morning a 10-cent glass of brandy; at noon and in the evening he takes a 15-cent appetizer. How much does he thus spend yearly?
34. A man when dying left \$13 500 to be divided as follows: the three sons should receive \$2 000 each; the two daughters, \$1 500 each; and the rest was to be given to a charitable institution. How much did the latter receive?

35. A person bought 20 pounds of coffee at 35 cents a pound, 12 pounds of tea at 45 cents a pound, 8 pounds of chocolate at 45 cents a pound, and 45 pounds of sugar at 6 cents a pound. Find the amount of the bill.
36. A merchant sold 6 dozen hats at \$2 a hat, and 8 dozen at \$3 a hat. What sum did he receive?
37. If I sold 28 yards of a piece of cloth containing 72 yards, what would be the value of the rest at \$2.50 a yard?
38. A fowl dealer sold 36 chickens at 45 cents apiece, 26 ducks at 40 cents apiece, 12 pigeons at 20 cents apiece, and 3 dozen geese at \$1.40 a goose. How much money did he receive?
39. Wilfrid deposits \$1.50 in the School Savings Bank each week. What sum shall he have deposited at the end of 3 years?
40. Find the distance from the earth to the sun, if a locomotive would take 217 years of 365 days to go that distance, at the rate of 60 miles an hour.
41. A fat sheep gave me 80 pounds of mutton and 10 pounds of suet. I sold the mutton at 13 cents a pound and the suet at 6 cents a pound, and I received 82 cents for the skin. How much did this sheep bring in?
42. A nest of four little birds consume about 250 caterpillars a day. How many caterpillars would 87 nests consume in 28 days?
43. A train running at the rate of 38 miles an hour left at 9 o'clock in the morning. How many miles away will it be at 6 o'clock in the evening?
44. A man drives 6 miles an hour. He travels from 7 o'clock in the morning till 7 o'clock in the evening. What distance did he go during the day if he took a rest of 2 hours?
45. If a stationer bought 150 dozen of copy books at 35 cents a dozen, and retailed them at 5 cents each, what did he gain in all?
46. A milkman had 4 cows, each of which gave 17 pounds of milk daily, and 6 others that gave 19 pounds. How many pounds of milk did these cows give during the year?

47. One fountain gives 80 gallons of water a minute; another gives 3540 an hour. How much more than the second will the first give in 24 hours?
48. A farmer sowed 12 acres with oats, 8 with barley, and 5 with wheat. He harvested 42 bushels of oats, 35 of barley, and 21 of wheat per acre. How many bushels of grain did he harvest in all?
49. If I bought 12 pounds of tea at 28 cents a pound, and twice as much coffee at 24 cents a pound, and gave the merchant a \$10 bill, how much change should he have given me?
50. A dealer had 47 lambs that cost him \$155. He sold 33 of these lambs at \$3.50 each, and the others at \$5 each. How much did he gain?
51. Leo refused to sell 50 barrels of apples at \$2.00 a barrel. Later on, 5 barrels being spoiled, he sold the rest at \$2.50 a barrel. Did he gain or lose and how much?
52. A chickadee can eat 50 caterpillars a day. How many caterpillars would 8 broods of 5 young each destroy in 75 days?
53. Andrew earns \$2.30 a day and works 24 days a month. If he spends \$1.25 a day, how much will he save in a year?
54. Is it more profitable to sell 3 dozen eggs at 24 cents a dozen, or to exchange them for 5 yards of cotton at 18 cents a yard?
55. To adorn the shrine of the Blessed Virgin, a sodality bought 3 pair of lilies at \$5.75 a pair, 4 pair of rosebushes at \$4.60 a pair, and 12 pots of greens at \$1.85 a pot. How much did they spend?

Second Review.

56. A faucet, giving 15 gallons of water a minute, was kept running into a reservoir for an hour. During this time 120 and 87 gallons were taken out of the reservoir. How many gallons were left at the end of the hour?

57. My father earns \$75 a month; my brother Henry, \$20 less than my father, and my brother Andrew, \$12 less than Henry. How much do they earn all together during 2 years?

58. Mr. Miller bought two farms; the first cost him \$2 547, and the second, \$3 230. He sold the first for \$2 240. For how much must he sell the second to lose no money on the two?

59. A man who used to spend 75 cents a day in the hotel quit the bad habit, and for the last 8 years he has been saving that sum. How much has he thus saved?

60. In 1758, Louisbourg was provided with 219 cannons and 18 mortars. The fleet defending the town comprised 5 vessels of 68 cannons each and 6 frigates of 29 cannons each. How many pieces of artillery defended the place against the English?

61. Verify the expression: $478 \times 27 \times 9 = 110\,727$. If there be an error, find the difference.

62. Leo bought 275 acres of land at \$78 an acre, and 128 acres at \$98 an acre; he sold the whole lot at \$88 an acre. Did he gain or lose and how much?

63. A wild goose, a partridge, and a duck are worth \$3.20 together; the wild goose is worth \$1.75; the duck, 80 cents less than the wild goose. Find the price of the duck and that of the partridge.

64. A servant earns \$300 a year. How much should he receive at the end of the year if he has already received \$2.75 a week for 43 weeks?

65. A grocer bought 96 gallons of molasses at 35 cents a gallon. He lost 26 gallons, and he sold the rest at 50 cents a gallon. How much did he gain or lose in all?

66. If a seamstress bought 9 yards of cloth at \$2.43 a yard, 27 yards of velvet at \$1.87, 43 yards of printed cotton at 16 cents, and 36 yards of flannel at 43 cents, what would be the amount of the bill?

67. It cost 25 cents a day to feed a cow that gave 3

gallons of milk a day. What profit did she bring in in 30 days, if the milk was sold at 23 cents a gallon?

68. A farmer sells 4 tons of hay at \$16 a ton. He receives in exchange 8 pounds of tea at 65 cents, and 25 pounds of coffee at 35 cents. How much is still due him?

69. It has been reckoned that the swallow, which remains 4 months in our country, destroys 500 insects daily. A child who kills 24 of those birds would hinder the destruction of how many hurtful insects?

70. The hail has broken 324 panes of a hothouse. To repair the damage, a glazier asks 18 cents a pane and \$3.25 a day for his work. If he works 7 days, how much is due him?

71. Soulanges Canal is 14 miles long, and 9 times its length minus 36 miles equals the length of Suez Canal. What is the length of the latter?

72. A hardwareman pays \$30 for 65 pieces of crockery. He sells 17 at 40 cents each, 23 at 60 cents, and the remainder at 48 cents. What is his profit?

73. Two day-laborers worked 26 days each and received together \$150. One of them earned \$3.50 a day. What sum did the other receive?

74. The Experimental Farm of Ottawa distributed 957 samples of peas in 1906. The samples of oats distributed the same year equal 15 times that number minus 467. How many samples of oats were distributed?

75. A hatter paid \$120 for 4 dozen hats. He wishes to gain \$1.25 on each hat. What sum will he receive?

76. By selling a property for \$47 250, B gained \$5 285. What should he have sold it for to gain \$7 000?

77. By selling 76 pair of skates for \$133, a merchant gained 25 cents a pair. How much did the 76 pair cost him?

78. I bought 328 yards of cloth at \$3.25 a yard and I paid \$3.40 for freight. How much must I receive for all to gain \$331.60?

79. In one summer, a hive produced 64 pounds of honey

worth 13 cents a pound, and 26 pounds of wax worth 35 cents a pound. How much money would 20 hives bring in?

80. My neighbor spends 50 cents a day in liquor and 35 cents in cigars. On Sunday, these expenses double. Find the sum thus lost in 10 years?

81. The milk of a good cow gives yearly 350 pounds of butter worth 22 cents a pound. The feeding of the cow costs \$47.65. What is a farmer's profit who has 18 cows?

82. A day-laborer earns \$1.75 a day, and works 26 days a month. If he spends \$56 every three months, how much has he left at the end of one year?

83. I buy a farm of 145 acres at \$126 an acre. In payment I give a check for \$3 428, a note for \$6 550, and a city property worth \$8 200. How much do I still owe?

84. Viator works 300 days a year at \$4 a day. If his expenses are \$2.19 daily, how much does he save in one year?

85. A horse dealer had 25 horses that cost him \$3 125. He sold 13 at \$125, and received \$146 each for the others. How much did he gain in all?

86. A woman bought 7 dozen pansies at 75 cents a dozen, and 8 dozen gilliflowers at 88 cents a dozen. She gave the florist \$5.60; how much does she still owe?

87. A trader bought 150 sheep at \$3.50 each. He sold 92 at \$4 and the others at \$3.75 each. What was his total gain?

88. Two trains running towards each other are 975 miles apart. One runs 40 miles an hour, and the other, 45 miles. How far apart will they be 9 hours later?

89. A and B leave the same place together, to travel in the same direction. A travels 24 miles a day and B, 17. After travelling 5 days, B turns back, and he travels only 14 miles a day. How far are they apart 7 days after their leaving?

90. A horse is hitched to a wagon loaded with 22 bags of wheat that weigh on an average 114 pounds. What weight does the horse draw, if the wagon weighs 853 pounds?

91. My uncle is 8 years older than my aunt, and the latter is 29 years older than I. How old is my uncle, if I am 14 years old?
92. My sister is 37 years younger than my mother, and I am 13 years older than my sister. What is my age, if my mother is 76 years old?
93. A stock raiser said: "If 29 horned cattle are given me and I buy 178 others, I can sell 138 and shall have 200 left." How many horned cattle had he?
94. A man bought 98 horses and 48 wagons. In selling them he gained \$25 on each wagon, and lost \$15 on each horse. What was his gain or loss on all?
95. I buy 2 farms of 135 acres each at \$97 an acre, and 3 other farms of 85 acres each, at \$168 an acre. I sell all at \$134 an acre. Do I lose or gain, and how much?
96. George, who has \$15.05 in the School Savings Bank, asks Frederick how much money he has on deposit. The latter answers: "Give me your savings and I shall have \$3.50 more than Victor." How much has Frederick on deposit, if Victor has \$28.40?
97. An intoxicated man had a fall and thereby lost 26 days' work. Each of the 8 visits of the doctor cost him \$2.50, and he spent \$8.40 in remedies. How much did he lose in all, if his wages were \$3.25 a day?
98. A farmer has 120 acres of land and his neighbor has 3 times as many, minus 75 acres. How many have they together?
99. Joseph has \$25; Henry has \$8 less, and Rudolph has as much as Joseph and Henry together. They spend \$39 on a trip to a neighboring city. How much have they left in all?
100. Edward has \$400; Ferdinand, \$500; George, 8 times as much as Edward and Ferdinand, minus \$600. How much have they together?
101. A workman earned \$4.50 a day. Due to the effect of alcohol, his physical strength diminished and from 25 to 30 years, he earned only \$3.25 a day; from 30 to 35 years,

\$1.50 a day. Find the loss in these last 10 years, counting 300 workdays a year.

102. A farmer's wife had 55 hens. She sold 34, then bought 5 times as many as she had left. How many hens has she now?

103. George has \$3 542; Leo, 3 times as much, minus \$2 757; and Charles, 3 times as much as George and Leo. How much money have they together?

104. A bookseller buys 40 volumes at 50 cents each; he receives 5 others gratis. What is his total gain if he sells them all at 75 cents a volume?

105. A hawk, flying at the rate of 808 yards a minute, tries to catch a pigeon which is 220 yards ahead, and which flies at the rate of 783 yards a minute. How near will the hawk be from the pigeon after 6 minutes?

106. A farmer gains 45 cents apiece by selling 72 turkeys for \$169.20. How much did the 72 turkeys cost him?

107. A shoe merchant buys 25 pair of boots, that he sells for \$52.50, losing 30 cents a pair. How much did the 25 pair cost him?

108. A vessel filled with water weighs 743 pounds. Half the water is spilt out and the vessel now weighs but 434 pounds. What is the weight of the vessel?

109. An accountant earns \$12 a week. He loses the salary of 4 weeks and spends on an average \$1.25 a day. What are his savings at the end of the year?

110. Robert bought 12 cows for \$276. During 23 weeks he spent weekly \$1.05 to feed each. If they bring in \$400, and he then sells them at \$35 each, how much does he gain or lose?

Examination Problems.

I

1. Philip works on an average of 26 days a month and earns \$2.35 a day. How much does he earn yearly?

2. Each of twenty-four cows gives yearly enough milk

to make 249 pounds of butter. How much does a farmer make who sells this butter for 22 cents a pound?

3. One day 1 228 horned cattle were counted at the Montreal slaughter-houses. On the same day 28 times as many minus 1 384 were counted at the Chicago slaughter-houses. How many horned cattle were there at the Chicago slaughter-houses?

4. A workman spends \$1.25 weekly in the tavern and \$2.50 at gambling. He also loses his day on Monday, say \$3.75. Find the sum he loses in a year.

5. Multiply the difference between MDCCXCIX and DCCLXXXIV by DLXXIV.

6. The tax bill of a proprietor amounts to \$78.40 for the year; but having paid \$50, the proprietor found an incorrect increase of \$13.35. What sum does he still owe?

7. A merchant buys 12 pieces of cloth of 150 yards each at \$4.50 a yard, and 10 pieces of woollen stuff of 75 yards each at \$2.50 a yard. By selling all for \$12 000, what profit does he make?

8. A man's pulse beats about 4 550 times an hour; what is the number of pulsations in a week?

9. A mother is 4 times the age of her daughter. Find the sum of their ages, if the daughter is 13 years old.

10. Henry owed his supplier \$375.25. He has already given him in payment 25 barrels of apples at \$2.40 a barrel, 30 bags of potatoes at 70 cents a bag, and 250 bushels of oats at 40 cents a bushel. How much does he still owe?

II

11. A farm of 256 acres has been bought at the rate of \$75 an acre. The proprietor spends \$1 980 in draining it; he then sells the farm at \$105 an acre. How much did he gain?

12. Philip sells 23 bushels of potatoes at 68 cents a bushel, and 9 barrels of apples at \$2.15 a barrel. How much money has he remaining after buying 36 gallons of molasses at 46 cents a gallon, and paying \$10.50 to his doctor?

13. A merchant buys, at \$2.37 a yard, 14 pieces of cloth, 8 of which are 38 yards long, and the others, 32 yards each. He pays an installment of \$790. How much does he still owe?

14. A horse dealer sells 13 horses at \$120 each, and 17 others at \$150 each. If the first ones cost him \$1 495, and the last ones \$2 640, how much does he gain or lose in all?

15. A mechanic earns \$4 a day and works 24 days a month. He spends daily 65 cents for food, \$23.25 a month for lodging and minor expenses, and \$72 a year for clothing. How much has he left at the end of the year?

16. A merchant buys 135 pieces of China ware at the rate of 89 cents each; 13 of these pieces are broken. How much does he gain in all by selling the remainder at \$1.50 each?

17. Joseph has \$475; Victor, 4 times as much, minus \$287; and Francis, 3 times as much as Joseph and Victor, plus \$843. How much have they together?

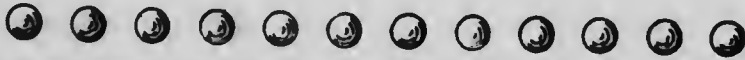
18. Paul sells 18 pair of boots at the rate of \$2.65 a pair. By selling them at \$3 a pair, he would have gained \$1.15 a pair. Find the gain he made on each pair, and the total cost.

19. My brother is 65 years younger than my grandfather, and I am 4 times as old as my brother, plus 5 years. What is the sum of our ages, if my grandfather is 74 years old?

20. Napoleon had \$25. He bought a pair of trousers for \$4, a hat for \$2.50, a pair of shoes for \$3.25, 2 dozen handkerchiefs at 6 cents each handkerchief, and an overcoat for \$12.50. How much has he left?

DIVISION

PROBLEM. — I wanted to distribute twelve marbles equally among four boys. How many marbles did each boy receive?



I first gave one marble to each boy, that is *four*, in all, and then had eight left. I did the same a second time; I had then given *eight* marbles away and had four left. At last, I gave each boy another marble. I had none left after having given away *twelve*.

When I act as above, *without subtracting*, I make a division.

	1st boy	2nd boy	3rd boy	4th boy
1st distribution:				
2nd distribution:				
3rd distribution:				

61. Division is an operation by which we find how many times one number is contained in another.

62. The number to be divided is the *dividend*; the number by which we divide is the *divisor*; the result is the *quotient*.

The **sign** of division is \div . It reads: *divided by*. It is placed between the numbers to be divided: the dividend before it, and the divisor after it.

Ex. — $36 \div 9 = 4$ is read: 36 divided by 9 equals 4.

63. The *remainder* is the number of units left over when the divisor is not contained an exact number of times in the dividend.

contained in the 3638 tens of the dividend. We may separate them from the units by a comma. Hence by dividing 3638 by 543 we shall find the tens of the quotient.

To divide 3638 by 543, is to find the largest number whose product, when multiplied by 543, will equal 3638 or be less than 3638. We find that the tens' figure is 6; multiplying the divisor by 6, we have 3258; subtracting 3258 from the partial dividend 3638, we find that 380 tens remain.

To the right of 380, we carry down the 6 of the dividend, which gives 3806 units for the second partial dividend.

This number contains the product of the divisor by the units' figure of the quotient, plus the remainder, if there be any.

Hence by dividing 3806 by 543, we obtain the units' figure of the quotient, 7, and the operation gives 5 as remainder.

$$\begin{array}{r} 543 \overline{) 36386} \quad (67 \\ \underline{3806} \\ 5 \end{array}$$

In practice, we mentally separate, to the left of the dividend, as many figures as are necessary to form a number that will contain the divisor at least one time and 9 times at the most; and we say:

1° In 36 how many 5's? 6; 6 times 3, 18, subtracted from 18, there remains 0, which we place under the 8, and 1 to carry; 6 times 4, 24, and 1 to carry, 25, subtracted from 33, there remains 8 and we carry 3; 6 times 5, 30, and 3 to carry, 33, subtracted from 36, there remains 3; and we carry down the 6 units to the right of the remainder.

2° In 38 how many 5's? 7; 7 times 3, 21, subtracted from 26, there remains 5, and we carry 2; 7 times 4, 28, and 2 to carry, 30, subtracted from 30 there remains 0 and we carry 3; 7 times 5, 35, and 3 to carry, 38, subtracted from 38, there remains 0.

67. Rule. — 1° *Separate by a comma as many figures to the left of the dividend as will form a number that contains the divisor one time at least, and at the most nine times, which gives the first partial dividend.*

2° *Then divide the number expressed by the first or by the first two figures of the partial dividend by the first figure at the left of the divisor. Write the figure obtained in the quotient; multiply all the figures of the divisor by this figure, and subtract the product from the partial dividend.*

3° *To the right of the remainder carry down the next figure of the dividend which gives the second partial*

dividend. Operating on the second as on the first, find out the second figure of the quotient.

4° Continue till all the figures of the dividend have been carried down.

5° Should any partial dividend not contain the divisor, place a cipher in the quotient, carry down another figure to the right of the partial dividend and proceed as usual.

Proof. — Multiply the divisor by the quotient, and to the product add the remainder, if any; if the work is correct, the result will equal the dividend.

Written Exercises.

Divide the following:

- | | | |
|-----------------------|-------------------------|-------------------------|
| 1. $255 \div 5$. | 26. $57\,636 \div 6$. | 51. $79\,282 \div 49$. |
| 2. $384 \div 6$. | 27. $11\,480 \div 7$. | 52. $36\,424 \div 58$. |
| 3. $399 \div 7$. | 28. $98\,536 \div 8$. | 53. $61\,714 \div 59$. |
| 4. $616 \div 7$. | 29. $11\,232 \div 9$. | 54. $95\,064 \div 68$. |
| 5. $736 \div 8$. | 30. $23\,769 \div 9$. | 55. $71\,277 \div 69$. |
| 6. $432 \div 8$. | 31. $4\,464 \div 12$. | 56. $10\,120 \div 44$. |
| 7. $504 \div 8$. | 32. $3\,836 \div 14$. | 57. $18\,963 \div 63$. |
| 8. $441 \div 9$. | 33. $7\,770 \div 15$. | 58. $21\,045 \div 69$. |
| 9. $774 \div 9$. | 34. $8\,118 \div 22$. | 59. $19\,998 \div 66$. |
| 10. $711 \div 9$. | 35. $5\,904 \div 18$. | 60. $15\,600 \div 65$. |
| 11. $885 \div 5$. | 36. $4\,056 \div 24$. | 61. $23\,715 \div 79$. |
| 12. $984 \div 6$. | 37. $1\,085 \div 35$. | 62. $25\,149 \div 83$. |
| 13. $714 \div 7$. | 38. $2\,546 \div 38$. | 63. $96\,084 \div 92$. |
| 14. $392 \div 8$. | 39. $3\,159 \div 39$. | 64. $23\,032 \div 75$. |
| 15. $396 \div 9$. | 40. $2\,911 \div 41$. | 65. $95\,418 \div 93$. |
| 16. $6\,531 \div 3$. | 41. $4\,514 \div 61$. | 66. $97\,638 \div 76$. |
| 17. $6\,906 \div 6$. | 42. $2\,769 \div 71$. | 67. $41\,942 \div 99$. |
| 18. $3\,248 \div 7$. | 43. $38\,220 \div 65$. | 68. $92\,524 \div 87$. |
| 19. $9\,136 \div 8$. | 44. $29\,736 \div 56$. | 69. $97\,762 \div 98$. |
| 20. $5\,688 \div 9$. | 45. $71\,820 \div 76$. | 70. $99\,999 \div 47$. |
| 21. $7\,182 \div 7$. | 46. $32\,572 \div 34$. | 71. $38\,049 \div 89$. |
| 22. $9\,432 \div 8$. | 47. $88\,736 \div 32$. | 72. $75\,006 \div 93$. |
| 23. $5\,747 \div 7$. | 48. $47\,838 \div 42$. | 73. $80\,498 \div 78$. |
| 24. $7\,256 \div 8$. | 49. $75\,036 \div 52$. | 74. $79\,540 \div 97$. |
| 25. $7\,576 \div 8$. | 50. $93\,807 \div 63$. | 75. $97\,699 \div 98$. |

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|---------------------|--------------------------|
| 76. 107 235 ÷ 45. | 106. 932 121 ÷ 207. |
| 77. 295 470 ÷ 90. | 107. 436 172 ÷ 506. |
| 78. 274 032 ÷ 48. | 108. 897 384 ÷ 807. |
| 79. 682 345 ÷ 88. | 109. 178 350 ÷ 502. |
| 80. 794 061 ÷ 83. | 110. 122 305 ÷ 305. |
| 81. 218 579 ÷ 42. | 111. 964 224 ÷ 216. |
| 82. 727 748 ÷ 98. | 112. 724 608 ÷ 612. |
| 83. 232 848 ÷ 56. | 113. 789 050 ÷ 367. |
| 84. 901 234 ÷ 81. | 114. 346 583 ÷ 127. |
| 85. 620 157 ÷ 78. | 115. 574 620 ÷ 610. |
| 86. 589 067 ÷ 45. | 116. 603 264 ÷ 192. |
| 87. 666 842 ÷ 58. | 117. 42 837 ÷ 987. |
| 88. 387 648 ÷ 67. | 118. 542 100 ÷ 834. |
| 89. 316 160 ÷ 52. | 119. 99 685 ÷ 999. |
| 90. 243 488 ÷ 78. | 120. 342 604 ÷ 883. |
| 91. 838 327 ÷ 65. | 121. 317 646 ÷ 126. |
| 92. 838 327 ÷ 45. | 122. 748 137 ÷ 786. |
| 93. 838 327 ÷ 43. | 123. 142 705 ÷ 988. |
| 94. 669 046 ÷ 65. | 124. 800 025 ÷ 974. |
| 95. 747 474 ÷ 66. | 125. 529 429 ÷ 585. |
| 96. 20 367 ÷ 187. | 126. 145 260 ÷ 108. |
| 97. 79 528 ÷ 204. | 127. 250 000 ÷ 124. |
| 98. 32 525 ÷ 306. | 128. 2 015 029 ÷ 1 004. |
| 99. 89 990 ÷ 409. | 129. 7 481 888 ÷ 1 021. |
| 100. 88 832 ÷ 256. | 130. 31 846 489 ÷ 1 047. |
| 101. 666 351 ÷ 441. | 131. 1 194 477 ÷ 210. |
| 102. 365 733 ÷ 345. | 132. 705 083 ÷ 547. |
| 103. 911 640 ÷ 710. | 133. 6 419 995 ÷ 2 135. |
| 104. 840 248 ÷ 472. | 134. 978 462 ÷ 409. |
| 105. 735 750 ÷ 481. | 135. 4 600 304 ÷ 907. |
| 136. \$35.10 ÷ 15. | 146. \$20.54 ÷ 13. |
| 137. \$57.78 ÷ 18. | 147. \$0.50 ÷ 25. |
| 138. \$87.36 ÷ 21. | 148. \$104 ÷ 32. |
| 139. \$98.40 ÷ 30. | 149. \$175 ÷ 28. |
| 140. \$79.46 ÷ 29. | 150. \$390 ÷ 52. |
| 141. \$70.07 ÷ 11. | 151. \$25.46 ÷ 38. |
| 142. \$21.80 ÷ 4. | 152. \$80.96 ÷ 46. |
| 143. \$48.12 ÷ 12. | 153. \$14 ÷ 50. |
| 144. \$48.24 ÷ 4. | 154. \$76.72 ÷ 56. |
| 145. \$0.81 ÷ 9. | 155. \$92.80 ÷ 29. |
| | 156. \$6 300 ÷ 15. |
| | 157. \$5.67 ÷ 21. |
| | 158. \$875 ÷ 125. |
| | 159. \$480 ÷ 300. |
| | 160. \$147 ÷ 350. |
| | 161. \$69.06 ÷ 6. |
| | 162. \$91.36 ÷ 8. |
| | 163. \$92 ÷ 23. |
| | 164. \$3.84 ÷ 32. |
| | 165. \$9.20 ÷ 46. |

Review Exercises.

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|--------------------------------------|---|
| 166. $(49 + 84) \div 7$. | 176. $\$0.25 \times (840 \div 14)$. |
| 167. $(\$68 + \$0.60) \div 7$. | 177. $(\$0.25 \times 840) \div 14$. |
| 168. $\$3.50 + (\$0.50 \div 0.25)$. | 178. $(992 \div 32) - 18$. |
| 169. $(384 - 96) \div 72$. | 179. $(376 \div 94) \times 15$. |
| 170. $(\$0.42 \times 63) \div 21$. | 180. $(\$19.44 \div 54) \div 18$. |
| 171. $(\$0.84 \div 21) \times 42$. | 181. $\$19.44 \div (54 \div 18)$. |
| 172. $\$0.75 \times (24 \div 8)$. | 182. $(96 \div 8) \div (48 \div 8)$. |
| 173. $(144 \div 24) + 78$. | 183. $(\$0.68 \div 4) \times (51 \div 3)$. |
| 174. $(\$88.20 \div 42) \div 21$. | 184. $(23 \times 8) \div (48 \div 6)$. |
| 175. $\$88.20 \div (42 \div 21)$. | 185. $(\$0.24 \times 9) \div (18 \times 2)$. |

68. Principles of Analysis for Division:

10. I divide because I wish to find the *quotient* of..... by.....

11. I divide because having the *total value* and the *number of objects*, I wish to find the *value of one object*.

12. I divide because having the *total value* and the *value of one object*, I wish to find the *number of objects*.

13. I divide because I wish to find..... *times less than* what I have.

Oral Exercises.

186. Nine workmen together receive \$81; what does each receive?

187. A cask holds 96 gallons of water but a crack lets 8 gallons run out daily. How many days will it take to empty the cask?

188. Twelve ounces of musk are worth \$108. What is the price of one ounce?

189. In an orchard there are 84 trees planted in 6 rows. How many trees are there in each row?

190. What is the number which is 8 times smaller than 336?

191. \$189 is divided among 9 poor families. How much does each receive?

192. If 23 sheep are worth \$92, what is one sheep worth?

Problems on Division.

193. It is 833 miles from Montreal to Halifax. How long will it take a train, running at the rate of 49 miles an hour, to make the run?

194. The distance from the earth to the moon is 240 000 miles. How long would it take a balloon, rising at the rate of 75 miles an hour, to fly over that distance?

195. Soulages Canal, which is 14 miles long, cost \$6 851-978. How much did it cost a mile?

196. One thousand nine hundred and three cannon shots cost \$34 958.11. What did one shot cost?

197. Seventy-two whales give 180 000 gallons of oil. What is the average number of gallons?

198. The great pyramid of Egypt rises to the height of 455 feet, and Pike's Peak (Colorado), to the height of 14 105 feet. The height of the mountain is how many times the height of the pyramid?

199. There are 8 064 miles of streets in London, and 224 in Montreal. Those of London are how many times those of Montreal?

200. The annual civil list of the King, in England, is \$2 349 997.75. How much does he receive a day?

ADDITION, SUBTRACTION, MULTIPLICATION, DIVISION.

First Review.

1. A dozen of apple trees cost \$4.25. How much will 29 dozen cost?

2. We know that sound travels at the rate of 1 142 feet a second. At what distance from a storm cloud is the person who hears the thunder 15 seconds after seeing the lightning?

3. The wheels of a locomotive are 15 feet in circumference; how many revolutions must they make to cover the distance from Montreal to St. Hyacinthe, which is 35 miles, or 184 800 feet?

4. At how many yards can a lighthouse be seen at sea, if its light can be seen at 23 nautical miles, and a nautical mile is 2 028 yards long?

5. How much shall we pay for 8 horses, if 12 are worth \$1 380?

6. An employee receives \$910 for 7 months' work; how much does he earn a year?

7. How much shall we pay for 10 dozen of volumes at \$1.75 for 5 volumes?

8. A bookseller bought 8 dozen of grammars at 18 cents a grammar, and 16 dozen of copy books at 50 cents a dozen. How much did he pay for all?

9. A farmer had 36 apple trees planted in his orchard, which cost \$4.15 a dozen. How much must he pay?

10. A father earns \$3.25 a day; his son, \$1.35. What sum will they together receive for two weeks' work?

11. It has been reckoned that during 23 days (from July 13, to August 5, 1759) 9 000 bombs and 9 998 cannon balls were shot into the city of Quebec. On an average, how many projectiles did the English shoot daily?

12. How much money is in a chest that contains 30 twenty-dollar bills, 40 ten-dollar bills, 60 five-dollar bills, 80 two-dollar bills, 100 one-dollar bills, 150 fifty-cent pieces, 200 twenty-five-cent pieces, 400 ten-cent pieces, and 800 five-cent pieces?

13. With 288 sheets of paper we can make 9 copy books. How many can we make with 8 000 sheets?

14. How long can I feed 15 cows on 28 125 pounds of fodder beets, if I give each 25 pounds a day?

15. A machinist worked 26 days a month for 9 months, and he received \$702. How much did he earn a day?

16. An acre of ground produces 77 bushels of Indian

corn worth 83 cents a bushel. What sum does a man make who sows 7 acres?

17. How many bushels of wheat at \$1.62 a bushel shall we have for 36 bushels of oats at 54 cents a bushel?

18. From 15 acres of land we harvested 270 bushels of wheat worth 90 cents each. What is the income per acre?

19. For \$1 170 we bought 36 acres of land. How many acres should we have for \$3 120?

20. A workman receives \$213.75 for 95 days' work. How much does he earn a month of 26 working days?

21. How many grains of wheat will be reaped from 125 square yards of land, in supposing that each ear gives 35 grains and there are 67 ears per square yard?

22. In London there is one death every 5 minutes. How many deaths are there in a year?

23. What is the gain by selling at 5 cents each 144 copy books that cost \$4.58?

24. 6 pieces of ribbon, of 18 yards each, cost \$37.80. What is the price per yard?

25. If 25 armchairs cost \$91.25, what is the price per dozen?

26. With \$10 I bought 15 yards of cloth, and the merchant gave me back \$3.25. What is the price a yard?

27. A man has an income of \$2 550 a year. He wishes to save \$1 090. How much can he spend a day?

28. Joseph has a debt of \$322. He earns \$55 a month, and spends \$32. How long will it take him to pay his debt?

29. In a nursery there are 24 rows of 40 apple trees each. What are the trees worth at the rate of \$4 a dozen?

30. What is the value of a train, if the locomotive is worth \$18 500, the first 5 cars, \$9 300 each, and the 2 sleeping cars, \$17 700 each?

31. To ornament a park, a town council orders, at a florist's, 700 daisy plants at \$8 a hundred, 1 000 coleus plants at \$4 a hundred, 200 canna plants at \$10 a hundred, 2 000 geranium plants at \$7.50 a hundred, and 200 caladium bulbs at \$25 a hundred. What sum must the town pay?

32. Out of \$500 a charitable person gives \$326 to a hospital and divides the remainder among 12 poor families. How much does each receive?
33. How many hours will it take to fill a reservoir that holds 1800 gallons, if it receives 185 gallons an hour and loses 140 gallons in the same time?
34. A young man smokes 30 cents' worth of cigars a day. How many volumes at 75 cents each could he buy in a year with the money thus wasted?
35. A warbler does not eat less than 225 insects daily. How long would it take 8 warblers to destroy 81 000 insects?
36. A locomotive goes 88 feet a second. How many miles will it go in five minutes, there being 5 280 feet in a mile?
37. I bought a farm for \$6 737.50; I sold it again for \$7 218.75, gaining \$2.75 an acre. How large is the farm?
38. In the construction of an aqueduct 5 640 feet of pipes, worth \$2 per 10 feet, are used. What is the total cost, if the workmanship costs \$1 500?
39. Joseph earns \$13.50 per week and spends \$7.70. How many weeks must he work to save \$69.60?
40. Wheat weighs 60 pounds a bushel; oats, 34 pounds. What quantity of oats will weigh as much as 136 bushels of wheat?
41. Viator owes \$7 603. After 9 equal payments, he still owes \$1 735. Find the amount of each payment.
42. During 32 weeks the plague of 1720 made 39 200 victims at Marseilles. What was the daily average of deaths?
43. How many gallons of water are supplied a second by a canal that supplies 982 500 gallons in 5 minutes?
44. A farmer working by routine harvested only 18 bushels of wheat per acre and his neighbor harvested 29. The price being 95 cents a bushel, how much did the latter gain by using modern methods?
45. A tap gives 60 gallons of water in 5 seconds. How many hours will it take to fill a reservoir of 950 400 gallons?

46. Clovis owes \$43.75. In a day he earns \$5 and spends \$3.75. How long will it take him to pay his debt with his savings?
47. What sum is necessary to pay the wages of 28 men and 12 boys who worked 17 days, if the former received \$2.25 a day, and the latter, 90 cents?
48. A bookseller buys 12 sheets of 108 images each. He sells the images at 48 cents a dozen. How much does he receive?
49. Sixteen barrels of wine, holding 57 gallons each, cost \$866.40. What is the price of a gallon?
50. For \$320, I bought 25 sheep and a horse. The latter cost \$200. What is the price of a sheep?
51. My father bought a farm for \$3360. He sold it after for \$3648, and gained \$3 an acre. How many acres did he buy?
52. For the last year Paul has saved what he used to spend in the tavern. With these savings he is able to buy a lot of 1825 square feet worth 8 cents a foot. How much did the passion for alcohol formerly make him spend a day?
53. Each of eighteen acres of land yielded 19 bushels of wheat; this harvest was sold for \$495.90. What was the price of a bushel?
54. Henry buys carpet at \$2.40 a yard; in selling it at \$3.25 a yard he gained \$63.75. How many yards did he buy?
55. Out of 9300 persons, how many do not reach their twentieth year, if 44 persons out of a hundred do not reach it?
56. How many wagons are needed to cart 8640000 bricks in 60 days, if each wagon makes 6 trips daily and carts 1500 bricks each trip?
57. How many rows of 24 apple trees are there in an orchard that produces 1536 bushels of apples, if the average yield per tree is 8 bushels?
58. Abraham lived 175 years; 36 times his age equals

35 times the age of Isaac. How old was the latter when he died?

59. A grocer mixes 50 pounds of sugar at 5 cents a pound with 50 pounds of sugar at 3 cents. How much per pound must he sell the mixture to gain \$2?

60. Moses lived 120 years; 43 times his age minus 363 years equals 39 times Aaron's age. How old was the latter when he died?

61. Louis spends 15 cents each morning for a glass of brandy, and smokes 35 cents' worth of cigars daily. How much might he save in 8 years by avoiding the useless expenses?

62. Albert gives 20 gallons of maple syrup, worth 90 cents a gallon, in exchange for 36 pounds of tea. What is the price of a pound of tea?

63. A merchant bought 104 yards of serge at 90 cents a yard, and 215 yards of cloth at 70 cents. For how much must he sell all to gain \$47.70?

64. A wax maker made 26 172 tapers that cost him \$1 308.60. He sells them at 45 cents a pound. If there are 6 tapers in a pound, what profit does he make?

65. A wholesale grocer sold 880 pounds of maple sugar for \$105.60. If the sugar cost him \$70.40, how much did he gain a pound?

66. Eight beds of tomatoes, of 78 plants each, yield 8 112 pounds of tomatoes. What is the average yield per plant?

67. How many bushels of Indian corn, weighing 56 pounds each, will be required to sow 7 acres, if it requires 24 pounds an acre?

68. Twenty-five pounds of beet-root give 1 pound of sugar. How many pounds of sugar will 7 acres produce, at the rate of 23 475 pounds of beet-root per acre?

69. A cow eats 30 pounds of hay daily. How much will her feed for 180 days cost, if a bundle of hay weighs 15 pounds, and hay costs \$8 a hundred bundles?

70. 18 bushels of oats worth 49 cents a bushel are mixed with 27 bushels worth 54 cents. What is the price of a bushel of the mixture?

71. Three pounds of flour give 4 pounds of bread. How much bread will be made from 24 sacks of flour, each holding 99 pounds?

72. Elmer has 917 gallons of oil; he sells 428 gallons for \$642. At this price what is the rest worth?

73. John loses 2 days' work a month, estimated at \$2 per day, and he spends \$2.50 each day off. How many months' rent at \$7.75 could he pay with the money thus spent in a year?

74. In selling 56 yards of cloth for \$125, a tailor makes \$13 profit. How much did a yard cost him?

75. Peter buys 18 horses at \$75 each and then sells them for \$1 314. How much does he lose on each?

Second Review.

76. A sheep gives yearly 5 pounds of wool, worth 32 cents a pound. Find how many sheep I have, if I sold \$38.40 worth of wool.

77. An engine of 75 horse power consumes 1 500 pounds of coal an hour. What is the cost of coal for 24 hours, at \$4.25 a ton of 2 000 pounds?

78. Two gallons of milk give 1 pound of butter. How many pounds of butter can be made in 45 days from the milk of six cows, if each gives 3 gallons a day?

79. A and B spent together \$5.40 at the tavern. B spent \$2.10 more than A. How much did each spend?

80. A father divides \$10 000 between his two sons. He gives \$1 200 more to the older than to the younger. How much does each receive?

81. Albert and Henry have together \$8.60 in the School Savings Bank. Albert has \$1.20 more than Henry. How much has each?

82. Louis owes the shoemaker for 3 pair of shoes at \$3.10 each, and for 4 mendings worth 65 cents each. In payment he gives him potatoes worth 85 cents a bushel. How many bushels does he give?

83. The wool production of Canada, in 1908, rose to 12 million pounds. The Province of Quebec yielded 2 670 000 pounds valued at \$667 500. At that price, what was the value of the total production?

84. A fruit merchant received 30 dozen of oranges in two cases, one of which contained 72 oranges more than the other. How many oranges were in each case?

85. A horticulturist sold 4 barrels of apples at \$2.70 a barrel, 6 cases of tomatoes at 45 cents a case, and 15 bushels of potatoes at 64 cents a bushel. How many sacks of flour, worth \$2.10 a sack, can he buy with the proceeds of the sale?

86. To make 4 pair of trousers 6 yards of serge are bought at \$1.45 a yard. A tailoress works on them two days, at \$1.25 a day, and the trimmings cost \$2.40. How much does each pair cost?

87. Divide \$1 500 between A and B so that B receives \$100 less than A.

88. To make brass, 24 pounds of zinc at 7 cents a pound, and 56 pounds of copper at 17 cents, were melted together. What is the brass worth a pound?

89. Two excavators earned together \$84.50 in 26 days. If one earned \$1.50 a day, how much did the other earn?

90. John buys 700 hooks at \$3 a hundred, and then sells them for 10 cents a pair. How much does he gain in all?

91. A meadow yielded 9 700 pounds of hay one year; the next year, after an irrigation with liquid manure, it yielded 23 400 pounds. What is the increase in the revenue, if the hay was sold for 47 cents a hundred pounds?

92. A mercer buys needles at 40 cents a hundred. Then he sells them at 15 cents a paper of 25. What is his profit on 400 needles?

93. I bought 800 bushels of wheat which cost me \$776, after a deduction of \$32 had been made. What price a bushel was I asked at first?

94. One cow gave 6 460 pounds of milk. How many cows of the same capacity would be necessary to furnish

enough milk to make 2720 pounds of butter, if 19 pounds of milk give one pound of butter?

95. An acre of land yields 16 600 pounds of sugar beet. The crop of 8 acres was sold at 25 cents a hundred pounds. The growing expenses were \$75.53. What are the net proceeds?

96. A farmer's wife received \$17.60 for 15 dozen eggs at 22 cents a dozen, and for a certain number of chickens at 65 cents a pair. How many chickens did she sell?

97. A horse consumes yearly 700 bundles of hay and 60 bushels of oats. What will the feed of 4 horses cost for 3 years, if hay is worth \$9.50 a hundred bundles, and oats, 65 cents a bushel?

98. Two farmers hire, for a year, a meadow of 36 acres, at the rate of \$2.25 an acre. One of them pastures 18 cows in it, and the other, 12. How much should each pay?

99. Ten pounds of milk give 1 pound of cheese. If the price of one pound of cheese is 13 cents, how much is the cheese worth that is made from 660 pounds of milk?

100. By spending \$3.15 a day, Paul, in a year, goes \$36.50 in debt. How much can he spend a day, if he wishes to save \$50 a year, and give his mother \$8 a month?

101. A watch loses 48 minutes a day. It was set at noon. At 4 o'clock in the evening, what hour will be shown upon it?

102. I set my watch at Sunday noon. It gains 3 minutes a day. What hour will it show at the next Sunday noon?

103. A stock raiser bought 40 sheep at \$4 each. Having lost 5 of these sheep, for how much must he sell each of the others to gain \$43 on all?

104. To feed 52 hens it costs \$57.20 a year. If a hen lays 120 eggs a year, what profit does she give, eggs being worth 23 cents a dozen?

105. A fountain that gives 10 gallons of water a second, takes 56 minutes to fill a reservoir. Another fountain takes 1 hour and 20 minutes to fill the same reservoir. How many gallons does the latter give a second?

106. An orchard brought in \$992 in 8 years; a kitchen garden of the same area brought in \$187 a year. Which of these crops is the more advantageous, and how much in 15 years?

107. A milkman has 8 cows, and he spends 35 cents a day for the feed of each. For 95 days, each cow gives 5 gallons of milk a day, and the milk sells for 15 cents a gallon; for the following 200 days, each cow gives 3 gallons a day that sells for 25 cents a gallon. What is the milkman's profit for the year?

108. Bernard took to market 720 pounds of wheat that he sold at 95 cents for 60 pounds, and 270 pounds of grass seed that he sold at \$2.25 for 45 pounds. How much did he receive?

109. An acre of land produces 16 590 pounds of sugar beets worth 2 cents per 10 pounds. What is the profit on 5 acres, if the expenses of cultivation are \$11.85 per acre?

110. A tavern keeper in one week served 1 940 glasses of alcohol at 8 cents on an average. They cost him 43 cents per 20 glasses. How much did he gain by retailing his poison?

111. I mixed 75 bushels of barley worth \$1.15 a bushel, with 145 bushels worth 85 cents a bushel. By retail sales, I made a profit of \$39.10. How much did I receive a bushel?

112. To make 4 dozen shirts, 135 yards of cloth were used costing 32 cents a yard. A tailoress receiving \$1.10 a day, worked on them 8 days. The thread and buttons cost 80 cents. What is the cost of each shirt?

113. A merchant buys 94 yards of cloth at 45 cents a yard. He gives in payment 15 yards of drapery, plus \$7.80. What is the drapery worth a yard?

114. How many days will it take two travellers to meet who are 180 miles apart, if they leave at the same time, and one travels 35 miles a day, and the other, 25 miles a day?

115. Two cyclists, 540 miles apart, leave at the same time and ride towards each other. One rides 8 miles an hour, and the other, 10. If they travel 10 hours a day, how many days will it take them to meet?

116. Paul received \$2167.40 from the sale of 495 sheep, having sold 212 at \$4.35 each. How much did he receive for each of the others?
117. A merchant buys 12 pieces of cloth of 45 yards each for \$1512. He then sells the cloth at \$3.17 a yard. What profit does he make on 125 yards?
118. A train should run 1080 miles in 27 hours; 3 hours after leaving, an accident causes a delay of 4 hours. How many miles per hour must it now run to arrive at the indicated hour?
119. A post boy who drives at the rate of 8 miles an hour has been gone 3 hours. In how many hours will a second post boy, driving 12 miles an hour, overtake the first one?
120. To feed 24 Plymouth Rock hens one year it costs \$23.45. They lay, on an average, 119 eggs, worth 24 cents a dozen. What is the net profit?
121. Four copy books and 5 pencils are worth 35 cents; 4 copy books and 9 pencils, 47 cents. Find the price of one copy book and of one pencil.
122. Five grammars and 8 dictionaries are worth \$5.95; 8 grammars and 8 dictionaries, \$6.64. Find the price of one grammar and of one dictionary.
123. A grocer bought 16 cans of maple syrup each containing 9 gallons, at the rate of \$8.55 per can. After having lost 4 gallons, he sells the rest at \$1.20 a gallon. How much does he gain?
124. A speculator having bought 640 acres of land at \$15 an acre, sells 160 at \$20 an acre, and 240 at \$18; then he sells the remainder for \$4560. Find the total gain and the price per acre of the last sale.
125. A cabinetmaker sells to Peter 4 armchairs and 8 chairs for \$14.20; to Francis, 4 armchairs and 12 chairs similar for \$17.80. Find the price of one armchair and of one chair.
126. Our grocer bought 30 gallons of syrup and 12 pounds of maple sugar for \$27.96; then 50 gallons of the same syrup and 12 pounds of the same sugar for \$45.96. Find the price of one gallon of syrup and of one pound of sugar.

127. Eugene saved \$35 a month for 11 months, and the 12th month, \$20. Each day of the year he spent \$3. How much did he earn a day, if he worked 300 days?

128. The cloth of my shirts is worth 40 cents a yard. The making and the trimmings cost 35 cents a shirt. If 18 shirts cost \$27.90 in all, how many yards are there in each shirt?

129. A bookseller received 364 volumes. How many dozen did he buy if he received 13 volumes for 12?

130. John buys 500 apple trees. How many does he receive, if 5 are given to him for every hundred that he buys?

131. A florist buys 1800 geraniums at \$8 a hundred, 5 more on each hundred being given to him. What sum will he receive by selling them at 10 cents each?

132. A bookseller buys a dozen volumes at 60 cents each volume, one more being given to him. What profit will he make by selling these volumes, at 95 cents each?

133. A merchant bought two pieces of cloth for \$624. He sells 15 yards for \$60, gaining \$1.60 per yard. How many yards were there in the two pieces?

134. A little newsboy who earns 52 cents a day gives his mother a part of his earnings and deposits the rest in a bank. He works 307 days a year and deposits in the bank \$50.14. On an average, how much does he give daily to his mother?

135. A merchant buys 300 boxes of pens at 65 cents a box. He receives 13 boxes for 12. What is his gain on all if he sells them at 90 cents a box?

136. A schoolmistress bought 12 dozen pencils at 28 cents a dozen, receiving 13 for 12. If she gives 15 to poor children, what is her profit in selling the others at 3 cents each?

137. 79 must be multiplied by what number to have a product of 6241?

138. Three times my money minus \$42 equals \$99. How much money have I?

139. The product of two numbers plus 75 equals 1000. If one of these numbers is 25, what is the other?

140. A haberdasher buys 5 dozen pair of gloves at \$10.80 a dozen, receiving 13 pair for 12. He then sells them at \$1.50 a pair; what is his gain on all?
141. A workman earns \$3.15 for each day's work; his daily expenses are \$1.90. How many days must he work a year to save \$251.50?
142. The product of three numbers is 16 200. The first is 25, and the second, 18. What is the third?
143. In 1692, there were 80 corporals and 56 sergeants in the French army in Canada. The number of sergeants multiplied by the number of corporals increases fourfold the total number of soldiers and the above officers. Find the number of soldiers.
144. A workman earned \$56 in December. He worked 7 days less in January and earned \$46.75. How many days did he work in December?
145. A timberwork costing \$496.50 was done in 5 days. 240 planks worth \$1.50 each, and 80 boards worth 30 cents each were used. Find the number of workmen, if each received \$2.50 a day.
146. In 1908, there were 3 594 post offices in Ontario, and 1 419 less in the Province of Quebec. Three times the number of offices of the latter province minus 471 equals that of the other seven provinces. Find the number of post offices in Canada.
147. The sum of two numbers is 245 and the larger is 6 times the smaller. What are the numbers?
148. A workman earns \$3.15 a day and spends \$14.50 a week. How many years will it take him to save \$1 144, if he works 26 days a month?
149. A merchant bought 42 yards of cloth and 42 yards of velvet. He paid in all \$285.18. If the velvet cost \$2.35 a yard, how much did a yard of cloth cost?
150. A merchant buys 4 loads of potatoes of 45 bushels each. He sells a part of them at 65 cents a bushel and receives \$55.90. How many bushels has he left?
151. By selling for \$75 some watches that cost me \$60, I gained \$5 a watch. How much did each watch cost me?

152. By selling for \$3 080 some wood that cost me \$2 310 I gained \$1.75 per cord. How much did a cord cost me?

153. John pays \$195 for 40 sheep and 5 calves. A sheep costs 75 cents less than one calf. What is the price of one sheep and that of one calf?

154. A trader buys 60 tons of straw and 140 tons of hay for \$2 400. If the hay costs him \$10 a ton more than the straw, what is the price of one ton of hay?

155. \$35.02 were paid for 34 yards of muslin and 68 yards of linen. A yard of linen is worth 14 cents more than a yard of muslin. Find the price of a yard of linen.

Examination Problems.

I

1. Express in Arabic figures the two following numbers and find their product: CMXXXV and CDXIX.

2. A man works for 17 cents an hour. How much does he earn in 3 days of 10 hours, 5 days of 8 hours, and 4 hours?

3. By selling 47 pounds of butter for \$13.16, a grocer made a profit of \$2.35. How much did a pound cost him?

4. A horse dealer bought 29 horses for \$3 915; he sells 12 of them for \$1 776, and the others at \$155 each. How much did he gain?

5. Four men divide \$20 000 among themselves. The first receives \$4 000; the second \$500 more than the first, and the third, \$500 more than the second. What does the fourth receive?

6. Two brothers together have \$973, and the older, \$537. How much has he more than his brother?

7. A scholar had 43 good marks. He lost 18, then he won 5 times what he had left, minus 4. How many has he now?

8. In working 25 days a month a man earns \$1 170 a year. How much does he earn a day?

9. A family earn \$4.80 a day, and spend \$2.75 every day. If at the end of the year, they have saved \$388.25, how many days did they work?

10. The product of three numbers is 16 422. What is the third factor, if the other two are 42 and 17?

II

11. Divide \$2 600 among three men, so that the first shall have \$450 more than the second, and the second, \$400 more than the third.

12. With \$7.44 a man bought 24 yards of calico at 15 cents a yard, and cotton at 12 cents a yard. How many yards of cotton did he buy?

13. Two couriers, 684 miles apart, leave at the same time and travel towards each other, driving respectively 16 and 12 miles an hour. How far apart will they be after 18 hours?

14. Leo has \$350; Louis, twice as much, minus \$42; Joseph, 4 times less than Leo and Louis together, plus \$48. How much money have the three together?

15. I received 468 volumes bought at the rate of 13 for 12. How many dozen did I buy?

16. I gained \$3.25 per acre by selling 240 acres of land for \$15 180. How much did I pay an acre?

17. A workman who earns \$18 a week spends 50 cents a day for food, \$14 a month for rent and \$230 a year for other expenses. What are his savings at the end of the year?

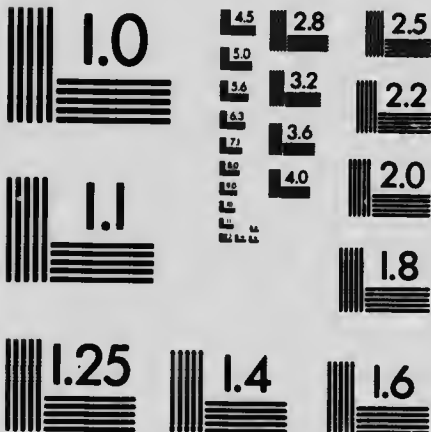
18. A bookseller received 156 volumes that he bought at the rate of 13 for 12. How much did he pay for them, at \$8.16 a dozen?

19. In one year a workman saves \$106.75, after spending \$2.80 a day. He earns \$3.75 a day. Find the number of days he worked?

20. A merchant bought 4 dozen pair of shoes, which he sold for \$120. How much did a pair cost him, if he gained 95 cents on each pair?



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III

21. In 1910, the sum of the ages of Joseph and his grandfather was 96 years, and Joseph was 19 years old. In what year was his grandfather born?

22. A piece of cloth costs \$168, and another of the same quality, which is 5 yards longer, costs \$185.50. How many yards in each piece?

23. What number multiplied by 27 gives a product equal to the quotient of 3 402 by 42?

24. For \$17.76, I buy an equal number of pounds of cheese at 14 cents and of butter at 23 cents. How many pounds of each do I buy?

25. Paul sold sheep for \$205.96 that cost him \$218.50, thus losing 33 cents per sheep. How much did a sheep cost him?

26. At \$3 a hundred, a merchant bought plates for \$16.20. How much must he sell them a dozen to gain \$15.30 on his purchase?

27. Twelve yards of cloth and 8 yards of serge cost \$53.20; 12 yards of the same cloth and 15 yards of the same serge cost \$61.95. What is the price of one yard of serge?

28. A dealer in earthenware buys 5 dozen flowerpots for \$25. If 15 pots are broken, and if he sells the others at 75 cents each, how much does he gain?

29. Peter and Paul divide between themselves 65 yards of cloth that cost \$292.50. If Paul paid \$31.50 more than Peter, how many yards does each receive?

30. Six pieces of cloth of 48 yards each cost me \$828.80. What is my loss per yard, if I sell it at \$2.50 a yard?

IV

31. I bought cucumbers at \$2 a hundred, and then I sold them at 45 cents a dozen, making a profit of \$10.50. How many dozen did I buy?

32. A trader bought 786 chickens at 22 cents each. If he lost 29, for how much must he sell each of the others to gain \$92.03 in all?

33. I have 237 yards of serge that cost me \$422.70, and I sell 102 yards of it at \$1.55 a yard. For how much a yard must I sell the remainder so as not to lose nor gain anything?

34. How much did James pay for 72 yards of cloth, if by selling 18 yards for \$10.08 he gained 18 cents a yard?

35. In one week, a fruiterer sold 65 baskets of apples each containing 12 dozen, which cost him 85 cents a basket. If he sold 4 apples for 5 cents, what was his profit?

36. Twenty-six bushels of wheat and 43 bushels of barley cost \$89.30. If a bushel of wheat is worth 25 cents more than a bushel of barley, find the price of a bushel of wheat.

37. A bookseller has 25 gross of pencils that cost him \$18.75. If he wishes to gain \$17.25, how many pencils can he sell for 5 cents?

38. Thirty pounds of chocolate and 26 pounds of coffee cost \$29.10; 30 pounds of the same chocolate and 42 pounds of the same coffee cost \$38.70. Find the cost of a pound of chocolate and of a pound of coffee.

39. 48 yards of calico and 56 yards of cotton cost \$61.92. If a yard of calico is worth 38 cents more than a yard of cotton, what is the price of a yard of each cloth?

40. A trader sells 36 tons of hay for \$432, at a loss of \$1.25 a ton. How much did a ton cost him?

PROPERTIES OF NUMBERS

69. A multiple of a number is any number that is exactly divisible by it: 6, 9, 12, 18, and 27 are multiples of 3.

70. A common multiple of two or more numbers is any number that is exactly divisible by each of them.

Thus 24 is a common multiple of 2, 3, 4, 6, 8, and 12, because it is divisible by each of these numbers without a remainder.

71. A *divisor*, a *factor*, or a *submultiple* is any whole number that exactly divides another whole number: 2, 3, 6, and 9 are the *factors* of 18, 18 being a *multiple* of each of these numbers.

72. An *even number* is a number that is exactly divisible by 2. All numbers whose unit figure is 0, 2, 4, 6, or 8 are even.

An *odd number* is a number that is not exactly divisible by 2. All numbers whose unit figure is 1, 3, 5, 7, or 9, are odd.

1.—Divisibility of Numbers.

73. An *exact divisor* of a number is one that will divide it without a remainder.

A number is exactly divisible:

74. 1° by 2, when the unit figure is 0 or an even number: 30, 42, 56;

75. 2° by 3, when the sum of its digits is divisible by 3: 27, 45, 51;

76. 3° by 4, when its two right-hand figures are zeros, or when they express a number divisible by 4: 2 500, 432;

77. 4° by 5, when its unit figure is 0 or 5: 620, 275;

78. 5° by 6, when the number is even, and the sum of its digits is divisible by 3: 234, 516;

79. 6° by 8, when its three right-hand figures are zeros, or when they express a number divisible by 8: 4 000, 9 128;

80. 7° by 9, when the sum of its digits is divisible by 9: 810, 7 245.

II. — Prime Numbers.

81. A *prime number* is a number that is exactly divisible by but one and itself: 1, 2, 3, 5, 7, 11, 13, 17, 19, 23.

82. Numbers are *prime to each other* when they have no common factors, or divisors: 8, 15, 23.

83. The *prime factors* of a number are the prime numbers whose product equals the given number: the prime factors of 35 are 5 and 7, because they are prime numbers, and $5 \times 7 = 35$.

EXAMPLE. — Resolve 1 050 into its prime factors.

OPERATION.

EXPLANATION.

2)1050

3)525

5)175

5)35

7

Since 1 050 is an even number, it is divisible by 2, a prime number; 525 ($5 + 2 + 5 = 12$) is divisible by 3 (a prime number); 175 (the right-hand figure being 5) is divisible by 5 (a prime number); 35 is divisible by 5; the last quotient 7 is a prime number. Therefore, 2, 3, 5, 5 and 7, are the prime factors of 1 050.

84. Rule. — Divide the given number by the least prime factor; divide the quotient in the same manner, and so continue the division until the quotient is a prime number. The several divisors and the last quotient will be the prime factors required.

Proof. — The product of all the prime factors will be the given number: $2 \times 3 \times 5 \times 5 \times 7 = 1\ 050$.

Oral Exercises.

1. Name all the odd numbers from 20 to 36.
2. Find two multiples of 7, four multiples of 12.
3. What are the prime factors of 6? of 8? of 12? of 20?
4. Find the prime factors of 24, of 36, of 20.
5. Name all the prime numbers from 1 to 30.

Written Exercises.

Resolve the following numbers into their prime factors :

6. 24.	11. 81.	16. 105.	21. 276.
7. 40.	12. 108.	17. 165.	22. 512.
8. 48.	13. 124.	18. 252.	23. 392.
9. 56.	14. 126.	19. 175.	24. 429.
10. 45.	15. 135.	20. 325.	25. 1 155.

III. — The Greatest Common Divisor.

85. The **common divisor** of two or more numbers is a number that will exactly divide each of them.

86. The *greatest common divisor* (G.C.D.) of two or more numbers is the largest number that will exactly divide each of the given numbers.

EXAMPLE I. — 30 has for divisors 1, 2, 3, 5, 6, 10, 15, and 30.
36 has for divisors 1, 2, 3, 4, 6, 9, 12, 18, and 36.

These two numbers have 1, 2, 3, and 6 as *common divisors*. So their *greatest common divisor* is 6.

EXAMPLE II. — Find the greatest common divisor of 18, 24, and 42.

OPERATION.

EXPLANATION.

3) 18	24	42	Since 3 exactly divides each of these numbers, it is a factor of their G. C. D.; since 2 exactly divides all the quotients obtained, it is also a factor of their G. C. D.; since there are no other common divisors, the product of the factors found ($3 \times 2 = 6$) should be the greatest common divisor.
2) 6	8	14	
3	4	7	
$3 \times 2 = 6.$			

87. **Rule.** — To obtain the greatest common divisor of two or more numbers, divide them by any factor common to all the numbers; divide the quotients in like manner, and continue the division till a set of

quotients is obtained that have no common factor; find the product of all the divisors.

Oral Exercises.

26. What are the prime numbers from 15 to 50?
27. What are the prime factors of 15? of 18? of 27?
28. Find three multiples of 9, four multiples of 11.
29. What prime factor is common to 12 and 15? to 35 and 50?
30. What is the greatest common divisor of 6 and 12? of 9 and 27? of 15 and 25? of 14 and 21? of 15, 20 and 25?

Written Exercises.

Find the G. C. D. of each of the following groups of numbers:

- | | | |
|-----------------|--------------------|-----------------------|
| 31. 12 and 20. | 36. 315 and 378. | 41. 84, 96 and 120. |
| 32. 16 and 28. | 37. 366 and 128. | 42. 48, 72 and 360. |
| 33. 30 and 42. | 38. 392 and 672. | 43. 252, 308 and 364. |
| 34. 48 and 84. | 39. 576 and 936. | 44. 392, 448 and 504. |
| 35. 75 and 125. | 40. 5265 and 3645. | 45. 432, 504 and 648. |
-
46. What is the sum of the prime numbers found between 30 and 50?
 47. What is the sum of the odd numbers found between 50 and 60?
 48. Resolve the number 728 into its prime factors.
 49. The prime factors of a number are 2, 3, 5, 7, and 11. What is that number?
 50. If the prime factors of a number are the prime numbers between 4 and 15, what is the number?
 51. Find the greatest common divisor of 168 and 392.
 52. What is the length of the longest cord which will exactly measure the length and the width of a hall 84 feet by 48 feet?
 53. Three boards, measuring respectively 12, 16, and 20

feet, were cut without loss into the longest possible equal parts. Find the length of each of these parts.

54. Find the three smallest common multiples of 3 and 4.

55. What is the greatest common divisor of 78 234 and 468?

56. What should be the length of the longest pole which will exactly measure three lots respectively 84, 56 and 70 feet wide?

57. A, B, and C receive respectively \$120, \$240, and \$384 for a certain number of cows sold at the same price a head. Find this price, knowing that it is the highest than can exactly produce each of these three amounts.

58. A grocer has 136 pints of berries and 152 pints of raisins, which he puts into boxes containing the greatest equal number of pints possible. How many pints does each box contain?

IV. — The Least Common Multiple.

88. The least common multiple (L.C.M.) of two or more numbers is the least number that is one or more times each of them; 36 is the least common multiple of 4, 6, and 9, because 36 is the least number exactly divisible by 4, 6, and 9.

EXAMPLE. — Find the L. C. M. of 4, 6, 9, and 60.

OPERATION.	ANALYSIS.
$2 \overline{) 4 \ 6 \ 9 \ 60}$	$= 2 \overline{) 2 \times 2 \ 2 \times 3 \ 3 \times 3 \ 2 \times 2 \times 3 \times 5}$
$2 \overline{) 2 \ 3 \ 9 \ 30}$	$= 2 \overline{) 2 \ 3 \ 3 \times 3 \ 2 \times 3 \times 5}$
$3 \overline{) 3 \ 9 \ 15}$	$= 3 \overline{) 3 \ 3 \times 3 \ 3 \times 5}$
$3 \ 5$	$= 3 \ 5$
	$2 \times 2 \times 3 \times 3 \times 5 = 180.$

EXPLANATION.

Since two or more of these numbers contain the prime factor 2, the L. C. M. should also contain it as factor at least once; but as 2 is again a prime factor of two of the quotients, the L. C. M. should contain another 2 as factor. Since 3 is a prime factor of two or more of the new quotients, the L. C. M. should contain 3 at least once. Besides the factors 2, 2, and 3, the L. C. M. should contain the last quotients 3 and 5. Hence, $2 \times 2 \times 3 \times 3 \times 5 = 180$, the L. C. M. of 4, 6, 9 and 60.

NOTE. — Since 4 and 6 are factors of 60, we could have rejected these two numbers and considered only 9 and 60.

89. Rule. — To find the least common multiple of two or more numbers:

1° Write the numbers in a line, and divide by any prime factor common to two or more of the numbers, bringing down the quotients and undivided numbers;

2° In like manner divide the numbers brought down, and continue the process till the last numbers brought down are prime to each other;

3° Then find the product of the divisors and the last quotients, which product should be the least common multiple of the given numbers.

NOTE. 1° We may omit from the operation any small numbers which are factors of the larger ones.

2° If not even two of the numbers have common factors, the L. C. M. is the product of the numbers themselves.

Oral Exercises.

59. What are the prime factors of 6? of 8? of 12? of 20? of 24?

60. Find the greatest common divisor of each of the following groups of numbers: 3 and 12; 12 and 18; 12 and 24; 18 and 24; 32 and 48.

61. Find the least common multiple of each of the following groups of numbers: 3 and 4; 8 and 12; 10 and 15; 12 and 16; 2, 3, and 4.

PROPERTIES OF NUMBERS
Written Exercises.

Find the least common multiple of each of the following groups of numbers:

- | | | |
|--------------------|--------------------|--------------------|
| 62. 10 and 25. | 67. 12, 20 and 30. | 72. 18, 24 and 42. |
| 63. 16 and 20. | 68. 32, 48 and 60. | 73. 15, 35 and 45. |
| 64. 28 and 56. | 69. 24, 32 and 40. | 74. 17, 34 and 68. |
| 65. 6, 10 and 15. | 70. 32, 60 and 72. | 75. 28, 56 and 84. |
| 66. 14, 21 and 28. | 71. 24, 36 and 40. | 76. 15, 42 and 70. |

77. What is the least common multiple of 12, 15, 42, and 60?

NOTE. -- Since 12 and 15 are factors of 60, they may be omitted from the operation, thus finding the L. C. M. of 42 and 60.

78. What is the smallest number exactly divisible by 16, 40, 96, and 105?

79. What is the greatest common divisor of 252, 336, and 420?

80. I have three poles whose lengths are respectively 3, 6, and 8 feet. What is the shortest distance which can be exactly measured by these three poles?

Cancellation.

90. **Cancellation** consists in cutting off common factors from both dividend and divisor, to shorten the operation. It is founded upon the principle: *Suppressing a like factor from the dividend and the divisor, does not change the quotient.*

EXAMPLE. — Divide (42×60) by (24×28) .

OPERATION.

$$\begin{array}{r} 3 \\ 6 5 \\ \cancel{42} \times \cancel{60} = \frac{15}{4} = 3\frac{3}{4} \\ \cancel{24} \times \cancel{28} \\ 2 4 \end{array}$$

EXPLANATION.

Cancel the factor 12 in 60, and 24, writing the remaining factors 5 above 60 and 2 below 24; cancel the factor 7 in 42 and 28, writing their remaining factors 6 and 4; cancel the factor 2 in 6 by the 2 in the divisor. The product of the remaining factors in the dividend $(3 \times 5 = 15)$ divided by the remaining factor of the divisor, 4, gives $\frac{15}{4}$, or $3\frac{3}{4}$.

91. Rule. — *Write the factors of the dividend above a horizontal line, and the factors of the divisor under it. Cut off all common factors from the dividend and the divisor. The product of the remaining factors of the dividend divided by the product of the remaining factors of the divisor gives the required quotient.*

Written Exercises.

81. Divide (350×9) by (25×6) .
 82. Simplify $(35 \times 75) \div (7 \times 5 \times 3)$.
 83. What is the quotient of $(315 \times 64 \times 56) \div (360 \times 392)$?
 84. What is the quotient of $(630 \times 352 \times 65) \div (90 \times 88 \times 91)$?
 85. Divide the product of $81 \times 25 \times 34 \times 30$ by the product of $21 \times 5 \times 6 \times 17$.
 86. How many pounds of beef, worth 18 cents a pound, should we get in exchange for 45 bushels of wheat worth 80 cents a bushel?
 87. A workman has worked 8 hours a day for 32 days, at 25 cents an hr. If he receives in payment wheat worth 80 cents a bushel, how many bushels should he receive?
 88. How many pieces of calico of 42 yards each, worth 5 cents a yard, are equal in value to 35 pieces of linen, of 52 yards each, worth 18 cents a yard?
 89. How much should we pay for 7840 pounds of coal, if 2240 pounds cost \$6?
 90. How many acres of land worth \$35 an acre would we get in exchange for 34 tons of hay worth \$15 a ton?
-

COMMON FRACTIONS

92. A **fraction** is one or more of the equal parts into which a unit or quantity is divided.

93. If a quantity is divided into 10, 100, 1000, etc., equal parts, the fraction is called a **decimal fraction**: *three tenths* is a decimal fraction.

If a quantity is divided into a number of equal parts other than 10, 100, 1000, etc., the fraction is called a **common fraction**: *three fifths* is a common fraction.

94. A common fraction is represented by placing one number above an other and separating them by a line. Thus, the fraction *three fifths* is written $\frac{3}{5}$.

95. The number below the line is called the **denominator**; it indicates the number of equal parts into which the quantity is divided.

96. The number above the line is called the **numerator**; it indicates the number of the equal parts of the quantity that are taken or considered.

97. The numerator and denominator are called the **terms** of the fraction.

98. In reading fractions, we first name the numerator, then the denominator, giving it the same termination as the ordinal numeral adjectives, and adding *s*. *Halves* and *thirds* are exceptions.

The fractions $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, and $\frac{7}{9}$ are read *one half*, *two thirds*, *three fourths*, *five sixths*, and *seven ninths*.

99. The numerator may be smaller than the denominator, greater than it, or equal to it.

100. A **proper fraction** is one whose numerator is less than its denominator; its value is less than the unit: $\frac{2}{7}$, $\frac{5}{9}$.

101. An **improper fraction** is one whose numerator is equal to its denominator or is greater than it; its value equals the unit or is more than it: $\frac{8}{8}$, $\frac{7}{4}$, $\frac{6}{5}$.

102. NOTE. — *A fraction expresses an unperformed division. The value of the fraction is the quotient of the numerator divided by the denominator.*

103. The different modifications that fractions undergo are founded upon the five following principles:

I. *Multiplying the numerator of a fraction by a number, multiplies the fraction by that number.*

$\frac{2}{9} \times 4 = \frac{2 \times 4}{9} = \frac{8}{9}$. We have four times the number of the same pieces; so, four times the total value.

II. *Dividing the numerator of a fraction by a number, divides the fraction by that number.*

$\frac{9}{10} \div 3 = \frac{9 \div 3}{10} = \frac{3}{10}$. We have but $\frac{1}{3}$ of the number of the same pieces; so, but $\frac{1}{3}$ of the total value.

III. *Multiplying the denominator of a fraction by a number, divides the fraction by that number.*

$\frac{5}{6} \div 4 = \frac{5}{6 \times 4} = \frac{5}{24}$. We have the same number of pieces, 5; since each piece is but $\frac{1}{4}$ the original ones, their total value is but $\frac{1}{4}$.

IV. *Dividing the denominator of a fraction by a number, multiplies the fraction by that number.*

$\frac{3}{8} \times 4 = \frac{3}{8 \div 4} = \frac{3}{2}$. We have the same number of pieces, 3; since each piece is 4 times the original ones, their total value is also 4 times as great.

V. *Multiplying or dividing both terms by the same number does not change the value of the fraction.*

$\frac{3 \times 4}{5 \times 4} = \frac{12}{20}$. We have four times as many pieces, but each piece is but $\frac{1}{4}$ the value of the original ones; so, there is no change in the total value: $\frac{3}{5} = \frac{12}{20}$.

$\frac{6 \div 3}{15 \div 3} = \frac{2}{5}$. We have $\frac{1}{3}$ as many pieces, but each piece is 3 times the value of the original pieces; so there is no change in the total value: $\frac{6}{15} = \frac{2}{5}$.

REDUCTIONS OF FRACTIONS

104. Operations which modify the terms or change the form of fractions without changing their values are called *reductions of fractions*.

Improper Fraction.

105. To reduce a whole number or a mixed number to an improper fraction.

EXAMPLES. — I. Reduce 5 units to sevenths.

In 1 unit there are $\frac{7}{7}$; in 5 units there are 5 times $\frac{7}{7}$ or $\frac{7 \times 5}{7} = \frac{35}{7}$.

II. Reduce $6\frac{3}{4}$ to fourths.

In 6 units there are $\frac{24}{4}$ (1st. case); $\frac{24}{4} + \frac{3}{4} = \frac{27}{4}$.

106. Rule. — Multiply the whole number by the denominator of the fraction, add the numerator to this product (2nd. case) and write the denominator under this sum.

Oral Exercises.

1. How many thirds are there in 2 units? in 5? in 7? in 12? in 15?
2. Reduce 3, 5, 7, 12, 20 to fifths.
3. In 5 yards there are how many thirds? fifths? twelfths?
4. Reduce 8, $4\frac{1}{7}$, $9\frac{6}{7}$ to sevenths.

Written Exercises.

Reduce to improper fractions:

5. $3\frac{1}{2}$.

6. $5\frac{2}{3}$.

7. $4\frac{2}{5}$.

8. $6\frac{3}{4}$.

9. $7\frac{5}{6}$.

10. $9\frac{4}{5}$.

11. $12\frac{7}{8}$.

12. $13\frac{2}{3}$.

13. $15\frac{3}{4}$.

14. $20\frac{7}{8}$.

15. $23\frac{2}{9}$.

16. $26\frac{5}{8}$.

17. $36\frac{4}{7}$.

18. $57\frac{5}{9}$.

19. $63\frac{4}{11}$.

20. $67\frac{4}{5}$.

21. $89\frac{5}{7}$.

22. $90\frac{4}{13}$.

23. $63\frac{8}{9}$.

24. $52\frac{11}{12}$.

25. $69\frac{7}{15}$.

26. $37\frac{8}{14}$.

27. $109\frac{5}{7}$.

28. $42\frac{9}{22}$.

29. $17\frac{23}{24}$.

30. $89\frac{2}{3}$.

31. $82\frac{4}{9}$.

32. $47\frac{6}{7}$.

33. $83\frac{17}{25}$.

34. $45\frac{4}{9}$.

107. To reduce an improper fraction to a whole number or to a mixed number.

EXAMPLE. — Reduce $\frac{38}{7}$ to a mixed number.

7 sevenths equal one unit; in 38 sevenths there are as many units as 7 is contained times in 38, or $38 \div 7 = 5$, with $\frac{3}{7}$ remaining; hence $\frac{38}{7} = 5$ units and $\frac{3}{7}$, or $5\frac{3}{7}$.

108. Rule. — Divide the numerator by the denominator.

Oral Exercises.

1. Reduce $\frac{4}{2}$, $\frac{12}{4}$, $\frac{15}{5}$, $\frac{12}{6}$, to whole numbers.
2. Reduce $\frac{10}{3}$, $\frac{14}{5}$, $\frac{17}{4}$, $\frac{27}{8}$, to mixed numbers.
3. Change $\frac{43}{8}$, $\frac{59}{7}$, $\frac{101}{9}$, $\frac{125}{12}$, to mixed numbers.

Written Exercises.

Reduce the following to whole or mixed numbers:

4. $\frac{9}{8}$.

5. $\frac{10}{5}$.

6. $\frac{31}{6}$.

7. $\frac{21}{5}$.

8. $\frac{32}{7}$.

9. $\frac{73}{10}$.

10. $\frac{50}{7}$.

11. $\frac{55}{8}$.

12. $\frac{102}{7}$.

13. $\frac{144}{12}$.

14. $\frac{181}{9}$.

15. $\frac{97}{15}$.

16. $\frac{49}{10}$.

17. $\frac{57}{13}$.

18. $\frac{107}{16}$.

19. $\frac{342}{9}$.

20. $\frac{182}{13}$.

21. $\frac{253}{50}$.

22. $\frac{710}{5}$.

23. $\frac{384}{37}$.

24. $\frac{412}{9}$.

Lowest Terms.

109. A fraction is reduced to its *lowest terms* when the numerator and the denominator have no common factor, or are prime to each other.

EXAMPLE. — Reduce $\frac{36}{48}$ to its lowest terms.

$$\frac{36 \div 2}{48 \div 2} = \frac{18}{24}; \quad \frac{18 \div 2}{24 \div 2} = \frac{9}{12}; \quad \frac{9 \div 3}{12 \div 3} = \frac{3}{4}.$$

EXPLANATION. — To divide the terms of a fraction by the same number does not change its value; so by dividing 36 and 48 by 2, 2 and 3, we reject the common factors of both terms; we have 3 and 4, which are prime to each other, and the new fraction has the same value.

110. Rules. — (a) *Reject by successive divisions all factors common to both terms.* (b) *Divide both terms by their greatest common divisor.*

Oral Exercises.

Reduce the following fractions to their lowest terms:

- | | | | |
|----------------------|----------------------|-----------------------|-----------------------|
| 1. $\frac{2}{4}$. | 5. $\frac{10}{15}$. | 9. $\frac{20}{35}$. | 13. $\frac{36}{42}$. |
| 2. $\frac{4}{6}$. | 6. $\frac{8}{24}$. | 10. $\frac{18}{36}$. | 14. $\frac{25}{35}$. |
| 3. $\frac{8}{12}$. | 7. $\frac{18}{24}$. | 11. $\frac{12}{30}$. | 15. $\frac{18}{54}$. |
| 4. $\frac{12}{14}$. | 8. $\frac{18}{27}$. | 12. $\frac{22}{33}$. | 16. $\frac{54}{60}$. |

Written Exercises.

Reduce the following fractions to their lowest terms:

- | | | | |
|-----------------------|-----------------------|-----------------------|--------------------------|
| 17. $\frac{4}{12}$. | 25. $\frac{36}{54}$. | 33. $\frac{45}{60}$. | 41. $\frac{70}{98}$. |
| 18. $\frac{12}{18}$. | 26. $\frac{28}{72}$. | 34. $\frac{42}{54}$. | 42. $\frac{34}{136}$. |
| 19. $\frac{24}{42}$. | 27. $\frac{32}{48}$. | 35. $\frac{64}{90}$. | 43. $\frac{54}{144}$. |
| 20. $\frac{27}{36}$. | 28. $\frac{21}{63}$. | 36. $\frac{50}{60}$. | 44. $\frac{80}{125}$. |
| 21. $\frac{15}{24}$. | 29. $\frac{36}{40}$. | 37. $\frac{32}{84}$. | 45. $\frac{63}{135}$. |
| 22. $\frac{24}{40}$. | 30. $\frac{25}{60}$. | 38. $\frac{18}{45}$. | 46. $\frac{128}{250}$. |
| 23. $\frac{80}{48}$. | 31. $\frac{48}{87}$. | 39. $\frac{70}{98}$. | 47. $\frac{126}{540}$. |
| 24. $\frac{18}{27}$. | 32. $\frac{48}{72}$. | 40. $\frac{40}{56}$. | 48. $\frac{485}{1044}$. |

Higher Terms.

111. A fraction is reduced to *higher terms* when it is brought to an equivalent fraction, having a larger numerator and denominator.

EXAMPLE. — Reduce $\frac{3}{4}$ to twelfths.

OPERATION.

EXPLANATION.

$$12 \div 4 = 3$$

$$\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$$

The required denominator, 12, is 3 times the given denominator, 4; therefore, to reduce fourths to twelfths, without changing the value of the fraction we should multiply both terms by 3.

112. Rule. — Divide the required denominator by the denominator of the fraction given, and multiply both terms of the given fraction by the quotient.

Oral Exercises.

1. Reduce $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$ to twelfths.
2. Reduce $\frac{1}{2}$, $\frac{3}{4}$, $\frac{3}{5}$, and $\frac{7}{10}$ to twentieths.
3. Reduce $\frac{1}{2}$, $\frac{2}{3}$, $\frac{5}{6}$, and $\frac{4}{9}$ to eighteenths.

Common Denominator.

113. A *common denominator* of two or more fractions is a denominator to which they can all be reduced. It is a common multiple of the denominators.

EXAMPLE. — What is the common denominator of $\frac{2}{3}$ and $\frac{4}{5}$?

OPERATION.

EXPLANATION.

$$3 \times 5 = 15$$

$$15 \div 3 = 5; \quad \frac{2 \times 5}{3 \times 5} = \frac{10}{15}$$

$$15 \div 5 = 3; \quad \frac{4 \times 3}{5 \times 3} = \frac{12}{15}$$

We multiply both terms of the first fraction by the denominator of the second fraction; and the terms of the second fraction by the denominator of the first.

114. Rule. — *Multiply the two terms of each fraction by the denominator (or denominators when more than two) of the other fraction.*

Oral Exercises.

Reduce the following fractions to a common denominator:

$$\begin{array}{l} 1. \frac{1}{2}, \frac{1}{3}. \\ 2. \frac{1}{2}, \frac{2}{5}. \\ 3. \frac{2}{3}, \frac{3}{4}. \end{array}$$

$$\begin{array}{l} 4. \frac{1}{3}, \frac{4}{5}. \\ 5. \frac{2}{5}, \frac{4}{7}. \\ 6. \frac{4}{7}, \frac{2}{3}. \end{array}$$

$$\begin{array}{l} 7. \frac{5}{6}, \frac{3}{5}. \\ 8. \frac{4}{7}, \frac{3}{8}. \\ 9. \frac{2}{5}, \frac{1}{9}. \end{array}$$

$$\begin{array}{l} 10. \frac{6}{7}, \frac{4}{9}. \\ 11. \frac{2}{3}, \frac{7}{11}. \\ 12. \frac{4}{9}, \frac{1}{4}. \end{array}$$

Least Common Denominator.

115. The *least common denominator* of two or more fractions is the smallest denominator to which all can be reduced.

EXAMPLE. — Reduce $\frac{5}{6}$, $\frac{7}{12}$, $\frac{9}{16}$ to their least common denominator.

OPERATION.

$$\begin{array}{l} 4 \overline{) 6 \quad 12 \quad 16} \\ \quad \underline{3 \quad 4} \\ 4 \times 3 \times 4 = 48, \text{ L. C. D.} \\ 48 \div 6 = 8; \frac{5 \times 8}{6 \times 8} = \frac{40}{48}. \\ 48 \div 12 = 4; \frac{7 \times 4}{12 \times 4} = \frac{28}{48}. \\ 48 \div 16 = 3; \frac{9 \times 3}{16 \times 3} = \frac{27}{48}. \end{array}$$

EXPLANATION.

The least common multiple of 6, 12, and 16 is 48; so 48 is the L. C. D. To reduce $\frac{5}{6}$ to forty-eighths, 48 is divided by 6 and both terms of the fraction are multiplied by the quotient, giving $\frac{40}{48}$. Each of the other fractions is reduced to forty-eighths in the same manner.

116. Rule. — 1° Find the least common multiple of the denominators, which will be the least common denominator.

2° Divide the least common denominator by the denominator of each fraction, and multiply both terms of each fraction by the respective quotient.

Oral Exercises.

Reduce the following fractions to their least common denominator:

13. $\frac{3}{4}, \frac{1}{2}$.

16. $\frac{5}{6}, \frac{7}{12}$.

19. $\frac{7}{9}, \frac{2}{3}$.

22. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$.

14. $\frac{1}{3}, \frac{5}{6}$.

17. $\frac{4}{9}, \frac{5}{3}$.

20. $\frac{5}{8}, \frac{7}{12}$.

23. $\frac{1}{2}, \frac{1}{4}, \frac{3}{5}$.

15. $\frac{3}{4}, \frac{5}{8}$.

18. $\frac{3}{4}, \frac{1}{6}$.

21. $\frac{5}{9}, \frac{11}{12}$.

24. $\frac{3}{4}, \frac{3}{5}, \frac{7}{8}$.

Written Exercises.

Reduce the following fractions to a common denominator:

25. $\frac{2}{3}, \frac{3}{5}$.

35. $\frac{3}{4}, \frac{5}{7}$.

45. $\frac{1}{2}, \frac{2}{3}, \frac{3}{5}$.

26. $\frac{3}{4}, \frac{5}{7}$.

36. $\frac{4}{5}, \frac{11}{12}$.

46. $\frac{2}{3}, \frac{3}{5}, \frac{5}{7}$.

27. $\frac{3}{5}, \frac{1}{6}$.

37. $\frac{3}{7}, \frac{8}{9}$.

47. $\frac{3}{5}, \frac{2}{3}, \frac{3}{4}$.

28. $\frac{2}{2}, \frac{6}{7}$.

38. $\frac{3}{8}, \frac{3}{5}$.

48. $\frac{1}{3}, \frac{1}{4}, \frac{2}{7}$.

29. $\frac{5}{7}, \frac{4}{9}$.

39. $\frac{5}{8}, \frac{11}{15}$.

49. $\frac{3}{5}, \frac{5}{8}, \frac{1}{3}$.

30. $\frac{4}{7}, \frac{5}{11}$.

40. $\frac{5}{12}, \frac{4}{9}$.

50. $\frac{1}{3}, \frac{1}{2}, \frac{5}{11}$.

31. $\frac{5}{9}, \frac{7}{12}$.

41. $\frac{6}{7}, \frac{6}{11}$.

51. $\frac{1}{3}, \frac{2}{5}, \frac{6}{7}$.

32. $\frac{3}{4}, \frac{7}{10}$.

42. $\frac{4}{5}, \frac{15}{16}$.

52. $\frac{3}{5}, \frac{1}{6}, \frac{6}{7}$.

33. $\frac{7}{8}, \frac{4}{5}$.

43. $\frac{4}{11}, \frac{6}{7}$.

53. $\frac{1}{4}, \frac{2}{5}, \frac{4}{7}$.

34. $\frac{8}{9}, \frac{6}{7}$.

44. $\frac{7}{10}, \frac{11}{21}$.

54. $\frac{3}{4}, \frac{2}{5}, \frac{5}{9}$.

Reduce the following fractions to their least common denominator:

55. $\frac{2}{3}, \frac{5}{6}$.

65. $\frac{3}{4}, \frac{2}{5}, \frac{3}{7}$.

75. $\frac{4}{9}, \frac{7}{8}, \frac{6}{5}$.

56. $\frac{5}{7}, \frac{12}{21}$.

66. $\frac{5}{6}, \frac{3}{10}, \frac{4}{5}$.

76. $\frac{5}{11}, \frac{4}{5}, \frac{7}{44}$.

57. $\frac{2}{9}, \frac{5}{6}$.

67. $\frac{5}{8}, \frac{7}{12}, \frac{3}{4}$.

77. $\frac{1}{5}, \frac{3}{8}, \frac{11}{25}$.

58. $\frac{4}{15}, \frac{3}{5}$.

68. $\frac{3}{4}, \frac{7}{12}, \frac{0}{20}$.

78. $\frac{5}{8}, \frac{7}{12}, \frac{4}{9}$.

59. $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}$.

69. $\frac{3}{5}, \frac{5}{12}, \frac{7}{30}$.

79. $\frac{2}{0}, \frac{9}{10}, \frac{11}{12}$.

60. $\frac{2}{3}, \frac{5}{12}, \frac{8}{8}$.

70. $\frac{3}{4}, \frac{3}{5}, \frac{7}{15}$.

80. $\frac{3}{4}, \frac{5}{9}, \frac{3}{11}$.

61. $\frac{2}{9}, \frac{7}{12}, \frac{5}{6}$.

71. $\frac{1}{3}, \frac{2}{7}, \frac{5}{6}$.

81. $\frac{5}{12}, \frac{7}{15}, \frac{11}{24}$.

62. $\frac{5}{6}, \frac{3}{4}, \frac{7}{5}$.

72. $\frac{4}{5}, \frac{3}{8}, \frac{7}{25}$.

82. $\frac{8}{0}, \frac{13}{20}, \frac{7}{15}$.

63. $\frac{5}{6}, \frac{2}{9}, \frac{5}{18}$.

73. $\frac{2}{9}, \frac{3}{5}, \frac{11}{15}$.

83. $\frac{8}{9}, \frac{5}{8}, \frac{5}{7}$.

64. $\frac{5}{7}, \frac{3}{14}, \frac{4}{21}$.

74. $\frac{3}{7}, \frac{5}{21}, \frac{8}{15}$.

84. $\frac{5}{17}, \frac{2}{3}, \frac{1}{12}$.

ADDITION OF FRACTIONS

117. Fractions should express similar parts of a unit before they can be added; so, they must have a common denominator.

EXAMPLES. — I. Add $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{5}{6}$.

$$\frac{1}{2} + \frac{2}{3} + \frac{5}{6} = \frac{15}{30} + \frac{20}{30} + \frac{18}{30} = \frac{15+20+18}{30} = \frac{53}{30}, \text{ or } 1\frac{23}{30}.$$

When the fractions have been reduced to the L. C. D., the numerators indicate the number of parts to be added, and the common denominator gives the value of each of these parts. As 15 inches + 20 in. + 18 in. = 53 inches; so, 15 thirtieths + 20 thirtieths + 18 thirtieths = 53 thirtieths.

II. Add $2\frac{3}{4}$, $5\frac{1}{3}$, $7\frac{1}{9}$.

$$\frac{3}{4} + \frac{1}{3} + \frac{1}{9} = \frac{27+12+4}{36} = \frac{43}{36}, \text{ or } 1\frac{7}{36};$$

$$2+5+7=14; 14+1\frac{7}{36}=15\frac{31}{36}.$$

118. Rule. — *If necessary, reduce the fractions to a common denominator, then add the numerators and write their sum over the common denominator.*

To add mixed numbers, add the whole numbers and the fractions separately, and unite their sums.

Written Exercises.

1. $\frac{2}{4} + \frac{1}{4}$.

2. $\frac{3}{5} + \frac{1}{5}$.

3. $\frac{5}{8} + \frac{2}{8}$.

4. $\frac{1}{6} + \frac{2}{3}$.

5. $\frac{1}{2} + \frac{1}{4}$.

16. $\frac{2}{3} + \frac{4}{5}$.

17. $\frac{1}{2} + \frac{7}{8}$.

18. $\frac{3}{4} + \frac{7}{12}$.

19. $\frac{7}{10} + \frac{3}{4}$.

20. $\frac{11}{12} + \frac{2}{3}$.

6. $\frac{3}{4} + \frac{1}{6}$.

7. $\frac{1}{2} + \frac{2}{3}$.

8. $\frac{2}{3} + \frac{3}{4}$.

9. $\frac{5}{6} + \frac{3}{4}$.

10. $\frac{3}{4} + \frac{5}{12}$.

21. $\frac{7}{12} + \frac{5}{9}$.

22. $\frac{7}{15} + \frac{3}{10}$.

23. $\frac{7}{10} + \frac{3}{4}$.

24. $\frac{2}{3} + \frac{8}{21}$.

25. $\frac{4}{7} + \frac{2}{8}$.

11. $\frac{7}{8} + \frac{1}{4}$.

12. $\frac{3}{7} + \frac{2}{3}$.

13. $\frac{4}{9} + \frac{2}{3}$.

14. $\frac{3}{8} + \frac{1}{3}$.

15. $\frac{3}{5} + \frac{3}{4}$.

26. $\frac{3}{8} + \frac{2}{5}$.

27. $\frac{5}{12} + \frac{2}{9}$.

28. $\frac{4}{25} + \frac{3}{5}$.

29. $\frac{5}{9} + \frac{7}{13}$.

30. $\frac{5}{6} + \frac{7}{8}$.

$$31. \frac{3}{10} + \frac{11}{12}.$$

$$32. \frac{5}{12} + \frac{4}{15}.$$

$$33. \frac{2}{5} + \frac{4}{9}.$$

$$34. \frac{3}{4} + \frac{7}{8}.$$

$$35. \frac{5}{8} + 2\frac{2}{5}.$$

$$36. 4\frac{1}{2} + 6\frac{1}{5}.$$

$$37. 5\frac{2}{3} + 4\frac{1}{3}.$$

$$38. 4\frac{2}{3} + \frac{5}{7}.$$

$$39. \frac{4}{11} + 8\frac{2}{5}.$$

$$40. 6\frac{1}{4} + 6\frac{1}{5}.$$

$$41. 5\frac{4}{9} + 4\frac{3}{7}.$$

$$42. 6\frac{2}{3} + 3\frac{4}{5}.$$

$$43. 3\frac{1}{4} + 9\frac{5}{12}.$$

$$44. 6\frac{11}{12} + 2\frac{3}{4}.$$

$$45. 4\frac{10}{11} + 14\frac{4}{5}.$$

$$46. \frac{2}{3} + \frac{1}{6} + \frac{1}{2}.$$

$$47. \frac{4}{5} + \frac{1}{2} + \frac{7}{10}.$$

$$48. \frac{2}{10} + \frac{2}{5} + \frac{3}{20}.$$

$$49. \frac{1}{8} + \frac{2}{3} + \frac{3}{4}.$$

$$50. \frac{3}{4} + \frac{4}{5} + \frac{5}{12}.$$

$$51. \frac{3}{8} + \frac{1}{2} + \frac{5}{24}.$$

$$52. \frac{2}{3} + \frac{3}{4} + \frac{5}{7}.$$

$$53. \frac{1}{8} + \frac{3}{10} + \frac{1}{3}.$$

$$54. \frac{2}{3} + \frac{3}{4} + \frac{1}{8}.$$

$$55. \frac{4}{9} + \frac{11}{15} + \frac{1}{6}.$$

$$56. \frac{3}{5} + \frac{2}{11} + \frac{1}{3}.$$

$$57. \frac{1}{4} + \frac{5}{7} + \frac{2}{10}.$$

$$58. \frac{1}{10} + \frac{2}{7} + \frac{5}{6}.$$

$$59. \frac{4}{5} + \frac{1}{10} + \frac{2}{15}.$$

$$60. \frac{1}{7} + \frac{2}{9} + \frac{5}{6}.$$

$$61. 2\frac{3}{5} + \frac{2}{10} + \frac{1}{2}.$$

$$62. \frac{3}{4} + 3\frac{5}{6} + \frac{7}{12}.$$

$$63. 4\frac{3}{8} + 7\frac{4}{5} + \frac{1}{2}.$$

$$64. \frac{1}{2} + 7\frac{1}{4} + 8\frac{2}{5}.$$

$$65. 1\frac{2}{3} + 2\frac{3}{4} + 4\frac{1}{2}.$$

$$66. 4\frac{2}{8} + 3\frac{5}{6} + \frac{7}{12}.$$

$$67. \frac{3}{8} + 5\frac{1}{4} + 7\frac{11}{12}.$$

$$68. 2\frac{8}{11} + 6\frac{1}{2} + 12\frac{10}{22}.$$

$$69. \frac{1}{6} + 2\frac{5}{7} + \frac{5}{14}.$$

$$70. 3\frac{1}{6} + 4\frac{2}{3} + 3\frac{2}{9}.$$

$$71. 5\frac{1}{4} + \frac{2}{5} + 2\frac{7}{10}.$$

$$72. 2\frac{1}{2} + 6\frac{1}{3} + \frac{2}{4}.$$

$$73. 3\frac{2}{7} + 1\frac{8}{21} + 5\frac{1}{2}.$$

$$74. \frac{3}{4} + 3\frac{2}{8} + 6\frac{7}{18}.$$

$$75. 2\frac{4}{7} + \frac{8}{21} + 6\frac{2}{3}.$$

$$76. 4\frac{2}{5} + 6\frac{5}{9} + 8\frac{7}{12}.$$

$$77. \frac{4}{9} + 1\frac{7}{12} + 9\frac{1}{8}.$$

$$78. 5\frac{3}{4} + 6\frac{2}{3} + \frac{6}{11}.$$

$$79. 8\frac{5}{8} + 5\frac{2}{5} + 7\frac{6}{7}.$$

$$80. 9\frac{4}{15} + \frac{7}{9} + 11\frac{13}{24}.$$

$$81. 4\frac{1}{2} + 7\frac{1}{4} + 8\frac{2}{3}.$$

$$82. 6\frac{2}{3} + 4\frac{1}{2} + 2\frac{3}{4}.$$

$$83. 11\frac{3}{4} + 10\frac{1}{8} + 10\frac{3}{16}.$$

$$84. 8\frac{4}{5} + 4\frac{3}{10} + 7\frac{2}{25}.$$

$$85. 4\frac{1}{2} + 6\frac{4}{5} + 8\frac{3}{8}.$$

$$86. 10\frac{1}{2} + 9\frac{3}{4} + 8\frac{4}{5}.$$

$$87. 3\frac{5}{6} + \frac{7}{6} + 15\frac{3}{4}.$$

$$88. 8\frac{4}{5} + 13\frac{1}{10} + \frac{19}{25}.$$

$$89. 7\frac{4}{5} + 12\frac{3}{4} + \frac{5}{6}.$$

$$90. 3\frac{1}{2} + 8\frac{5}{6} + 1\frac{3}{21}.$$

$$91. 7\frac{2}{7} + 6\frac{1}{3} + 5\frac{4}{5}.$$

$$92. 3\frac{5}{12} + 12\frac{1}{8} + 1\frac{7}{24}.$$

$$93. 6\frac{2}{15} + 4\frac{5}{7} + \frac{9}{35}.$$

$$94. \frac{7}{12} + 8\frac{2}{5} + 4\frac{3}{8}.$$

$$95. 8\frac{5}{7} + 6\frac{2}{15} + \frac{9}{35}.$$

$$96. 11\frac{1}{9} + 2\frac{1}{4} + 12\frac{3}{8}.$$

$$97. 14\frac{1}{7} + 8\frac{2}{9} + 2\frac{5}{8}.$$

$$98. 15 + \frac{13}{45} + 10\frac{5}{9}.$$

$$99. 18\frac{1}{4} + 4\frac{1}{2} + 12\frac{8}{10}.$$

$$100. 43\frac{3}{8} + 54\frac{5}{7} + 87\frac{2}{8}.$$

Principles of Analysis relating to Addition:

1. I add because I wish to find the *sum* of.....
2. I add because..... (what is asked) is *more than*..... (what is given).
3. I add because I wish to find how many there are *in all, or together*.

Oral Exercises.

101. Find the sum of:

$$1^{\circ} \frac{2}{3} + \frac{1}{3}.$$

$$2^{\circ} \frac{1}{2} + \frac{3}{4}.$$

$$3^{\circ} \frac{2}{3} + \frac{1}{6}.$$

$$4^{\circ} \frac{3}{5} + \frac{1}{10}.$$

$$5^{\circ} \frac{3}{8} + \frac{3}{4}.$$

$$6^{\circ} \frac{2}{3} + \frac{1}{2}.$$

$$7^{\circ} \frac{1}{6} + \frac{1}{3}.$$

$$8^{\circ} \frac{3}{7} + \frac{1}{14}.$$

$$9^{\circ} \frac{1}{2} + \frac{5}{12}.$$

$$10^{\circ} \frac{3}{4} + \frac{1}{6}.$$

$$11^{\circ} \frac{2}{5} + \frac{3}{4}.$$

$$12^{\circ} \frac{7}{8} + \frac{3}{4}.$$

102. What is the weight of two fishes if one weighs $\frac{3}{8}$ of a pound and the other, $\frac{3}{4}$ of a pound?

103. To $\frac{5}{8}$ of a number we add $\frac{2}{7}$ of the same number. What fraction have we?

104. Michael had $\$1\frac{3}{4}$, and he earns $\$2\frac{1}{5}$. How much has he now?

105. James has two apple trees: one produced $7\frac{1}{2}$ bushels and the other $6\frac{2}{3}$ bushels. How many bushels did he harvest?

106. My brother is $10\frac{1}{3}$ years of age and I am $12\frac{1}{2}$. What is the sum of our ages?

107. A farmer sowed $2\frac{1}{4}$ bushels of oats and $3\frac{1}{2}$ bushels of wheat. How many bushels did he sow in all?

Problems on Addition.

108. By adding the $\frac{2}{5}$ of a number to its $\frac{3}{4}$, what fraction of this number do we find?

109. I sold $18\frac{3}{4}$ gallons of molasses, and I have $65\frac{3}{4}$ gallons left. How many had I in all?

110. A tree broke $37\frac{1}{3}$ feet from the ground; the part that fell measured $54\frac{3}{4}$ feet. What was the length of the tree?

111. In a subtraction, the small number is $46\frac{5}{8}$ and the difference is $58\frac{1}{7}$. What is the big number?

112. Reduce to improper fractions $8\frac{5}{9}$ and $9\frac{4}{11}$.

113. I have $15\frac{7}{8}$ pounds of tobacco after selling $36\frac{3}{4}$ pounds. How many pounds had I?

114. The wheat produced by Saskatchewan, in 1908, was $501\frac{1}{2}$ million bushels; the harvest of Manitoba was $49\frac{1}{4}$ million. How many bushels of wheat did the two provinces produce?

115. How many pounds are there in $\frac{77}{9}$ pounds?

116. A farmer has 4 stacks of hay, containing respectively $8\frac{4}{8}$ tons, $7\frac{3}{10}$ tons, $12\frac{7}{8}$ tons and $9\frac{9}{10}$ tons. How many tons of hay has he?

117. Find the sum of $12\frac{3}{8}$ pounds, $9\frac{3}{4}$ pounds and $20\frac{5}{12}$ pounds.

118. Reduce to their lowest terms $\frac{108}{117}$ and $\frac{108}{188}$.

119. Leo gave $\frac{2}{5}$ of his money to a beggar and spent one third of it to buy school books. What fraction of his money has he left?

120. What is the sum of the following numbers: $755\frac{1}{8}$
 $+ 25\frac{1}{4} + 30\frac{3}{8} + 5\frac{2}{9} + 13\frac{1}{12}$?

121. Reduce to the least common denominator: $\frac{7}{80}$, $\frac{5}{12}$, $\frac{1}{6}$.

122. A pupil spends $\frac{1}{4}$ of a day in recreation, $\frac{1}{10}$ at table, $\frac{3}{8}$ in bed, and the rest in class. What fraction of a day does he spend out of class?

123. I bought four pieces of linen; the first measured $54\frac{3}{4}$ yards, the second $55\frac{3}{8}$ yards, the third $51\frac{7}{10}$ yards, and the fourth $50\frac{1}{2}$ yards. How many yards did I buy?

124. Place the following fractions in the descending order of greatness: $\frac{1}{2}$, $\frac{4}{5}$, $\frac{5}{8}$, $\frac{10}{18}$, $\frac{1}{4}$.

125. In 1905, the Canadian Pacific had $8973\frac{1}{2}$ miles of railroad, and the Grand Trunk $3746\frac{1}{8}$ miles. How many

miles of railroad did these two companies together possess?

126. A case of goods was laid off at a railway station. The goods weighed $73\frac{2}{3}$ pounds net, and the case itself weighed $38\frac{1}{8}$ pounds. What is the gross weight of the invoice?

127. What is the total weight of five cases of goods weighing respectively $60\frac{4}{25}$ pounds, $49\frac{2}{50}$ pounds, $18\frac{1}{20}$ pounds, $6\frac{2}{4}$ pounds, and $90\frac{1}{2}$ pounds?

128. A grocer bought 4 barrels of brown sugar weighing respectively $275\frac{3}{8}$ pounds, $285\frac{3}{4}$ pounds, $291\frac{1}{2}$ pounds, and $269\frac{1}{16}$ pounds. Find the total weight.

129. In 1907, Canada produced $95\frac{2}{5}$ million bushels of wheat; the United States, $634\frac{1}{6}$ million, and Mexico, $9\frac{2}{10}$ million. What was the harvest of wheat that year in North America?

130. The timekeeper of a yard marked in the following way the number of hours one man worked: $7\frac{1}{2}$ hrs., $8\frac{1}{4}$ hrs., $9\frac{2}{4}$ hrs., $8\frac{2}{3}$ hrs., $9\frac{1}{4}$ hrs., and $8\frac{1}{3}$ hrs. How long did this man work?

131. On New Year's day my brother gave me $\$1\frac{1}{2}$; my godmother, $\$1\frac{2}{5}$; my aunt, $\$1\frac{2}{10}$. I deposited it all in the School Savings Bank. What is my actual deposit, if I had already deposited $\$4\frac{2}{4}$?

132. I tied to my kite three strings end to end: one $74\frac{1}{2}$ feet, the other, $148\frac{2}{3}$ feet, and the third, $46\frac{2}{4}$ feet. What is the total length?

133. My neighbor sold $112\frac{2}{7}$ bushels of wheat for $\$250\frac{4}{5}$, $9\frac{5}{12}$ bushels of barley for $\$62\frac{2}{10}$, and $225\frac{9}{14}$ bushels of oats for $\$104\frac{2}{4}$. Find the amount of the sale in bushels and in money.

134. Find the sum spent for digging the canals along the St. Lawrence, if Lachine Canal cost $11\frac{2}{10}$ million dollars; Soulanges Canal, $6\frac{1}{2}$ million; Cornwall Canal, $7\frac{1}{12}$ million; and the other canals, $11\frac{1}{8}$ million.

135. Albert deposited $\$3\frac{3}{8}$ in the School Savings Bank; his brother, $\$2\frac{1}{4}$ more than he. How much did both together deposit?

136. I paid $\$46\frac{1}{2}$ for a milch cow, and $\$56\frac{1}{4}$ more for a horse. How much did I pay for the two?

137. In an examination the following numbers were given to be added: $92\frac{7}{10} + 68\frac{5}{12} + 3\frac{3}{4} + 7\frac{1}{6} + 39$. Joseph found for answer $210\frac{7}{15}$ and Andrew $211\frac{4}{15}$. Which of the two was right?

138. I bought two pieces of cloth; the first measured $4\frac{1}{8}$ yards, and the second, $2\frac{3}{7}$ more than the first. What was the total length?

139. Our class is $24\frac{3}{4}$ feet long and $21\frac{2}{3}$ feet wide. What is the length of the moulding that goes around the class?

140. What would be the length of my garden fence, if the garden is $75\frac{3}{4}$ feet wide and $125\frac{1}{5}$ feet long?

SUBTRACTION OF FRACTIONS

119. Fractions should express similar parts of a unit before they can be subtracted; so, they must have a common denominator.

EXAMPLE. — Subtract $\frac{3}{4}$ from $\frac{6}{7}$.

$$\frac{6}{7} - \frac{3}{4} = \frac{24 - 21}{28} = \frac{3}{28}.$$

As 21 cents subtracted from 24 cents = 3 cents; so, 21 twenty-eighths subtracted from 24 twenty-eighths = 3 twenty-eighths. When the fractions have been reduced to the L. C. D., the numerators indicate the numbers of similar parts to be subtracted.

120. Rule. — *When subtracting one fraction from another, reduce them to a common denominator, when necessary; then subtract the numerators and write their difference over the common denom.*

Written Exercises.

Find the value of:

1. $\frac{3}{4} - \frac{2}{4}$.

2. $\frac{5}{6} - \frac{1}{6}$.

3. $\frac{9}{10} - \frac{3}{10}$.

4. $\frac{5}{6} - \frac{1}{2}$.

5. $\frac{2}{3} - \frac{5}{9}$.

6. $\frac{5}{6} - \frac{2}{3}$.

7. $\frac{3}{4} - \frac{1}{4}$.

8. $\frac{4}{5} - \frac{1}{5}$.

9. $\frac{1}{2} - \frac{2}{3}$.

10. $\frac{5}{9} - \frac{1}{3}$.

11. $\frac{11}{15} - \frac{2}{3}$.

12. $\frac{9}{10} - \frac{3}{5}$.

13. $\frac{3}{4} - \frac{5}{12}$.

14. $\frac{7}{8} - \frac{1}{2}$.

15. $\frac{9}{7} - \frac{8}{21}$.

121. A mixed number may also be subtracted from another mixed number.

EXAMPLES. — I. Subtract $3\frac{3}{4}$ from $8\frac{1}{4}$.

$$\frac{1}{4} - \frac{3}{4} = \frac{10 - 15}{20} = \frac{1}{20}; 8 - 3 = 5; 5 + \frac{1}{20} = 5\frac{1}{20}.$$

II. Subtract $6\frac{2}{3}$ from $9\frac{2}{3}$.

$$\frac{2}{3} - \frac{2}{3} = \frac{14}{21} - \frac{12}{21}. \text{ This being impossible, we borrow 1 unit from 9 and add it to our } \frac{14}{21}. 1 = \frac{21}{21}; \frac{14}{21} + \frac{21}{21} = \frac{35}{21}; \frac{35}{21} - \frac{12}{21} = \frac{23}{21}; 8 - 6 = 2; 2 + \frac{23}{21} = 2\frac{23}{21}.$$

122. Rule. — Subtract the fraction from the fraction and the whole number from the whole number and unite the two differences.

If the fraction of the smaller number is greater than that of the greater quantity, borrow one unit from the greater number.

Written Exercises.

Perform the following subtractions:

16. $4\frac{1}{2} - 2$.

17. $6\frac{1}{8} - 3$.

18. $7\frac{1}{4} - 3\frac{1}{2}$.

19. $6\frac{1}{2} - 4\frac{1}{4}$.

20. $7\frac{2}{7} - 3\frac{1}{2}$.

21. $8 - 4\frac{1}{2}$.

22. $9 - 6\frac{1}{4}$.

23. $8\frac{1}{8} - 4\frac{1}{4}$.

24. $3 - 1\frac{1}{2}$.

25. $7\frac{1}{4} - 2\frac{1}{8}$.

26. $8\frac{1}{4} - 4\frac{1}{2}$.

27. $9\frac{1}{2} - 3\frac{1}{4}$.

28. $7\frac{1}{2} - 6\frac{1}{8}$.

29. $8\frac{1}{2} - 7\frac{1}{4}$.

30. $7\frac{1}{8} - 4\frac{1}{8}$.

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| 31. $6\frac{1}{4} - 5\frac{1}{4}$. | 36. $19\frac{1}{8} - 13\frac{5}{8}$. | 41. $8\frac{1}{4} - 8\frac{1}{4}$. |
| 32. $13\frac{1}{4} - 10\frac{1}{4}$. | 37. $19\frac{1}{8} - 15\frac{1}{2}$. | 42. $16\frac{1}{11} - 5\frac{1}{11}$. |
| 33. $12\frac{1}{4} - 7\frac{1}{4}$. | 38. $17\frac{1}{4} - 13\frac{1}{4}$. | 43. $19\frac{1}{8} - 15\frac{1}{8}$. |
| 34. $8\frac{1}{8} - 4\frac{1}{2}$. | 39. $8\frac{1}{7} - 4\frac{1}{3}$. | 44. $37\frac{1}{11} - 18\frac{1}{11}$. |
| 35. $10\frac{1}{4} - 3\frac{5}{4}$. | 40. $29\frac{1}{4} - 23\frac{7}{8}$. | 45. $27\frac{11}{12} - 9\frac{1}{4}$. |

Review Exercises.

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| 46. $12\frac{3}{7} - 9\frac{1}{2}$. | 51. $18\frac{5}{12} + 17\frac{3}{4}$. | 56. $17\frac{2}{3} + 19\frac{3}{4}$. |
| 47. $19\frac{1}{6} - 7\frac{2}{11}$. | 52. $9\frac{1}{2} - 3\frac{1}{6}$. | 57. $12\frac{1}{2} - 4\frac{1}{3}$. |
| 48. $3\frac{3}{7} + 4\frac{1}{4}$. | 53. $57\frac{2}{3} + 13\frac{7}{12}$. | 58. $9\frac{3}{16} - 3\frac{1}{8}$. |
| 49. $5\frac{6}{7} + 4\frac{3}{4}$. | 54. $51\frac{1}{2} - 18\frac{3}{4}$. | 59. $12\frac{3}{8} + 15\frac{7}{12}$. |
| 50. $15\frac{1}{8} - 8\frac{7}{8}$. | 55. $65 - 25\frac{3}{16}$. | 60. $8\frac{3}{10} - 5\frac{1}{21}$. |

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| 61. $\frac{8}{9} + \frac{4}{5} - \frac{4}{15}$. | 71. $6\frac{3}{8} - 4\frac{1}{2} + 5\frac{5}{7}$. |
| 62. $\frac{5}{8} + \frac{7}{9} - \frac{1}{36}$. | 72. $\frac{15}{16} + 3\frac{2}{3} - 2\frac{7}{8}$. |
| 63. $\frac{8}{11} + \frac{2}{4} - \frac{5}{11}$. | 73. $8\frac{1}{2} - \frac{1}{9} - 7\frac{2}{3}$. |
| 64. $\frac{7}{10} - \frac{1}{3} + \frac{3}{4}$. | 74. $4\frac{1}{21} + 8\frac{5}{14} - 6\frac{3}{4}$. |
| 65. $\frac{2}{7} + \frac{5}{9} - \frac{5}{21}$. | 75. $18\frac{15}{16} - 13\frac{11}{12} + \frac{5}{6}$. |
| 66. $\frac{5}{6} + 2\frac{1}{7} - \frac{2}{3}$. | 76. $8\frac{5}{9} + 2\frac{7}{15} - 10\frac{2}{3}$. |
| 67. $\frac{3}{4} - \frac{2}{8} + 3\frac{5}{8}$. | 77. $14\frac{3}{11} - 7\frac{1}{7} + \frac{1}{4}$. |
| 68. $3\frac{3}{4} + 2\frac{2}{3} - \frac{2}{15}$. | 78. $5\frac{7}{8} + 2\frac{3}{5} - \frac{3}{2}$. |
| 69. $6\frac{3}{8} - 4\frac{2}{7} + 3\frac{9}{10}$. | 79. $6\frac{5}{11} - 4\frac{1}{9} - \frac{7}{6}$. |
| 70. $2\frac{8}{9} + 3\frac{3}{4} - 1\frac{5}{8}$. | 80. $6\frac{2}{7} + 4\frac{5}{9} - 8\frac{1}{15}$. |

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| 81. $(5\frac{1}{4} + 9\frac{2}{3}) - 4\frac{5}{6}$. |
| 82. $(12 - 5\frac{3}{8}) + 4\frac{3}{10}$. |
| 83. $8\frac{11}{24} + (5\frac{1}{9} - 3\frac{3}{4})$. |
| 84. $12\frac{1}{11} - (3\frac{1}{5} + 1\frac{1}{5})$. |
| 85. $(\frac{5}{6} + 4) - (\frac{2}{3} + \frac{1}{24})$. |
| 86. $(12\frac{3}{4} - 7\frac{6}{7}) + (7\frac{1}{2} - 4\frac{3}{4})$. |
| 87. $(6\frac{7}{8} + 7\frac{9}{10}) - (9\frac{1}{3} - 5\frac{9}{10})$. |
| 88. $10\frac{3}{16} + (2\frac{5}{8} + 3\frac{3}{5} + 1\frac{1}{2})$. |
| 89. $(9\frac{3}{4} + 6\frac{1}{3} - 7\frac{5}{6}) - 3\frac{9}{10}$. |
| 90. $(6\frac{7}{8} + 3\frac{3}{5} - 6\frac{1}{6}) + (9\frac{11}{12} - 3\frac{3}{5} - 4\frac{3}{4})$. |

Principles of Analysis relating to Subtraction:

4. I subtract because I wish to find the *difference* between..... and.....
5. I subtract because I wish to find *what is left* or *what remains*.
6. I subtract because..... (what is asked) is *less than*.... (what is given).

Oral Exercises.

91. What is the difference between $\frac{1}{2}$ and $\frac{1}{4}$? $\frac{5}{6}$ and $\frac{2}{3}$? $\frac{7}{8}$ and $\frac{3}{4}$?
92. To what fraction must we add $\frac{3}{8}$ to have 1 whole?
93. What fraction must we subtract from a unit to have $\frac{4}{7}$?
94. A child received $2\frac{1}{2}$ pounds of raisins and he gave $1\frac{1}{4}$ pounds to his little companions. How much did he keep for himself?
95. Henry had $\$3\frac{3}{4}$ and he gave $\$2\frac{1}{2}$ to the poor. How much has he left?
96. What must we subtract from $4\frac{3}{4}$ to have $2\frac{1}{2}$?
97. My cousin is $13\frac{5}{6}$ years old and I am $2\frac{1}{2}$ years younger than he. What is my age?
98. I have $\$6\frac{1}{2}$ in the School Savings Bank and my little brother has $\$2\frac{3}{4}$ less than I. What sum has he deposited?
99. I gained $\$5\frac{7}{10}$ on an armchair I sold for $\$12\frac{1}{2}$. How much had I paid for it?
100. During the course of a year, Oliver deposited $\$8\frac{1}{5}$ in the School Savings Bank, and Joseph, $\$1\frac{9}{10}$ less. How much did the latter deposit?

Problems on Subtraction.

101. Richard will be $29\frac{2}{3}$ years old in $15\frac{5}{6}$ years. What is his age?

102. Rideau Canal is $126\frac{1}{4}$ miles long, and Lachine Canal, $8\frac{1}{2}$ miles. How much longer is one than the other?

103. A machinist earns $\$10\frac{3}{4}$ a week, but he spends $\$7\frac{9}{10}$ for liquor. How much has he left for family use?

104. In 1905, $23\frac{7}{10}$ inches of rain fell; in 1906, $21\frac{9}{25}$ inches. Find the difference.

105. A field that is not fertilized produces $74\frac{2}{3}$ bushels of peas; when it is fertilized it produces $95\frac{2}{5}$ bushels. What is the difference?

106. With $42\frac{5}{7}$ acres more, my farm would be $261\frac{1}{2}$ acres in area. What is the area of my farm?

107. How much must I add to $99\frac{9}{10}$ to have $174\frac{5}{8}$?

108. The greater of two numbers is $474\frac{4}{15}$; their difference is $128\frac{1}{12}$. What is the smaller number?

109. The wool of my sheep weighs $85\frac{2}{9}$ pounds; if, after washing, it weighs $68\frac{3}{4}$ pounds, how many pounds did it diminish?

110. From $27\frac{5}{6}$ take $(27\frac{4}{7} - 12\frac{2}{3})$.

111. The sum of two numbers is $79\frac{7}{8}$ and one of these numbers is $49\frac{8}{9}$. What is the other?

112. Lachine Canal cost $11\frac{7}{20}$ million dollars, and Soulanges Canal, $6\frac{7}{8}$ million. How much did one cost more than the other?

113. I still need $\$25\frac{3}{4}$ to pay a debt of $\$340\frac{3}{5}$. What sum have I?

114. A mattress maker has $76\frac{5}{7}$ pounds of wool; to make 5 mattresses, he needs $95\frac{2}{3}$ pounds. How much is he still lacking?

ADDITION AND SUBTRACTION.

First Review.

1. A beggar met 4 persons. From the first he received $\$1\frac{1}{10}$; from the second, $\$1\frac{1}{5}$; from the third, $\$1\frac{1}{4}$, and from the fourth, $\$1\frac{1}{2}$. How much did he receive in all?

2. Emile carried two flint stones weighing $25\frac{3}{8}$ pounds together. One weighed $7\frac{3}{4}$ pounds; what was the weight of the other?

3. If from a number I take $6\frac{7}{8}$ away, I shall have $3\frac{5}{10}$ left. What is the number?

4. A does $\frac{1}{8}$ of a piece of work in 1 day; B, $\frac{1}{5}$; and C, $\frac{1}{4}$. What part of the work do they do together in a day?

5. Lewis sowed turnip seed in two fields of one acre each. One field gave $21\frac{3}{8}$ tons and the other $14\frac{2}{3}$ tons. What was the total weight of the crop?

6. A boy having picked 1 bushel of cranberries, sold $\frac{1}{4}$ of them to a grocer, $\frac{1}{8}$ to a fruit dealer and $\frac{3}{10}$ to a cook. How much has he left to sell?

7. Find the sum of: $8\frac{1}{3} + 47\frac{1}{6} + 32\frac{2}{9} + 105\frac{5}{18}$.

8. What was the weight of the trunk of a tree, if the planks sawed out of it weigh $335\frac{3}{4}$ pounds and the slabs, $88\frac{1}{2}$ pounds?

9. How much greater is $178\frac{2}{3}$ than $98\frac{2}{3}$?

10. The sum of two fractions is $\frac{5}{8}$; if one of these fractions is $\frac{9}{20}$, find the other.

11. A mason did $\frac{1}{8}$ of his work the first day, $\frac{2}{5}$ the second day, and $\frac{1}{10}$ the third day. What part of the work is still to be done?

12. The difference between two numbers is $498\frac{9}{10}$, and the greater is $648\frac{7}{8}$. What is the smaller?

13. A train left Montreal at $10\frac{1}{4}$ o'clock, went through Rigaud $1\frac{1}{12}$ hours later, and arrived at Ottawa $2\frac{1}{4}$ hours after going through Rigaud. At what time did it arrive at Ottawa?

14. A granary contains $98\frac{3}{4}$ bushels of wheat, $148\frac{2}{5}$ bushels of oats and $48\frac{7}{8}$ bushels of rye. How many bushels does it contain in all?

15. By distraction I cut $\frac{5}{8}$ of a yard of cloth instead of $\frac{5}{9}$. My mistake is what part of a yard?

16. What must I subtract from $123\frac{1}{2}$ to have $94\frac{1}{8}$?
17. The construction of the Grand Trunk and its different branches in Canada had cost, until 1905, $373\frac{3}{4}$ million dollars; that of the Canadian Pacific, $324\frac{1}{8}$ million. What had been the total cost for the construction of these two railways?
18. What number becomes $397\frac{1}{11}$ if we add $187\frac{2}{3}$ to it?
19. In 1907, England imported $37\frac{2}{5}$ million dollars worth of cheese. If Canada furnished $22\frac{1}{75}$ million pounds, find the importation coming from the other countries.
20. I plowed $5\frac{1}{2}$ acres of my field, and I still have $9\frac{4}{5}$ acres to plow. What is the area of my field?
21. What must I add to $173\frac{7}{8}$ to have $438\frac{3}{4}$?
22. I have done $\frac{4}{7}$ and $\frac{5}{28}$ of my work. What part is left to do?
23. Beauharnois Canal cost $1\frac{2}{5}$ million dollars, and Soulanges Canal, $5\frac{3}{10}$ million more. Find the cost of the latter.
24. What is the value of: $\frac{3}{6} + \frac{7}{8} + \frac{1}{2} - \frac{2}{4}$?
25. What must be added to the sum of the three numbers $7\frac{3}{4}$, $9\frac{1}{2}$ and $10\frac{5}{6}$, to make 30?
26. George comes from fishing with 4 fishes weighing together $9\frac{13}{16}$ pounds. The three smallest weigh respectively $1\frac{1}{2}$ pounds, $2\frac{1}{4}$ pounds, and $2\frac{7}{16}$ pounds. Find the weight of the fourth?
27. What number must be added to $7\frac{2}{4}$ to obtain $12\frac{1}{6}$?
28. On a credit of $\$545\frac{9}{10}$, I received $\$205\frac{1}{2}$ in cash, and $\$138\frac{4}{5}$ in merchandise. How much is still owing me?
29. During a year, a cow gave $\$83\frac{4}{5}$ worth of butter; the skimmed milk was valued at $\$12\frac{1}{2}$. What net gain did the cow yield, if it cost $\$42\frac{3}{4}$ to feed her?
30. From what number should I subtract $384\frac{1}{8}$ to find a difference of $274\frac{1}{8}$?
31. To pay a debt, William gave goods worth $\$178\frac{1}{4}$ and

a check for $\$846\frac{3}{5}$. He received $\$27\frac{9}{10}$ in change. How much did he owe?

32. I have three tomato plants which gave me $37\frac{1}{6}$ pounds of tomatoes. One gave $13\frac{1}{4}$ pounds; another, $12\frac{3}{8}$ pounds. What was the amount given by the third?

33. Find the value of the expression: $28\frac{5}{12} - (\frac{3}{4} + \frac{1}{6} + \frac{5}{8} + \frac{2}{3})$.

34. A pupil had $\$3\frac{3}{4}$ in the School Savings Bank. He withdrew first $\$2\frac{7}{10}$, then $\$ \frac{3}{4}$. How much has he still left on deposit?

35. $12\frac{1}{6}$ pounds of silver and $37\frac{9}{10}$ pounds of lead were mixed with a certain quantity of tin. What is the weight of this last metal, if the alloy weighs $95\frac{1}{2}$ pounds?

36. From a cheese weighing 60 pounds, a merchant sold to different persons $7\frac{3}{4}$ pounds, $12\frac{1}{8}$ pounds, $3\frac{5}{16}$ pounds, and $8\frac{1}{2}$ pounds. How much had he left?

37. Paul, after having fertilized his field well, harvested $37\frac{4}{9}$ bushels of barley to the acre; his neighbor, a neglectful farmer, harvested only $16\frac{2}{3}$ bushels. Find the difference.

38. From $9\frac{2}{3} + 5\frac{1}{4}$ take $4\frac{5}{6}$.

39. A father earns $\$3\frac{1}{5}$ a day; his son, $\$2\frac{3}{4}$; his daughter, $\$1\frac{1}{2}$. What is the daily economy of this family, if the expenses are $\$3\frac{4}{5}$ a day?

40. Ernest had $\$68\frac{3}{4}$ deposited in the Merchants Bank and he deposited $\$37\frac{1}{2}$ more. He withdrew at one time $\$27\frac{3}{4}$, and $\$53\frac{1}{8}$ at another. How much has he still in the bank?

41. In one year the milk of my three cows gave $753\frac{7}{12}$ pounds of butter. I sold $50\frac{1}{2}$ pounds the first time, and $412\frac{2}{5}$ the second. How much did my family use, if my family used all the rest?

42. From $\frac{5}{6} + \frac{1}{6}$ subtract $\frac{1}{7} + \frac{3}{4}$.

43. A foundry burnt $153\frac{1}{2}$ tons of coal in a month. The first week, it burnt $35\frac{3}{4}$ tons; the second, $38\frac{1}{4}$ tons, and the third, $39\frac{1}{14}$ tons. What was the consummation of the fourth week?

44. A cask contained $63\frac{1}{2}$ gallons of wine. After having drawn out $23\frac{3}{8}$ gallons, I put $12\frac{3}{4}$ gallons of water into the cask. How many gallons did it then contain?

45. Frederick mowed $15\frac{3}{4}$ acres of a field. When he has mowed as much more, there will be $27\frac{2}{3}$ acres left. Find the area of the field.

Second Review.

46. Bernard, having received \$10 from his godfather, gave $\$3\frac{1}{4}$ to his mother and $\$2\frac{1}{6}$ to a little poor companion; then he spent $\$1\frac{1}{2}$ for books, and deposited the rest in the School Savings Bank. What is the sum deposited?

47. If in one year a cow eats $\$23\frac{1}{2}$ worth of hay, $\$5\frac{1}{4}$ of straw, $\$21\frac{1}{5}$ of bran, and $\$24\frac{3}{4}$ of roots and ensilage, what profit does she give, the milk being sold for $\$128\frac{2}{3}$?

48. Lachine Canal cost $11\frac{7}{20}$ million dollars; that of Soulanges, $6\frac{17}{20}$ million; that of Cornwall, 7 million. If Welland Canal cost as much as the three together, how much did it cost?

49. What fraction is lacking $\frac{1}{4}$ to equal $\frac{7}{9}$?

50. Ernest is $6\frac{1}{2}$ years old; Henry, $9\frac{3}{4}$, and Dollard, $14\frac{1}{8}$. What is Joseph's age, if his age added to that of the first three gives $48\frac{5}{12}$ years?

51. Find the value of the following expression: $4\frac{1}{2} + 4\frac{2}{5} - 5\frac{4}{5} + 5\frac{3}{10} - \frac{4}{5}$.

52. From Montreal to Cornwall, by the Grand Trunk, the distance is $67\frac{2}{3}$ miles; from Cornwall to Kingston, $39\frac{1}{2}$ miles more than the former distance; and from Kingston to Toronto, $158\frac{7}{10}$ miles. What is the distance from Montreal to Toronto?

53. What is the number which, added to the difference between $133\frac{1}{4}$ and $27\frac{7}{10}$, gives $212\frac{5}{8}$?

54. A earned $\$23\frac{3}{4}$ in one fortnight and $\$18\frac{1}{4}$ the next. If he : $\$13\frac{9}{10}$ in gambling and $\$8\frac{1}{6}$ for intoxicating

liquors, how much did he have left out of his month's wages for the use of his family?

55. From $5\frac{2}{3} - 2\frac{2}{7}$ take $\frac{5}{7} + \frac{5}{14} + \frac{1}{6}$.

56. There were three benevolent parties for the benefit of the poor. The first brought in $\$379\frac{3}{4}$; the second, $\$427\frac{1}{2}$; and the third, $\$592\frac{4}{5}$. The respective expenses were $\$27\frac{2}{5}$, $\$38\frac{1}{2}$, and $\$47\frac{2}{10}$. How much was left for the poor?

57. From the difference between $12\frac{2}{3}$ and $4\frac{2}{9}$ take the difference between $37\frac{1}{6}$ and $29\frac{1}{4}$.

58. Two fields produced $60\frac{2}{10}$ bushels. One, well fertilized, produced $37\frac{3}{4}$ bushels. How much more than the other did it produce?

59. Julius earned $\$14\frac{2}{5}$, then spent $\$16\frac{2}{4}$, and had $\$4\frac{1}{2}$ left. How much had he at first?

60. The smaller of two numbers is $27\frac{5}{12}$, and their sum, $54\frac{19}{24}$. What is the larger?

61. James threw a ball $118\frac{1}{2}$ feet and Ernest threw another $32\frac{3}{4}$ feet farther. How many feet must Ernest run to go and get his ball and come back to the starting point?

62. Find the value of $(16\frac{1}{3} - 8\frac{1}{2}) + (47\frac{1}{9} - 8\frac{5}{6})$.

63. An acre of ground planted in tobacco brought in $\$114\frac{1}{10}$, and an acre planted in potatoes brought in $\$26\frac{1}{4}$ less. What is the value of the production of the two acres of ground?

64. Robert is $11\frac{1}{3}$ years old; Frederick, $3\frac{1}{2}$ years older than Robert; and Edward, $5\frac{7}{12}$ years older than Frederick. Find the sum of their ages.

65. The difference between two fractions is $\frac{7}{9}$, and the smaller is $\frac{24}{81}$. Find the other.

66. My horses ate $27\frac{1}{4}$ bushels of oats, and I have left $12\frac{3}{8}$ bushels more than they ate. How much had I at first?

67. A farmer sold $38\frac{1}{6}$ tons of hay, and he still has $9\frac{3}{4}$ tons more than he sold. How many tons had he at first?

68. Wallace sold $18\frac{1}{4}$ tons of hay, and he still has $14\frac{1}{4}$ tons less than he sold. How much had he at first?
69. The difference between two numbers is $21\frac{1}{4}$, and the greater is $52\frac{1}{8}$. Find the difference between the smaller and $99\frac{1}{4}$.
70. A field sowed in oats gave $59\frac{1}{4}$ bushels; another, sowed in wheat gave $19\frac{1}{4}$ bushels less. How many bushels did both give?
71. A maple is $68\frac{1}{4}$ feet high; an elm, $12\frac{1}{2}$ feet higher, an ash, $15\frac{1}{2}$ feet less than the elm. What is the height of the ash?
72. On an acre of land, I spread $12\frac{1}{4}$ tons of manure; on a second acre, $5\frac{1}{8}$ tons more. How many tons of manure did I spread in all?
73. Arthur and Henry started off together for the market. When the former had spent $\$43\frac{1}{2}$ and the other $\$37\frac{1}{4}$ they had in all $\$82\frac{3}{4}$ left. Find the sum that Henry had on leaving, if Arthur had $\$87\frac{1}{8}$.
74. How much is the fraction $\frac{1}{8}$ increased or diminished, if we subtract 4 from each of its terms?
75. How much is the fraction $\frac{1}{8}$ increased or diminished, if we add 4 to each of its terms?
76. A stone plunged into a vessel full of water made $24\frac{3}{4}$ pounds of water run out. The vessel then weighed $33\frac{3}{8}$ pounds more than it had weighed before. What was the weight of the stone?
77. A workman spent $\$18\frac{1}{2}$; afterwards he earned $\$12\frac{1}{2}$, and he then had $\$15\frac{3}{4}$. How much had he at first?
78. A cake of maple sugar weighs $3\frac{5}{8}$ pounds; another, $5\frac{1}{12}$; and a third, $1\frac{1}{12}$ more than the second. What is the total weight of these three cakes of sugar?
79. A mason has $\$85\frac{1}{4}$ to pay three companions. He gives $\$23\frac{2}{5}$ to the first; to the second, he gives $\$14\frac{1}{5}$ more than to the first; and to the third, $\$15\frac{1}{4}$ less than to the second. How much has he left?

80. How much is the sum of $1\frac{1}{20}$ and $\frac{9}{13}$, greater than their difference?
81. I sold a lamb for $\$21\frac{1}{2}$. If I had sold it for $\$3\frac{3}{4}$ less, I should have lost $\$1\frac{1}{4}$. How much did it cost me?
82. If I had sold my bicycle for $\$15\frac{3}{4}$ more, I should have gained $\$8\frac{3}{8}$. If it cost me $\$45\frac{1}{2}$, for how much did I sell it?
83. My little cousin says that if he had not spent $\$24\frac{3}{8}$ for cigarettes, and $\$3\frac{3}{4}$ for candy, he would have $\$81\frac{1}{8}$. How much has he left?
84. From the sum of $25\frac{2}{3}$ and $17\frac{1}{2}$ take their difference.
85. A father is $40\frac{1}{3}$ years old and his son, $9\frac{3}{4}$ years. How old was the son when the father was $34\frac{5}{12}$ years old?
86. My uncle is $6\frac{1}{2}$ years older than my aunt; she is $24\frac{2}{3}$ years older than I. What is my uncle's age, if I am $12\frac{3}{4}$ years old?
87. A hall is $322\frac{2}{3}$ feet long and $29\frac{1}{8}$ feet wide. What is the length of the moulding that goes around the hall?
88. The recreation yard at our school is $58\frac{3}{4}$ yards long by $47\frac{2}{3}$ yards wide. What is the total length of the fence that surrounds it?
89. My godfather is $4\frac{2}{3}$ years younger than my godmother, who is $28\frac{1}{4}$ years older than I. If I am $11\frac{1}{2}$ years old, find my godfather's age.
90. Our class is $18\frac{1}{2}$ feet long and $16\frac{1}{4}$ feet wide. Find the perimeter of our class.

MULTIPLICATION OF FRACTIONS

123. *To multiply a fraction by an integer.*

EXAMPLE I. — $\frac{2}{15} \times 5 = \frac{2 \times 5}{15} = \frac{10}{15}$, or $\frac{2}{3}$.

To multiply a fraction by an integer, means that a certain number of equal parts should be repeated a definite number of times. Thus, 2 fifteenths was repeated 5 times, producing 10 fifteenths; as, \$2 repeated 5 times produce \$10.

124. *Rule.* — To multiply a fraction by a whole number, multiply the numerator by the whole number and place the product over the denominator. When possible, cancel, or divide the denominator by the number.

125. *To multiply an integer by a fraction.*

EXAMPLE II. — $8 \times \frac{5}{16} = \frac{8 \times 5}{16} = \frac{40}{16} = 2\frac{8}{16}$, or $2\frac{1}{2}$.

The quantity 8 has to be divided into 16 equal parts which gives 8 sixteenths; now 5 of these parts must be taken, or 8 sixteenths must be repeated 5 times, giving 40 sixteenths.

126. *Rule.* — To multiply an integer by a fraction, multiply the integer by the numerator of the fraction, and place the product over the denominator. When possible, cancel.

127. *To multiply a fraction by a fraction.*

EXAMPLE III. — $\frac{3}{4} \times \frac{5}{6} = \frac{3 \times 5}{4 \times 6} = \frac{15}{24}$, or $\frac{5}{8}$.

The quantity $\frac{3}{4}$ has to be divided into 6 equal parts which gives $\frac{3}{4 \times 6}$; $\frac{3}{4 \times 6}$ must be repeated 5 times producing $\frac{3 \times 5}{4 \times 6}$, or $\frac{15}{24}$.

128. *Rule.* — To multiply a fraction by a fraction, find the product of the numerators and of the denominators and then reduce. When possible, cancel.

NOTE. — Reduce mixed numbers to improper fractions before applying the above rule.

Written Exercises.

Perform the following operations:

1. $\frac{2}{3} \times 6.$

2. $\frac{3}{4} \times 8.$

3. $\frac{1}{2} \times 9.$

4. $\frac{2}{10} \times 5.$

5. $\frac{5}{12} \times 6.$

16. $8 \times \frac{3}{4}.$

17. $9 \times \frac{2}{3}.$

18. $12 \times \frac{5}{6}.$

19. $13 \times \frac{3}{5}.$

20. $15 \times \frac{4}{7}.$

31. $6 \times \frac{2}{9}.$

32. $7 \times \frac{8}{9}.$

33. $5 \times \frac{13}{15}.$

34. $2 \times 9\frac{2}{5}.$

35. $4 \times 8\frac{5}{6}.$

46. $\frac{2}{3} \times \frac{3}{4}.$

47. $\frac{2}{9} \times \frac{3}{5}.$

48. $\frac{4}{13} \times \frac{5}{6}.$

49. $\frac{7}{8} \times \frac{4}{7}.$

50. $\frac{7}{8} \times \frac{2}{9}.$

61. $4\frac{4}{7} \times \frac{7}{8}.$

62. $2\frac{5}{11} \times \frac{11}{12}.$

63. $6 \times 2\frac{9}{11}.$

64. $2\frac{8}{9} \times 7.$

65. $\frac{7}{9} \times 12\frac{3}{5}.$

76. $7\frac{1}{2} \times 3\frac{1}{3}.$

77. $5\frac{5}{7} \times 9\frac{4}{5}.$

78. $2\frac{1}{2} \times 3\frac{3}{5}.$

79. $\frac{9}{16} \times 2\frac{2}{3}.$

80. $17\frac{1}{4} \times 6\frac{2}{3}.$

6. $\frac{2}{3} \times 5.$

7. $\frac{3}{4} \times 4.$

8. $\frac{5}{8} \times 6.$

9. $\frac{2}{5} \times 9.$

10. $\frac{5}{6} \times 7.$

21. $3 \times \frac{3}{10}.$

22. $4 \times \frac{4}{15}.$

23. $6 \times \frac{6}{11}.$

24. $14 \times \frac{13}{14}.$

25. $12 \times \frac{11}{12}.$

36. $5 \times 3\frac{4}{5}.$

37. $4\frac{3}{5} \times 5.$

38. $8\frac{3}{8} \times 6.$

39. $2 \times 8\frac{7}{12}.$

40. $8 \times 9\frac{3}{7}.$

51. $\frac{4}{5} \times \frac{3}{7}.$

52. $\frac{4}{5} \times \frac{5}{8}.$

53. $\frac{5}{9} \times \frac{2}{3}.$

54. $\frac{6}{7} \times \frac{1}{8}.$

55. $\frac{4}{5} \times \frac{10}{11}.$

66. $\frac{4}{7} \times 8\frac{2}{3}.$

67. $\frac{3}{10} \times 2\frac{2}{9}.$

68. $2\frac{5}{7} \times \frac{7}{8}.$

69. $4\frac{2}{5} \times \frac{3}{11}.$

70. $5\frac{8}{9} \times \frac{3}{4}.$

81. $4\frac{1}{4} \times 8\frac{4}{5}.$

82. $3\frac{3}{7} \times 12\frac{1}{4}.$

83. $4\frac{2}{5} \times \frac{7}{8}.$

84. $\frac{7}{8} \times 6\frac{3}{5}.$

85. $6\frac{1}{2} \times 7\frac{3}{8}.$

11. $\frac{3}{4} \times 8.$

12. $\frac{8}{9} \times 5.$

13. $\frac{7}{8} \times 4.$

14. $\frac{4}{7} \times 8.$

15. $\frac{3}{9} \times 10.$

26. $12\frac{2}{3} \times \frac{1}{10}.$

27. $9\frac{1}{2} \times 5.$

28. $15\frac{3}{4} \times 3.$

29. $10 \times 5\frac{4}{5}.$

30. $9 \times \frac{9}{10}.$

41. $6\frac{5}{12} \times 4.$

42. $3\frac{4}{5} \times 8.$

43. $4\frac{6}{8} \times 9.$

44. $4\frac{2}{3} \times 8.$

45. $8\frac{4}{5} \times 7.$

56. $\frac{2}{3} \times 4\frac{1}{2}.$

57. $\frac{5}{8} \times 10\frac{2}{7}.$

58. $\frac{7}{10} \times \frac{5}{8}.$

59. $3\frac{1}{5} \times \frac{11}{12}.$

60. $6\frac{5}{6} \times \frac{9}{10}.$

71. $\frac{5}{9} \times 6\frac{6}{11}.$

72. $9\frac{2}{3} \times \frac{3}{4}.$

73. $5\frac{3}{5} \times \frac{2}{7}.$

74. $3\frac{1}{8} \times 5.$

75. $14\frac{5}{7} \times \frac{7}{8}.$

86. $9\frac{5}{7} \times 8\frac{2}{5}.$

87. $8\frac{3}{4} \times 1\frac{6}{7}.$

88. $14\frac{1}{2} \times \frac{2}{3}.$

89. $4\frac{1}{11} \times 13\frac{1}{9}.$

90. $24\frac{1}{2} \times 2\frac{1}{3}.$

- | | | |
|---|---|---|
| 91. $\frac{2}{3} \times \frac{5}{8}$. | 96. $8\frac{5}{8} \times 9\frac{3}{8}$. | 101. $6\frac{1}{7} \times 7\frac{1}{8}$. |
| 92. $6\frac{3}{4} \times 12\frac{1}{7}$. | 97. $6\frac{1}{8} \times 5\frac{1}{4}$. | 102. $12\frac{1}{10} \times 4\frac{3}{4}$. |
| 93. $4\frac{3}{4} \times 2\frac{2}{9}$. | 98. $5\frac{1}{3} \times 5\frac{1}{5}$. | 103. $7\frac{2}{3} \times 10\frac{1}{8}$. |
| 94. $\frac{1}{4} \times 10\frac{1}{3}$. | 99. $6\frac{1}{2} \times 8\frac{2}{3}$. | 104. $6\frac{1}{5} \times 9\frac{1}{3}$. |
| 95. $2\frac{5}{8} \times 6\frac{1}{11}$. | 100. $6\frac{2}{9} \times 6\frac{1}{4}$. | 105. $2\frac{2}{3} \times 8\frac{1}{7}$. |

Review Exercises.

- | | |
|--|---|
| 106. $6 \times (\frac{1}{2} + \frac{1}{3})$. | 116. $(3\frac{1}{2} - 2\frac{1}{5}) \times \frac{5}{8}$. |
| 107. $\frac{1}{2}$ of $\frac{1}{3}$ of 60. | 117. $\frac{1}{4}$ of $(5\frac{1}{5} - 3\frac{1}{3})$. |
| 108. $\frac{3}{4} \times 12 \times \frac{2}{3}$. | 118. $(3\frac{2}{3} \times 4\frac{1}{2}) - 10\frac{1}{8}$. |
| 109. $(8\frac{1}{3} + 3\frac{1}{2}) \times 1\frac{5}{8}$. | 119. $(4\frac{3}{5} \times 2\frac{2}{4}) - 12\frac{2}{8}$. |
| 110. $(8\frac{1}{3} - 3\frac{1}{2}) \times 1\frac{5}{8}$. | 120. $(13\frac{2}{5} - 7\frac{2}{3}) \times \frac{3}{4}$. |
| 111. $16 \times (2\frac{7}{8} + 1\frac{3}{4})$. | 121. $3\frac{1}{2} \times \frac{2}{7} \times 7\frac{1}{8}$. |
| 112. $(24\frac{1}{2} - 15\frac{2}{3}) \times 36$. | 122. $(\frac{1}{10} \times \frac{2}{3}) + (4\frac{1}{8} \times 6\frac{7}{8})$. |
| 113. $100 - (4 \times 13\frac{3}{7})$. | 123. $(3\frac{1}{4} + 2\frac{1}{5}) \times (3\frac{1}{4} - 2\frac{1}{5})$. |
| 114. $83\frac{7}{8} + (17\frac{2}{3} \times 24)$. | 124. $(14\frac{3}{4} \times 7) - (9 \times 10\frac{1}{8})$. |
| 115. $(83\frac{7}{8} + 17\frac{2}{3}) \times 24$. | 125. $\frac{2}{3}$ de $\frac{3}{4} \times (3\frac{1}{2} + 1\frac{3}{4})$. |

Principles of Analysis relating to Multiplication.

7. I multiply because I should find the *product of*..... by.....

8. I multiply because having the *value of one object* and the *number of objects*, I wish to find the *total value*.

9. I multiply because I wish to find..... *times as much* as what I have.

Oral Exercises.

126. What is: 4 times $\frac{2}{3}$? 3 times $\frac{3}{4}$? 5 times $\frac{5}{8}$?
127. Multiply: $\frac{2}{3}$ by 3; $\frac{4}{7}$ by 5; $\frac{5}{6}$ by 12.
128. What is the cost of 8 pounds of tea at $\$ \frac{3}{8}$ a pound?
129. At $\$ \frac{3}{4}$ a yard, what is the cost of 4 yards?
130. What is the product of $2\frac{1}{2} \times 7$? of $4\frac{3}{5} \times 6$?
131. What are $9\frac{1}{8}$ yards of calico worth at 9 cents a yard?

132. If a ton of coal is worth $\$7\frac{1}{2}$, what is the price of 3 tons?

133. What are $7\frac{1}{4}$ dozen of images worth at 8 cents a dozen?

134. If 8 men can mow a field in $8\frac{1}{2}$ days, how many days will it take one man to do the same work?

135. Multiply: $\frac{2}{3}$ by $\frac{3}{4}$; $\frac{5}{6}$ by $\frac{3}{4}$; $\frac{4}{5}$ by $\frac{1}{6}$.

136. What are: $\frac{2}{4}$ of $\frac{1}{2}$? $\frac{1}{3}$ of $\frac{2}{4}$? $\frac{2}{3}$ of $\frac{5}{6}$?

137. A boy having $\frac{3}{4}$ of a dollar, gave $\frac{2}{3}$ of this sum to a poor man. What fraction of a dollar did he give?

Problems on Multiplication.

138. Find the product of $6\frac{1}{2} \times 5\frac{1}{4}$.

139. George has 25 apple trees. If each produced $1\frac{1}{8}$ barrels of apples, how many barrels of apples did he harvest?

140. How many bushels of wheat will be required to sow $4\frac{3}{4}$ acres, at $2\frac{1}{2}$ bushels to the acre?

141. A cord of pulp-wood is worth about \$7; when transformed into paper, it augments $5\frac{1}{2}$ times its value. What is the price of paper produced from one cord of wood?

142. A machinist has a salary of $\$15\frac{1}{2}$ a week. How much does he earn in $5\frac{3}{4}$ weeks?

143. A man travels $20\frac{5}{8}$ miles an hour. What distance would he have gone after a 12-hour run?

144. What is the length of a wall which surrounds a square garden $98\frac{1}{2}$ feet to a side?

145. It is estimated that a tomato plant produces $11\frac{3}{4}$ pounds of ripe tomatoes. How many pounds would 60 plants yield?

146. What is the cost of $8\frac{3}{4}$ tons of coal at $\$6\frac{1}{2}$ a ton?

147. Alfred saves $\$5\frac{2}{3}$ a week. How much would he have saved at the end of $8\frac{1}{2}$ weeks?

148. How much would 16 pounds of rice cost at $3\frac{1}{2}$ cents a pound?

149. What is the cost of $6\frac{1}{2}$ dozen *Duchess* apple trees at $\$4\frac{1}{2}$ a dozen?
150. It requires about $19\frac{1}{2}$ pounds of milk to make a pound of butter. What quantity of milk will produce $55\frac{1}{4}$ pounds of butter?
151. What are the $\frac{2}{5}$ of 60?
152. A farmer harvested 220 bushels of potatoes from one acre. How many bushels could he sell if the $\frac{2}{10}$ of them were not salable?
153. During a hurricane the wind traveled 90 miles an hour. During a light breeze it traveled but $\frac{2}{15}$ as fast. What was its velocity then?
154. What are $2\frac{2}{5}$ tons of bran worth at $\$20\frac{3}{4}$ a ton?
155. Peru has the most elevated railway in the world, 15 680 feet above the level of the sea. The $\frac{5}{8}$ of this height equals the altitude of Mount Belœil. What is the height of the latter?
156. My neighbor has bought $25\frac{1}{2}$ acres of land at $\$47\frac{4}{5}$ an acre. What is the cost?
157. Ralph has $\$6\frac{2}{5}$ at the School Savings Bank and his brother has $5\frac{2}{3}$ times this sum. How much has the latter deposited?
158. How many bushels of oats would be required to feed 24 horses during $19\frac{1}{2}$ days, if one horse eats $\frac{2}{3}$ of a bushel a day?
159. In 1907 the Society of Saint Vincent de Paul of Montreal spent \$18 000 in helping the poor; the same society of New York spent $4\frac{7}{9}$ times as much. What sum did the latter outlay?
160. In 1908 there were 1 170 newspapers in Canada. This number multiplied by $18\frac{1}{5}$ gives the number published in the United States. How many newspapers were published in the United States?
161. A drunkard spends $\$2\frac{2}{5}$ a week at the tavern. How much will he have wasted at the end of $8\frac{3}{4}$ years?

162. Mr. Fallon rents a shop for $3\frac{1}{4}$ years at $\$42\frac{3}{4}$ a month. What amount will be required to pay the rent?

ADDITION, SUBTRACTION AND MULTIPLICATION.

First Review.

1. I had 125 chickens and I sold $\frac{4}{5}$ of them. How many did I sell?

2. Abraham, who died at the age of 175, was $\frac{4}{7}$ of this age when Isaac was born. How old was he then?

3. At 75 cents a pound, how much would $\frac{3}{5}$ of a pound of tea cost?

4. The weight of a man's blood is $\frac{1}{13}$ of that of his body. If a man weighs 143 pounds what is the weight of his blood?

5. How many pounds of corn would I need to sow 7 acres of land, at the rate of $12\frac{1}{3}$ pounds an acre?

6. The sum of two fractions equals $\frac{5}{6}$. One of them is $\frac{2}{7}$; what is the other?

7. What is the depth of an artesian well, if the first day they bored $3\frac{3}{4}$ yards; the second day, $8\frac{1}{2}$ yards; the third day, $5\frac{1}{5}$ yards; and the fourth day, $53\frac{1}{5}$ yards?

8. Sugar cane furnishes $\frac{4}{25}$ of its weight of sugar; how many tons of sugar could we get from 3875 tons of cane?

9. In 1907, the revenue of the city of Montreal was $4\frac{9}{10}$ million dollars. At that rate, what should be its revenue for 5 years?

10. If a pound of raw silk is worth \$4.10, what is the price of $315\frac{3}{5}$ pounds?

11. A pipe giving $15\frac{3}{4}$ gallons of water a minute, took $27\frac{1}{2}$ minutes to fill a tank. How many gallons does the tank hold?

12. I have $79\frac{2}{5}$ yards plus $137\frac{3}{4}$ yards of cotton. How many yards are still lacking that I may have $750\frac{1}{4}$ yards?

13. The Isthmus of Panama is 30 miles wide. What is the width of the Isthmus of Suez, if it is $2\frac{4}{15}$ times as wide?

14. Each of 17 poor children received $\frac{3}{8}$ of a pound of bread. How many pounds in all were distributed to them?
15. A cubic foot of iron weighs 450 pounds, and a cubic foot of platinum, $2\frac{9}{10}$ times as much. How much does a cubic foot of platinum weigh?
16. Joseph, when sold by his brothers, was 16 years old, and the number of years that he lived equals $6\frac{7}{8}$ times that many years. How old was he when he died?
17. My watch loses half a minute an hour. How much does it lose in 3 days?
18. In 1906, 8 650 deaths were registered in Montreal, and $\frac{17}{173}$ of these deaths were caused by tuberculosis. How many victims were carried off by this disease?
19. What would be the cost of $28\frac{3}{5}$ yards of cloth at \$3.35 a yard?
20. On 1978 alcoholic men the $\frac{10}{23}$ were declared tuberculous. What is the number of tuberculous men?
21. A tailor bought $8\frac{3}{5}$ yards of serge at \$1 $\frac{1}{2}$ a yard. He gave in payment a \$20 bill. What change did he receive?
22. To make powder they mixed $7\frac{1}{3}$ pounds of saltpetre, $1\frac{7}{18}$ pounds of sulphur, and as much charcoal as sulphur. What is the weight of powder thus obtained?
23. I bought two tables at \$9 $\frac{1}{2}$ each, 6 chairs at \$3 $\frac{3}{4}$ a piece, a secretary for \$45 $\frac{1}{2}$ and a sofa for \$28 $\frac{3}{4}$. What is the amount of my bill?
24. One weaver made $\frac{5}{8}$ of a yard of linen in an hour, and another $\frac{4}{5}$ of a yard. Calculate the difference between what each would make in a day of 8 hours.
25. If a pound of maple sugar cost 12 $\frac{1}{2}$ cents, how much would 3 loaves weighing $8\frac{2}{3}$ pounds each cost?
26. A farm of 90 acres is sown in the following manner: the $\frac{2}{3}$, in wheat; the $\frac{1}{5}$, in clover seed, and the rest in oats. Find the number of acres under oats.
27. My annual revenue is \$1 095. What sum can I economize, if I spend the $\frac{1}{3}$ plus the $\frac{2}{5}$ of this revenue?

28. A cask contained $47\frac{1}{2}$ gallons of wine; they took out $14\frac{2}{3}$ gallons, then $9\frac{1}{4}$ gallons, and $11\frac{7}{8}$ gallons. How many gallons were left in the cask?
29. What is the cost of 8 wagons of coal, containing $23\frac{1}{2}$ tons each, at $\$6\frac{3}{4}$ a ton?
30. What is the difference between the cost of 18 pounds of rice at $4\frac{1}{2}$ cents a pound and that of 12 pounds of raisins at $7\frac{1}{4}$ cents a pound?
31. What sum would be needed to buy 34 pounds of sugar at $5\frac{1}{2}$ cents a pound and 42 pounds of coffee at $24\frac{1}{3}$ cents?
32. A field produced 8 loads of hay, weighing on an average $\frac{3}{5}$ tons each. If this hay was sold for $\$8\frac{3}{4}$ a ton, what was the sum received?
33. If the impression of a newspaper requires $36\frac{3}{4}$ tons of paper a week, what would be the annual expense, if the paper cost $\$35.40$ a ton?
34. How much would a grocer receive, if he sold $9\frac{1}{2}$ pounds of cheese at 15 cents a pound, and $7\frac{1}{2}$ pounds of tea at 40 cents a pound?
35. Last year I harvested $27\frac{3}{4}$ bushels of oats an acre. This year, after fertilizing my land, I harvested $36\frac{2}{3}$ bushels an acre. What is the increase of my harvest on 8 acres?
36. I sowed barley on 8 acres of my land, at the rate of $1\frac{3}{4}$ bushels to the acre, and oats on 12 other acres at the rate of $1\frac{2}{3}$ bushels to the acre. How many bushels did I sow in all?
37. If I sold $\frac{2}{5}$ plus $\frac{1}{4}$ of a piece of cloth 60 yards long, how much would the rest of the piece be worth at $\$3.20$ a yard?
38. What would be the total cost of $4\frac{1}{2}$ yards of cloth at $\$3\frac{2}{5}$ a yard, and 8 yards of serge at $\$1\frac{7}{10}$ a yard?
39. A farmer's wife gave 12 pounds of butter for 24 yards of cotton costing $12\frac{1}{2}$ cents a yard. What was the price of a pound of butter?
40. I have $45\frac{1}{2}$ bushels of wheat left, after having sowed

18 acres at the rate of $1\frac{1}{4}$ bushels to the acre; how many bushels had I at first?

41. What would be the cost of a piece of land containing 4 968 square feet, at the rate of $16\frac{3}{4}$ cents a square foot?

42. At Carillon, in 1758, Montcalm's army was composed of 3 500 men. How many men were in Abercromby's army, if it was $4\frac{2}{5}$ times as numerous?

43. An orchard of $7\frac{1}{2}$ square acres contains 36 apple trees to the acre. How many barrels of apples could be gathered from it, if an apple tree gives an average of $2\frac{1}{2}$ barrels?

44. A farmer sold first $\frac{2}{3}$ then $\frac{1}{6}$ of a 75-acre prairie. How many acres has he left?

45. If I sold $37\frac{1}{4}$ yards of cloth from a piece 50 yards long, how much would I receive for the rest at $\$1\frac{1}{8}$ a yard?

46. Peter sold $\frac{1}{4}$ plus $\frac{2}{5}$ of his flock of 280 sheep. What is the value of the rest at \$4.50 a head?

47. It is 180 miles from Montreal to Quebec by the St. Lawrence. If from Toronto to Chicoutimi the distance is $4\frac{7}{10}$ times as great, what is the distance between these last two cities?

48. Your neighbor's farm contained 140 acres. He sold $\frac{2}{7}$ plus $\frac{1}{4}$ of it, at \$72 an acre. What sum did he receive?

49. If I had 120 nuts and ate $\frac{3}{8}$ of them plus 5, how many did I eat?

50. Noah died at the age of 950. When he left the ark, he was only $\frac{12}{19}$ of that plus 1 year. How old was he then?

51. At Waterloo, Napoleon had about 80 000 men. $\frac{3}{10}$ of his soldiers less 815 were killed or wounded. Find this number.

52. Martin had \$32.80 in the School Savings Bank. He then put in $\frac{1}{8}$ of that sum plus \$2. How much has he now on deposit?

53. One day a saloon keeper served 8 dozen glasses of beer, that cost him $1\frac{1}{10}$ cents a glass. If his receipts were \$4.80, what was his profit?

54. Find the $\frac{3}{5}$ of $\frac{4}{9}$.
55. What is the value of $9\frac{3}{4} \times \frac{1}{2}$ of $36\frac{3}{4}$?
56. At the eruption of the Yedo Volcano, in 1703, 210 000 people perished. The $\frac{2}{3}$ of $\frac{2}{7}$ of that number were victims of the catastrophe in Saint-Pierre, in 1902. How many lost their lives in the latter catastrophe?
57. If I have $\frac{3}{4}$ of $\frac{5}{8}$ of \$96 in my purse, how many dollars have I?
58. I earn $\$2\frac{3}{4}$ a day, and my daily expenses amount to $\$1\frac{9}{10}$. How much can I save in a month if I work 26 days?
59. A hatter bought 6 dozen hats at $\$1\frac{1}{8}$ apiece. He sold 35 of them at $\$2\frac{1}{4}$ and the rest at $\$2\frac{1}{2}$ each. Find his total gain.
60. Each month 16 of my cows give me a profit of $\$7\frac{1}{4}$ each, and 19 others a profit of $\$5\frac{2}{5}$ each. What is my total profit a month?
61. An alcoholic, who spends every day 25 cents for intoxicating drinks, buys daily for his family $5\frac{1}{2}$ pounds of bread at $3\frac{1}{2}$ cents a pound. In a week's time, how much more does he spend in drink than in bread?
62. Wheat of superior quality gives $\frac{3}{4}$ of its weight in flour. If a farmer brought 35 bushels of wheat to the mill, how many pounds of flour would he bring back, if a bushel of wheat weighs 60 pounds?
63. I had 152 chickens and I sold $\frac{7}{8}$ of them. How many have I left?
64. In 1759, Wolfe landed 9 000 men at Wolfe's Cove. If $\frac{1}{6}$ of $\frac{17}{80}$ of his men were killed or wounded, how many victims were there?
65. If a workman spends $\frac{2}{5}$ of his wages in drinks, and earns $\$9\frac{1}{2}$ a week, how much does he spend while ruining his health?
66. A butcher gives a reduction of $3\frac{1}{4}$ cents a pound on meat, in favor of a hospital. What alms does he give each week, if he furnishes the hospital with 375 pounds of meat?

Second Review.

67. On $\frac{2}{3}$ of a farm of 130 acres a farmer harvested $34\frac{3}{4}$ bushels to the acre. What was the value of his grain, at 52 cents a bushel?
68. Gregory used to earn $\$3\frac{3}{4}$ a day and worked 25 days a month. Since he started to use alcoholic liquors, he earns only $\$2\frac{1}{2}$ a day and works but 19 days a month. How much does the evil habit make him lose each month?
69. Raymond earned \$458 in a year. He spent $\frac{2}{3}$ of $\frac{3}{8}$ of his salary in the hotel. How much did he spend in the hotel?
70. The distance by railroad from Montreal to St. Hyacinthe is $35\frac{1\frac{3}{20}}$ miles. If the station of Belœil is $21\frac{3}{25}$ miles from Montreal, at what distance is it from St. Hyacinthe?
71. Two travelers start off together from a certain point in opposite directions; one goes $4\frac{1}{3}$ miles an hour and the other, $3\frac{3}{4}$ miles. At what distance apart will they be after 8 hours?
72. Two crops were harvested from a certain field. The first gave $4\frac{1}{2}$ tons to the acre, and the second, half as much. Find the total weight harvested, if the area of the field is $8\frac{1}{2}$ acres.
73. In our country there were, a certain year, under hay and clover 8 million acres that produced on an average $1\frac{2}{5}$ tons of feed. Find the value of that harvest, at $\$10\frac{8}{20}$ a ton.
74. Your father is the proprietor of $\frac{2}{5}$ of a boat valued at \$45 580. If he sells $\frac{3}{8}$ of his share, what would be the value of the part he has left?
75. The sum of three numbers is $4\frac{3}{4}$. The first is $\frac{2}{3}$ and the second, $\frac{2}{5}$. Find the third.
76. I spent $\frac{3}{40}$ of my money to buy a piece of land and 9 times as much to construct a house on it. What part of my money have I left?

77. I bought $3\frac{2}{3}$ yards of ribbon at 15 cents a yard, $2\frac{1}{2}$ yards of cotton at 10 cents, and 12 pounds of sugar at $5\frac{1}{2}$ cents. How much did I spend?

78. How much would $\frac{7}{8}$ of a yard of carpet cost, if 75 yards cost \$132?

79. A grocer bought 32 loaves of maple sugar weighing $8\frac{3}{4}$ pounds each. How much did he pay for them at $9\frac{1}{2}$ cents a pound?

80. How much would I pay for $8\frac{2}{3}$ cords of cherry at $\$6\frac{3}{4}$ a cord, $2\frac{1}{8}$ cords of maple at $\$8\frac{1}{2}$, and $9\frac{1}{2}$ cords of hemlock at $\$3\frac{1}{4}$?

81. How much should I add to $7\frac{3}{4}$ that the sum might equal the product of $4\frac{1}{2}$ by $8\frac{1}{2}$?

82. An acre of ground will produce on an average 27 bushels of beans or 232 bushels of potatoes. If beans are sold at $\$1\frac{2}{5}$ and potatoes at 55 cents a bushel, which is the more advantageous crop, and how much would I gain thereby?

83. If a maple tree gives $2\frac{1}{12}$ pounds of sugar which is sold at $9\frac{1}{2}$ cents a pound, how much would a farmer make if he has 2 448 maples tapped?

84. I bought a house for \$7 560. If I pay $\frac{1}{3}$ of this sum in cash and $\frac{2}{9}$ in six months, how much shall I still owe?

85. One day-laborer earns \$3.50 a day, and another $\frac{5}{7}$ as much. How much will the latter earn in 35 days?

86. A butcher sold for 12 pounds a piece of meat that weighed only $\frac{7}{8}$ of that weight. Of how much does he rob the purchaser, if meat is worth 15 cents a pound?

87. One pound of wheat gives $\frac{9}{10}$ of a pound of flour. How many pounds of flour would 124 bushels of wheat give, if a bushel of wheat weighs 60 pounds?

88. The Catholic population of the diocese of Montreal in 1909 was 408 720 souls; $\frac{3}{16}$ of that number equals that of the children then frequenting the Catholic schools. Find

the number of Catholic schools in the diocese, if 117 was the average number of pupils for each school.

89. A sheep when butchered gives $\frac{11}{20}$ of its weight in mutton, and the mutton is sold at $11\frac{1}{2}$ cents a pound. For how much would we sell the mutton of a sheep that weighs 220 pounds when alive?

90. My grandfather owned 200 acres of land. He gave $\frac{2}{5}$ of it to my father, who sold $\frac{2}{7}$ of his share. How many acres did my father sell?

91. I had \$475 in the bank, and I withdrew $\frac{3}{5}$ of it. How much of the sum withdrawn have I left, if I spent $\frac{2}{8}$ of it?

92. A settler owned $\frac{7}{8}$ of 368 cords of wood, and he lost $\frac{2}{7}$ of what he owned by fire. How many cords did he lose?

93. Great Britain imports 125 000 tons of cheese yearly, of which Canada furnishes 90 000. How much does New Zealand furnish, if she furnishes $\frac{2}{7}$ of the rest?

94. I had \$4 850 and I spent $\frac{3}{5}$ of it, then I lent $\frac{1}{2}$ of the rest. How much have I now?

95. A pedestrian goes $3\frac{1}{4}$ miles an hour, and a cyclist goes $4\frac{1}{2}$ times as fast. If they start together and go in the same direction, at what distance will they be one from the other in two hours?

96. One train leaves at 9 A.M. and goes $45\frac{1}{2}$ miles an hour; a second train leaves at 10.15 A.M., following the same road and going 42 miles an hour. How far ahead will the first one be at noon?

97. What part of an orchard does a man own, if he had already $\frac{3}{8}$ of it and he has just bought $\frac{4}{5}$ of the rest?

98. A surveyor who earns \$100 a month, spends $\frac{1}{4}$ of his salary and sends $\frac{2}{5}$ of the rest to his parents. What sum has he left at the end of the year?

99. What number must I add to $\frac{1}{5}$ of $2\frac{1}{7}$ to have $3\frac{2}{5}$?

100. The sale of wheat in the West brought in in one year 110 million dollars. If we subtract $\frac{5}{22}$ of this sum for

the transport, and $\frac{8}{17}$ of the rest for other expenses, how many millions are left to the farmers?

101. I bought 525 pounds of green coffee at 18 cents a pound. By the roasting, it lost $\frac{1}{5}$ of its weight. If I sell it at $48\frac{1}{2}$ cents a pound, what profit do I make?

102. I have $\$4\frac{3}{4}$ in the School Savings Bank. If they should give $\$1\frac{4}{5}$ to my cousin, he would have $\$3\frac{7}{10}$ more than I. How much have we together?

103. Paul gave $\$1\frac{1}{10}$, and Henry, $\$1\frac{1}{4}$ to a beggar. If James gave him 3 times as much as the other two together, how much did the beggar receive in all?

104. If the rails on one mile of railroad weigh $148\frac{5}{9}$ tons, what would be the cost, at $\$35\frac{2}{3}$ a ton, of the rails on a railroad 27 miles long?

105. Water boils at 212 degrees Fahrenheit, and gold melts at a temperature $11\frac{4}{5}\frac{6}{3}$ times as great. At what temperature does gold melt?

106. Ambrose has to clean a ditch 160 yards long. The first day he does $\frac{1}{5}$ of the work; the second, $\frac{1}{8}\frac{1}{2}$; the third, $\frac{5}{16}$. How much has he still to do?

107. A shop consumes 520 tons of coal a month. By using a smoke consumer they could save $\frac{3}{20}$ of the coal. What would be the economy each month, if coal is worth $\$4\frac{3}{4}$ a ton?

108. Charles had \$150. He bought 5 sheep at $\$31\frac{1}{4}$ each and 2 cows at $\$38\frac{1}{2}$ a head. How much is he now lacking to be able to buy a horse worth \$100?

109. If Fred has 40 sheep and his brother $21\frac{1}{5}$ times as many, how many sheep have both together?

110. A merchant bought, at $7\frac{1}{2}$ cents a yard, 16 bales of cotton each containing 13 pieces of 75 yards apiece. How much did the cotton cost him?

111. I have $\$21\frac{1}{2}$ in the School Savings Bank, and my brother, $21\frac{1}{5}$ times as much. How much have we both together?

112. The area of Lake St. John is 350 square miles; that of Lake Mistassini, $2\frac{1}{4}$ times as great; that of Lake Winnipeg, $9\frac{9}{13}$ times as great as the preceding one. Find the area of Lake Winnipeg.

113. I bought 1 196 plates for $\$74\frac{1}{2}$. What profit did I make by selling them $\$1\frac{1}{4}$ a dozen, if I gave 13 plates for 12?

114. I paid \$875 for a house that requires on an average \$32.50 a year for repairs. For how much a month must I rent the house so that the net income may equal $\frac{1}{10}$ of the buying price?

115. David wrote 150 psalms and $\frac{2}{5}$ of $\frac{1}{15}$ of the number of psalms equals the number of parables in the Gospel. Find the number of parables.

116. Each time that my ball touches the ground it bounds to a height equal to $\frac{2}{5}$ of that from which it fell. How many feet will it go up in the air on the second bounce, if I throw it 40 feet high?

117. At Chouaguen, in 1756, Montcalm had 2 760 men under his command, $\frac{1}{3}$ of whom were killed or wounded. Find the number of men that had the same fate on the English side, if this number was $5\frac{1}{15}$ times as great.

118. After the victory of Carillon, in 1758, the French counted 104 dead, and their wounded were $2\frac{5}{13}$ times as numerous. By multiplying the number of dead and wounded by $9\frac{2}{2}$, we have the number of French who took part in the battle. What is this number?

119. Sound travels through the air 1 140 feet a second. In the water it goes $4\frac{1}{3}$ times as rapidly, and through steel $3\frac{1}{2}$ times as fast as through water. What is the distance it goes through steel in a second?

120. A million dollars in gold weighs $3\ 685\frac{4}{5}$ pounds; this number multiplied by 16, then diminished of $42\frac{9}{10}$ pounds equals the weight of a million dollars in silver. What is its weight in silver?

121. The *Empress of Britain* carried one day 270 passengers in the first class and $1\frac{5}{6}$ times as many in the second.

$\frac{2}{3}$ of the passengers in the first plus $\frac{1}{6}$ of those in the second equaled those in the third. Find the total number of passengers.

122. Germany published, in 1906, 28 560 books, and the United States, $\frac{1}{4}$ as many. Find the number published by England, if she published $1\frac{1}{5}$ times as many as the United States.

123. A miller took for his toll $\frac{1}{16}$ of the grain he ground. What was the value of the toll received for grinding 30 bushels of wheat, if wheat was worth $88\frac{1}{2}$ cents a bushel?

124. A man expected to raise 560 pounds of tobacco worth 20 cents a pound; but his crop being damaged by hail, was diminished by $\frac{1}{5}$, and he had to sell it for $\frac{1}{8}$ of the price that he expected. How much did he receive?

125. A woman bought 26 yards of linen, and the merchant's yardstick was $\frac{1}{24}$ too short. How much did this woman lose, if linen cost 45 cents a yard?

126. Each week a man spends $1\frac{1}{2}$ days in the saloon, and spends \$2 $\frac{2}{5}$ there. How much does this bad habit make him lose in a year, if he earns \$3 $\frac{1}{2}$ for each day he works?

DIVISION OF FRACTIONS

129. *To divide a fraction by an integer.*

EXAMPLE. — If 5 pounds of coffee cost \$ $\frac{15}{16}$, what will 1 pound cost?

1 pound will cost $\frac{1}{5}$ as much as 5 pounds. So, $\$ \frac{15}{16} \times \frac{1}{5} = \$ \frac{3}{16}$, the cost of 1 pound.

130. *To divide an integer by a fraction.*

EXAMPLE. — A rug is 8 feet wide. How often shall I have to apply a rule $\frac{2}{3}$ of a foot long, to measure the width?

If my measure were $\frac{1}{3}$ of a foot, I should repeat it 3 times to measure each foot; hence 8×3 times in all.

Since it is not $\frac{1}{3}$, but twice $\frac{1}{3}$, I shall apply it only $\frac{1}{2}$ of 8×3 times = $\frac{8 \times 3}{2} = 12$ times.

131. To divide a fraction by a fraction.

EXAMPLE. — If $\frac{5}{7}$ of a bushel of corn costs \$ $\frac{3}{4}$, what will 1 bushel cost?

Since $\frac{5}{7}$ of a bushel cost \$ $\frac{3}{4}$, $\frac{1}{7}$ of a bushel cost \$ $\frac{\frac{3}{4}}{5}$, and the $\frac{7}{7}$ of a bushel cost \$ $\frac{3 \times 7}{4 \times 5} = \$\frac{3}{4} \times \frac{7}{5} = \frac{21}{20}$, or \$ $1\frac{1}{20}$.

132. Rules. — 1° To divide a fraction by an integer, divide the numerator by the integer, if possible; if not, multiply the denominator by the integer, and reduce.

2° To divide an integer by a fraction, multiply the integer by the inverted fraction.

3° To divide a fraction by a fraction, invert the terms of the divisor and proceed as in multiplication.

NOTE. — Reduce mixed numbers to improper fractions before applying the above third rule.

Written Exercises.

Perform the following divisions:

1. $\frac{3}{4} \div 3.$

6. $\frac{5}{6} \div 4.$

11. $\frac{4}{9} \div 11.$

2. $\frac{5}{6} \div 5.$

7. $\frac{5}{7} \div 5.$

12. $\frac{9}{10} \div 15.$

3. $\frac{4}{5} \div 4.$

8. $\frac{4}{5} \div 8.$

13. $\frac{8}{5} \div 8.$

4. $\frac{4}{9} \div 2.$

9. $\frac{7}{8} \div 7.$

14. $\frac{5}{6} \div 6.$

5. $\frac{8}{7} \div 3.$

10. $\frac{2}{4} \div 12.$

15. $\frac{8}{8} \div 13.$

16. $5 \div \frac{1}{5}.$

21. $8 \div \frac{7}{8}.$

26. $5 \div 1\frac{1}{2}.$

17. $4 \div \frac{1}{8}.$

22. $3 \div \frac{9}{12}.$

27. $9 \div 1\frac{2}{3}.$

18. $7 \div \frac{3}{5}.$

23. $7 \div \frac{2}{3}.$

28. $8 \div 1\frac{3}{4}.$

19. $3 \div \frac{3}{4}.$

24. $9 \div \frac{5}{9}.$

29. $8 \div 1\frac{1}{8}.$

20. $7 \div 1\frac{1}{2}.$

25. $10 \div \frac{7}{9}.$

30. $6 \div 3\frac{3}{4}.$

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| 31. $4\frac{2}{3} \div 2.$ | 36. $5\frac{2}{3} \div 15.$ | 41. $3\frac{1}{4} \div \frac{9}{10}.$ |
| 32. $6\frac{1}{3} \div 3.$ | 37. $6 \div 3\frac{2}{7}.$ | 42. $8\frac{4}{7} \div \frac{1}{5}.$ |
| 33. $6 \div 7\frac{1}{2}.$ | 38. $3\frac{2}{3} \div 9.$ | 43. $4 \div 12\frac{2}{3}.$ |
| 34. $6 \div 3\frac{1}{3}.$ | 39. $7 \div 4\frac{1}{4}.$ | 44. $3\frac{1}{8} \div 3.$ |
| 35. $2 \div 15\frac{1}{2}.$ | 40. $5 \div \frac{7}{8}.$ | 45. $9 \div 3\frac{2}{3}.$ |
| 46. $\frac{4}{7} \div \frac{2}{7}.$ | 51. $8 \div 4\frac{1}{3}.$ | 56. $8\frac{4}{7} \div 5.$ |
| 47. $\frac{3}{4} \div \frac{1}{3}.$ | 52. $6\frac{1}{9} \div \frac{1}{5}.$ | 57. $6\frac{2}{7} \div 6.$ |
| 48. $\frac{4}{5} \div \frac{7}{10}.$ | 53. $2\frac{1}{2} \div 3\frac{1}{2}.$ | 58. $3\frac{1}{4} \div 2\frac{4}{11}.$ |
| 49. $\frac{7}{15} \div \frac{3}{4}.$ | 54. $6\frac{4}{7} \div 2\frac{4}{7}.$ | 59. $7\frac{1}{8} \div 9.$ |
| 50. $\frac{1}{18} \div \frac{9}{11}.$ | 55. $\frac{1}{3} \div 6\frac{1}{3}.$ | 60. $8 \div 3\frac{4}{5}.$ |
| 61. $8\frac{1}{3} \div 2\frac{1}{2}.$ | 66. $\frac{4}{5} \div 8.$ | 71. $\frac{4}{15} \div \frac{11}{15}.$ |
| 62. $3\frac{1}{3} \div \frac{5}{6}.$ | 67. $\frac{5}{6} \div 10.$ | 72. $3\frac{3}{5} \div \frac{8}{5}.$ |
| 63. $16\frac{2}{3} \div \frac{5}{7}.$ | 68. $6 \div \frac{5}{8}.$ | 73. $\frac{4}{7} \div 3\frac{2}{7}.$ |
| 64. $7\frac{5}{7} \div 4\frac{10}{11}.$ | 69. $12 \div \frac{7}{9}.$ | 74. $6 \div 8\frac{4}{7}.$ |
| 65. $9\frac{5}{8} \div 5\frac{1}{2}.$ | 70. $\frac{11}{16} \div \frac{5}{6}.$ | 75. $\frac{7}{8} \div \frac{4}{9}.$ |
| 76. $12 \div \frac{3}{7}.$ | 81. $8\frac{4}{5} \div 3\frac{2}{3}.$ | 86. $7 \div 12\frac{3}{5}.$ |
| 77. $\frac{4}{7} \div 4.$ | 82. $\frac{5}{6} \div 7\frac{3}{4}.$ | 87. $37\frac{3}{5} \div 15.$ |
| 78. $8 \div 4\frac{1}{2}.$ | 83. $8\frac{3}{4} \div \frac{2}{5}.$ | 88. $18\frac{3}{4} \div 2\frac{1}{8}.$ |
| 79. $7\frac{9}{10} \div 2\frac{3}{4}.$ | 84. $11\frac{1}{9} \div 3\frac{1}{3}.$ | 89. $5 \div 9\frac{1}{6}.$ |
| 80. $11\frac{1}{4} \div 4\frac{2}{7}.$ | 85. $6\frac{3}{7} \div 14\frac{1}{7}.$ | 90. $17\frac{17}{21} \div \frac{11}{12}.$ |

Review Exercises.

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| 91. $(20 \times \frac{3}{4}) \div \frac{7}{8}.$ | 101. $(\frac{3}{7} + \frac{1}{14}) \div 4\frac{1}{2}.$ |
| 92. $(\frac{7}{8} \times 20) \div \frac{3}{4}.$ | 102. $(\frac{5}{18} - \frac{1}{24}) \div \frac{17}{36}.$ |
| 93. $(20 \div \frac{7}{8}) \times \frac{3}{4}.$ | 103. $(\frac{7}{11} \times \frac{4}{5}) \div (\frac{3}{5} \times \frac{7}{11}).$ |
| 94. $(7\frac{3}{4} \div \frac{4}{7}) + 8\frac{1}{2}.$ | 104. $(\frac{1}{8} \times 12) - (\frac{16}{17} \times \frac{1}{2}).$ |
| 95. $(20 \div \frac{7}{8}) \div \frac{3}{4}.$ | 105. $5\frac{1}{4} \times \frac{1}{6} \text{ of } \frac{8}{9}.$ |
| 96. $(7 \div \frac{7}{12}) + 8\frac{4}{5}.$ | 106. $\frac{7}{9} \text{ of } 28 \div (\frac{1}{2} \times \frac{4}{5}).$ |
| 97. $(\frac{1}{2} \times \frac{2}{3}) \div 6\frac{1}{3}.$ | 107. $\frac{2}{3} \text{ of } 5\frac{1}{2} \div \frac{7}{8}.$ |
| 98. $7\frac{1}{8} \div (\frac{3}{4} \times \frac{9}{10}).$ | 108. $25\frac{1}{4} \div (\frac{1}{4} \times 26).$ |
| 99. $20 \div (\frac{7}{8} \times \frac{3}{4}).$ | 109. $\frac{7}{9} \div \frac{3}{7} \text{ of } \frac{7}{10}.$ |
| 100. $20 \times (\frac{7}{8} \div \frac{3}{4}).$ | 110. $\frac{7}{8} \text{ of } 15\frac{3}{4} \div 4\frac{1}{4}.$ |

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| 111. $(3\frac{1}{2} + 6\frac{1}{4}) \div 3$. | 121. $(7\frac{1}{7} - 3\frac{1}{3}) \div 7\frac{1}{2}$. |
| 112. $(24\frac{1}{2} + 16\frac{1}{4}) \div 8$. | 122. $(9\frac{2}{4} \times 8\frac{1}{3}) + 18\frac{2}{4}$. |
| 113. $\frac{1}{4} \times (5\frac{1}{6} - 3\frac{2}{3})$. | 123. $\frac{5}{6} \div (7 \div 12\frac{2}{3})$. |
| 114. $(\frac{2}{9} \times \frac{3}{5}) \div (\frac{1}{4} \times 2\frac{1}{9})$. | 124. $(31\frac{1}{2} \div 4\frac{1}{2}) + 24\frac{1}{2}$. |
| 115. $(\frac{1}{8} \times 12) - (\frac{1}{17} \times \frac{1}{2})$. | 125. $(2\frac{1}{2} + 1\frac{1}{8}) \div (2\frac{1}{2} + 3\frac{1}{8})$. |
| 116. $(18\frac{1}{5} - 6\frac{2}{11}) \div 11$. | 126. $(\frac{2}{4} \div \frac{2}{3}) \times \frac{1}{8} \times 1\frac{1}{2}$. |
| 117. $3\frac{3}{4} \times (3\frac{1}{3} + 1\frac{2}{5})$. | 127. $(2\frac{1}{4} \div \frac{2}{5}) \div (4\frac{1}{12} - \frac{5}{6})$. |
| 118. $52\frac{1}{2} \times (1\frac{7}{8} - \frac{1}{16})$. | 128. $(4\frac{1}{2} + 3\frac{1}{3} - 6\frac{7}{8}) \times 5$. |
| 119. $30\frac{2}{7} \div \frac{2}{8}$ of 7. | 129. $(1\frac{1}{3} \div \frac{2}{7}) + (6\frac{2}{5} \div \frac{1}{4})$. |
| 120. $(\frac{1}{2} + \frac{2}{7}) \div 4\frac{1}{4}$. | 130. $(8\frac{2}{3} \times 21) - (15\frac{5}{8} \div 5)$. |

Principles of Analysis relating to Division.

10. I divide because I wish to find the *quotient* of..... by.....

11. I divide because having the *total value* and the *number of objects*, I wish to find the *value of one object*.

12. I divide because having the *total value* and the *value of one object*, I wish to find the *number of objects*.

13. I divide because I wish to find..... *times less* than what I have.

Oral Exercises.

131. What is the quotient of $\frac{4}{5} \div 2$? of $\frac{8}{9} \div 2$? of $\frac{15}{17} \div 5$?

132. How many times is $\frac{2}{3}$ contained in 4? in 6? in 8?

133. What is the value of 1 dozen of oranges, if 3 dozen are worth \$ $\frac{2}{5}$?

134. One pair of stockings costs \$ $\frac{2}{5}$; how many pair should we buy for \$4?

135. What is the quotient of $\frac{1}{3} \div 2$? of $\frac{3}{4} \div 4$? of $\frac{1}{7} \div 5$?

136. How much did I pay for each pound of sugar, if 3 pounds cost me \$ $\frac{1}{4}$?

137. Find the quotient of $\frac{1}{2} \div \frac{1}{3}$; of $\frac{4}{5} \div \frac{2}{3}$; of $\frac{1}{3} \div \frac{5}{6}$.

138. If a gallon of vinegar costs \$ $\frac{2}{3}$, how many gallons should we have for \$2 $\frac{1}{2}$?

139. How many sacks of $\frac{2}{3}$ pounds each would be required to hold six pounds of tea?

140. $\frac{7}{8}$ of a number equals 35. What is this number?

141. I spent $\frac{5}{7}$ of my money and I have \$4 remaining. How much money had I?

142. How many jugs of $2\frac{3}{4}$ gallons each would be required to hold $13\frac{3}{4}$ gallons of maple syrup?

Problems on Division.

143. Eight war vessels cost $48\frac{1}{2}$ million dollars; what is the average price of one vessel?

144. If a horse eats $\frac{2}{9}$ of a bushel of grain in one day, how long would it take him to eat $3\frac{1}{9}$ bushels?

145. It takes $\frac{2}{3}$ of a yard of cotton to make one apron; how many aprons can be made out of 2 yards?

146. How many pair of gloves should I receive for \$28, if one pair costs $1\frac{3}{4}$ dollars?

147. Lewis paid $\$12\frac{1}{2}$ for a ton of hay; how many tons could he buy for $\$62\frac{1}{2}$?

148. Harold has $\$7\frac{1}{8}$ in the School Savings Bank. How many weeks has he had the bank book, if he deposits $\$3\frac{3}{8}$ a week?

149. At $\$3\frac{2}{5}$ a pound, how many pounds of tea should I receive for \$3?

150. If a man earns $\$1\frac{3}{4}$ a day, how many days would it take him to earn \$42?

151. By what number did I multiply $8\frac{1}{2}$, if I have 48 for product?

152. William received \$2.96 for cording $18\frac{1}{2}$ cords of wood. How much did he receive a cord?

153. How many families could David help with $\$24\frac{1}{2}$, by giving $\$1\frac{3}{4}$ to each?

154. The number $336\frac{1}{9}$ is a product of which $18\frac{1}{3}$ is one factor. Find the other factor.

155. A letter takes 33 days to go to the Philippine Islands; how long would it take to go to Rome, if it would take $3\frac{2}{3}$ times less?

156. An iron bar weighs 17 pounds; what is its length, if a foot of this bar weighs $2\frac{2}{3}$ pounds?

157. If a cyclist goes $14\frac{1}{2}$ miles an hour, how many hours would it take him to go $79\frac{3}{4}$ miles?

158. Find a number $9\frac{1}{8}$ times smaller than $134\frac{2}{5}$.

159. If $\frac{7}{12}$ of Joseph's money equals \$861, how much has he?

160. In front of Quebec $\frac{7}{10}$ of the width of the St. Lawrence equals 742 feet. What is its total width?

161. A gallon of milk can produce $\frac{8}{9}$ of a pound of butter. How many gallons of milk would be needed to make 25 pounds of butter?

162. In 1909, $\frac{4}{17}$ of the number of Catholic churches in Canada equaled 564. Find the number.

163. If 260 square miles is $\frac{4}{15}$ of the area of Lake Mississini, find the total area.

164. By what number must I multiply $9\frac{1}{2}$ to find $28\frac{3}{4}$?

165. In 1908, the Canadian Pacific had 1 400 locomotives. Find the number of its freight cars, the number of locomotives equaling $\frac{7}{228}$ of the number of freight cars.

166. In England there were 9 600 different publications in 1909. How many were there in the whole world, if this number equaled $\frac{4}{25}$ of the entire number of publications?

167. If an excavator digs in $\frac{3}{4}$ of a day 14 yards of ditch, how many yards of ditch will he dig in a day?

ADDITION, SUBTRACTION, MULTIPLICATION, DIVISION.

First Review.

1. 3 ounces of silver and 5 ounces of copper were melted together. The silver is what fraction of the alloy?

2. What would an entire work cost, if $\frac{1\frac{5}{2}}{2}$ of it cost \$75?
3. If 27 equals $\frac{3}{14}$ of a number, what is $\frac{5}{9}$ of this same number?
4. What is the length of Victoria Bridge, if $\frac{3}{8}$ of its length equals 2514 feet?
5. A horse eats $\frac{3}{8}$ of a bushel of oats in a day. In how many days will he eat $5\frac{1}{4}$ bushels?
6. If a ton of coal costs $\$6\frac{2}{5}$, how many tons could be bought with \$44 $\frac{1}{5}$?
7. A man goes $3\frac{1}{3}$ miles an hour; what distance will he travel in $5\frac{1}{3}$ hours?
8. In 1909 there were 144 Catholic churches in New York. Find the number of churches in Montreal, if they were $2\frac{1}{17}$ times less numerous.
9. If $5\frac{1}{2}$ tons of coal cost $\$30\frac{1}{4}$, how much would $10\frac{1}{2}$ tons cost?
10. How many sheep, at $\$7\frac{1}{2}$ a head, could I buy with the product of the sale of 48 cords of beech at $\$6\frac{1}{4}$ a cord?
11. The product of two numbers is $141\frac{5}{6}$, and one of these numbers is $7\frac{2}{3}$. What is the other?
12. With $8\frac{3}{4}$ bushels of wheat we can sow 5 acres; how many acres can we sow with 60 bushels?
13. A farm and house cost \$19 250. The farm is worth $4\frac{1}{2}$ times as much as the house. What is the house worth?
14. What is the difference between one third and one fourth of $1\ 056\frac{1}{2}$?
15. The weight of a bushel of corn increased by $\frac{1}{7}$ equals 64 pounds. How much does a bushel weigh?
16. The height of Mount Blanc increased by its $\frac{1}{8}$ equals 29 595 feet. Find the height of this mountain.
17. The sum of three fractions is $\frac{5}{6}$; two of these fractions are $\frac{1}{3}$ and $\frac{1}{4}$. What is the third?
18. The difference between the $\frac{5}{7}$ and the $\frac{1}{7}$ of a number is 35. What is this number?

19. What distance separates Montreal from Liverpool, if being increased by its $\frac{1}{5}$ it would equal 3 312 miles?

20. After having obtained a discount of $\frac{1}{20}$ on my bill, I paid it with \$342. What was the amount of this bill?

21. A farmer gave $6\frac{2}{3}$ dozen of eggs worth 12 cents a dozen for $\frac{4}{5}$ of a gallon of olive oil. How much is a gallon worth?

22. A man gave $\frac{1}{3}$ of his fortune to his wife, $\frac{1}{4}$ to his daughter, and the rest, which was \$5 000, to his son. What was his fortune?

23. If I pay \$6 $\frac{3}{4}$ for a ton of coal, how much would I pay for 8 $\frac{1}{3}$ tons?

24. A pound of flour gives about 1 $\frac{1}{4}$ pounds of bread; how much flour would it take to make 12 loaves of 6 pounds each?

25. After spending $\frac{1}{4}$ and $\frac{1}{5}$ of my money, I have \$517 left. How much had I?

26. The 4 falls of the River Manicouagan develop 1 $\frac{1}{5}$ million horse power, and this power equals only $\frac{12}{85}$ of that of Niagara Falls. What is the power developed by Niagara Falls?

27. What was the number of Catholic bishops in the world in 1910, if $\frac{2}{5}$ plus $\frac{8}{31}$ of this number equaled 770?

28. If a butcher bought turkeys at the rate of \$5 $\frac{1}{4}$ for 3, how many could he buy for \$31 $\frac{1}{2}$?

29. Twelve acres of land sowed in oats gave an average crop of 48 $\frac{1}{4}$ bushels to the acre, worth 58 $\frac{1}{3}$ cents a bushel. Find the value of the total crop.

30. A man spent in a year $\frac{1}{3}$ of his salary for his board, $\frac{1}{5}$ for his lodging, and $\frac{1}{4}$ for his other expenses. He has \$494 left. What is his yearly salary?

31. The tilling of an acre of land cost on an average \$14 $\frac{1}{5}$, and brings in \$23 $\frac{3}{4}$. What is the net profit on a farm of 86 acres?

32. By what number must I multiply $27\frac{2}{3}$ to have $320\frac{1}{8}$ for product?
33. Find the number of prisoners made by Colonel Winslow in the village of Grand Pré and the environs in 1755, if $\frac{2}{6}$ plus $\frac{1}{4}$ of their number is 2329.
34. William gave 16 bushels of wheat, worth $\$1.42\frac{1}{2}$ a bushel, in exchange for 40 bushels of oats. What is the price of one bushel of oats?
35. If $\frac{2}{15}$ of the length of the Ottawa River is $91\frac{1}{3}$ miles, what is its total length?
36. Instead of taking $\frac{3}{4}$ of a certain sum, I took only the $\frac{2}{5}$, and thereby made an error of \$18. What is the total sum?
37. Paul gathered $24\frac{3}{8}$ tons of carrots to the acre from a field of 6 acres; and from a field of 7 acres, $26\frac{3}{4}$ tons of beets to the acre. How many tons of vegetables did he gather in all?
38. What fraction of 150 gallons is 25 gallons?
39. An acre of land produces $17\frac{3}{8}$ bushels of wheat worth $\$1\frac{1}{2}$ a bushel. At that rate what would be the value of an 18-acre crop?
40. In a basket there are 40 oranges and 35 lemons. The number of lemons is what fraction of the total number of fruit in the basket?
41. The expenses for building a parish road were supported by 5 capitalists. The first paid the $\frac{1}{3}$; the second, $\frac{1}{6}$; the third, $\frac{1}{12}$; the fourth, $\frac{1}{4}$; and the fifth, \$9894. Find the total cost of the road.
42. The difference between $\frac{3}{7}$ and $\frac{2}{5}$ of the number of yearly deaths in New York is 2263. How many die each day in that city?
43. Eighteen acres of land gave 405 bushels of barley worth $\$1\frac{1}{10}$ a bushel. Find the value of the income per acre.
44. An electric car goes $\frac{5}{6}$ of its way in 45 minutes. How long would it take to go half of its way?

45. Shawinigan Falls are 120 feet high, and $\frac{2}{3}$ of their height equals $\frac{2}{5}$ of that of Montmorency Falls. What is the height of the latter falls?

46. A merchant bought 48 iron beds, and sold them for \$360, making a profit of $\$3\frac{1}{4}$ per bed. How much did each bed cost him?

47. A man spent daily 25 cents for cigars and 25 cents for liquors. If he quit these two habits, how many months of rent, at $\$18\frac{1}{4}$, could he pay with the sum thus economized during a year?

48. Find the height of Niagara Falls if 44 feet is $\frac{4}{15}$ of its height.

49. I sold $\frac{3}{4}$ of a case of oranges. How many oranges were there in this case, if I threw 8 away and there were 64 left?

50. The area of Lake St. John is 350 square miles. Find the area of Lake Mistassini, if $\frac{5}{14}$ of the area of the former equals $\frac{5}{89}$ of the area of the latter.

51. What is the length of Columbia River, if $95\frac{5}{6}$ miles is the difference between $\frac{3}{4}$ and $\frac{2}{3}$ of its length?

52. If $\frac{5}{8}$ of a cord of wood cost $\$3\frac{3}{4}$, how much will $\frac{3}{4}$ of a cord cost?

53. Find the weight of the great bell on Notre Dame Church, in Montreal, if 2718 pounds is 240 pounds more than $\frac{1}{10}$ of its weight.

54. I bought apples at the rate of 5 for 3 cents. How many must I sell at the rate of 6 for 5 cents to gain 14 cents?

55. Peter pays 3 cents for 5 oranges and sells them at the rate of 2 for 5 cents. How many oranges must he sell to gain \$3.80?

56. There is a difference of $211\frac{2}{7}$ miles between the $\frac{3}{7}$ and the $\frac{3}{8}$ of the length of the Amazon. What is the length of the Amazon?

57. If $\frac{3}{8}$ of a certain ore is copper, how many pounds of ore would be required to produce 75 pounds of copper?

58. In 1909, $\frac{1}{6}$ plus $\frac{5}{12}$ of the number of priests that were in the diocese of Montreal equaled 361. How many were there?

59. If Hubert should spend $\frac{1}{3}$ of his money plus \$25, he would have \$225 left. How much has he?

60. A merchant spent $\frac{2}{5}$ of his money plus \$40, and had \$125 left. How much had he?

61. In 1757, $\frac{1}{8}$ plus $\frac{3}{4}$ of the number of English soldiers who came out of Fort William Henry with the honors of war was 1981. What was the total number?

62. I spent $\frac{4}{7}$ of my money plus \$3.18, and I have \$14.16 left. Find the sum I had at first.

63. The difference between $\frac{2}{5}$ and $\frac{2}{9}$ of the rate of speed of wind during a cyclone is 16 miles an hour. What is the rate of wind?

64. Divide $\$18\frac{1}{2}$ between A and B so that B may receive $\$1\frac{1}{5}$ more than A.

65. The sum of the ages of Henry and Francis is $47\frac{3}{4}$ years. Henry is $5\frac{1}{3}$ years older than Francis. Find the age of each.

66. A gallon of water weighs 10 pounds, and a cubic foot of water $62\frac{1}{2}$ pounds. How many gallons of water are there in a cistern that contains 748 cubic feet of water?

67. A drunkard earns \$511 a year, and spends $\frac{2}{7}$ of his wages in the saloon. How much does he spend on an average each day while ruining his health?

68. A horse and carriage cost together $\$221\frac{1}{4}$, and the carriage cost $\$29\frac{3}{4}$ less than the horse. What is the price of the horse and that of the carriage?

69. Find the number of which $\frac{1}{2}$ plus $\frac{1}{6}$ equals 861.

70. How many acres of land could I buy, at \$42, with the $\frac{3}{4}$ of \$4 228?

71. Joseph's watch is worth $\frac{3}{4}$ of Gilbert's and the two watches together are worth \$70. Find the value of each.

72. A father and his son earn together \$996, and the son earns only $\frac{5}{7}$ as much as the father. How much does each earn?

73. Philip mixed 28 bushels of barley worth $64\frac{1}{2}$ cents a bushel with 46 bushels of oats worth $52\frac{1}{2}$ cents a bushel. For how much a bushel did he sell the mixture, if he gained \$4.04 on the whole?

74. At $\$1\frac{1}{8}$ a dozen, how many dozen of eggs should I receive for $\$3\frac{3}{4}$?

75. What fraction of a gallon of syrup should I give for $\frac{1}{2}$, if I sell a gallon $\$3\frac{3}{4}$?

76. I paid $\$67\frac{1}{2}$ for two articles and one is worth $3\frac{1}{2}$ times as much as the other. What is the value of each?

Second Review.

1. When a keg of herrings is worth \$7, what part of a keg would be sold for $\$1\frac{1}{8}$?

2. If $3\frac{3}{4}$ yards of serge cost $\$4\frac{1}{2}$ how much would I pay for $\frac{2}{3}$ of a yard?

3. By subtracting 404 miles from 2989 miles, we have a number of miles equal to $\frac{5}{6}$ the distance from Montreal to Havre. Find the distance between the two places.

4. If $\frac{3}{4}$ of a yard of linen cost $\$2\frac{1}{8}$, how much would a yard cost?

5. A forester sold $\frac{1}{2}$ of $7\frac{1}{3}$ cords of maple for $\frac{1}{3}$ of $\$82\frac{1}{2}$. What is the cost of a cord?

6. A gardener sold 4 barrels of apples at $\$3\frac{3}{4}$ a barrel, and he used $\frac{3}{5}$ of the product of this sale to buy tea at $\$2\frac{1}{5}$ a pound. How many pounds of tea did he buy?

7. I sold for \$3240 the $\frac{2}{3}$ of my farm, and I have 81 acres left. How much did I receive an acre for what I sold?

8. Leo bought 6 tons of coal at $\$6\frac{1}{4}$ a ton. He gave in payment 20 bushels of oats at $\$1\frac{1}{2}$ a bushel, and 3 tons of hay. Find the price of a ton of hay.

9. Elmer has two cows; one gives 16 gallons of milk in 5 days, and the other, $26\frac{1}{2}$ gallons in 7 days. How many gallons of milk can he sell each day, if he keeps $2\frac{1}{2}$ gallons for family use?

10. It takes $19\frac{1}{2}$ pounds of milk to make a pound of butter. How much would a farmer receive if he sent to the factory 4680 pounds of milk, butter selling at $23\frac{3}{8}$ cents a pound?

11. A druggist bought 288 bottles of patent medicine at $\$ \frac{7}{10}$ a bottle; 9 of the bottles being broken, he sold the rest at $\$10\frac{4}{6}$ a dozen. What profit did he make?

12. Fourteen pounds of pepper are worth 5 pounds of cinnamon. How many pounds of cinnamon are worth 20 pounds of pepper?

13. It is known that 8 pounds of wood produce as much heat as 3 pounds of coal. How many pounds of wood would produce as much heat as 600 pounds of coal?

14. If to make bronze for bells they mixed 80 parts copper with 20 parts pewter, how many pounds of pewter would be in a bell that weighs 2360 pounds?

15. If a screw nail goes in $\frac{3}{10}$ of an inch with 3 turns, how many turns of the screw-driver would make it go in $3\frac{1}{2}$ inches?

16. For 7917 pounds of milk sent to a cheese factory, a farmer received \$92.82. If cheese is worth $11\frac{1}{3}$ cents a pound, how many pounds of milk does it require to make a pound of cheese?

17. Harry received $\$4\frac{1}{2}$ for $\frac{3}{5}$ of a week's work. How much does he receive a day?

18. If $\frac{3}{4}$ of a cord of maple cost $\$5\frac{5}{8}$, how much would 25 cords cost?

19. If $\frac{2}{3}$ of a bushel of oats cost $\$ \frac{2}{5}$, what would be the price of $\frac{5}{6}$ of a bushel?

20. A drover bought sheep at $\$2\frac{3}{4}$ a head, and sold them at $\$3\frac{1}{6}$. How many sheep did he buy if he gained \$105?

21. Robert bought wood for $\$175\frac{1}{2}$, and sold it at \$9 a cord, gaining $\$67\frac{1}{2}$. How many cords of wood did he buy?

22. My property of 120 acres is valued at \$78 $\frac{1}{2}$ an acre, and I pay on it a tax of $\frac{1}{100}$ of its value. What sum do I pay in taxes?
23. How many rivers flow into the Lake Superior, if 30 is $\frac{2}{5}$ of $\frac{1}{4}$ of their number?
24. What is $\frac{5}{8}$ of the value of my house, if $\frac{2}{3}$ of $\frac{1}{2}$ of its value is \$2 472?
25. Last year, each of my four cows gave on an average 17 $\frac{1}{2}$ pounds of milk a day, and the total receipts for the year were \$389.82. At what price per pound did I sell the milk?
26. Divide \$252 among three persons so that the second may receive $\frac{2}{3}$ as much as the first, and the third, half as much as the other two together.
27. If a bottle contains $\frac{1}{4}$ of $\frac{2}{3}$ of a gallon, how many like bottles could be filled with $\frac{2}{4}$ of 3 $\frac{1}{2}$ gallons?
28. Henry had 180 $\frac{1}{2}$ pounds of fish. After having given the $\frac{2}{3}$, he sold $\frac{2}{3}$ of the rest. At 12 cents a pound, how much would he receive for what he has left?
29. Edward owned $\frac{2}{5}$ of a coal mine, and he sold $\frac{2}{5}$ of his share for \$24 000. Find the value of the whole mine at that rate.
30. A pound of milk gives $\frac{1}{10}$ of a pound of cheese. What is the value of 115 pounds of milk turned into cheese, if cheese is worth 11 $\frac{1}{2}$ cents a pound?
31. Having bought $\frac{2}{5}$ of a hydraulic power, I sold $\frac{2}{5}$ of my share for \$12 000. At this rate, find the value of the entire power.
32. In the month of January, my cows gave 8 151 pounds of milk, which made 494 pounds of butter. In July they gave 18 272 $\frac{1}{2}$ pounds of milk, which made 878 $\frac{1}{2}$ pounds of butter. Find in each case the number of pounds of milk it took to make one pound of butter.
33. With a pound of flour we can make 1 $\frac{1}{4}$ pounds of bread. How many 2 $\frac{1}{4}$ -pound loaves of bread can be made with 196 pounds of flour?

34. In a hive $\frac{1}{4}$ of the bees die, then $\frac{1}{4}$ of the rest die, and there are still 10 000 left. How many bees were there in the hive at first?

35. The $\frac{1}{4}$ of the price of 5 horses is sufficient to buy 6 cows at \$55 a head. What is the price of one horse?

36. A farmer bought a horse for \$115, and 18 months later sold it for \$150. It cost $\$8\frac{1}{2}$ a month to feed the horse, and his work was valued at $\$13\frac{1}{2}$ a month. Find the profit the farmer made.

37. The difference between $\frac{5}{12}$ and $\frac{1}{3}$ of the price of 60 bushels of wheat is $\$4\frac{1}{2}$. Find the price of a bushel.

38. Thirty hens gave a net profit of \$30.83 in a year, and it cost $53\frac{1}{2}$ cents a week to care for them. If the eggs were sold at $25\frac{1}{2}$ cents a dozen, what was the average number of eggs laid by each hen?

39. A stock raiser had 700 sheep, and he lost $\frac{5}{14}$ of them. He then bought $\frac{2}{3}$ as many as he had left; how many has he now?

40. It cost \$23.25 to transport $15\frac{1}{2}$ cords of wood 60 miles away. At the same rate, how many miles could we transport $6\frac{9}{14}$ cords for the same money?

41. If a man does a piece of work in 6 hours, what part of the work does he do: 1° in 1 hour? 2° in 4 hours? 3° in $4\frac{1}{2}$ hours?

42. A pipe lets $\frac{2}{3}$ of the water run out of a tank in 1 hour. What part does it let run out: 1° in 2 hours? 2° in half an hour? 3° in $3\frac{1}{3}$ hours?

43. John did a piece of work in 12 days. In how many days would he do: 1° $\frac{2}{3}$ of the work? 2° $\frac{1}{4}$ of the work?

44. A weaver weaves a yard of linen in $\frac{2}{3}$ of an hour. 1° How many yards would he weave in $4\frac{1}{2}$ hours? 2° What part of a yard would he weave in $\frac{1}{3}$ of an hour?

45. A 4-acre orchard, which contained 36 apple trees to the acre, gave an income of \$792, the apples being sold at

$\$2\frac{1}{2}$ a barrel. What was the average number of barrels given by each tree?

46. In $\frac{2}{3}$ of a day, a workman does $\frac{2}{11}$ of a piece of work; in what time could he do the whole of it?

47. If 18 men do a piece of work in $\frac{1}{2}$ of a day, in how many days would one man do the same work?

48. Joseph does $\frac{1}{4}$ of a piece of work in 18 days. What part of the work would he do in $24\frac{1}{2}$ days?

49. It costs $1\frac{7}{10}$ cents to feed a hen for a week, and she lays about 98 eggs during a year. What profit will 25 hens bring in in a year, if the eggs are sold at 24 cents a dozen?

50. How many hours would it take to dig $1\frac{1}{2}$ yards of ditch, if in one hour $\frac{2}{10}$ yards are dug?

51. A father sold $\frac{2}{3}$ of his property, and distributed $\frac{1}{4}$ of the product among his 4 sons, who received \$2350 each. Find the total value of the property.

52. A merchant paid first $\frac{2}{4}$ of a debt, then $\frac{2}{3}$ of the rest. How much did he owe at first, if the difference between the two payments was \$175?

53. The $\frac{1}{4}$ of the length of the Richelieu equals that of the Chaudière, and their difference is 90 miles. What is the length of each river?

54. Stanislaus spent $\frac{2}{5}$ of his money to buy a horse, and $\frac{2}{5}$ of the rest to buy a carriage worth \$48. What sum had he at first?

55. I sold for \$8132 a house and a farm of $85\frac{1}{7}$ acres. How much did I receive an acre for the land, if the house was sold for \$2750?

56. How many gallons of juice could we get from 48 gallons of gooseberries, if their juice equals $\frac{2}{4}$ of their weight, and the press used extracts only $\frac{1}{4}$ of the juice?

57. A merchant sold 36 pair of boots for \$106 $\frac{1}{2}$. If he sold 20 pair at \$2 $\frac{3}{4}$ a pair, at what price did he sell each of the other pair?

58. A traveler could go $82\frac{1}{2}$ miles in $3\frac{1}{2}$ hours by train; were he to go in a carriage, it would take him $5\frac{1}{2}$ hours longer. At what rate per hour would the carriage travel?

59. How many days would it take a man to spade $\frac{1}{8}$ of a $2\frac{1}{2}$ -acre garden, if he spades $\frac{1}{4}$ acre a day?

60. A can dig a canal in 6 days, and B, in 4 days. In how many days could they dig it, if both work together?

61. Joseph could fence a garden in 12 days, and Herbert, in 9 days. If they should work together, how long would they take?

62. John, having bought 56 pounds of butter at $22\frac{1}{2}$ cents a pound, sold the $\frac{2}{3}$ of it for \$5.04, and the rest at a profit of $2\frac{1}{2}$ cents per pound. What was his total gain?

63. James sold $\frac{1}{4}$ of his crop of oats, then $\frac{2}{3}$ of the rest, and the part that he has left is worth \$12.60. How many bushels did James harvest, if the oats were worth 45 cents a bushel?

64. One faucet fills a reservoir in 6 hours; another empties it in 8 hours. If both are opened together, in how many hours will the reservoir be filled?

65. Two couriers $183\frac{1}{2}$ miles apart start at the same time and go one towards the other. If one goes 16 miles in 5 hours, and the other 10 miles in 3 hours, how many hours will it take them to meet?

66. From Montreal to Quebec, by the Canadian Pacific, it is 173 miles. At what distance from Quebec will two trains, that leave at the same time, meet, if the one leaving Quebec runs 36 miles an hour, and the one from Montreal, $33\frac{1}{2}$ miles an hour?

67. A grocer bought $15\frac{1}{2}$ dozen of eggs at 22 cents a dozen. If he lost $1\frac{1}{4}$ dozen, at what price a dozen must he sell the rest to gain 44 cents on the whole?

68. One faucet fills a reservoir in 2 hours, and another empties it in 3 hours. The reservoir being empty, in how many hours would it be filled if both faucets were left open?

Examination Problems.

I

1. A number diminished by its $\frac{2}{3}$ equals 279; what is the number?
2. What is the number whose $\frac{7}{10}$ equals the $\frac{4}{5}$ of 63?
3. A man spent $\frac{1}{7}$ of his income for his food, $\frac{4}{21}$ for his clothes, $\frac{1}{6}$ for rent, and he had \$732 left at the end of the year. What was his annual income?
4. I had \$31 $\frac{1}{2}$ in the School Savings Bank. I withdrew first \$1 $\frac{1}{4}$, then \$4 $\frac{1}{2}$; then I deposited twice as much as I had withdrawn. What sum have I now on deposit?
5. Divide \$27 $\frac{1}{2}$ between two persons so that one may receive \$3 $\frac{1}{2}$ more than the other.
6. Two watches cost \$52 $\frac{1}{2}$. Find the cost of each, if one cost 3 $\frac{1}{2}$ times as much as the other.
7. In how many days should I receive \$13 $\frac{1}{2}$, if $\frac{1}{4}$ plus $\frac{1}{8}$ of my daily salary is \$1 $\frac{1}{8}$?
8. This year a farmer has 768 bushels of potatoes, which is $\frac{1}{7}$ more than he had last year. How many bushels had he in the two years together?
9. I added 3 gallons of water to 18 gallons of wine. What quantity of water have I in 5 gallons of the mixture?
10. If a man does a piece of work in 2 $\frac{3}{4}$ hours, what fraction of the work does he do in one hour?

II

11. Patrick, owning $\frac{3}{8}$ of a boat, sold $\frac{1}{4}$ of his share for \$2700. What was the value of the boat?
12. Three brothers inherit their father's estate; the first receives $\frac{1}{5}$ of it; the second, $\frac{2}{5}$ of the rest. What was the value of this estate, if the third receives \$1242?
13. A tailor has 49 $\frac{1}{2}$ yards of serge with which to make an equal number of coats, pants, and vests. How many suits,

comprising the three pieces, could he make, if it takes $3\frac{3}{4}$ yards for a coat, $2\frac{3}{4}$ for a pair of pants, and $1\frac{3}{4}$ for a vest?

14. The bronze in the bells of our church is composed of 78 parts brass and 22 parts pewter. Find the cost of a pound of bronze, if the pewter is worth $42\frac{1}{2}$ cents a pound, and the brass, $21\frac{1}{4}$ cents.

15. Philip and Henry together paid \$272 for $8\frac{1}{2}$ months' board. How much did Philip pay a month, if Henry paid $\$17\frac{1}{2}$?

16. Emile worked during $12\frac{2}{5}$ days. How much did he earn a day, if after spending $\frac{2}{5}$ of his wages, he still has \$16.12?

17. The $\frac{2}{5}$ of a crop was sold for \$326. At the same rate, for how much would the $\frac{3}{4}$ of the crop be sold?

18. To pay a debt of \$819, Emerson withdrew from the bank $\frac{1}{2}$ of $\frac{2}{5}$ of his savings. How much has he left in the bank?

19. Joseph spent $\frac{2}{3}$ of his money, then he earned $\frac{2}{5}$ as much as he had spent, and he then had \$76. How much had he at first?

20. If $\frac{2}{5}$ of 4 cords of wood cost \$9 $\frac{2}{5}$, how much would $\frac{3}{4}$ of 2 cords cost?

III

21. $\frac{1}{3}$ of the trees in an orchard are apple trees; $\frac{1}{4}$, peach trees; $\frac{1}{5}$, plum trees; $\frac{1}{10}$, pear trees; and the 23 others are cherry trees. How many trees are there in the orchard?

22. My age is 9 years more than $\frac{2}{5}$ the age of my father, and my father is 27 years older than I. What is my age?

23. Two boxes of butter of the same weight cost respectively \$12 $\frac{1}{4}$ and \$14 $\frac{1}{4}$. If a pound of the first box costs 24 $\frac{1}{2}$ cents, how much does a pound of the second box cost?

24. Divide \$3840 $\frac{1}{5}$ among A, B, and C, so that A receive $4\frac{1}{2}$ times as much as B, and C, $\frac{1}{5}$ as much as A.

25. The $\frac{2}{5}$ of a farm is sowed in oats; $\frac{2}{4}$ of the rest, in

wheat; and 12 acres are still left. What is the area of the farm?

26. Arthur earns $\$3\frac{1}{4}$ and spends $\$1\frac{2}{10}$ daily. If during the year there are 60 days on which he does not work, how many years would it take him to pay for a property which costs \$1 191?

27. A merchant gained \$5.07 in selling, at the rate of 3 for 5 cents, oranges for which he had paid 80 cents a hundred. How many oranges did he sell?

28. Brass is usually composed of 65 parts copper and 35 parts zinc. How many pounds of copper are there in 50 pounds of brass?

29. Half of my merchandise was destroyed by fire, and half of the rest, damaged by water. What was the total value of my merchandise, if what I have left in a perfect condition is worth \$8 650?

30. Two capitalists furnished respectively $\frac{1}{12}$ and $\frac{5}{12}$ of a certain sum, the latter furnishing \$4 562 $\frac{1}{2}$ less than the former. How much did each furnish?

IV

31. The difference between one half and one third of the area of a farm is 18 $\frac{2}{3}$ acres. At \$28 $\frac{3}{4}$ an acre, what is the income of this farm?

32. Neil bought a piece of silk for \$108. He sold $\frac{1}{3}$ of it at cost price, and the rest at a profit of \$1 $\frac{1}{2}$ a yard. Find the buying price per yard, if the total sales brought in \$129 $\frac{3}{8}$.

33. If 25 gallons of wine were mixed with 7 gallons of water, what quantity of wine would there be in 8 gallons of the mixture?

34. A can do a piece of work in 16 days; B, in 12 days; C, in 10 days. How long will it take them to do the work, if all three work together?

35. A dealer, who had 84 tons of hay, sold $\frac{1}{2}$ of it at \$11 $\frac{1}{2}$ a ton, the $\frac{1}{3}$ at \$10 $\frac{1}{6}$ and the rest at \$11 $\frac{1}{4}$. How much

had he paid for the hay, if he gained $\$1\frac{3}{4}$ a ton on an average?

36. If my annual salary were increased $\$119$, I could spend $\$1\frac{1}{4}$ a day, give $\$3\frac{1}{2}$ a month to the poor, and save $\$370\frac{3}{4}$ a year. What is my annual salary?

37. George paid $\$21\frac{3}{8}$ for $\frac{3}{4}$ of a piece of linen. Find the cost per yard, if the rest of the piece contains 18 yards.

38. A man earned $\$1\frac{3}{4}$ a day, and spent $\frac{2}{5}$ of his wages in the saloon. If he has $\$21$ left, how many days has he worked?

39. Six friends had been traveling during 20 days and had spent $\$270$. Then five other friends joined them, and they traveled together during 25 days. What sum did they spend in the second part of their journey?

40. There is a difference of $\frac{3}{4}$ of an hour between two watches. The one that is ahead loses $2\frac{1}{2}$ minutes a day, and the other gains $1\frac{1}{4}$ minute. In how many days will both mark the same time?

DECIMAL FRACTIONS

133. When a quantity is divided into 10, or 100, or 1 000, etc., equal parts, one or more of those equal parts is a decimal fraction.

134. The unit equals 10 tenths, or 100 hundredths, or 1 000 thousandths, etc.

135. We have learned that the relative value of each figure increases tenfold, as we advance from right to left; and that it decreases in the same proportion as we advance from left to right. So, if we affix a number of digits to the right of the units' place, we shall have a series of fractions, of which the denominators are successively 10, 100, 1000, etc.

$$\text{Ex. — } 364.298 = 300 + 60 + 4 + \frac{2}{10} + \frac{9}{100} + \frac{8}{1000}.$$

136. Such expressions as 364.298 are called mixed decimals.

137. In decimal notation, the numerator only is written, the denominator being indicated by the position of the point ($.$), called *decimal point*.

138. The decimal point separates the integral part from the fractional part.

DECIMAL NUMERATION AND NOTATION.

139. Decimal Notation Scale.

Billions	Hundred-millions	Ten-millions	Millions	Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Units	.	Decimal point	Tenths	Hundredths	Thousandths	Ten-thousandths	Hundred-thousandths	Millionths	Ten-millionths	Hundred-millionths	Billionths
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140. The first place to the left of units is called *tens* and the first place to the right, *tenths*; the second place to the left of units, *hundreds*, the second to the right, *hundredths*; the third to the left, *thousands*, the third to the right, *thousandths*; etc.

141. In **reading** mixed decimals use the word *and* at the decimal point and omit it in all other places.

142. **Rule.** — Read the whole number, "*and*" then the number expressed by the decimal as a whole number, giving it the name or denomination of the right-hand figure.

EXAMPLES. —

5.6	is read:	5 and 6 tenths.
35.47	"	: 35 and 47 hundredths.
325.007	"	: 325 and 7 thousandths.
.0023	"	: 23 ten-thousandths.

Read the following numbers:

4.7.	64.1045.	672.0134.
8.95.	793.003.	4253.802.
43.43.	0.4748.	43.00302.
7.125.	3.80005.	0.450034.
9.475.	378.043.	425.843.
127.05.	4386.031.	45.01279.
62.0012.	0.489003.	83.000035.
0.374.	8870.32.	4485.6402.

143. Rule. — *In writing mixed decimals, write the whole number, the decimal point and the number expressed by the decimal.*

Place ciphers where any order is missing, so as to give each significant figure its true relative value.

Write the following numbers:

1. 6 and 8 tenths.
2. 4 and 3 thousandths.
3. 18 and 23 ten-thousandths.
4. Three hundred twenty-nine and 75 thousandths.
5. 12 ten-thousandths.
6. 82 and 35 hundredths.
7. 94 thousandths.
8. 7 and 42 hundred-thousandths.
9. 112 and 56 millionths.
10. 77 hundred-thousandths.
11. 17 and six hundred sixteen ten-thousandths.
12. 4 204 and 3 tenths.
13. 128 thousandths.
14. 4 002 and 25 ten-thousandths.
15. 60 and 40 thousandths.

MULTIPLYING AND DIVIDING NUMBERS BY

10, 100, 1 000, etc.

144. *To multiply a whole number by 10, 100, 1 000, we have but to write one, two or three ciphers to the right of this number.*

Ex. — $27 \times 100 = 2700$; and $19 \times 1\,000 = 19\,000$.

145. *To divide a whole number by 10, 100, 1 000, we have but to set off by the decimal point one, two, or three figures to the right of this number.*

Ex. — $4\,349 \div 100 = 43.49$; and $6\,522 \div 1\,000 = 6.522$.

146. *To multiply a mixed decimal by 10, 100, 1 000, we move the decimal point one, two, three places to the right, placing ciphers if necessary.*

Ex. — $4.548 \times 1\,000 = 4\,548$; and $72.35 \times 1\,000 = 72\,350$.

147. *To divide a mixed decimal by 10, 100, 1 000, we move the decimal point one, two, three places to the left, prefixing ciphers if necessary.*

Ex. — $728.9 \div 10 = 72.89$; and $2.24 \div 1\,000 = .00224$.

Oral Exercises.

1. Multiply the numbers 78, 128, 3 490 by 10.
2. 1^o Divide the numbers 43 and 72.93 by 10; 2^o Multiply the numbers 9.1 and 247 by 100.
3. Divide the numbers 693, 7.9, and 0.437 by 1 000.
4. Multiply the numbers 0.2, 7.49, 27, 0.0029, and 0.43 by 1 000.

ADDITION

148. Rule. — *As in addition of integers, place the decimal numbers to be added under one another so that the terms of the same order will stand in the same column; this brings the decimal points directly under one another. Then add as in whole numbers and place the decimal point in the result directly under the decimal points in the numbers added.*

EXAMPLES. —

$$\begin{array}{r} 454.37 \\ 32.453 \\ 29.7 \\ \hline 516.523 \end{array}$$

$$\begin{array}{r} 0.346 \\ 30.0005 \\ 9.4 \\ \hline 39.7465 \end{array}$$

$$\begin{array}{r} 25.1 \\ 4.015 \\ 377.2798 \\ \hline 406.3948 \end{array}$$

Written Exercises.

Perform the following additions:

1. $75.212 + 0.369 + 8.75$.
2. $37 + 5.4 + 62.5 + 0.44 + 3.845$.
3. $42.001 + 13.18 + 0.0004 + 67.5 + 4.1$.
4. $15.09 + 435 + 6\ 082 + 0.549 + 3.6$.
5. $151.01 + 111.01 + 16.5 + 6.7 + 46.1 + 0.67896$.
6. $7.61 + 637.1 + 6\ 516.14 + 67.1234 + 6.1235$.
7. $146.9 + 0.00412 + 31.416 + 125.001 + 231.8$.
8. $1\ 121.6116 + 61.87 + 46.67 + 165.13 + 676.1678$.
9. $5.00695 + 193.5 + 5.875 + 9.0000105 + 47.25$.
10. $171.61111 + 16.7101 + 0.00007 + 71.0006 + 1.167895$.
11. $\$10.25 + \$8.955 + \$3.0225 + \$135.24 + \$185.645$.
12. $\$1.35 + \$16.5025 + \$2.375 + \$0.5625 + \$2\ 000$.
13. $560.379 + 0.45687 + 350.0036 + 7.074 + 52.257$.
14. $\$23.61 + \$161.50 + \$2.6789 + \$61.111 + \$248.8999$.
15. $5.018 + 171.16 + 88.133 + 113.6 + 0.0045 + 14.178$.

Write in figures and add the following numbers:

16. Four hundred and seven, twenty-four *and* five thousandths, two hundred three *and* forty-nine ten-thousandths, eighteen hundredths, six *and* nineteen thousandths.
17. Twenty-four *and* forty-five hundredths, sixty-seven *and* five thousandths, eighty-seven *and* forty-eight hundred-thousandths, one hundred thirty *and* twelve hundredths, twenty-two ten-thousandths.
18. Two hundred forty *and* fifty-five hundredths, seventeen *and* twenty-nine thousandths, eight *and* twenty-eight ten-

thousandths, three thousand eight hundred two *and* four hundred thirty-two hundred-thousandths, sixty-three hundredths.

19. Eight hundred four *and* twenty-seven ten-thousandths, fifty-seven *and* three tenths, six hundred nine *and* fifty-four ten-thousandths, eight hundred-thousandths, thirty-nine hundredths, one tenth, two *and* forty-seven millionths.

20. Two hundred nineteen *and* seven hundred-thousandths, nineteen hundredths, ten *and* eighty-nine ten-thousandths, eight *and* forty-five hundred-thousandths, fifty-two millionths, eight thousand nine hundred two *and* forty-five ten-millionths.

SUBTRACTION

149. Rule. — *Write the numbers so that the decimal points stand one under the other. If the minuend has not so many decimal places as the subtrahend add ciphers to replace the missing terms, then subtract as in whole numbers, and place the decimal point in the result directly under the decimal points in the numbers subtracted.*

EXAMPLES. —

$$\begin{array}{r} 654.89 \\ 389.95 \\ \hline 264.94 \end{array}$$

$$\begin{array}{r} 495.4 \\ 29.6853 \\ \hline 465.7147 \end{array}$$

$$\begin{array}{r} 254.8721 \\ 69.29 \\ \hline 185.5821 \end{array}$$

Written Exercises.

Perform the following subtractions:

1. $1.869 - 0.0374$.

2. $204.1 - 36.002$.

3. $17.36 - 9.0184$.

4. $6.723 - 2.7981$.

5. $2.8706 - 0.49$.

6. $0.50376 - 0.065$.

7. $39.3 - 1.6789$.

8. $91.61 - 2.6671$.

9. $11.078 - 9.81$.

10. $46.13 - 7.8915$.

11. $1 - 0.876543$.

12. $87.1 - 5.6789$.

13. $100 - 0.3752$.

14. $73 - 0.073$.

15. $1\,000 - 999.99$.

20. $567 - 392.287$.

19. $0.001 - 0.00001$.

18. $1\,234 - 0.1234$.

17. $56 - 0.00056$.

16. $2 - 1.3678$.

21. Find the difference between one hundred fifteen *and* seven hundredths and eighty-five *and* thirty-five ten-thousandths.

22. What must we take from 87.001 to obtain .5943?

23. From nineteen thousand take nineteen hundred-thousandths.

24. Subtract .4321 from 1 235.

25. From one million, subtract one millionth.

MULTIPLICATION

EXAMPLE I. — 25.4×3.12 .

OPERATION.

$$\begin{array}{r} 25.4 \\ 3.12 \\ \hline 508 \\ 254 \\ 762 \\ \hline 79.248 \end{array}$$

ANALYSIS.

$$\frac{254}{10} \times \frac{312}{100} = \frac{79248}{1000} = 79.248.$$

EXAMPLE II. — $.0025 \times .097$.

OPERATION.

$$\begin{array}{r} .0025 \\ .097 \\ \hline 175 \\ 225 \\ \hline .0002425 \end{array}$$

ANALYSIS.

$$\frac{25}{10000} \times \frac{97}{1000} = \frac{2425}{10000000} = .0002425.$$

150. Rule. — 1° Multiply as in whole numbers, paying no attention to the point. 2° From the right of the product point off as many figures for decimals as there are decimal places in both factors.

If the product has not so many figures as the required number of decimal places, prefix ciphers.

Written Exercises.

Perform the following multiplications:

- | | |
|-------------------------------|------------------------------|
| 1. $380.06 \times 22.$ | 16. $18.46 \times 1.007.$ |
| 2. $38.4 \times 16.7.$ | 17. $0.0701 \times 0.0067.$ |
| 3. $14.25 \times 0.375.$ | 18. $6.0009 \times 123.12.$ |
| 4. $50.05 \times 0.045.$ | 19. $0.1234 \times 1\ 234.$ |
| 5. $436 \times 2.75.$ | 20. $14.136 \times 0.00045.$ |
| 6. $347 \times 0.085.$ | 21. $78.7 \times 100.$ |
| 7. $63.18 \times 2.402.$ | 22. $0.432 \times 100.$ |
| 8. $0.759 \times 0.032.$ | 23. $1.634 \times 1\ 000.$ |
| 9. $3.005 \times 25.4.$ | 24. $0.3856 \times 200.$ |
| 10. $214.76 \times 89.104.$ | 25. $5.927 \times 500.$ |
| 11. $4.2008 \times 1.25.$ | 26. $0.0075 \times 100.$ |
| 12. $456.87 \times 0.066.$ | 27. $0.0019 \times 1\ 000.$ |
| 13. $0.0756 \times 6.75.$ | 28. $0.00076 \times 0.0015.$ |
| 14. $40.86 \times 0.00293.$ | 29. $87.1 \times 10\ 000.$ |
| 15. $0.04128 \times 0.00025.$ | 30. $596.04 \times 0.00012.$ |

31. At \$25.125 an acre, what would be the cost of 127.045 acres?

32. Multiply fourteen ten-thousandths by one hundred.

33. Multiply ninety-seven ten-thousandths by four and seventy-seven hundredths.

34. Multiply two millions by seven tenths.

35. Multiply one million by one millionth.

DIVISION

151. EXAMPLE I. — Divide .9 by .3.

$$.9 \div .3 = 9 \text{ tenths} \div 3 \text{ tenths} = 9 \text{ units} \div 3 \text{ units} = 3.$$

152. EXAMPLE II. — Divide .9 by 3.

$$.9 \div 3 = 9 \text{ tenths} \div 3 = 3 \text{ tenths, or } .3.$$

153. EXAMPLE III. — Divide 14.4 by .024.

$$14.4 \div .024 = 14400 \div 24 = 600.$$

EXPLANATION. — If we multiply or divide both terms of a division by the same number, the quotient remains the same. By multiplying 14.4 and .024 by 1000, we have: $14400 \div 24 = 600$ times.

EXAMPLES IN FULL.

Divide 1.316 by 28, 38.5 by 2.75 and 423.5 by 6.25.

$$\begin{array}{r} 1. \\ 28 \overline{) 1.316 (.047} \\ \underline{1 \ 12} \\ 196 \\ \underline{196} \end{array}$$

$$\begin{array}{r} 2. \\ 275 \overline{) 3850 (14} \\ \underline{275} \\ 1100 \\ \underline{1100} \end{array}$$

$$\begin{array}{r} 3. \\ 625 \overline{) 42350 (.6776} \\ \underline{3750} \\ 4850 \\ \underline{4375} \\ 4750 \\ \underline{4375} \\ 3750 \\ \underline{3750} \end{array}$$

154. General Rule. — 1° Reduce the divisor to a whole number and carry the decimal point of the dividend as many places towards the right as there were decimal places in the divisor. If there are not enough places in the dividend, add ciphers.

2° Then divide as in whole numbers, placing the decimal point in the quotient just before using the tenths' figure in a partial dividend.

3° Should there be a remainder after carrying down all the figures of the decimal places in the dividend, add decimal ciphers and continue the division as far as is desired.

155. Divide 43 by 9.

$$\begin{array}{r} 9 \overline{) 43.00} \\ \underline{45} \\ 477 \dots \end{array}$$

In the quotient, we may have approximative decimals of 1 place, of 2 places, etc., by ceasing the division when we have the required number of figures after the decimal point.

Written Exercises.

Perform the following divisions:

1. $34.75 \div 25.$

2. $23.04 \div 48.$

3. $44.45 \div 35.$

4. $27.95 \div 65.$

5. $1\,600.8 \div 46.$

6. $2.3328 \div 54.$

7. $25.752 \div 74.$

8. $1.0692 \div 33.$

9. $7\,437.5 \div 85.$

10. $0.03136 \div 56.$

11. $115.2 \div 2.4.$

12. $641.28 \div 1.67.$

13. $8\,361.32 \div 22.$

14. $3\,388 \div 30.25.$

15. $937.5 \div 0.075.$

16. $1\,190.4 \div 3.1.$

17. $1\,675.8 \div 0.49.$

18. $15.275 \div 0.325.$

19. $0.045 \div 0.0025.$

20. $0.0141 \div 0.00047.$

Carry the quotients to 1 decimal place:

21. $5\,071 \div 51.$

22. $6\,198 \div 77.$

23. $6\,144 \div 63.$

24. $19\,721 \div 329.$

25. $57\,148 \div 787.$

26. $78.12 \div 3.6.$

27. $63.168 \div 0.94.$

28. $0.29194 \div 0.0057.$

29. $12.126 \div 0.235.$

30. $2.1832 \div 0.034.$

Carry the quotients to 2 decimal places:

31. $1\,247 \div 12.$

32. $2\,534 \div 75.$

33. $2\,911 \div 99.$

34. $64\,326 \div 105.$

35. $36\,591 \div 850.$

36. $2.45 \div 9.8.$

37. $7.8125 \div 31.25.$

38. $0.11936 \div 0.056.$

39. $0.014547 \div 0.0692.$

40. $167.544 \div 71.6.$

Carry the quotients to 3 decimal places:

41. $9\,605 \div 673.$

42. $7\,214 \div 512.$

43. $6.2512 \div 0.37.$

44. $18.312 \div 24.$

45. $16.025 \div 0.045.$

46. $9\,322.15 \div 6.275.$

47. $3.72896 \div 4.07.$

48. $0.33643 \div 12.45.$

49. $7.25406 \div 9.57.$

50. $0.07245 \div 0.23.$

Divide the following:

51. $392.5 \div 100$.
 53. $38.62 \div 1\ 000$.
 52. $4.825 \div 100$.
 54. $7.645 \div 500$.
 55. $725.61 \div 300$.

56. $569\ 000 \div 800$.
 57. $4\ 624.12 \div 2\ 000$.
 58. $4\ 066.2 \div 0.648$.
 59. $114.87 \div 0.0035$.
 60. $3\ 000 \div 0.0003$.

61. How many yards of ribbon should we buy for \$10.85, if one yard costs \$.0775?

62. Divide two hundred ten thousand by seven hundredths.

63. Divide five hundredths by fifty.

64. If 1 ton of coal costs \$8.25, how many tons should we have for \$45.84525?

65. Divide seventy-five by one hundred twenty-five ten-thousandths.

NOTE. — The thirteen principles of analysis should be applied in solving problems on decimals as they were applied in common fractions.

PROBLEMS ON DECIMAL FRACTIONS.

First Series.

1. Add 5 hundredths, 28 thousandths, 25 tenths, 48 ten-thousandths, 76 hundredths and 245 hundredths.

2. How much do 45.5 yards of cloth cost at \$5.40 a yard?

3. From 8.4 acres, I harvested 363.3 bushels of buck-wheat. What was the yield per acre?

4. How much shall we pay for 12.4 pounds of rice at \$.0425 a pound?

5. A tank contains 27.75 gallons, and another, 4.0375 gallons more than the first. How much do they hold together?

6. Multiply twenty-five hundredths by fifty-six ten-thousandths.

7. How many inches in a meter, if 15 meters are 590.55 inches?

8. .2 and .25 of a work have been completed. What part still remains to be done?
9. When one pound of sugar costs \$.0675, what is the cost of 56 pounds?
10. By giving up the use of alcoholic drink, Peter saved \$273.75 in one year. How much used he to spend a day?
11. If the interest of \$1 for a year is \$.07, what is the interest of \$75.43?
12. What decimal fraction is lacking .0375 to equal .375?
13. A kilogram equals 2.2046 pounds. What is the weight in pounds of a man who weighs 98 kilograms?
14. From 75 thousandths subtract 75 ten-thousandths.
15. What is the value, in Canadian money, of 25 francs, if one franc is worth \$.193?
16. If the pound sterling is worth \$4.866 $\frac{2}{3}$, what is the value in our money of 25 pounds sterling?
17. From a wire 350 yards long, 18.5 yards were cut off, then 27.75 yards, and lastly 76.125 yards. How many yards remain?
18. At what depth is complete darkness found in the sea, if .35 of this depth equals 61.25 feet?
19. A train runs 49.665 miles in 43 minutes; how far will it run in an hour?
20. The imperial gallon contains 277.274 cubic inches. How many cubic inches in 75 gallons?
21. A child has a pasteboard .875 of a yard long. If he cuts it into pieces .0025 of a yard long, how many pieces will he have?
22. How many gallons of wine are necessary to fill 36 sample bottles holding .0625 of a gallon each?
23. Out of 225 consumptive persons in a hospital, .72 were alcoholic. Find the number of the alcoholic.
24. A father earns \$.13875 an hour, and his son, \$.085. How much more does the father earn in 48 hours than the son?
25. Multiply 625 ten-thousandths by 25 thousandths, and divide the product by 125 ten-thousandths.

26. How many pounds of sea water will give 150 pounds of salt, if .025 of its weight is salt?
27. A kilometer equals .62137 of a mile. How many miles from Paris to Versailles, if the distance is 19 kilometers?
28. From 6.875 yards of cloth, three pieces of 1.875 yards each have been taken. How much remains?
29. A cord 175.6 yards long is divided into equal parts by 3 strokes of a knife. What is the length of each part?
30. From a remnant of cloth, 5 pieces of .75 of a yard each have been taken, then 6 pieces of .8 of a yard each, and 1.25 yards remain. What was the length of the remnant?
31. I have a right to .8 of a certain sum, and have received only .625 of it. How much is still due me?
32. The rate of tax in a town is \$.35 per \$100. What is the tax on a property of \$4 500?
33. Find the cost of 8 500 cigars at \$48 a thousand.
34. At \$45.50 per 1 000 feet, what is the price of 260 feet of lumber?
35. In .55 of an hour, a strong wind travels 38.5 miles. How far does it travel in an hour?
36. I bought 4 640 feet of pine boards at \$54.25 per 1 000 feet. How much did I pay?
37. If a kilometer equals .62137 of a mile, how many miles in 55 kilometers?
38. A cooperative society deducts \$3 per \$100 of its receipts for the poor. If in one year it gives \$1 457.10 to the poor, what are its receipts?
39. A number multiplied by 100 equals 6.5; find .2 of the number.
40. In 1897, at Philadelphia, 62 500 arrests were made. Out of each 1 000, 402 were made for drunkenness. Find the total of arrests for drunkenness.
41. A pound of milk will give .11 of a pound of cheese; how many pounds of milk are required for 60 pounds of cheese?

42. A bookseller buys 6 dozen volumes at \$6.60 a dozen; he receives 13 for 12. What does each volume cost him?
43. Having climbed .52 and .105 of the height of Mount Blanc, I still have 5 917.5 feet to climb. What is the altitude of the mountain?
44. I paid \$250 for a horse, and .425 of that sum for a carriage. How much did the carriage cost me?
45. What number multiplied by .5875 gives a product of 32.9?
46. If a pound of wheat gives .755 of a pound of flour, how many pounds of flour will a farmer receive who has 25 bushels of wheat ground, one bushel weighing 60 pounds?
47. A workman earns \$.275 per hour. How much will he receive in all, if he works 4.5 days of 8 hours, 3 days of 6 hours, and 4 days of 7.5 hours?
48. The .35 of the length of the tunnel of Mount Cenis equals 14 045.5 feet. Find its length in miles, if a mile equals 5 280 feet.
49. A linen draper sold on Monday .156 of a piece of cloth; on Tuesday, .085 of the same piece; on Wednesday, .0762; on Thursday, .35; on Friday, .105; on Saturday, .0778. If he has 6.6 yards left, what was the length of the piece?
50. The whale sometimes attains the length of 80 feet, and the boa is usually not more than .225 of that length. Find the length of the boa.

Second Series.

51. Full of water, a vessel weighs as much as 12 bricks of 145 pounds each; empty, it weighs 17.2 pounds. How much do the contents of the vessel weigh?
52. A faucet furnishes 3.5 gallons of water a minute and it remains open for 4.6 hours. How many more gallons are required to fill a basin holding 1 000 gallons?
53. If a train runs 25.125 miles an hour, how many hours are required to run 1 000 miles?

54. A mark is worth \$.238 of our money, and the pfennig is one hundredth of a mark. What is the value, in our money, of 12 marks and 5 pfennigs?

55. How many times is the number .04875 contained in 4.875?

56. How many units less are there in 3.2 times 1.25 than in .016 times 500?

57. A merchant bought 24 dozen oranges for \$3.60, and sold them for \$5.76. What did he gain apiece?

58. A piece of cloth was measured with a yardstick .002 too long, and it was found to contain 23.45 yards. What was the true length of the piece? (4 dec. places).

59. A cheese factory received 643 200 pounds of milk in a year, and the patrons received \$6 721.44. How much did they receive per 100 pounds for the milk?

60. Of a certain sum, .8 were spent and the remainder was \$73.65. What was the sum?

61. If 115.5 acres of land cost \$4 682.832, how much will $626.66\frac{2}{3}$ acres cost?

62. The difference between .62 and .476 of the depth of an artesian well is 385.92 feet. Find the total depth of the well.

63. A student multiplied 25 by .55 instead of multiplying it by 5.5. Find the error.

64. A stick 2.5 feet high projects a shade 4 feet long. What is the height of a tree that projects a shade 40 feet long at the same moment?

65. A fruit dealer pays 9 cents a dozen for apples and then sells them at the rate of 2 for 3 cents. How many apples must he sell to gain \$2.16?

66. A man discharges his debt by paying at first .25, then .58, and then has \$9.35 to pay at the last instalment. What was his debt?

67. A dressmaker has 130 yards of cotton out of which she makes shirts and bed sheets. For each shirt she uses 2.75 yards and for each sheet, 7.2 yards. If she makes 8 shirts, how many sheets does she make?

68. A field produced 24.8 bushels of oats per acre. What is the area of the field if the harvest was sold for \$234.36, at \$.60 a bushel?

69. The front wheels of a wagon have a circumference of 8.2 feet, and the hind wheels, a circumference of 9.84 feet. How many revolutions will the small wheels make while the large ones make 350?

70. A parcel weighs 56.5 pounds, and another, .65 of that weight. Find the weight of both.

71. A farmer's wife sold .25, .5, and .125 of 26 dozen eggs. How many eggs remain?

72. The sum of two numbers is 612.78, and their difference is 78.0626. What are the numbers?

73. A man sold for \$18.60, .625 of a piece of cloth at \$.24 a yard. At this price what is the value of the rest of the piece?

74. A man divides .65 of a certain sum among 12 poor families, and each receives \$9.75. What is the sum?

75. If .8 of a number plus \$24.625 equals 340.625, what is the number?

76. If .375 of the sum I have in my purse increased by \$5.25 equals \$51.75, how much have I?

77. After having sold .65 of a case of oranges at \$.025 an orange, a dealer throws 18 away, and has 80 remaining. If he sells the remainder at the same price as the others, how much does he receive for the total sales?

78. Wind at a gentle breeze travels 5.5 miles an hour. Find the number of feet it travels per second, if in a mile there are 5 280 feet. (3 dec. places).

79. A bushel of oats is worth \$.50, and the cost of growing is .4 of this value. Find the net gain on a harvest of 650 bushels.

80. I bought 8 760 pounds of coal at \$7.50 a ton of 2 000 pounds. If I gave in payment 130 pounds of butter at \$.225 a pound, how much do I still owe?

81. A meadow of 12 acres gave 2 600 pounds of hay per acre last year; after an irrigation of liquid manure it pro-

duced 3 150 pounds per acre. Find the increase in the revenue, if hay is worth \$9.50 a ton of 2 000 pounds.

82. A farmer neglecting to manure his field, reaped only 16.5 bushels of wheat per acre, while his neighbor reaped 29.75 bushels per acre, after having spread 12 tons of manure worth \$.35 a ton. If wheat is worth \$1.40 a bushel, how much more an acre did the latter make through the manuring?

83. Divide by $.00\frac{1}{2}$ the difference between 16.12 and $.04\frac{1}{2}$.

84. Find .5 of .875 of 1 000.

85. I spent .75 of what I possessed, plus .5 of the remainder, and I still have \$250. What sum did I have at first?

86. A man is proprietor of $\frac{1}{4}$ of a vessel, and he sells $\frac{3}{4}$ of his share. How much does he receive, if the vessel is worth \$45 750?

87. Three partners made a total profit of \$6 000. The first receives .475 of it; the second, .52 of the remainder. How much does the third receive?

88. A traveller made .25 of his journey in the morning and .5 of the remainder in the afternoon. If he still has 10.5 miles to travel, find the length of the journey.

89. A farmer's man has 75 yards of ditch to dig. The first day he digs .28, and the second day, .35 of the remainder. How many yards has he still to dig?

90. One pound of wheat gives .755 of a pound of flour, and one pound of flour gives 1.25 pounds of bread. How many pounds of bread can be made with 1 000 pounds of wheat?

91. A woman buys 30 yards of cloth at \$.55 a yard. How much does she lose if the yardstick was $\frac{1}{10}$ too short?

92. My field, which was not manured, yielded 408 bushels of oats weighing but 31.5 pounds per bushel, while the legal weight is 34 pounds. If I sell my harvest at \$.48 per legal bushel, what will be the diminution in my receipts?

93. I have two horses of which the daily allowance of hay is respectively 40.95 and 46.35 pounds. What will be the cost of feeding them for a year, at the rate of \$.45 per hundred pounds?

94. Milk gives .15 of its weight in cream, and cream gives .23 of its weight in butter. How many pounds of butter can be made with 1 800 pounds of milk?

95. An unbleached piece of cloth of 45 yards costs \$17.66 and in the washing it loses .125 of its length. What is the net cost per yard?

96. A man spent \$525 and had \$975 remaining. What decimal fraction of his money did he spend?

97. My orchard, which contains 140 apple trees, brought in \$855. If I sold the apples at \$2.50 a barrel, what was the average yield per tree?

98. A pound of milk gives .054 of a pound of butter. At \$.225 a pound, what is the value of the butter made from the milk of 12 cows, if each gives 25 pounds of milk a day for 250 days?

99. When 20 tobacco plants yield 7.25 pounds of dry tobacco leaves, find the income from an acre of land which contains 4 120 plants, if tobacco is worth \$.12 a pound.

100. A farmer started to fatten 8 oxen when their average weight was 1 236 pounds. Four months later their average weight was 1 430 pounds. How much did the increase in live weight cost per 100 pounds, if the feed cost \$82.89?

Examination Problems.

I

1. Add five hundredths, twenty *and* four thousandths, three hundred eighty-three hundred-thousandths, five *and* two thousand twenty-seven millionths, twenty-nine tenths, eight hundred thirty-two hundredths, five hundred ten *and* fifty-eight ten-millionths.

2. If .43 of a yard of cloth cost \$2.322, how much will 5.5 yards cost?

3. A grocer paid \$6.90 for 92 pounds of maple sugar, and he then sold it at \$.11 a pound. How much profit did he make a pound?

4. Beet gives about .08 of its weight in sugar. How many pounds of beets are required to obtain 1 000 pounds of sugar?
5. A young man earns \$10.50 a week, in working 10 hours a day. How much does he earn an hour?
6. I paid .625 of the cost of my house, and I still owe \$750. How much did my house cost?
7. What is the cost of 7 560 feet of pine at \$35.50 per 1 000 feet?
8. In .3 of a minute a wheel makes 13.5 revolutions. How many revolutions will it make in .65 of a minute?
9. Divide by nine *and* eighteen hundredths, the product of twenty-seven *and* forty-five hundredths by three hundred six thousandths.
10. How many kilometers in the 96 miles which separate Montreal from Three Rivers, if one mile equals 1.6093 kilometers?

II

11. I possess .24 of a manufacture of \$375 000. If I sell .25 of my share how much shall I receive?
12. I bought .65 of a piece of cloth for \$17.55, and 21 yards remained. What was the price a yard?
13. A farmer harvested 1 240 bushels of oats and he sells .625 of it, at \$.54 a bushel. How much does he receive?
14. With .34 of my money I bought a horse, and with .25 of the remainder, a carriage. If I have \$297 remaining, how much money had I at first?
15. I bought 40 yards of cloth; but they gave me only 39.375 yards. How much did they defraud me per yard? (4 dec. places).
16. After paying .29 and .635 of a debt I still owe \$75. What was the debt?
17. While the big wheels of a carriage make 126 revolutions the small ones make 151.2. If the big wheels have a circumference of 10.08 feet, find that of the small ones.

18. I bought 160 yards of cloth for \$640. On .75 of it I gained \$.375 per yard, and on the remainder I lost \$.125 per yard. Find my net gain on the whole.

19. I sold .355 of a barrel of vinegar at \$.35 a gallon, and I received \$4.97. How many gallons did the barrel contain?

20. The cheese made from 66 150 pounds of milk was sold for \$715.50, at the rate of \$.105 a pound. How many pounds of milk were required to make one pound of cheese?

DENOMINATE NUMBERS

4 feet 5 inches and 4 days 8 hours 10 minutes are denominate or compound numbers.

156. **Denominate numbers** are units used in measuring time, weight, distance, capacity, etc.

In the simple rules, quantities have been formed by one regular denomination, *ten*, the relative value of integers and decimals changing regularly by *tenfold*. Most units of denominate numbers bear no definite relative value to each other.

157. **Reduction** of denominate numbers is the process of changing their denomination without changing their value.

158. *Reduction descending* is changing from a higher to a lower denomination (See Example N^o 1.).

159. *Reduction ascending* is changing from a lower to a higher denomination (See Example N^o 2.).

MEASURES OF WEIGHT.

1. — Avoirdupois Weight.

160. *Avoirdupois Weight* is used for all the ordinary purposes of weight. The measuring prime unit is the *pound*.

TABLE.

16 ounces (oz.)	.....	= 1 pound	.....	lb.
100 pounds	.....	= 1 hundredweight,	.....	cwt.
20 hundredweight,	2 000 lb.	= 1 ton.	.....	T.

NOTE. — In wholesale transactions of coal and iron, the *long ton*, 2 240 pounds, is frequently used.

DENOMINATE NUMBERS

Examples of Reduction.

1° Reduce 21 tons 13 hundredweight 65 pounds 8 ounces to ounces.

OPERATION.

21 T. 13 cwt. 65 lb. 8 oz.

$$\begin{array}{r}
 21 \\
 \hline
 420 \\
 +13 \\
 \hline
 433 \text{ cwt.} \\
 \hline
 100 \\
 43300 \\
 +65 \\
 \hline
 43365 \text{ lb.} \\
 \hline
 16 \\
 693840 \\
 +8 \\
 \hline
 693848 \text{ oz. Ans.}
 \end{array}$$

EXPLANATION.

1 T. = 20 cwt., 21 T. = $20 \times 21 = 420$ cwt.; 420 cwt. + 13 cwt. = 433 cwt.; 1 cwt. = 100 lb., 433 cwt. = $100 \times 433 = 43\,300$ lb.; 43 300 lb. + 65 lb. = 43 365 lb.; 1 lb. = 16 oz., 43 365 lb. = $16 \times 43\,365 = 693\,840$ oz.; 693 840 oz. + 8 oz. = Ans. 693 848 oz.

2° Reduce 44 520 ounces to tons, hundredweights, pounds, and ounces.

OPERATION.

$$\begin{array}{r}
 16 \overline{) 44520} \text{ oz.} \\
 100 \overline{) 2782} \text{ lb.} + 8 \text{ oz.} \\
 20 \overline{) 27} \text{ cwt.} + 82 \text{ lb.} \\
 1 \text{ T.} + 7 \text{ cwt.}
 \end{array}$$

EXPLANATION.

44 520 oz. $\div 16$ oz. = 2 782 lb., and 8 oz. remaining; 2 782 lb. $\div 100$ lb. = 27 cwt., and 82 lb. remaining; 27 cwt. $\div 20$ cwt. = 1 T., and 7 cwt. remaining.

Ans. 1 T. 7 cwt. 82 lb. 8 oz.

Oral Exercises.

1. How many ounces are there in 3 pounds? in 5 pounds?

2. Reduce 32 ounces to pounds; 600 pounds to hundredweights.

3. How many pounds are there in 8 cwt. 12 lb.? in 1 T. 3 cwt.?
4. Reduce 3 long tons to pounds.
5. How many tons are there in 60 cwt.? in 100 cwt.?

Written Exercises.

6. Reduce to ounces: 6 lb. 8 oz.; 1 cwt. 4 lb. 12 oz.
7. Reduce to pounds: 7 T. 9 cwt. 16 lb.; 41 T. 8 cwt. 80 lb.
8. How many hundredweights, pounds, and ounces in 6 812 oz.? in 6 024 oz.?
9. Reduce 1 056 oz. to pounds; 8 260 lb. to tons.
10. Reduce to ounces: 27 cwt. 4 lb. 12 oz.; 25 T. 6 cwt. 84 lb. 12 oz.
11. Express the following in higher denominations: 16 004 lb.; 470 507 oz.
12. How many pounds and ounces are there in 6 780 oz.? in 3 497 oz.?
13. Express the following in ounces: 9 cwt. 24 lb.; 30 T. 17 cwt. 31 lb. 3 oz.

2. — Troy Weight.

161. *Troy Weight* is used in weighing precious metals and in scientific experiments. The measuring prime unit is the *pound*.

TABLE.

24 grains (<i>gr.</i>).....	=	1 pennyweight,	<i>pwt.</i>
20 pennyweights.....	=	1 ounce,	<i>oz.</i>
12 ounces.....	=	1 pound,	<i>lb.</i>

Oral Exercises.

1. How many grains are there in 3 pwt.? in 1 oz.?
2. How many pennyweights are there in 8 oz.? in 2 lb.?
3. Reduce to pennyweights: 3 lb.; 72 grains.
4. What is 4 ounces of silver bullion worth at 6 cents a pennyweight?

Written Exercises.

5. When gold is worth \$20 an ounce, what is the value of a grain?
6. Reduce to grains: 10 oz. 19 pwt.; 2 oz. 12 pwt. 18 gr.
7. How many grains are there in 3 lb. 10 oz. 6 pwt. 3 gr.? in 9 lb. 11 pwt. 10 gr.?
8. How many pounds, ounces and pennyweights in 3996 pwt.?
9. Reduce 8406 pwt. to pounds; 6004 gr. to ounces.
10. Reduce to grains: 10 oz. 16 pwt. 12 gr.; 8 lb. 9 oz. 15 pwt. 18 gr.
11. Express 23036 gr. in higher denominations.
12. Reduce to pennyweights: 18 lb. 6 oz. 4 pwt.; 40 lb. 3 oz. 18 pwt.
13. How many pounds are there in 18759 grains?

3. — Apothecaries' Weight.

162. *Apothecaries' Weight* is used by druggists and physicians in preparing prescriptions, etc.; but drugs and medicines are bought and sold by Avoirdupois weight.

TABLE.

20 grains (<i>gr.</i>).....	=1 scruple,	<i>sc.</i> or ʒ.
3 scruples	=1 dram,	<i>dr.</i> or ʒ.
8 drams	=1 ounce,	<i>oz.</i> or ʒ.
12 ounces	=1 pound,	<i>lb.</i>

Oral Exercises.

1. How many grains are there in 2 sc.? in 2 dr.?
2. How many scruples in 60 gr.? in 8 dr.?
3. Reduce to ounces: 40 dr.; 8 lb.
4. Express in drams: 1 lb. 2 oz. 3 dr.
5. How many drams, scruples, and grains are there in 86 grains?

Written Exercises.

6. Reduce to grains: 7 dr. 2 sc. 15 gr.; 3 oz. 18 gr.
7. How many scruples are there in 6 oz. 5 dr. 2 sc.? in 15 lb. 5 oz. 2 dr. 4 sc.?
8. How many ounces in 206 sc.? in 6 000 gr.?
9. Find the number of pounds in 1 239 dr.; in 4 260 sc.
10. Reduce: 30 lb. to scruples; 67 dr. 1 sc. to grains.
11. How many pounds are there in 239 oz.? in 5 681 sc.?
12. How many grains are there in $4\frac{3}{4}$, $2\frac{3}{4}$, $1\frac{3}{4}$? in 1 lb. $2\frac{3}{4}$ 1 $\frac{3}{4}$ 16 gr.?
13. Express in higher denominations: 34 572 gr.; 57 050 gr.

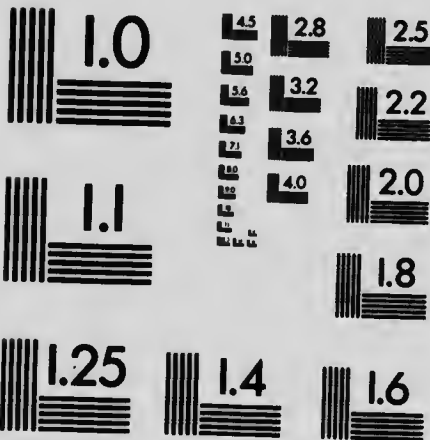
Review of the Measures of Weight.

1. Express in ounces: 3 cwt. 50 lb. 2 oz.
2. Reduce 9 oz. 2 dr. 14 gr. to pennyweights.
3. How many tons, hundredweights, and pounds in 11 675 pounds?
4. How many grains are there in 7 lb. 3 pwt. 4 gr.?
5. How many pounds (*Apothecaries'*) in 6 300 grains?
6. How many pounds of gold are there in 5 273 pwt.?
7. 153 812 ounces make how many tons?
8. Reduce 5 lb. 8 oz. 13 pwt. to grains.
9. How many pennyweights are there in $11\frac{3}{4}$ $2\frac{3}{4}$ 1 $\frac{3}{4}$ 16 gr.?
10. How many pounds of silver are there in 58 376 gr.?
11. A man weighs 1 cwt. 87 lb. 12 oz. Give his weight in ounces.
12. How many pounds are there in 7 183 drams?
13. With 1 lb. 8 oz. 6 dr. 2 sc. of quinine, how many pills of 1 gr. each can be made?
14. I bought 1 T. 11 cwt. 12 lb. of hay at $\frac{1}{2}$ cent a pound. What did it cost me?
15. A gold chain weighs 1 oz. 15 pwt. If it contains $\frac{1}{2}$ alloy, how many grains of pure gold are there?



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Linear Measure.

163. *Linear Measure* is used in measuring lengths and distances. The principal unit of measure is the *yard*.

TABLE.

12 inches (<i>in.</i>).....	= 1 foot, <i>ft.</i>
3 feet	= 1 yard, <i>yd.</i>
$5\frac{1}{2}$ yards	= 1 rod, <i>rd.</i>
320 rods	= 1 mile, <i>mi.</i>
3 miles	= 1 league, ... <i>lea.</i>

EXAMPLE. — Reduce 7 246 inches to rods.

12	7246 in.
3	603 ft. + 10 in.
$5\frac{1}{2}$	201 yd. + 0 ft.
2	2
11	402 half-yards.
	36 rd. + 6 half-yards, or 3 yd.

Ans. 36 rd. 3 yd. 10 in.

164. *Rule.* — When the divisor is a mixed number, reduce both divisor and dividend to a common denomination by multiplying both by 2 or by 4, and divide as usual.

The remainder will be half-yards or quarter-square yards.

Oral Exercises.

1. How many inches are there in 9 ft.? in 4 yd.?
2. Reduce 8 rd. to yards; 6 rd. to feet.
3. How many feet are there in 6 yd.? in 5 rd.?
4. How many inches are there in 7 ft. 4 in.? in 1 yd. 1 ft.?
5. How many rods are there in 2 mi.? in 44 yd.?

Written Exercises.

6. Reduce 5 yd. 2 ft. 8 in. to inches; 4 rd. 2 yd. 2 ft. to feet.
7. How many feet are there in 6 rd. 3 yd. 1 ft.? in 2 mi. 16 rd. 8 ft.?
8. How many rods are there in 7 441 in.? in 6 552 in.?
9. Reduce to yards: 98 in.; 210 in.
10. Reduce to feet: 37 mi. 270 rd. 1 yd.; 8 mi. 234 rd. 1 yd.
11. Express in inches: 26 rd. 2 ft. 4 in.; 3 mi. 40 rd. 2 ft. 7 in.
12. How many feet are there in 5 rd. 2 yd. 3 ft.?

Square Measure.

TABLE.

165. *Square Measure* is used in measuring all surfaces, such as land, boards, plastering, etc.

144 square inches (<i>sq. in.</i>)	=	1 square foot, <i>sq. ft.</i>
9 " feet	=	1 " yard <i>sq. yd.</i>
30 $\frac{1}{4}$ " yards.....	=	1 " rod, <i>sq. rd.</i>
160 " rods	=	1 acre, <i>A.</i>
640 acres	=	1 square mile, <i>sq. mi.</i>

Each quantity of units is the product of *two* dimensions: 12 in. by 12 in. equals 144 sq. in.; 3 ft. by 3 ft. equals 9 sq. ft. etc.

Oral Exercises.

1. How many square feet are there in 3 sq. yd.? in 288 sq. in.?
2. How many square rods are there in 3 A.?
3. Reduce to square rods: 3 A.; 5 A.
4. Reduce 49 sq. ft. to square yards.
5. Reduce 720 sq. in. to square feet.

Written Exercises.

6. Reduce to square inches; 9 sq. ft.; 20 sq. yd. 4 sq. ft.
7. How many square feet are there in 4 sq. rd. 5 sq. ft.?
in 5 sq. rd.?
8. Reduce to square yards: 7 460 sq. in.; 6 720 sq. in.
9. How many square rods are there in 4 A. 120 sq. rd.?
in 1 110 sq. ft.?
10. Express in square rods: 3 319 sq. ft.; 158 112 sq. in.

Cubic Measure.

166. *Cubic Measure* is used in measuring things which have length, breadth and thickness.

TABLE.

1728 cubic inches (*cu. in.*) = 1 cubic foot, *cu. ft.*
 27 cubic feet = 1 cubic yard, *cu. yd.*

NOTE. — One cord of wood is 8 feet long, 4 feet wide and 4 feet high, that is 128 cubic feet.

Each quantity in cubic units is the product of three dimensions: 3 ft. by 3 ft. by 3 ft. equals 27 cu. ft., etc.

Oral Exercises.

1. How many cubic feet are there in 1 cu. yd.? in 3 cu. yd.?
2. Reduce to cubic yards: 54 cu. ft.; 81 cu. ft.
3. How many cubic feet are there in 3 cords of wood?

Written Exercises.

4. Reduce to cubic inches: 15 cu. ft. 240 cu. in.; 32 cu. ft. 114 cu. in.
5. How many cubic yards are there in 69 875 cu. in.?
in 96 780 cu. in.?
6. Reduce 218 cu. yd. 18 cu. ft. to cubic feet.
7. Reduce 18 cu. yd. 3 cu. ft. 1 600 cu. in. to cubic inches.
8. How many cubic yards are there in 426 790 cu. in.?

Measures of Capacity.

167. *Measures of Capacity* are used in measuring liquids, grains, fruit, etc. The prime unit is the *imperial gallon*.

TABLE.

4 gills (<i>gi.</i>)	=	1 pint, <i>pt.</i>
2 pints	=	1 quart, <i>qt.</i>
4 quarts	=	1 gallon, <i>gal.</i>
8 gallons	=	1 bushel, <i>bu.</i>

A *peck* equals $\frac{1}{4}$ of a bushel.

LEGAL WEIGHT OF A BUSHEL OF THE PRINCIPAL FARM PRODUCTS.

Wheat	60 lb.	Turnips	60 lb.	Onions	50 lb.
Beans	60 lb.	Carrots	60 lb.	Barley	48 lb.
Peas	60 lb.	Beets	60 lb.	Buckwheat ...	48 lb.
Potatoes	60 lb.	Rye	56 lb.	Timothy seed.	48 lb.
Clover seed...	60 lb.	Corn	56 lb.	Oats	34 lb.

Oral Exercises.

1. How many gills are there in 8 pt.? in 2 qt.?
2. Reduce to gallons: 3 bu.; 32 qt.
3. How many quarts are there in 4 gal.? in 12 pt.?
4. Express in pints: 2 gal.; 1 bu.
5. How many quarts are there in 12 pt.? in 32 gi.?

Written Exercises.

6. Reduce to gills: 2 gal. 1 qt. 1 pt.; 5 gal. 3 qt. 1 pt.
7. Express in pints: 4 bu. 5 gal. 1 qt.; 8 bu. 2 gal. 1 qt.
8. How many gallons are there in 156 gills? in 250 gills?
9. How many bushels are there in 368 pt.? in 2014 gi.?
10. Reduce to gills: 5 gal. 1 qt. 1 pt.; 4 bu. 3 gal. 1 qt.
11. How many bushels are there in 6 138 gi.? in 9 118 gi.?

12. Reduce to pints 20 bu. 6 gal.; 18 bu. 7 gal. 2 qt. 1 pt.
 13. How many quarts are there in 25 bu. 5 gal.? in 2000 gi.?

Measure of Time.

60 seconds (<i>sec.</i>)	= 1 minute, <i>min.</i>
60 minutes	= 1 hour, <i>hr.</i>
24 hours	= 1 day, <i>da.</i>
7 days	= 1 week, <i>wk.</i>
365 days	= 1 common year, <i>c. yr.</i>
366 days	= 1 leap year, <i>l. yr.</i>
12 months (<i>mo.</i>) ..	= 1 year, <i>yr.</i>
52 weeks	= 1 year, <i>yr.</i>

April, June, September, and November have 30 days. The other months have 31 days, excepting *February* which has 28 days, and 29 each leap year.

Oral Exercises.

- How many minutes are there in 2 hr.? in 120 sec.?
- How many hours are there in 180 min.? in 2 da.?
- Reduce to hours: 4 days; 1 week.
- Name the months that have 30 days; that have 31 days.
- How many days are there in 2 leap years?

Written Exercises.

- Reduce to seconds: 5 hr. 15 min. 12 sec.; 6 hr. 27 min. 38 sec.
- Reduce to seconds: 11 hr. 10 min. 9 sec.; 11 da. 31 min. 59 sec.
- How many weeks are there in 348 hr.? in 994 hr.?
- How many years are there in 17 616 hr.? in 26 439 hr.?
- Reduce to minutes: 4 wk. 3 da. 1 hr. 10 min.; 1 yr. 1 da. 1 hr.
- How many years are there in 43 800 hr.? in 1 054 200 min.?

12. How many weeks are there in 867 896 sec.? in 1 153 800 sec.?

13. How many hours were there from January 1st to March 1st 1910? From July 1st to the end of the year?

Miscellaneous Tables.

12 units	= 1 dozen, <i>doz.</i>
12 dozen	= 1 gross, <i>gro.</i>
24 sheets of paper.....	= 1 quire, <i>qr.</i>
20 quires	= 1 ream, <i>rm.</i>

Oral Exercises.

1. How many dozen are there in 48 oranges? in 2 gross of pens?

2. How many sheets of paper are there in 2 quires? in 1 ream?

3. How many dozen of sheets are there in a ream of paper?

Written Exercises.

4. How many lemons are there in 5 gro. and 4 doz.? in 9 gro. and 8 doz.?

5. Reduce to dozen and gross: 2 232 pencils; 2 724 pens.

6. Reduce to sheets: 4 reams and 8 quires; 20 reams, 15 quires and 18 sheets.

7. How many reams are there in 4 527 sheets? in 5 279 sheets?

Review of Reductions.

Reduce:

1. 4 lb. 9 oz. to grains (*Troy*).
2. 3 mi. 80 rd. to feet.
3. 3 oz. 5 dr. 2 sc. to grains.
4. 4 A. 80 sq. rd. to square feet.
5. 188 gills to gallons.
6. 1 788 pwt. to pounds.

7. 12 T. 17 cwt. 97 lb. to pounds.
8. 15 days 18 hr. 20 min. to minutes.
9. 8 oz. 12 pwt. 10 gr. to grains.
10. 316 pt. to bushels.
11. 5 lb. 8 oz. 7 dr. to scruples.
12. 5 294 ft. to miles.
13. 288 807 oz. to tons.
14. 3 A. 120 sq. rd. to square yards.
15. 9 bu. 5 gal. to gills.
16. 2 332 pwt. to pounds.
17. 73 815 gr. to pounds (*Apothecaries'*).
18. 2 cu. yd. 12 cu. ft. to cubic feet.
19. 6 648 gi. to bushels.
20. 14 lb. 2 oz. to grains (*Troy*).
21. 26 052 cu. in. to cubic feet.
22. 27 780 min. to weeks.
23. 1 mi. 8 rd. 4 ft. to inches.
24. 8 T. 16 cwt. 7 lb. to ounces.
25. 21 315 pt. to bushels.
26. 46 518 gr. to pounds (*Apothecaries'*).
27. 1 192 536 sq. in. to square rods.
28. 5 500 lb. to tons.
29. 33 565 gr. to pounds (*Troy*).
30. 160 704 cu. in. to cubic yards.
31. 6 596 gi. to bushels.
32. 25 lb. 11 oz. to scruples.
33. 3 yr. 42 da. to hours.
34. 13 212 ft. to miles.
35. 23 bu. 5 gal. to gills.
36. 5 T. 18 cwt. 50 lb. to ounces.
37. 15 lb. 9 oz. to grains (*Troy*).
38. 6 rd. 4 yd. 2 ft. to inches.
39. 3 720 sheets to reams.
40. 7 lb. 5 $\frac{3}{4}$ 1 $\frac{1}{2}$ to grains.
41. 4 A. 120 sq. rd. 1 sq. yd. to square feet.
42. 32 lb. 11 oz. to grains (*Apothecaries'*).
43. 170 280 oz. to tons.
44. 18 bu. 7 gal. to gills.
45. 8 lb. 8 $\frac{3}{4}$ 5 $\frac{3}{4}$ 2 $\frac{1}{2}$ to grains.
46. 90 392 sq. ft. to acres.

47. 3 065 pwt. to pounds.
48. 551 235 sec. to days.
49. 196 992 cu. in. to cu. yards.
50. 1 T. 3 cwt. to ounces.

Addition of Denominate Numbers.

Addition, subtraction, multiplication, and division of denominate numbers are performed much like these same operations with abstract numbers; yet, in passing from one denomination to another, we have not the regular scale, 10, but a varying scale according to the table.

COMPARATIVE EXAMPLES.

	10	10		12	20	24
h.	t.	u.	lb.	oz.	pwt.	gr.
3	6	4	8	5	12	3
2	7	8	11	2	9	18
8	3	5	4	7	18	6
7	4	0	12	5	3	7
<hr/>			<hr/>			
22	1	7	36 lb.	9 oz.	3 pwt.	10 gr.
=22						

EXPLA. Arrange the numbers as in simple addition, so that t. of the same order stand in the same column. By adding the first column at the right, the result is 34 gr. 34 gr. = 1 pwt. + 10 gr.; write the 10 gr. under the grains and carry the 1 pwt. to be added with the pennyweights. Adding the pennyweights, the result is 43 pwt. 43 pwt. = 2 oz. + 3 pwt.; write the 3 pwt. under the pennyweights and carry the 2 oz. to be added with the ounces. And continue thus.

Written Exercises.

1. Add 10 lb. 10 oz. 3 pwt. 8 gr.; 11 lb. 9 oz. 6 pwt. 16 gr.; 3 lb. 8 oz. 16 pwt.; 9 oz. 6 pwt. 14 gr.
2. Add 8 T. 16 cwt. 80 lb. 8 oz.; 18 T. 6 cwt. 69 lb. 12 oz.; 3 T. 4 cwt. 12 lb. 8 oz.; 9 T. 8 cwt. 89 lb. 1 oz.
3. Find the sum of 8 yr. 3 mo. 16 da.; 4 yr. 11 mo. 29 da.; 10 yr. 8 mo. 10 da.; 1 yr. 1 mo. 6 da.; 9 mo. 11 da.

4. Find the sum of 28 lb. 7 oz. 5 dr. 2 sc. 15 gr.; 25 lb. 10 oz. 4 dr. 1 sc. 15 gr.; 19 lb. 9 oz. 5 dr. 1 sc. 23 gr.; 27 lb. 8 oz. 3 dr. 2 sc. 17 gr.

5. Add 6 gal. 3 qt. 1 pt. 2 gi.; 3 gal. 2 qt. 1 pt.; 7 gal. 3 qt. 2 gi.; 4 gal. 1 qt. 1 pt. 2 gi.; 3 qt. 2 gi.

Subtraction of Denominate Numbers.

COMPARATIVE EXAMPLES.

th.	h.	t.	u.	T.	cwt.	lb.	oz.
8	4	7	2	12	14	67	6
4	7	3	5	6	16	50	8
3	7	3	7	5 T.	18 cwt.	16 lb.	14 oz.

= 3737.

EXPLANATION. — Place the smaller number under the greater, so that the units of the same order shall stand under one another. 8 oz. cannot be taken from 6 oz.; so mentally take 1 lb. (16 oz.) from 67 lb. and add it to 6 oz., making 22 oz.

22 oz. — 8 oz. = 14 oz. Since 1 lb. was borrowed from 67 lb., there remains but 66 lb.; 66 lb. — 50 lb. = 16 lb.

16 cwt. cannot be taken from 14 cwt.; so mentally take 1 T. (20 cwt.) from 12 T. and add it to 14 cwt., making 34 cwt.

34 cwt. — 16 cwt. = 18 cwt.; 11 T. — 6 T. = 5 T.

Written Exercises.

1. From 16 lb. 10 oz. 16 pwt. 18 gr. subtract 12 lb. 11 oz. 17 pwt. 15 gr.

2. Take 3 lb. 6 oz. 6 dr. 2 sc. 16 gr. from 7 lb. 4 oz. 7 dr. 2 sc. 10 gr.

3. Subtract 5 rd. 2 yd. 4 ft. 8 in. from 8 rd. 1 yd. 5 ft. 4 in.

4. What is the difference between 20 T. 6 cwt. 60 lb. 7 oz. and 16 T. 8 cwt. 69 lb. 12 oz.?

5. From 10 hr. 15 min. 20 sec. subtract 8 hr. 17 min. 49 sec.

Multiplication of Denominate Numbers.

COMPARATIVE EXAMPLES.

	10	10		12	20	24
h.	t.	u.	lb.	oz.	pwt.	gr.
4	6	5	4	6	15	12
		7				7
<hr/>			<hr/>			
32	5	5	31 lb. 11 oz. 8 pwt. 12 gr.			
= 3255.						

EXPLANATION. — 7 times 12 gr. = 84 gr. = 3 pwt. 12 gr.; write 12 gr. under grains and carry the 3 pwt.; 7 times 15 pwt. = 105 pwt. + 3 pwt. = 108 pwt. = 5 oz. 8 pwt.; write 8 pwt. under pennyweights and carry the 5 oz.; 7 times 6 oz. = 42 oz. + 5 oz. = 47 oz. = 3 lb. 11 oz.; write 11 oz. and carry the 3 lb.; 7 times 4 lb. = 28 lb. + 3 lb. = 31 lb.

Written Exercises.

1. Multiply 3 cwt. 10 lb. 9 oz. by 12.
2. Multiply 7 lb. 8 oz. 15 pwt. 18 gr. by 15.
3. Find the product of 2 gal. 3 qt. 1 pt. 2 gi. by 10.
4. Multiply 5' 4 oz. 5 dr. 2 sc. 8 gr. by 9.
5. Multiply 6 c 3 hr. 33 min. 18 sec. by 9.

Division of Denominate numbers.

COMPARATIVE EXAMPLES.

	10	10	10		20	100	16
th.	h.	t.	u.	T.	cwt.	lb.	oz.
8) 4	2	7	4	8) 19	17	48	12
<hr/>				<hr/>			
	5	3	4 $\frac{1}{4}$	2 T. 9 cwt. 68 lb. 9 $\frac{1}{2}$ oz.			
= 534 $\frac{1}{4}$.							

EXPLANATION. — 19 T. \div 8 = 2 T. with a remainder of 3 T.; write the 2 T. in the quotient and add 3 T. (= 60 cwt.) to the next lower denomination; 60 cwt. + 17 cwt. = 77 cwt.; 77 cwt. \div 8 = 9 cwt. with a remainder of 5 cwt.; write the 9 cwt. in the quotient and add 5 cwt. (= 500 lb.) to the next lower denomination; 500 lb. + 48 lb. = 548 lb.; 548 lb. \div 8

= 68 lb. with a remainder of 4 lb.; write the 68 lb. and add the 4 lb. (= 64 oz.) to the next lower denomination; 64 oz. + 12 oz. = 76 oz.; $76 \text{ oz.} \div 8 = 9\frac{1}{2} \text{ oz.}$

Written Exercises.

1. Divide 70 lb. 10 oz. 14 pwt. 8 gr. by 6.
2. Divide 112 T. 16 cwt 66 lb. by 7.
3. Divide 12 lb. 9 oz. 6 dr. 2 sc. 8 gr. by 12.
4. Divide 48 da. 18 hr. 36 min. 32 sec. by 16.

PROBLEMS ON DENOMINATE NUMBERS.

First Series.

1. At 10 cents a pint, how many bushels of nuts did I sell, if my receipts were \$6.40?
2. How much calomel did a druggist use to make 5 000 pills of 5 grains each?
3. How many hours are there from 10 o'clock in the morning, May 28, till 8 o'clock in the evening, June 9?
4. If 4 pounds of coal cost 1 cent, how much would a long ton cost?
5. What quantity of quinine would be required to make 980 pills of 4 grains each?
6. How many pint bottles could we fill with 25 gallons of wine?
7. A merchant sold 42 gal. 3 qt. 1 pt. of wine, at 80 cents a pint. How much money did he receive?
8. What is the price of a hog weighing 3 cwt. 67 lb., at 6 cents a pound?
9. If a voyage began at noon on August 29, and closed on September 3, at 4 o'clock P.M., how many hours did it last?
10. If a vessel took 8 days and 10 hours to go from Montreal to Liverpool, how many minutes did it take to go across?
11. How many cords are there in 1 920 cubic feet of beech?
12. Add 4 lb. 8 oz. 12 pwt. 16 gr.; 8 lb. 9 oz. 4 pwt. 18 gr.; 14 lb. 4 oz. 6 pwt. 20 gr.; 10 lb. 10 oz. 17 pwt. 19 gr.

13. How much would one dozen of silver spoons cost, at \$1.20 an ounce, if they weigh 3 oz. 5 pwt. each?
14. What sum would be required to cover with silver a table one yard square, if a 25-cent piece were put on every square inch?
15. How many tablets of 3 grains each can be made with one half ounce of pepsin?
16. A wine merchant paid \$120 for three casks of wine each containing 50 gallons. What was the price per pint?
17. At \$6 a ton, how many pounds of coal should I receive for one cent?
18. What is the price of 12850 pounds of coal at \$6.80 a ton?
19. If a clock loses 2 seconds in 15 minutes, how much would it lose in 8 days and 10 hours?
20. How many hours are there in the first quarter of a leap year?
21. How much would 8 quires of paper cost at \$3.30 a ream?
22. What is the price of a gold chain weighing 384 grains at \$1.15 a pennyweight?
23. How many square feet are there in an acre?
24. If the area of a farm is 50 A. 120 sq. rd., what is it in square yards?
25. How many pills of 7 grains each can be made with $1\frac{2}{3}$ 25 2 9 11 gr.?
26. A tank is emptied in $8\frac{1}{2}$ hours by a faucet that lets 1 pint run out per second. What is the capacity of the tank?
27. Two barrels of oil contain respectively 48 and 40 gallons. If 150 pints are taken from one and 90 from the other, how many pints will be left in all?
28. How much will 15 T. 7 cwt. 52 lb. of coal cost at \$5 a ton?
29. Albert was born January 1, 1901. Give his age in days January 1, 1913, considering the leap years.
30. Give the price of 16 eggs at \$2.52 a gross.

31. At \$20 an ounce, what would be the price of a gold ring weighing 12 pwt. 6 gr.?
32. It is 180 miles from Montreal to Quebec by the St. Lawrence. If a boat makes the trip in 12 hours, how many yards does it go per minute?
33. How many wafers can be filled with 2 lb. 3 oz. 5 dr. 1 sc. 10 gr., if each wafer is to contain 15 grains?
34. What is the price of a hundredweight of maple sugar, if 12 8-ounce loaves cost 66 cents?
35. A merchant sold 35 gal. 3 qt. of oil at 35 cents a pint. How much did he receive?

Second Series.

36. Multiply 7 da. 4 hr. 48 min. 50 sec. by 20.
37. A grocer sold maple syrup at 15 cents a pint. At that rate, what was the cost of 20 gallons?
38. If a weaver takes 3 hr. 20 min. to weave one yard of cloth, how many yards will he weave in 2 days of 10 hours?
39. Two couriers are 5 miles apart; if they go one toward the other, each at the rate of 6 feet per second, how long will it take them to meet?
40. How much would a floor of 40 square yards cost, at the rate of 38 cents a square foot?
41. If a horse goes 15 feet a second, how many miles will he go in 45 minutes?
42. To go to school, a child takes 840 steps 2 feet long. Over what distance will he go in a year, if there are 190 days of class and he goes to school twice a day?
43. If a doctor uses 5 oz. 7 dr. 1 sc. 4 gr. of medicine a day, what quantity would he use during the month of May?
44. With 100 gallons of wine, how many pint bottles could I fill?
45. An alcoholic takes half a gill of brandy 3 times a day. What quantity of brandy does he absorb in a year, while ruining his health?

46. If 1 lb. 7 oz. of coffee cost 46 cents, how much would I pay for 3 lb. 9 oz.?

47. How long is the night, when the sun sets at 6.42 p.m. and rises at 5.10 a.m.?

48. Find the price of 5 reams 15 quires and 20 sheets of paper, at \$3.60 a ream.

49. If 2 lb. 3 oz. 6 pwt. of silver are worth \$32.76, what is the value of 15 lb. 7 oz. 4 pwt.?

50. Sound travels 1 142 feet per second. If I saw the smoke of a cannon 8 seconds before hearing the report, how far was I from the cannon?

51. If a man takes 100 steps a minute, and 15 of his steps measure 12 yards, how far does he go in an hour?

52. If a family uses 2 gal. 3 qt. 1 pt. of milk a week, how much milk does this family use in a year?

53. If a grocer has $3\frac{1}{2}$ pounds of pepper, how many sacks could he fill, putting 4 ounces in each?

54. How much would 8 000 pounds of wheat cost at 90 cents a bushel?

55. How much paper would be required to print 1 000 copies of a book of 352 pages, if 32 pages are printed on each sheet?

56. Divide 8 lb. 7 oz. 6 dr. 2 sc. 8 gr. by 6.

57. If a square blackboard measures 4 feet on each side, find its area.

58. A sheet of paper is 14 inches long and 9 inches wide; what is its area in square inches?

59. If the classroom floor is 33 feet long and 24 feet wide, what is its area?

60. The circumference of a wheel is 8 ft. 3 in. How many revolutions would it make to go 21 miles?

61. Find the cost of paving an alley 12 feet wide and 63 feet long, at the rate of \$2.50 a square yard.

62. Find the value of a piece of land 100 feet long by 25 feet wide, if a square inch is worth one cent.

63. If a druggist bought 3 pounds of medicine at \$4.50 a

pound, and sold it at 5 cents a scruple, how much did he gain?

64. A dealer bought 25 tons of coal at \$5.60 a long ton, and sold the coal at \$6.75 a short ton. Find his gain.

65. For the printing of 2000 copies of a book it requires 66 reams 13 quires 8 sheets of paper. Find the number of pages in each copy, if they print 16 pages to a sheet.

66. Find in square yards the area of a ground 60 feet long by 36 feet wide.

67. From Montreal to Terrebonne it is 18 miles, and a cyclist made the trip in 3 hours. The wheels of his bicycle being 8 feet in circumference, how many revolutions did they make a minute?

Examination Problems.

I

1. How many rods in 5 544 inches?

2. Add 12 T. 16 cwt. 80 lb. 4 oz.; 8 T. 4 cwt. 42 lb. 12 oz.; 6 T. 18 cwt. 92 lb. 6 oz.; 16 T. 3 cwt. 49 lb. 10 oz.

3. How many rings, each weighing 16 grains, could be made with 1 lb. 8 oz. of gold?

4. If it takes 10 min. 30 sec. to go one mile, how long would it take to go 27 miles?

5. From 12 lb. 6 oz. 9 dr. 1 sc. 14 gr., subtract 4 lb. 8 oz. 7 dr. 1 sc. 16 gr.

6. How many feet are there in 3 mi. 140 rd. 2 yd. 1 ft.?

7. If it requires 14 sheets of paper to print a book, how many reams would be required to print 500 copies of the same work?

8. If a horse eats 3 quarts of oats daily, how many bushels would he eat in a year?

9. How many square feet are there in 1 A. 132 sq. rd. 4 sq. yd. 2 sq. ft.?

10. If 6 ounces of tea cost $22\frac{1}{2}$ cents, how much should I pay for 3 lb. 12 oz.?

II

11. How many spoons of 2 oz. 18 pwt. each can be made with 5 lb. 9 oz. 12 pwt. of silver?

12. When a hogshead is empty it weighs 48 pounds, and 338 pounds when it is full. If a gallon of water weighs 10 pounds, how many pints of water does the hogshead hold?

13. How many pounds of quinine would be required to prepare 10 000 tablets of 5 grains each?

14. Multiply 8 rd. 3 yd. 4 ft. 7 in. by 12.

15. A lot is 180 feet long by 63 feet wide. Find its area in square yards.

16. If 9 T. 1 568 lb. of coal cost \$48.92, how much could I buy with \$73.11?

17. Divide 43 bu. 6 gal. 3 qt. 1 pt. 2 gi. by 8.

18. If a traveler, taking 132 steps a minute, went 3 miles in 48 minutes, find in inches the length of each step.

19. At 18 cents a linear foot, what is the cost of a palisade which encloses a square lot of 10 rd. 5 yd. to a side?

20. How long would it take a man to go 4 miles, if each second he takes a step of 2 ft. 8 in.?

MODEL COMMERCIAL FORMS

Invoice.

MONTREAL, *Sept. 6, 1918.*Mr. *Jas. Durnin*Bought of **GEO. MURPHY.**Terms: *30 days.*

<i>12 yd. Serge</i>	@	<i>\$0.65</i>	<i>\$7 80</i>	
<i>4 Pair of Stockings</i>	"	<i>25</i>	<i>1 00</i>	
<i>1 Man's Hat</i>	"		<i>3 50</i>	
<i>2 Boy's Coats</i>	"	<i>3.50</i>	<i>7 00</i>	<i>\$19 30</i>

*Received payment.**By G. D.*

Statement of Account.

MONTREAL, *May 18, 1918.*Mr. *A. B. Martel,**St. Lambert,*In account with **D. GAGNON & CO.**

<i>1918</i>		<i>Dr.</i>			
<i>Jan.</i>	<i>17</i>	<i>Mdse</i>	.....	<i>\$ 12 60</i>	
<i>Feb.</i>	<i>23</i>	"	.....	<i>7 95</i>	
<i>April</i>	<i>5</i>	"	.....	<i>27 08</i>	<i>\$47 63</i>
		<i>Cr.</i>			
<i>April</i>	<i>27</i>	<i>Cash</i>	.....		<i>40 00</i>
		<i>Balance due</i>	.....		<i>\$ 7 63</i>

Statement of Account in Detail.

MONTREAL, *July 13, 1918.**Mr. Lea Brennan*OWES **H. J. LEVIS,**
GROCER

1918						
Jan.	17	3 lb. Java Coffee.....	@	\$ 0.35	\$ 1.05	
"	"	15 " Tallow.....	"	.09	1.35	
"	"	5 " Fresh Butter.....	"	.28	1.40	
"	20	18 " Refined Sugar.....	"	.05	.90	
"	"	24 " B. wn Sugar.....	"	.04	.96	
Feb.	7	3 " Green Tea.....	"	.65	1.95	
"	"	4 doz. Fresh Eggs.....	"	.27	1.08	
"	12	4 lb. Cheese.....	"	.14	.56	
"	"	5 " Fresh Butter.....	"	.27	1.35	
Mar.	1	13 " Flour.....	"	.06	.78	\$11.38

Exercises on Bills and Accounts.

1. January 5, 1918, The Montreal Furniture Exchange sold to Mr. John Dineen as follows: 6 chairs at \$1.50; 2 tables at \$8.50; 4 rocking-chairs at \$3.75, and 2 sofas at \$9.75. Make out the bill.

2. March 7, 1918, Mr. Henry Rowley bought of W. Brown, grocer of Montreal, as follows: 5 lb. of tea at 45 cents; 15 lb. of butter at 24 cents; 12 lb. of maple sugar at 11 cents. What is the amount of the purchase?

3. February 27, 1918, Mr. Arthur Moore bought of John Murphy, Montreal, the following goods: 18 yards of printed cotton at 23 cents; 12 yards of serge at 55 cents; 9 yards of cashmere at \$1.20, and 15 yards of cotton at 18 cents. What is the amount of the sale?

4. July 12, 1918, William Stoles bought of Thomas McGarvey as follows: 3 bushels of potatoes at 55 cents; 5 dozen ears of corn at 12 cents; 12 cucumbers at 5 cents; 3 bunches of carrots at 10 cents; 2 bunches of turnips at 13 cents; 5 bundles of rhubarb at 30 cents, and 4 quarts of raspberries at 25 cents. Figure out the amount of the purchase.

5. J. W. Goodwins, of Montreal, sold to Daniel McCarthy, May 18, 1918, the following: 60 pair of rubbers at 63 cents; 24 pair of shoes at \$1.57; 48 pair of cashmere stockings at 20 cents; 30 pair of slippers at 55 cents. Make out the bill and receipt it.

6. April 13, 1918, the Burnside Meat Market, Montreal, sold to Ernest Lee, as follows: 60 lb. of butter at 27 cents; 43 lb. of ham at 15 cents; 23 lb. of fresh pork at 15 cents; 33 lb. of beef at 12 cents, and 2 pails of lard at \$2.50. Make the bill and receipt it.

7. February 23, 1918, Mr. William Welch bought of Mr. G. Graham, grocer, the following: 6 dozen oranges at 20 cents; 4 dozen bananas at 25 cents; 10 lb. of raisins at 18 cents; 2 lb. of almonds at 30 cents. Find the amount of the purchase.

8. June 25, 1918, bought of David Gordon by Joseph Meed: 12 yards of silk at \$2.75; $12\frac{1}{2}$ yards of blue cloth at \$2.90; $4\frac{3}{4}$ yards of cashmere at \$2.20; $2\frac{1}{2}$ dozen stockings at \$1.80; $8\frac{3}{4}$ yards of ribbon at 48 cents; $1\frac{1}{2}$ dozen coat buttons at 60 cents. Give the amount of the purchase.

9. February 13, 1918, George Harvey sold to Alex Watson, as follows: 15 bushels of wheat at \$1.35; 30 bushels of oats at $42\frac{1}{2}$ cents; 2 tons of hay at \$8.75. Make out the bill and receipt it.

10. Sold by Dupuis Bros. to Mr. J. C. Savage, September 12, 1918, as follows: 1 man's suit, \$13.50; 2 boy's suits, \$6.75; 30 yards of linen at 45 cents; 25 linen napkins at 18 cents; 3 pair of curtains at \$3.50; 35 yards of carpet at 43 cents; 3 rugs at \$13. What is the amount of the sale?

11. Sold by J. Hunter Sons to Mr. Robert Bruce, August 13, 1918, as follows: 560 feet of pine at \$42 a thousand;

4 500 feet of hemlock at \$26 a thousand; and 800 feet of maple at \$45 a thousand. What is the amount of the bill?

12. August 12, 1918, Mr. George White bought at the Notre Dame Library, Montreal: 2 dozen copies of "Sacred History" at 96 cents; $4\frac{1}{2}$ dozen copies of "Catechism of Quebec" at 68 cents; $\frac{1}{2}$ dozen Dictionaries at \$10.64; 2 dozen Elementary Grammars at \$1.44; $1\frac{1}{2}$ dozen copies of "History of Canada" by C. S. Viator, at \$2.40; $1\frac{3}{4}$ dozen "La Classe en Anglais", at \$1.92. Make the bill and receipt it.

13. April 17, 1918, Mr. Joseph Smith bought of James Walker: 50 raspberry bushes at 10 cents; 250 strawberry plants at \$3.50 a hundred; 25 gooseberry bushes at 15 cents, and 25 vines at 35 cents. Find the amount of the invoice.

14. December 5, 1917, McBride Bros. sold to Edgar Reardon, as follows: 2 barrels of apples at \$3.50; 4 dozen oranges at 25 cents; 7 dozen bananas at 15 cents; 5 dozen peaches at 30 cents; 8 lb. of almonds at 20 cents. What is the amount of the sale?

15. Mr. W. H. Dwyer sold to Mr. Maurice Leahy, February 12, 1918: 25 bushels of oats at 55 cents; 3 tons of bran at \$23.60; 5 tons of hay at \$9.50; 2 tons of straw at \$4, and 5 bushels of wheat at \$1.45. Find the amount of the bill.

16. Due to Mr. J. M. Thornton, shoemaker, by Mr. James Gordon, as follows: January 27, 2 pair of shoes at \$2.75; February 15, 1 mending, 60 cents; 5 pair of laces at 5 cents; March 4, 1 pair of slippers, \$2.25; April 5, 2 mendings at 50 cents; 2 pair of slippers at \$1.25. Make out the bill.

17. November 27, 1917, Mr. Andrew Philips bought from Mr. A. H. Pringle, as follows: $6\frac{1}{2}$ yards of merino at \$1.12; $12\frac{1}{2}$ yards of printed cotton at 18 cents; $4\frac{3}{4}$ yards of cloth at \$4.40; 7 yards of ticking at 30 cents. Make out the invoice and receipt it.

18. Mr. John Boyd sold to Mr. R. Rice, as follows: January 27, 1918, 8 hammers at 75 cents; 4 handsaws at \$1.50; 100 lb. of nails at $3\frac{1}{2}$ cents; February 12, 6 shovels at 60 cents; March 2, 12 locks at 80 cents; 42 fastenings

at \$1.40. On March 3, Mr. Rice paid \$50. Balance this account.

19. May 30, 1918, sold by Mr. William Dunn to Mr. M. V. Hardy: 60 lb. of maple sugar at $9\frac{1}{2}$ cents; $8\frac{3}{4}$ lb. of cheese at 16 cents; 30 lb. of butter at $25\frac{1}{2}$ cents; 2 pounds of pepper at 45 cents; 5 lb. of chocolate at 30 cents; 50 lb. of granulated sugar at $5\frac{1}{2}$ cents. What is the amount of the sale?

20. Mr. R. Valley sold to Mr. Antoine Pilon, as follows: March 24, 1918, 100 lb. of granulated sugar at $3\frac{1}{2}$ cents; 50 lb. of butter at 28 cents; 15 gallons of syrup at \$1.10; April 7, 12 lb. of prunes at 10 cents; 5 lb. of Java coffee at 80 cents; 1 pail of lard at \$2.50. On April 25, Mr. Pilon gave in payment 25 bushels of oats at 48 cents, and 1 ton of hay at \$9.50. Find the balance of this account.

Model of a Receipt.

\$220.⁰⁰/₁₀₀

MONTREAL, Feb. 4, 1918.

Received of DeLang & Co., an account,
Two hundred and twenty ⁰⁰/₁₀₀ Dollars.

J. E. Coleman.

Model of a Receipt in full of Account.

\$90.⁵⁰/₁₀₀

MONTREAL, Feb. 4, 1918.

Received of Casa & Co.,
Ninety ⁵⁰/₁₀₀ Dollars,
in full of account.

J. E. Coleman.

Model of a Note.

\$225.⁰⁰/₁₀₀

MONTREAL, July 12, 1918.

Three months after date, for value received, I promise to pay to the order of Mr. Henry Miller, at his office, Two hundred and twenty-five Dollars, with interest at 6 % per annum.

No 7. Due Oct. 15, 1918.

Daniel Clemens.

Model of a Check.

\$150.⁵⁰/₁₀₀.

Montreal, Aug. 5, 1918.

The Provincial Bank of Canada.

Pay to the order of Mr. Charles O'Reilly,
One hundred and fifty ~~~~~ ⁵⁰/₁₀₀ Dollars.

No 8

Richard Finn.

PERCENTAGE

168. Percentage is the process of computing by hundredths.

5 per cent, written 5%, means .05 of the whole or the base. It may also be considered as 5 units on 100 units.

EXAMPLE I. — Find 6% of 360.

SOLUTION.

360 represents the whole or base, 100%.

Since 100% = 360,

1% = $\frac{360}{100}$

and 6% = $\frac{360 \times 6}{100} = 21.60$, Ans.

This case is a simple problem of multiplication of decimals:
 $360 \times .06 = 21.60$.

EXAMPLE II. — 25% of a sum of money equals \$450.
 What is this sum?

SOLUTION.

The sum is the whole, or *base*, 100%.
 Since 25% of the sum = \$450.
 1% " " = $\frac{\$450}{25}$,
 and 100% " " = $\frac{\$450 \times 100}{25} = \$1\ 800$, the sum.

Oral Exercises.

1. What is 3% of \$200? 7% of \$300? 10% of \$25? 12% of 50 cents?
2. Find 2% of \$250; 25% of \$100; 50% of \$50; 20% of 30 cents.
3. What is the amount of \$40 plus 10%? of \$250 plus 2%? of \$3 000 plus 1%? of \$600 plus 8%?
4. What is the difference of \$25 less 4%? of \$10 less 60%? of \$2 000 less 5%? of 80 cents less 50%?
5. How much do I gain, at 20% profit, on cloth that cost \$90?
6. I paid \$50 for a cow, and I sold her at 12% profit. What was my profit?
7. At the rate of 4%, what would be the custom duties on an importation of \$500?
8. If a farmer, by selling his farm for \$1 600, loses 20%, how much did the farm cost him?
9. How much had some fruits cost me, if I sold them for \$36, making a gain of 20%?
10. A real estate agent sold a farm for \$800. What was his commission at 5%?

Problems on Percentage.

11. In our municipality, the tax on properties is 1% of their value. If my house is worth \$5 600, what tax should I pay?

12. A speculator paid \$2 900 for a piece of land. If he sold it at 15% profit, what profit did he make?

13. Two horses cost me \$150 each. I sold one of these horses at 12% profit, and the other at 15% loss. What was my net loss on the whole transaction?

14. What is $17\frac{1}{2}\%$ of \$860? $33\frac{1}{3}\%$ of \$270? $12\frac{1}{2}\%$ of \$48? $37\frac{1}{2}\%$ of \$720?

15. I sold for a speculator 5 500 bushels of wheat at 85 cents a bushel. What is my commission at 3%?

16. I made a profit of \$45 on a sale of cloth, and this profit represents 15% of the cost price. What is the cost of the cloth?

17. A merchant suffered a loss of 10% by selling a pair of shoes for \$1.80. Find the cost price.

18. If potatoes cost \$150, for how much would the purchaser have to sell them to gain 40%?

19. By selling a coat for \$18, I lost 40%; what was the cost of the coat?

20. If a merchant sold 37% of a piece of cloth, and has 126 yards left, how many yards were in the whole piece?

21. My neighbor's fortune is \$72 000. His fortune is 20% greater than my brother's fortune. What is my brother's fortune?

22. For how much should I sell a pound of butter that cost 20 cents to gain 25%?

23. A man paid \$20 for a suit, \$2.50 for a hat, and \$4.50 for a pair of shoes. If he has 25% of his money left, how much had he at first?

24. A man bought a farm of 55 acres for \$2 200. If he sold the farm at a profit of 20%, what was his profit per acre?

25. My father's farm is worth \$8 500. I ... is worth only 46% of that sum, what is the value of m ... ?

26. A debtor gave \$800 to his creditor, that is $33\frac{1}{3}\%$ of his total debt. How much was the total debt?

27. I sold, at 25% loss, wheat that had cost me \$1.20 a bushel. How many bushels did I sell, if the total sale amounted to \$225?

28. A man bought three houses for \$1600 each. He sold the first at 10% gain, the second at 15% gain, and the third at 12% loss. What was his net gain?

29. An agent sold 50 cords of wood at \$5.40 a cord. If he kept 10% commission, how much should he give to his principal?

30. A grocer sold sugar for \$550. If by this sale he made a profit of 10% , what was the cost price?

31. What was the cost of a carriage, if it was sold for \$126, and the profit was $12\frac{1}{2}\%$?

32. If a dozen of eggs cost 25 cents, for how much must I sell them to gain 20% ?

33. An agent for farm implements sold a self-binder for \$350. What was his commission at 15% ?

34. A commercial traveler sold \$240 000 worth of goods in one year. If his commission was $2\frac{1}{2}\%$, what was his monthly salary?

35. A real estate broker sold my house for \$5 000, at $4\frac{1}{2}\%$ commission. How much money should he give me as net proceeds?

INTEREST

169. **Interest** is the compensation paid for the use of another's money.

170. The **principal** is the sum of money used and for the use of which money is paid.

171. The **rate of interest** expresses the number of hundredths of the principal to be paid for its use for 1 year.

The legal rate in Canada is 5% .

EXAMPLE I. — Find the interest of \$500, at 6%, for 2 years.

OPERATION.

$$\begin{array}{r} \$500 \\ .06 \\ \hline \$30.00, \text{ int. for 1 yr.} \\ 2 \\ \hline \$60.00, \text{ int. for 2 yr.} \end{array}$$

EXPLANATION.

6 hundredths (.06) of \$500 = \$30, the interest for 1 year.
\$30, int. for 1 year, \times 2, number of years, = \$60, total interest.

EXAMPLE II. — What principal placed at 4% during 3 years will yield \$48 interest?

SOLUTION.

$$\begin{array}{rcll} .04 \times 3 = .12 & \text{of the principal} & = & \text{the interest for 1 yr.} \\ & \text{Since } 12\% & = & \text{3 yr.} \\ & 1\% & = & \$48 \\ & \text{and } 100\% & = & \frac{\$48 \times 100}{12} = \$400, \text{ the} \\ & \text{principal.} & & \end{array}$$

Oral Exercises.

1. What is the interest of \$12 for 1 year at 4%?
2. What is the interest of \$5 for 2 years at 3%?
3. What is the interest of \$50 for 4 years at 5%?
4. What is the interest of \$300 for 2 years at 6%?
5. What is the interest of \$40 for 2 years at 7%?
6. What is the interest of \$20 for 2 years at $5\frac{1}{2}\%$?
7. What is the amount of \$100 for 4 years at 3%?
8. Find the interest of \$60 for 2 years and 6 months at 4%.
9. Find the interest of \$8 for 5 years and 9 months at 8%.
10. What sum placed at 4% will yield \$6.40 interest in 2 years?

Problems on Interest.

11. What is the interest of \$1 000 for 15 years at $2\frac{1}{2}\%$?
12. What is the interest of \$90 for 8 months at 6%?
13. What is the interest of \$550 for 3 years and 6 months at 7%?
14. What is the amount of \$240 for 10 months at 12%?
15. If I borrow \$450 to-day, how much should I give back in 3 years and 3 months at 8%?
16. What principal will, in 8 months at 9%, bring in \$3 interest?
17. What principal will bring in \$320 interest in 1 year and 4 months at 12%?
18. A farmer borrowed \$3 600, 3 years ago. If the rate of interest is 5%, what amount does he owe to-day?
19. A usurer lent \$400 to a workman, and demanded \$436, at the end of 6 months, as principal and interest. If the legal rate was 5%, how much more than the legal interest did he charge?
20. What is the interest of \$75 for 10 years and 2 months at 5%?
21. What is the interest of \$956 for 1 month at 8%?
22. I lent \$2 530 at 5%, 2 years and 3 months ago. How much is owing me to-day, principal and interest?
23. What sum should I pay as principal and interest at 4% on \$200 due 3 years and 9 months ago?
24. I sold a farm for \$5 400, 4 years and 11 months ago, and placed this sum at 7%. What interest should I receive to-day?
25. What is the interest of \$30 for 4 years and 6 months at 15%?
26. What principal placed at 10% brings in \$34.50 interest in 9 months?
27. At the end of 7 months, I owe \$13.30 interest on a sum borrowed at 6%. How much did I borrow?
28. What is the amount of \$36 for 4 months at 4%?

29. What is the interest of \$180.40 for 1 year and 4 months at 5%?

30. Before dying my father left me a legacy of \$15 500 that my tutor put on interest at 8%. How much interest should I receive 3 years and 2 months after?

31. If I made a note for \$250.50, how much should I give to pay the note and 3 months' interest at 7%?

32. A house worth \$7 000 brought in each year \$840 rent. If I sell this house and place my money at $6\frac{1}{2}\%$, how much shall I lose each year?

33. I rent my house for \$24 a month, and the annual rent represents 8% of the value of my house. How much is my house worth?

34. I deposited \$44 in the Hochelaga Bank 6 months ago. What is the interest on this deposit at 3%?

35. An alcoholic spends, on an average, \$3 a week in the saloon. Should he use this money to pay interest at 5% per year, what sum could he borrow?

