

**APPLIED MATHEMATICS FOR GIRLS**



# **APPLIED MATHEMATICS FOR GIRLS**

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## PREFACE

Women and girls who have found their places in business realize the necessity for quick thinking with numbers, and the development of a sort of mathematical sense.

To meet this need, problems from everyday life have been used in this third edition of **APPLIED MATHEMATICS FOR GIRLS**. The author has drawn largely upon her teaching experience in various departments of the Girls' Trades and Technical High School of Milwaukee, Wisconsin. In addition to her own experience, she has made use of suggestions from many sources—interviews, consultations, and correspondence with officials of many industries and public utilities as well as heads of departments in vocational schools; and requests from teachers who have been using the earlier editions of the book.

**APPLIED MATHEMATICS FOR GIRLS** is a basic textbook for secondary education. Girls employed in the business world, as well as housewives, will find it a key to the mathematical problems of their daily life.

THE AUTHOR

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The Author

## TEACHING SUGGESTIONS

In secondary schools, ungraded students of widely different training often report to the same class. Teachers may awaken new interests in these pupils by dividing them into groups according to the last grade attended in the elementary schools and then selecting from *APPLIED MATHEMATICS FOR GIRLS* the work suited to the need of each group. To illustrate: pupils may be drilled in the fundamental operations of integers, common fractions, and decimal fractions; they may review percentage, trades, and commercial problems, and gain a working knowledge of algebra and geometry. By following this method, several groups may work profitably at the same time on individual problems. Since *APPLIED MATHEMATICS FOR GIRLS* has been arranged with a gradual increase of difficulty, teachers who follow this chronological order will find it especially helpful.

As each new topic is introduced, its objective is given and the solution follows, step by step. Because this model is clearly in the student's mind, all succeeding problems in the given lesson may be solved with ease.

An examination of the table of contents will show how readily the teacher can adapt this textbook to the individual needs of her class.

NETTIE STEWART DAVIS

## A TALK WITH THE STUDENT

You have some special gift or talent which you hope to use in your chosen vocation, to improve your home life, and to make yourself helpful to others. You may be working all day at one occupation—designing and cutting garments, drawing pictures, keeping accounts, or typing letters; or you may be turning from one duty to another in your home—planning the dinner, making an apron, a curtain, a cover for the davenport, or just baking a cake. Do you realize that most of these occupations involve the use of mathematics?

Have you permitted your mathematical faculties to become "rusty" through lack of use? Perhaps you have thought of mathematics only as a study. You will enjoy the fun of *applying* it to your daily work.

Skill in using numbers in the ordinary affairs of life is not as difficult to acquire as skill in playing a musical instrument, learning the steps of a new dance, or running a race. All you need is interest and practice. Form the habit of *applying* your knowledge of mathematics.

Don't let yourself be confused by the special words which are used in mathematics. For example, the word *integer* means simply a whole number (not a fraction) and a *digit* is just one of the figures of the number. The number 234 is an integer and 2, 3, and 4 are its digits. Whenever you find, in a problem, a word you do not understand, use your dictionary. You can't study anything without a dictionary.

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## Chapter I

# FUNDAMENTALS OF INTEGERS

**OBJECTIVE:** The general purpose or objective of Chapter I is to establish habits of absolute accuracy and reasonable speed in the four fundamentals of arithmetic.

Skill in applying your knowledge of arithmetic to your everyday living is nothing more than accuracy and speed in addition, subtraction, multiplication, and division, plus the common sense which tells you when to use each one of these fundamental operations.

### LESSON 1

#### Checks for Addition

##### FIRST METHOD:

$$\begin{array}{r} \text{1. } 234 \\ 97 \\ 375 \\ 46 \\ \hline 752 \end{array} \qquad \begin{array}{r} \text{2. } 234 \\ 97 \\ 375 \\ 46 \\ \hline 22 \\ 23 \\ 5 \\ \hline 752 \end{array}$$

Find the sum for the example as shown in 1.

One method used to check addition is given in the following steps:

1. Rewrite the problem. For this check there is no carrying from one column to the other.
2. Find the sum of the first column to the left, and write it under that first column.
3. Continue to find the sum of each column, and write it under that column as given in problem 2.
4. Add these partial sums, and if this sum is the same as that found in problem 1, the addition is correct.

## SECOND METHOD:

234 . . .	9 <sup>(1)</sup> . . .	9 <sup>(2)</sup>
97 . . .	16 . . .	7
375 . . .	15 . . .	6
46 . . .	10 . . .	1
<u>752 . . .</u>	<u>14<sup>(5)</sup> . . .</u>	<u>5<sup>(6)</sup></u>
	<u>50</u>	<u>23<sup>(3)</sup> . . .</u>
		<u>5<sup>(4)</sup></u>

## Explanation of the Second Check

After finding the sum in addition,

1. Find the sum of the digits in the top line, and add these digits until one figure is obtained.
2. Follow this method until all the crosslines have been added so as to obtain a single figure, thus forming a column of single figures.
3. Find the *sum* of these single digits.
4. Then add the digits of that sum. This result will be used for the final check.
5. The next step is to add the digits of the sum, or answer, of the problem. Continue the addition of these digits until one figure is obtained.
6. If the result of step 4 is the same as the result of step 6, the problem is checked.

## LESSON 2

Check each of the following after finding the sum:

1. \$ 567.80	2. \$9,225.45	3. 5,383	4. \$837.50
809.76	6,005.34	6,962	7.367
74.43	9,870.02	4,599	56.96
13.82	2,256.73	7,789	843.955
105.57	9,875.64	4,587	3.604
<u>1,567.95</u>		6,956	<u>5.964</u>
		5,647	
		8,248	
5. 7,684	6. 2,345	3,978	8. 768,459
3,891	7,980		724,838
7,642	1,040	7. 7,654	683,075
1,879	1,615	3,124	865,096
2,679	2,254	8,765	8,375
<u>8,976</u>	<u>3,333</u>	9,381	<u>46,759</u>

## FUNDAMENTALS OF INTEGERS

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9. 959,614	10. 84,679	11. 490,339	12. 58,516
2,624,176	13,045	147,623	21,359
1,760,170	6,804	473,598	53,498
1,908,149	956	254,936	48,802
<u>1,492,037</u>	<u>3,047</u>	<u>397,437</u>	<u>49,726</u>

### LESSON 3

Adding certain numbers always brings the *same right-hand figure*, as shown in the

First illustration or       $8 + 7 = \underline{15}$        $27 + 8 = \underline{35}$

Second illustration or       $8 + 9 = \underline{17}$        $29 + 8 = \underline{37}$

1.	$\frac{7}{8}$	$\frac{27}{8}$	$\frac{68}{7}$	$\frac{48}{17}$	$\frac{128}{47}$
	<u>15</u>	<u>35</u>	<u>75</u>	<u>65</u>	<u>175</u>

2.	$\frac{9}{8}$	$\frac{29}{8}$	$\frac{69}{8}$	$\frac{49}{28}$	$\frac{129}{48}$
	<u>17</u>	<u>37</u>	<u>77</u>	<u>77</u>	<u>177</u>

### LESSON 4

1. 7,348	2. 47,832	3. \$632.47	4. 5,627
3,925	6,274	61.89	3,246
106	32,446	462.74	18,792
7,531	<u>78,581</u>	257.86	22,318
<u>8,643</u>		625.34	6,575
		<u>486.97</u>	<u>7,446</u>

5. 71,416	6. 5,438	7. 125,679	8. 33,743
235,420	16,579	90,167	36,169
97,787	9,276	367,185	53,209
53,296	12,943	58,147	51,700
189,724	<u>6,827</u>	<u>29,274</u>	<u>21,621</u>
312,078		<u>183,264</u>	<u>64,004</u>
121,633			16,513
<u>85,739</u>			<u>58,327</u>

## APPLIED MATHEMATICS FOR GIRLS

9. 3,165	10. 58,621	11. 43,948	12. 74,398
4,836	34,680	65,837	85,912
8,265	75,196	64,926	79,458
4,436	57,205	83,797	23,506
<u>5,768</u>	<u>86,321</u>	<u>47,853</u>	<u>87,016</u>
	4,386		
	<u>52,171</u>	<u>63,434</u>	<u>70,707</u>

## LESSON 5

1. 27,624	2. 8,543	3. 9,987	4. 3,721
8,792	4,621	4,372	1,825
19,643	5,875	18,586	6,083
23,360	9,326	3,241	3,659
31,067	<u>4,434</u>	<u>12,079</u>	<u>4,562</u>
<u>49,003</u>			<u>3,041</u>
5. 20,787	6. 82,028	7. 6,535	8. 1,436
9,276	69,304	4,225	5,160
24,535	37,830	1,916	4,560
27,684	19,509	1,722	4,632
<u>31,561</u>	<u>49,600</u>	<u>5,061</u>	<u>8,378</u>
	<u>87,498</u>	<u>3,519</u>	
9. 33,479	10. 85,372	11. 73,963	12. 48,713
24,186	76,954	42,457	23,877
41,063	48,327	31,286	37,624
36,311	87,265	58,493	13,729
<u>57,693</u>	<u>29,876</u>	<u>69,847</u>	<u>48,679</u>

## Cross Addition

**OBJECTIVE:** Cross addition is much used in business. Practice the following lessons till you can add horizontally as readily as you can add vertically.

This skill will be valuable to you, especially in keeping records of such items as your weekly sales as a clerk in a store and the hours and wages of the employees of a business.

## LESSON 6

Add without writing in a column. Check your answers.

$$1. 100 + 75 + 28 + 32 + 67 + 59 =$$

$$2. 21 + 648 + 195 + 16 + 200 + 65 =$$

3.  $108 + 225 + 17 + 102 + 75 + 399 =$
4.  $23 + 106 + 295 + 519 + 63 + 54 =$
5.  $27 + 101 + 38 + 16 =$
6.  $100 + 200 + 300 =$
7.  $\$1.98 + \$6.02 + \$ .98 + \$ .49 =$
8.  $1.2 + 6.09 + .7 + .89 + 17 =$
9.  $3 \text{ ft.} + 7 \text{ yd.} + 72 \text{ in.} =$
10.  $2 \text{ ft.} + 8 \text{ in.} + 6 \text{ ft.} + 3 \text{ in.} + 13 \text{ in.} =$
11.  $7 \text{ lb.} + 8 \text{ oz.} + 16 \text{ oz.} + 24 \text{ oz.} =$
12.  $2 \text{ lb.} + 9 \text{ oz.} + 7 \text{ oz.} + 8 \text{ oz.} =$
13.  $3 \text{ qt.} + 5 \text{ pt.} + 7 \text{ pt.} + 6 \text{ qt.} =$
14.  $8 \text{ yd.} + 22 \text{ ft.} + 5 \text{ yd.} + 5 \text{ ft.} =$
15.  $8 \text{ qt.} + 6 \text{ pt.} + 3 \text{ pt.} + 1 \text{ gal.} =$

Add both ways. Check.

16. $7 + 12 + 8 + 20 =$	$17. 12 + 32 + 68 + 18 + 74 =$
$3 + 3 + 4 + 8 =$	$95 + 18 + 19 + 17 + 25 =$
$10 + 15 + 18 + 16 =$	$83 + 32 + 24 + 8 + 13 =$
$\underline{9 + 8 + 20 + 13 =}$	$7 + 64 + 16 + 9 + 12 =$
	$\underline{20 + 5 + 6 + 22 + 10 =}$

## LESSON 7

To check cross addition, find the sum of each line and add these sums; then find the sum of the columns and the cross sum of the columns. If these two sums are the same, the problem is correct.

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1. Find the weekly sales for each clerk and the daily sales for the firm:

Clerk	Mon.	Tues.	Wed.	Thur.	Fri.	Total
A	\$19.98	\$22.36	\$16.19	\$18.93	\$21.18	
B	\$17.49	\$18.29	\$15.50	\$16.60	\$24.95	
C	\$21.16	\$12.34	\$18.28	\$19.95	\$15.75	
D	\$12.88	\$19.77	\$20.00	\$11.75	\$15.00	
E	\$15.67	\$13.50	\$25.00	\$10.99	\$20.65	
Total						

2. Find the weekly sales for each clerk and the daily sales for the firm:

Clerk	Sales on Mon.	Sales on Tues.	Sales on Wed.	Sales on Thur.	Sales on Fri.	Sales on Sat.	Sales Total
A	\$22.50	\$42.00	\$19.95	\$ 9.85	\$12.50	\$18.25	
B	\$13.25	\$25.35	\$17.29	\$24.75	\$18.95	\$12.84	
C	\$18.75	\$21.98	\$15.89	\$28.68	\$ 7.50	\$17.82	
D	\$19.98	\$15.85	\$17.35	\$26.84	\$17.28	\$ 9.99	
E	\$45.50	\$19.95	\$35.00	\$17.88	\$22.32	\$25.28	
F	\$28.39	\$30.28	\$18.85	\$22.22	\$16.85	\$16.82	
Total							

## FUNDAMENTALS OF INTEGERS

LESSON 8

1. Find the hours and wages for the following employees, and the total number of hours and wages to be paid by the company:

2. Find the weekly wages for the following employees:

<i>Person</i>	<i>Hr.</i> <i>Mon.</i>	<i>Hr.</i> <i>Tues.</i>	<i>Hr.</i> <i>Wed.</i>	<i>Hr.</i> <i>Thur.</i>	<i>Hr.</i> <i>Fri.</i>	<i>Hr.</i> <i>Sat.</i>	<i>Total</i> <i>Hr.</i>	<i>Wages</i> <i>per</i> <i>Hour</i>	<i>Week-</i> <i>ly</i> <i>Wages</i>
1	8	7½	6½	7½	6	8		\$ .58	
2	6½	6	7	8	7½	7		.57½	
3	7½	8	8	6	7	6½		.56	
4	7	8	6	6½	8	8		.56	
5	8	6½	8	8	6½	6		.57½	
6	6	7	7½	7	8	8		.57½	

3. Find the weekly wages for the following employees, and the total number of hours and wages to be paid by the company:

# FUNDAMENTALS OF INTEGERS

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## LESSON 9

1. In a factory where piecework is figured find the weekly wages for the following employees:

<i>Person</i>	<i>Pcs. on Mon.</i>	<i>Tues.</i>	<i>Wed.</i>	<i>Thur.</i>	<i>Fri.</i>	<i>Sat.</i>	<i>Total No. of Pieces</i>	<i>Price per Piece</i>	<i>Week- ly Wages</i>
1	96	98	94	103	90	48		\$ .04	
2	92	97	90	98	88	43		\$ .04	
3	95	97	93	102	89	47		\$ .04	
4	94	99	92	100	90	45		\$ .04	
5	93	100	93	99	89	45		\$ .04	
6	90	98	88	100	88	44		\$ .04	
7	91	95	90	102	90	46		\$ .04	

2. Find the weekly wages for piecework of the following employees:

<i>Person</i>	<i>Pcs. on Mon.</i>	<i>Tues.</i>	<i>Wed.</i>	<i>Thur.</i>	<i>Fri.</i>	<i>Sat.</i>	<i>Total No. of Pieces</i>	<i>Price per Piece</i>	<i>Week- ly Wages</i>
1	40	42	40	44	41	21		\$ .19	
2	36	40	38	39	38	18		\$ .18	
3	48	45	47	44	46	25		\$ .20	
4	45	50	48	45	44	24		\$ .21	

3. Find the weekly wages for the following people:

<i>Person</i>	<i>Hr. Mon.</i>	<i>Hr. Tues.</i>	<i>Hr. Wed.</i>	<i>Hr. Thur.</i>	<i>Hr. Fri.</i>	<i>Hr. Sat.</i>	<i>Total Hr.</i>	<i>Wages per Hour</i>	<i>Week- ly Wages</i>
Alice Horn	8	7	8	6½	7½	4		\$ .45	
Helen Martin	6½	8	7½	7	8	3		.42	
Ethel Rose	7½	7	7½	8	7½	3½		.55	
Lois Reed	6½	8	6½	7½	8	4		.40	
Marie Hill	7	8	8	5	8	4		.50	
Betty Mason	8	6½	7	7½	8	5		.60	
Rita Marsh	8	7	8	8	7	3½		.48	

4. Find the weekly wages for piecework of the following employees:

<i>Person</i>	<i>Pcs. on Mon.</i>	<i>Tues.</i>	<i>Wed.</i>	<i>Thur.</i>	<i>Fri.</i>	<i>Sat.</i>	<i>Total No. of Pieces</i>	<i>Price per Piece</i>	<i>Week- ly Wages</i>
1	100	95	102	98	105	55		\$ .04	
2	90	87	95	89	85	48		\$ .04	

## FUNDAMENTALS OF INTEGERS

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### Checks for Subtraction, Multiplication, and Division

**OBJECTIVE:** To acquire speed and accuracy. When you are solving problems for yourself or your employer, you do not have a teacher or an answer book to verify your work.

Learn at least one simple method of checking the accuracy of each fundamental process. Then you will know that your work is correct.

### LESSON 10

#### FIRST METHOD:

To check subtraction, add the remainder and the subtrahend, and the sum is the minuend.

#### EXAMPLE:

$$\begin{array}{r} 346,978 \text{ minuend} \\ 112,364 \text{ subtrahend} \\ \hline 234,614 \text{ remainder} \\ 346,978 \text{ minuend} \end{array}$$

Subtract and check the following:

1. 7,654,320	2. 846,938	3. 846,923	4. 89,476,829
<u>1,492,176</u>	<u>628,299</u>	<u>489,376</u>	<u>74,826,932</u>
5. 954,378			
<u>872,969</u>			

#### SECOND METHOD:

To use addition to check subtraction, find the number which, added to 4, makes 8. In like manner, what number added to 6 equals 7, etc.? (This illustrates the additive method.)

Work the example at the right by this method: 346,978

6. 57,652	7. 64,877	<u>112,364</u>
<u>38,431</u>	<u>18,589</u>	<u>234,614</u>
8. 87,421	9. 424,400	10. 205,138
<u>57,698</u>	<u>65,879</u>	<u>179,763</u>

## LESSON 11

1. 873,420	2. 1,873	3. 213,416	4. 96,573
<u>576,480</u>	<u>796</u>	<u>57,769</u>	<u>42,806</u>
5. 18,576	6. 896,342	7. 423,649	8. 798,340
<u>13,923</u>	<u>57,963</u>	<u>329,420</u>	<u>526,498</u>
9. 876,209	10. 587,421	11. 935,504	12. 730,107
<u>59,729</u>	<u>269,328</u>	<u>318,876</u>	<u>347,029</u>

## LESSON 12

1. 182,540	2. 791,322	3. 73,926	4. 5,426,873
<u>126,829</u>	<u>523,641</u>	<u>47,853</u>	<u>2,278,459</u>
5. 437,631	6. 774,267	7. 185,920	8. 91,738
<u>277,318</u>	<u>426,548</u>	<u>117,609</u>	<u>78,526</u>
9. 94,229	10. 816,480	11. 863,198	12. 638,467
<u>83,837</u>	<u>271,842</u>	<u>487,289</u>	<u>347,579</u>

## LESSON 13

## Checks for Multiplication

A proof for multiplication is to divide the product by the multiplier, and if the quotient is the same as the multiplicand, the multiplication is correct.

## EXAMPLE:

Multiplicand	6891
Multiplier	<u>89</u>
	62019

## FIRST METHOD:

Divisor	<u>89</u>	613299	product (6891)	Quotient
		55128		
			534	
			792	
			712	
			809	
			801	
			89	
			89	

## SECOND METHOD:

This short method of checking multiplication is a timesaver and is simple.

Multiplicand	6891 . . . 24 <sup>(1)</sup> . . . 6 <sup>(2)</sup>	
Multiplier	$\times 89 . . . 17^{(3)} . . . \underline{\times 8^{(4)}}$	
	<u>62019</u>	<u>48<sup>(5)</sup> . . . 12<sup>(6)</sup> . . . 3<sup>(7)</sup></u>
	55128	
Product or answer	<u>613299 . . . 30<sup>(8)</sup> . . . 3<sup>(9)</sup></u>	

Follow the same method of checking as used in addition.

Multiply as usual, and prove as follows:

1. Add the digits of the multiplicand.
2. Add these digits until a single figure is obtained.
3. Add the digits of the multiplier.
4. Add these digits until a single figure is obtained.
5. Then *multiply* the sum found in step 2 by the sum found in step 4.
6. In this example,  $6 \times 8 = 48$ . Add the digits of 48:  $4 + 8 = 12$ .
7. Add the digits of the last figure obtained which is 12. This will give you a single figure:  $1 + 2 = 3$ .
8. The sum of the digits of the product or answer is 30.
9. The sum of the digits of 30 is 3. If the answer in step 9 is the same as in step 7, the problem is checked.

## LESSON 14

Multiply and check each of the following problems:

1. 76,443	2. 94,073	3. 4,675	4. 196,750
<u><math>\times 75</math></u>	<u><math>\times 706</math></u>	<u><math>\times 17</math></u>	<u><math>\times 43</math></u>
5. 864,973	6. 94,638	7. 342,987	8. 786,402
<u><math>\times 169</math></u>	<u><math>\times 492</math></u>	<u><math>\times 234</math></u>	<u><math>\times 267</math></u>
9. 4,679	10. 7,846	11. 765,024	12. 283,754
<u><math>\times 431</math></u>	<u><math>\times 88</math></u>	<u><math>\times 863</math></u>	<u><math>\times 946</math></u>

## LESSON 15

Multiply and check each problem:

1. 543

68

2. 643

32

3. 927

62

4. 845

93

5. 627

58

6. 432

682

7. 697

253

8. 784

196

9. 681

719

10. 477

226

## LESSON 16

Multiply and check each problem:

1. 1427

86

2. 5428

.92

3. 8654

78

4. 9732

58

5. 7752

48

6. 7658

342

7. 8731

564

8. 3720

937

9. 4895

782

10. 3696

473

## LESSON 17

Multiply and check each problem:

1. \$42.78

129

2. \$68.91

243

3. 6841

82

4. 74,125

685

5. 961,432

69

6. 7625

526

7. 2342

686

8. 21,186

4225

9. 6892

298

10. 3875

682

11. 7594

734

12. 37,509

593

## LESSON 18

## Checks For Division

## FIRST METHOD:

The checks for division are similar to those for addition and multiplication. See page 2, Lesson 1, and page 13, Lesson 13.

## EXAMPLE:

$$\begin{array}{r}
 \begin{array}{r} (3) \dots 3 \\ (2) \dots 21 \end{array} \quad \begin{array}{r} 3 \times 5 = 15^{(4)} \\ +4 \text{ rem.} \end{array} \\
 \begin{array}{r} (1) \dots 5 \\ 23 \end{array} \quad \begin{array}{r} 4188 \\ \overline{)96328} \dots 28^{(6)} \dots 10^{(7)} \dots 1^{(8)} \\ 92 \\ \overline{43} \\ 23 \\ \overline{202} \\ 184 \\ \overline{188} \\ 184 \\ \overline{4 \text{ (rem.)}} \end{array}
 \end{array}$$

## EXPLANATION:

1. The sum of the digits of the divisor is 5.
2. The sum of the digits of the quotient is 21.
3. The sum of these digits is 3.
4. The sum of the digits of the quotient multiplied by the sum of the digits of the divisor is 15.
5. To this product (15) add the remainder (4), which equals 19.
6. Add the digits of 19 until a final digit is obtained:  $1 + 9 = 10$ .  $1 + 0 = 1$ .
7. Next find the sum of the digits of the dividend which is 28.
8. The sum of these digits is 10.
9. When the final sum obtained in step 5, by the process just explained, equals the final sum of the dividend digits in step 8, the problem checks.

## SECOND METHOD:

Quotient      4188

Divisor       $\times 23$ 12564

8376

Product      96324

Remainder      +4

Dividend      96328

Multiply the quotient by the divisor and add the remainder, and if the result equals the dividend, the problem checks.

Students have discovered for themselves this second method of checking division. It is the more obvious method, but it requires more work than the first one. Check a number of problems by the first method. You will see that all the work can be done mentally and that the process is both fast and simple.

## LESSON 19

1. When the divisor is 13 and the dividend is 392,652, what is the quotient?

2.  $64,307 \div 28 = ?$

6.  $642,061 \div 91 = ?$

3.  $193,468 \div 37 = ?$

7.  $834,250 \div 575 = ?$

4. Divide 36,495 by 57.

$\frac{1}{57} \times 834,250 = ?$

5.  $64,590 \div 15 = ?$

(Use cancellation.)

$\frac{1}{15} \times 64,590 = ?$

8.  $807,245 \div 264 = ?$

(Use cancellation.)

9.  $59,687 \div 432 = ?$

10.  $1,258,402 \div 570 = ?$

## LESSON 20

Divide and check each problem:

1.  $45,648 \div 48$

6.  $562,536 \div 468$

2.  $96,447 \div 39$

7.  $897,468 \div 523$

3.  $85,608 \div 82$

8.  $783,720 \div 376$

4.  $64,719 \div 27$

9.  $634,653 \div 453$

5.  $27,572 \div 61$

10.  $268,946 \div 687$

## LESSON 21

Divide and check each problem:

1.  $55,269 \div 621$

5.  $5,236,374 \div 374$

2.  $837,336 \div 278$

6.  $50,068,514 \div 4,001$

3.  $126,665 \div 329$

7.  $8,965,194 \div 678$

4.  $387,942 \div 253$

8.  $15,867 \div 738$

- |                             |                             |
|-----------------------------|-----------------------------|
| 9. $8,524,615 \div 3,245$   | 13. $10,989,178 \div 8,568$ |
| 10. $1,286,477 \div 1,865$  | 14. $7,184,346 \div 4,397$  |
| 11. $86,730,995 \div 4,735$ | 15. $331,401 \div 2,569$    |
| 12. $6,489,298 \div 7,391$  |                             |

### Divisibility of Numbers

**OBJECTIVE:** To train yourself to see at a glance whether a number is divisible by a given number without a remainder. This will save time for yourself or your employer.

#### LESSON 22

An *even* number ends in 0, 2, 4, 6, 8, and is divisible by 2.

An *odd* number is not divisible by 2.

A number is divisible by 3 if the *sum* of its digits is divisible by 3.

**EXAMPLE:**

$471 \dots 4 + 7 + 1 = 12 \div 3 = 4$ . Therefore 471 is divisible by 3.

A number is divisible by 6 when it is divisible by 2 and by 3.

**EXAMPLE:**

$498 \div 2 = 249$ ; and  $498 \div 3 = 166$ . Therefore 498 is divisible by 6.

A number is divisible by 9 if the sum of its digits is divisible by 9.

**EXAMPLE:**

$675 \dots 6 + 7 + 5 = 18 \div 9 = 2$ . Therefore 675 is divisible by 9.

A number is divisible by 4 when its two right-hand digits are divisible by 4.

**EXAMPLE:**

$476 \dots 76 \div 4 = 19$ . Therefore 476 is divisible by 4.

A number is divisible by 8 when its 3 right-hand digits are divisible by 8.

**EXAMPLE:**

$2120 \dots 120 \div 8 = 15$ . Therefore 2120 is divisible by 8.

A number is divisible by 5 when it ends in 5 or 0.

A number is divisible by 10 when it ends in 0.

### LESSON 23

From the following, select the numbers which are divisible by the numbers given in the foregoing:

	<i>Number</i>	<i>Divisible by</i>		<i>Number</i>	<i>Divisible by</i>
1.	752		6.	9582	
2.	550		7.	7824	
3.	3468		8.	322,645	
4.	501		9.	8955	
5.	675		10.	1824	

### Drill in Fundamental Combinations

**OBJECTIVE:** To train yourself in rapid calculation. You always enjoy the work or play in which you are skillful. You will enjoy lessons 24 and 25.

In the following problems, perform each arithmetical operation in the order in which it is given. Thus, in problem 1:  $6 \times 5 = 30$ ,  $30 + 7 = 37$ ,  $37 - 5 = 32$ ,  $32 \div 8 = 4$ ,  $4 \times 6 = 24$ ,  $24 + 24 = 48$  Answer.

### LESSON 24

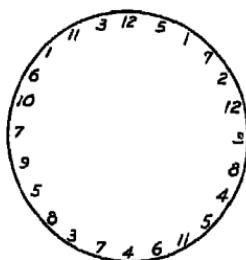
1.  $6 \times 5 + 7 - 5 \div 8 \times 6 + 24 =$
2.  $10 \times 10 \div 10 + 10 - 10 =$
3.  $13 + 12 \times 3 \div 25 =$
4.  $17 + 8 \div 5 + 95 \div 10 =$
5.  $13 \times 3 + 9 \div 4 - 10 \times 10 =$
6.  $3 \times 3 + 3 \div 3 - 3 =$
7.  $8 \div 0 + 8 \times 8 - 50 \times 2 =$
8.  $50 - 25 \times 4 \div 10 + 9 - 4 \times 3 =$
9.  $3 \times 12 + 12 \div 4 \times 12 \div 6 =$
10.  $7 + 5 \div 3 \times 4 + 9 \times 0 =$
11.  $75 \div 5 \times 4 \div 20 + 15 \times 2 =$
12.  $50 \div 5 \times 10 + 25 - 50 \div 3 =$

13.  $8 \times 9 + 16 \div 8 + 9 \div 4 \times 13 =$   
 14.  $100 \div 4 \times 3 - 15 \div 3 \times 5 =$   
 15.  $81 \div 9 \times 3 + 7 \times 2 - 18 \div 25 =$

Make a set of problems similar to the foregoing. Keep this set with your answers; then make a duplicate set without answers. Exchange this set of problems with one of your classmates who will work the problems and return them to you for correction. Work as accurately and quickly as you can. Each one of your classmates participates in making and correcting such a lesson.

### Drill Device for Addition and Multiplication

#### LESSON 25



You may use this device as a game by having a plus (+) sign in the center with any given number placed before the sign; then, with a pointer see how rapidly you can give the answer by adding the given number to any of the numbers in the circle. Change the center number and continue.

The multiplication sign ( $\times$ ) with a number before it can be used and the game continued.

A useful drill in division may be effected by using in the center numbers from 12 to about 110 with the divisor sign *after* the number.

A subtraction drill will be equally effective. Use the same circle as for the other processes. Then make a circle with 10, 20, 30, etc., up to 100 and put a minus sign *before* the letter in the center.

## Short Cuts in Arithmetic

**OBJECTIVE:** To gain speed in mental arithmetic and to make the problems simpler and more interesting. Perhaps you have already discovered some of these short cuts for yourself.

**LESSON 26**

To multiply by:

1. 10 . . . add a zero to the number, as 989

$$\begin{array}{r} \times 10 \\ \hline 9890 \end{array}$$

2. 5 . . . add a zero and divide by 2,  
as 989

$$\begin{array}{r} \times 5 \\ \hline 9890 \\ \hline 2 \end{array} = 4945.$$

3. 11 . . . add a zero to the number and add the original number, 989 = 9890

$$\begin{array}{r} \times 11 \\ \hline 989 \\ \hline 10879 \end{array}$$

4. 22 . . . add a zero to twice the number and add two times the number, as 989 = 19780

$$\begin{array}{r} \times 22 \\ \hline 1978 \\ \hline 21758 \end{array}$$

5. 4 . . . add a zero to the number, divide by 2, and subtract the number, as 989 = 9890 ÷ 2 = 4945

$$\begin{array}{r} \times 4 \\ \hline -989 \\ \hline 3956 \end{array}$$

6. 25 . . . multiply by 100 by adding two zeros to the number and divide by 4, as 975 = 97500 ÷ 4 = 24375.

$$\begin{array}{r} \times 25 \\ \hline \quad \quad \quad 4 \end{array}$$

7. 9 . . . add zero to the number and subtract the original number as 989 = 9890

$$\begin{array}{r} \times 9 \\ \hline -989 \\ \hline 8901 \end{array}$$

## Problems in Short Cuts

## LESSON 27

Multiply the following, using the short cuts:

1. $345 \times 11 =$	6. $103 \times 11 =$	11. $722 \times 11 =$
2. $209 \times 10 =$	7. $7777 \times 5 =$	12. $308 \times 9 =$
3. $1888 \times 5 =$	8. $8932 \times 9 =$	13. $768 \times 4 =$
4. $732 \times 9 =$	9. $2762 \times 10 =$	14. $94 \times 5 =$
5. $872 \times 4 =$	10. $398 \times 4 =$	15. $83 \times 4 =$

## LESSON 28

Review of fundamentals:

1.  $3,467,596$

$\times 587$

Check

2.  $846,347 \div 27 = ?$

3.  $\$46\frac{3}{4} + \$7.35 + \$5\frac{45}{100} + \$36.25 = ?$

4. From  $\$13.85$  take  $\$6\frac{5}{8}$ .

5. Add:  $4,376$

728

9,638

475

4,685

Check

6. Anne bought the following goods: 3 yd. percale @ 25¢;  $2\frac{1}{4}$  yd. poplin @ 60¢; a wool dress for \$7.45; a hat for \$2.98; shoes for \$3.49; a coat for \$25.95.

How much was her bill?

She paid  $\frac{1}{4}$  of the bill in cash and received a 3% discount on that amount.

How much was the discount?

How much was the cash payment?

How much remained on her charge account?

## Chapter II

### TABLES OF MEASUREMENTS

**OBJECTIVE:** To acquaint you with the common tables of weights and measurements and to help you to use them in solving practical problems. These tables of weights, measures, time, money, etc., are used constantly in business and at home. You will find it necessary to refer to them frequently.\*

#### Linear Measure

12 in.	= 1 ft.
3 ft.	= 1 yd.
16½ ft.	= 1 rd.
5½ yd.	= 1 rd.
320 rd.	= 1 mi.
5280 ft.	= 1 mi.

#### Square Measure

12 <sup>2</sup> or 144 sq. in.	= 1 sq. ft.
3 <sup>2</sup> or 9 sq. ft.	= 1 sq. yd.
16½ <sup>2</sup> or 272½ sq. ft.	= 1 sq. rd.
5½ <sup>2</sup> or 30½ sq. yd.	= 1 sq. rd.
320 <sup>2</sup> or 102,400 sq. rd.	= 1 sq. mi.
160 sq. rd.	= 1 acre
640 A.	= 1 sq. mi.
1 sq. mi.	= 1 section
36 sq. mi.	= 1 township

#### Cubic Measures

##### Cubical Contents

12 <sup>3</sup> or 1728 cu. in.	= 1 cu. ft.
3 <sup>3</sup> or 27 cu. ft.	= 1 cu. yd.

##### Dry Measure

1 bu.	= 2,150.42 cu. in.
8 bu.	= 10 cu. ft.

#### Liquid Measure

231 cu. in.	= 1 gal.
7½ gal. (7.48 gal.)	= 1 cu. ft.
62½ lb.	= 1 cu. ft. (water)

#### Wood Measure

16 cu. ft.	= 1 cord ft.
8 cd. ft.	= 1 cd.
128 cu. ft.	= 1 cd.

\*Additional tables will be found in Appendix III.

The power of a number is the product of that number used as a factor a given number of times, indicated by a small figure or exponent at the upper right of the number, thus:

$$3^2 = 3 \times 3 = 9; 5^3 = 5 \times 5 \times 5 = 125.$$

Linear measure is changed to square and cubic measures in this manner, by using the linear table and raising figures to the second or third power.

Memorize the linear-measure table, then develop your own tables for square and cubic measures.

Linear or line measure is used to measure yardage for dress materials, drapes, lace, ribbons, carpets, etc. Square measure is used to find the square surfaces used in painting, papering, varnishing, cement sidewalks, cement floors in basements, linoleum, etc.

Cubic measure is used to figure the cubical contents for basements, ditches, bins, tanks, etc.

By understanding this explanation of measurements you may make yourself useful in positions where these tables are used.

You can figure the cost of materials for your home such as curtains, drapes, linoleum, painting, varnishing, papering, etc. To the cost of materials, add the labor charges and you have an estimate of the cost. Many women do this work in their own homes and assist their neighbors in such problems.

Draw a straight line 12 in. long (mark the inches) linear measure. Use the 12-in. line and make a square having 12 in. on each side. Connect these marks by lines and you have a square foot or  $12^2 = 144$  sq. in. in 1 sq. ft. (square measure).

By following the foregoing suggestions, make a drawing of a box having equal sides of 12 in. Imagine the lines which are made on all sides connected by lines and you have a cube with all sides alike or  $12^3 = 12 \times 12 \times 12 = 1728$  cu. in. in one cubic foot (cubic measure). A paper box would illustrate this suggestion.

Measure of Units	Paper Measures
12 articles = 1 doz.	24 sheets = 1 quire
12 doz. } = 1 gross	20 quires = 1 ream
144 articles	480 sheets = 1 ream
12 gross = 1 great gross	500 sheets = 1 ream typing paper
20 articles = 1 score	

Long Ton		Dry Measure	
28 lb.	= 1 quarter	2 pt.	= 1 qt.
4 quarters	= 1 long cwt.	8 qt.	= 1 pk.
20 long cwt.	= 1 long ton	4 pk.	= 1 bu.
2240 lb.	= 1 long ton	105 qt.	= 1 bbl.*
		7056 cu. in.	= 1 bbl.*

## Liquid Measure

4 gills	= 1 pt.
2 pt.	= 1 qt.
4 qt.	= 1 gal.
31 $\frac{1}{2}$ gal.	= 1 bbl.
63 gal.	= 1 hhd.
2 bbl.	= 1 hhd.

## Problems for Measurement Tables

## LESSON 29

Complete the following:

1. — tbsp. in 1 qt.
2. — fluid oz. in  $\frac{1}{2}$  gal.
3. — drams in 2 lb.
4. — scruples in 1 lb.
5. 10 pennyweight = — grains.
6. — pennyweight = 1 oz.
7. 8 bbl. = — pk.
8. — qt. = 1 bu.
9.  $4\frac{1}{2}$  ton = — lb.
10.  $3\frac{3}{4}$  lb. = — oz.

State whether the following answers are true (T) or false (F).

11. 9 gills = 2 pt.
12.  $2\frac{1}{2}$  gal. = 10 qt.
13.  $1\frac{1}{2}$  long tons = 3360 lb.
14. 1 gross = 11 doz.
15. 3 reams of typing paper = 1548 sheets.
16. 5 =  $\frac{1}{3}$  of a score.
17. "Four score and seven years ago" = 87 years.
18. 1 lb. = the same as 96 drams.
19.  $5\frac{1}{2}$  ft. = 1 rd.
20. 3 mi. = 15,840 ft.
21. 2 sq. rd. = 60 sq. rd.
22. 144 sq. in. = 1 sq. ft.
23. 7 gal. = 1617 cu. in.
24. 5 cu. ft. =  $37\frac{1}{2}$  gal.
25.  $2\frac{1}{2}$  cords of wood = 40 cu. ft.

\*For fruits and vegetables.

# TABLE OF MEASUREMENTS

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## Money Tables

<i>Country</i>	<i>Monetary Unit</i>	<i>Normal Value in U. S. Money</i>
Austria	Krone	\$ .203
Belgium	Franc	.027
Brazil	Milreis	.546
Canada	Dollar	1.00
Chile	Peso	.121
Denmark	Krone	.268
France	Franc	.193
Germany	Mark (Reichsmark)	.238
Great Britain	Pound Sterling	4.8665
India	Rupee	.365
Italy	Lira	.193
Japan	Yen	.498
Mexico	Peso	.498
Netherlands	Florin (Gulden)	.402
Norway	Krone	.268
Philippine Is.	Peso	.50
Sweden	Krona	.268
Switzerland	Franc	.193

## United States Money

10 mills	= 1 cent (¢)
10 cents	= 1 dime (di.)
10 dimes	= 1 dollar (\$)
10 dollars	= 1 eagle (E.)

## English Money

## U. S. Value

4 farthings (far.)	= 1 penny (d.) — \$0.02
12 pence	= 1 shilling (s.) — \$0.24½
5 shillings	= 1 crown — \$1.21¾
20 shillings	= 1 pound (£) or a sovereign — \$4.8665
21 shillings	= 1 guinea — \$5.109

## LESSON 30

Using the Money Table, find the value of the following in U. S. money:\*

- |                              |                                |
|------------------------------|--------------------------------|
| 1. (a) 20 farthings (far.) = | 2. (a) 24 pennies = ? farthing |
| (b) 48 pence =               | (b) 4 shilling = ? pence       |
| (c) 25 shillings (s) =       | (c) 12 crowns = ? shilling     |
| (d) 8 pounds (£) =           | (d) 3 pounds = ? shilling      |
| 3. (a) 28¢ = ? pennies       | (c) \$3.65 = ? shillings       |
| (b) 73¢ = ? shillings        | (d) \$1.00 = ? farthings       |

$\frac{1}{10}$  of a cent = 1 mill  $\therefore \$16.004$  is read as sixteen dollars and 4 mills.

4. Read the following, taking special notice of the mills.  
\$3.008; \$12.054; \$8.256; \$16.582.
5. Give the number of mills in the following:  
(a) 1¢      (b) 5¢      (c) 3¢      (d) 10¢

## Review Problems

OBJECTIVE: To review denominations\*\* numbers involving the tables studied.

## LESSON 31

1.  $\frac{1}{4}$  in. =  $\frac{7}{8}$  in. =  $\frac{7}{10}$  in.?
2.  $\frac{3}{4}$  yd. =  $\frac{7}{10}$  yd. =  $\frac{7}{8}$  yd.
3.  $\frac{1}{2}$  ft. =  $\frac{7}{32}$  ft. =  $\frac{7}{8}$  ft.
4.  $\frac{2}{3}$  rods =  $\frac{7}{8}$  rods =  $\frac{7}{10}$  rods.
5. If 1 yd. of rayon costs 79¢, find the cost of  $\frac{5}{8}$  yd.
6. If 2 yd. of wool crepe cost \$3.96, find the cost of  $\frac{1}{2}$  yd.
7. If 1 doz. eggs cost 30¢, find the cost of 10 eggs.
8. If 1 doz. oranges cost 29¢, find the cost of  $\frac{4}{5}$  oranges.

\*For other problems in U. S. money see Chapter IX, Sales Technique.  
\*\*Denominations or concrete numbers are numbers joined to names of things. For example, 5 feet, 10 eggs. Numbers that do not refer to particular objects are called abstract numbers or just numbers. For example, 5, 10.

## TABLE OF MEASUREMENTS

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9. If 1 gross of shoes cost \$496.80, find the cost of 1 pair of shoes.
10. If 1 gross of stockings cost \$84.96, find the cost of  $\frac{1}{2}$  doz.
11. \$10 = how many dimes? \$10 = how many quarters?
12. \$5 = how many cents? \$5 = how many nickels?
13. \$3 = how many halves? \$10 = how many nickels?
14. 10 nickels =                    15. Read the following:

5 quarters =	\$1,532.68	2,598
30 halves =	\$10,299.99	19,009
50 dimes =	\$999,999.99	25,700
80 quarters =	\$225.25	18,000
100 nickels =	\$100,998,765.00	725,097
	\$235,985,765,775.00	1,001

## Chapter III

### COMMON FRACTIONS

**OBJECTIVE:** To increase speed and accuracy in the use of the fundamental processes (addition, subtraction, multiplication, and division) when solving problems containing common fractions.

In Chapter I you have been dealing mostly with integers, or whole numbers, or units. In your daily use of mathematics you will meet many problems that involve the use of fractions; that is, parts of integers.

The word *fractions* comes from a Latin verb which means "to break up." In mathematics, a fraction is one or more of any number of equal parts into which a whole number is divided.

There are two groups of fractions: *common fractions* and *decimal fractions*. In common fractions, the unit may be divided into any given number of parts; e.g., fifths, eighths, etc. In decimal fractions, the parts are tenths or some power of ten.\* Chapter III deals primarily with common fractions.

#### LESSON 32

The terms of a common fraction are the *numerator* and the *denominator*.

**ILLUSTRATION:**     $\frac{3}{4}$  . . . numerator or counter of the parts.  
                         $\frac{3}{4}$  . . . denominator or namer of the parts.

The numerator is the counter of the parts, and the denominator is the namer of the parts.  $\$ \frac{3}{4}$  means that a dollar has been divided into four equal parts and three of these parts are used.

\*A power of a number is the product obtained when the number is multiplied by itself any number of times. For example, the first power of ten is ten; the second power of ten ( $10^2$ ) is  $10 \times 10 = 100$ ; the third power of ten ( $10^3$ ) is  $10 \times 10 \times 10 = 1,000$ .

A proper fraction is one whose value is less than a unit.

EXAMPLE:  $\frac{2}{3}$

An improper fraction is one whose value is greater than a unit, or the numerator is larger than the denominator.

EXAMPLE:  $\frac{7}{3}$

A mixed number is an integer (whole number) and a fraction (a part of a number).

EXAMPLE:  $2\frac{1}{2}$

An improper fraction can be changed to a mixed number by dividing the numerator by the denominator:  $\frac{7}{3} = 2\frac{1}{3}$ . A mixed number may be changed to an improper fraction by multiplying the integer by the denominator and adding the numerator:  $2\frac{1}{3} = \frac{7}{3}$ .

You can change the denominator without changing the value of a fraction if you multiply both the numerator and the denominator by the same number.

EXAMPLE: Change  $\frac{2}{3}$  to sixths.

$$\text{SOLUTION: } \frac{2}{3} \times \frac{2}{2} = \frac{4}{6}.$$

EXAMPLE: Change  $\frac{2}{3}$  to tenths.

$$\text{SOLUTION: } \frac{2}{3} \times \frac{3}{3} = \frac{6}{9}.$$

To reduce a common fraction to its lowest terms, divide both the numerator and the denominator by the same number until the terms of the fraction have no common divisor.

EXAMPLE: Reduce  $\frac{24}{60}$  to lowest terms.

$$\text{SOLUTION: } \frac{24}{60} = \frac{6}{15} = \frac{2}{5}.$$

## LESSON 33

### Addition and Subtraction of Common Fractions

In order to add or subtract common fractions, the denominators must be changed to a common denominator (a common name),

that is, a denominator that is divisible by each of the denominators without a remainder. The least common denominator is the least number that will contain each of the denominators without a remainder; this is obtained by a process of factoring the given denominators. Factor (factors are divisors) the given denominators as in the illustration. Keep on factoring until all the factors are used. The product of these divisors is the Least Common Denominator.

By using (1) as the numerator in the first part of each of the following problems and then using the same denominator with different numerators, the work is simplified. The product of the factors of a number equals the number.

$$\text{EXAMPLE: } \frac{1}{6} + \frac{1}{12} + \frac{1}{3} = ? \quad \frac{2}{6} + \frac{5}{12} + \frac{2}{3} = ?$$

$\begin{array}{r} 2) 9 - 12 - 3 \\ \hline 2) 9 - 6 - 3 \\ \hline 3) 9 - 3 - 3 \\ \hline 3) 3 - 1 - 1 \\ \hline 1 - 1 - 1 \end{array}$	$\begin{array}{r} 36 \\ \hline \frac{1}{6} \boxed{4} \\ \frac{1}{12} \boxed{3} \\ \frac{1}{3} \boxed{12} \\ \hline \frac{1}{6} \end{array}$	$\begin{array}{r} 36 \\ \hline \frac{2}{6} \boxed{8} \\ \frac{5}{12} \boxed{15} \\ \frac{2}{3} \boxed{24} \\ \hline \frac{47}{36} = 1 \frac{11}{36} \end{array}$
---	---	--

$2 \times 2 \times 3 \times 3 = 36$  which is the Least Common Denominator.

$$\text{EXAMPLE: } \frac{1}{3} - \frac{1}{5} = ? \quad \frac{2}{3} - \frac{3}{5} = ?$$

SOLUTION:

$\begin{array}{r} 15 \\ \hline \frac{1}{3} \boxed{5} \\ \frac{1}{5} \boxed{3} \\ \hline \frac{2}{15} \end{array}$	$\begin{array}{r} 15 \\ \hline \frac{2}{3} \boxed{10} \\ \frac{3}{5} \boxed{9} \\ \hline \frac{1}{15} \end{array}$
---	--

$$\text{EXAMPLE: } \frac{1}{4} + \frac{1}{5} + \frac{1}{10} = ?$$

SOLUTION:

$\begin{array}{r} 20 \\ \hline \frac{1}{4} \boxed{5} \\ \frac{1}{5} \boxed{4} \\ \frac{1}{10} \boxed{2} \\ \hline \frac{11}{20} \end{array}$	$\begin{array}{r} 20 \\ \hline \frac{3}{4} \boxed{15} \\ \frac{2}{5} \boxed{8} \\ \frac{3}{10} \boxed{6} \\ \hline \frac{29}{20} = 1 \frac{9}{20} \end{array}$
--	--

## Addition and Subtraction of Mixed Numbers

EXAMPLE:  $2\frac{1}{8} + 3\frac{1}{8} + 4\frac{1}{8} + 2\frac{1}{2} = ?$

SOLUTION:

$2\frac{1}{8}$	24
$3\frac{1}{8}$	3
$4\frac{1}{8}$	8
$2\frac{1}{2}$	4
$12\frac{1}{8}$	12
	7
	$\frac{7}{24}$
	$1\frac{3}{24} = 1\frac{1}{8}$

## LESSON 34

1.  $26\frac{1}{2} + 78\frac{1}{8} + 10\frac{1}{4} + 52\frac{1}{8} = ?$

2.  $\$7.35 + \$19\frac{3}{4} + \$8\frac{4}{5} + \$9.63 = ?$

3. Add: $2\frac{3}{4}$	4. Add: $32\frac{1}{2}$	5. Add: $7\frac{3}{8}$ bu.
$5\frac{1}{8}$	$10\frac{5}{8}$	$6\frac{2}{3}$ bu.
$6\frac{3}{8}$	$6\frac{3}{8}$	$9\frac{5}{8}$ bu.
$4\frac{3}{8}$	$18\frac{1}{4}$	

6.  $85\frac{3}{8}$  lb. -  $73\frac{1}{2}$  lb. = ?

7.  $895\frac{3}{5} - 760\frac{5}{8} = ?$

8.  $3\frac{2}{3}$  yd. +  $6\frac{5}{8}$  yd. +  $7\frac{5}{6}$  yd. = ?

9.  $\$14\frac{3}{4} - \$7\frac{1}{2} + \$3.85 = ?$

10.  $\$156\frac{7}{8} - \$5\frac{3}{5} + \$2\frac{2}{5} = ?$

## LESSON 35

1.  $\frac{5}{8} + \frac{2}{3} + 1\frac{1}{6} + 6\frac{7}{8} = ?$

2.  $3\frac{1}{10} + \frac{5}{8} + 2\frac{1}{4} + 1\frac{1}{10} = ?$

3.  $1\frac{1}{5} + \frac{4}{15} + 6\frac{5}{6} + 2\frac{3}{10} + 8\frac{2}{3} = ?$

4.  $\$8\frac{3}{4} + \$2\frac{2}{5} + \$1\frac{1}{5} + \$1\frac{1}{20} + \$\frac{5}{8} = ?$

5.  $\frac{1}{2}$  lb. +  $\frac{7}{8}$  lb. +  $\frac{3}{16}$  lb. +  $\frac{9}{4}$  lb. = ?

6.  $\frac{1}{4} + \frac{3}{20} + \frac{3}{8} + \frac{7}{16} = ?$

7.  $29\frac{3}{8} - 7\frac{5}{16} = ?$

8.  $6\frac{1}{24} - 5\frac{1}{3} = ?$

9.  $\$6\frac{3}{5} - \$4\frac{1}{6} + \$1\frac{3}{10} = ?$

10.  $8\frac{2}{3} \text{ ft.} + 5\frac{1}{12} \text{ ft.} - 7\frac{9}{4} \text{ ft.} = ?$

11.  $3\frac{5}{8}$

12.  $1\frac{1}{3}\frac{9}{10}$

13.  $189\frac{2}{15}$

14.  $21\frac{5}{6}$

$+ 7\frac{5}{8}$

$+ 4\frac{5}{6}$

$- 16\frac{3}{5}$

$- 10\frac{1}{12}$

$+ \frac{6}{8}$

$+ 3\frac{1}{4}$

$+ 1\frac{5}{12}$

$+ \frac{9}{10}$

15.  $3\frac{4}{9} + 1\frac{6}{7} - \frac{2}{3} = ?$

### Multiplication of Common Fractions

#### LESSON 36

EXAMPLE:  $\frac{3}{4} \times \frac{5}{6} = ?$

ONE SOLUTION:  $\frac{3}{4} \times \frac{5}{6} = \frac{15}{24} = \frac{5}{8}$

ANOTHER SOLUTION:  $\frac{3}{4} \times \frac{5}{6} = \frac{5}{8}$

In the first solution the numerators are multiplied together, the denominators are multiplied together, and the terms of the fraction thus obtained are reduced to lowest terms. In the second solution the common factors are canceled out of the numerators and denominators, and then the numerators are multiplied together and the denominators are multiplied together. The last process is called *cancellation* and is preferable.

#### LESSON 37

1.  $\frac{3}{5} \times 2\frac{1}{2} \times 1\frac{7}{8} = ?$

7.  $\frac{10}{7} \times \frac{6}{9} \times \frac{77}{88} \times \frac{45}{70} = ?$

2.  $3\frac{3}{8} \times 16\frac{1}{2} \times 9\frac{6}{7} \times \frac{8}{55} = ?$

3.  $2\frac{1}{4} \times 1\frac{3}{5} \times 3\frac{7}{8} \times \frac{5}{63} = ?$

4.  $\frac{3}{8} \times \frac{9}{16} \times \frac{3}{4} \times 10\frac{3}{8} = ?$

5.  $\frac{10}{21} \times \frac{8}{5} \times \frac{24}{55} \times \frac{55}{72} = ?$

6.  $\frac{21}{84} \times \frac{9}{10} \times \frac{6}{7} \times \frac{34}{72} = ?$

8. \$3.98      10. 60 min.

$\times 18\frac{7}{8}$

$\times 45\frac{7}{10}$

$\times 7\frac{9}{5}$

$\times 16\frac{1}{2}$

9. 5280 ft.    11. 7326 rods

## COMMON FRACTIONS

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$$12. \frac{4}{5} \times \frac{9}{10} \times \frac{15}{8} \times \frac{8}{9} = ?$$

$$13. \frac{3}{5} \times \frac{3}{5} \times \frac{8}{9} \times \frac{3}{8} = ?$$

$$14. \frac{5}{8} \times \frac{12}{8} \times \frac{21}{8} \times \frac{8}{20} = ?$$

$$15. \frac{2}{3} \times \frac{5}{6} \times \frac{12}{5} \times \frac{1}{2} = ?$$

### Review of Multiplication of Common Fractions

#### LESSON 38

$$1. 9\frac{1}{3} \times \frac{3}{4} = ?$$

$$7. 346\frac{5}{8}$$

× 48

$$2. \frac{1}{12} \times 4\frac{4}{7} = ?$$

$$8. 7,641$$

× 67\frac{2}{3}

$$3. 6\frac{2}{3} \times \frac{3}{5} = ?$$

$$9. 4\frac{3}{5} \times 6\frac{1}{2} \times 6\frac{6}{7} = ?$$

$$4. \frac{3}{4} \times \frac{9}{10} \times \frac{7}{12} \times \frac{6}{5} = ?$$

$$10. 9,364$$

× 96\frac{1}{2}

$$5. \frac{8}{15} \times \frac{7}{8} \times \frac{3}{4} \times \frac{2}{7} = ?$$

$$6. \$9.13 \times 3\frac{3}{4} = ?$$

### Division of Common Fractions

#### LESSON 39

EXAMPLE: Divide  $\frac{5}{6}$  by  $\frac{2}{3}$ .

SOLUTION:  $\frac{5}{6} \div \frac{2}{3} = \frac{5}{6} \times \frac{3}{2} = \frac{5}{4} = 1\frac{1}{4}$

RULE: Invert the divisor and proceed as in multiplication.

Difficulty arises only when you are unable to determine which is the divisor in concrete problems or word problems in which the numbers are associated with some particular name as 5 yd., 5 men, etc.

$$1. 9\frac{3}{4} \div \frac{3}{8} = ? \quad 3. 3\frac{1}{8} \div 1\frac{2}{3} = ? \quad 5. \frac{5}{6} \div \frac{2}{3} = ?$$

$$2. 5\frac{1}{8} \div \frac{4}{9} = ? \quad 4. 235 \div 3\frac{3}{4} = ?$$

#### LESSON 40

$$1. 2\frac{5}{6} \div 7\frac{1}{3} = ?$$

$$2. 6\frac{4}{5} \div 1\frac{7}{10} = ?$$

3. $56 \div 3\frac{3}{7} = ?$	7. $19 \div 5\frac{3}{7} = ?$
4. $\frac{8}{25} \div \frac{4}{5} = ?$	8. $38 \div 6\frac{2}{5} \div 5\frac{3}{7} = ?$
5. $\frac{81}{64} \div \frac{9}{4} = ?$	9. $22 \div 6\frac{2}{5} \div 2\frac{6}{7} = ?$
6. $1\frac{1}{2} \div 5\frac{5}{7} = ?$	10. $3\frac{3}{8} \div 3 \div 1\frac{1}{16} = ?$

**LESSON 41**

1. $6\frac{2}{3} + 5\frac{5}{8} + 3\frac{3}{4} = ?$	6. Multiply $13\frac{1}{2}$ by $3\frac{1}{4}$ .
2. $\frac{7}{12} + \frac{5}{6} + \frac{1}{3} = ?$	7. Divide $7\frac{1}{2}$ by $2\frac{1}{3}$ .
3. $9\frac{3}{5} - 5\frac{5}{8} = ?$	8. $9\frac{3}{4} \div 3\frac{1}{4} = ?$
4. Take $5\frac{3}{5}$ from $6\frac{3}{10}$ .	9. $6\frac{2}{3} \div 1\frac{1}{3} + 8\frac{3}{4} = ?$
5. $\frac{7}{15} \times \frac{5}{8} \times 3\frac{1}{2} \times 1\frac{5}{14} = ?$	10. $16\frac{5}{8} + 3\frac{5}{6} \times 3\frac{1}{2} = ?$

**LESSON 42**

1. Add: $2\frac{3}{8}$	2. Add: $2\frac{3}{8}$	3. $\frac{7}{8} + 1\frac{3}{5} - 1\frac{7}{10} = ?$
$\underline{1\frac{7}{8}}$	$\underline{4\frac{5}{8}}$	$\underline{-9\frac{1}{4}}$
$6\frac{5}{8}$	$3\frac{2}{8}$	

5.  $4\frac{3}{8}$  divided by  $3\frac{3}{4} = ?$

6.  $7\frac{2}{3} \div 1\frac{1}{27} = ?$

7.  $5\frac{5}{8} + 2\frac{2}{3} \times \frac{8}{51} \div 1\frac{7}{18} = ?$

8.  $3\frac{1}{8} + 1\frac{3}{4} \times \frac{30}{81} \div 2\frac{1}{4} = ?$

9.  $13 - 5\frac{4}{9} + \frac{2}{3} \times \frac{21}{58} \div 3\frac{1}{8} = ?$

10. 
$$\begin{array}{r} 30 \\ \times 12\frac{3}{8} \\ \hline \end{array}$$

**LESSON 43**

1.  $\frac{1}{2} \times 8 \times 4 \times \frac{1}{4} \div 4 \times 5 = ?$
2.  $\frac{1}{4} \times \frac{1}{2} \div \frac{1}{8} \times 7 + 3 \times 10 = ?$
3.  $16 - 12 \times \frac{1}{4} - 1 \times 5 = ?$
4.  $\frac{1}{2} \div \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} - \frac{1}{2} = ?$

## COMMON FRACTIONS

5.  $3 \times 6 \times \frac{1}{8} \times 4 - 10 \times 8 \times \frac{1}{8} = ?$
6.  $\frac{1}{4} \div \frac{1}{3} + \frac{5}{4} - \frac{3}{2} + \frac{1}{4} = ?$
7.  $1\frac{1}{2} \times \frac{1}{3} + \frac{3}{2} \times 8 \div 8 - 2 = ?$
8.  $\frac{7}{8} \times \frac{6}{7} \div \frac{1}{8} \times 5 - 15 \times \frac{1}{2} = ?$
9.  $\frac{5}{8} \times \frac{1}{5} + 1 \div 7 \times 3 + 1\frac{1}{2} = ?$
10.  $\frac{1}{4} \times 12 \times \frac{4}{5} + \frac{2}{3} \times 2 - 1\frac{1}{2} = ?$
11.  $\frac{1}{8} \times 56 \div 7 - \frac{5}{8} \times 12 + \frac{6}{8} = ?$
12.  $22 \div 11 - \frac{1}{2} \times \frac{1}{3} \times \frac{4}{3} - 1 = ?$
13.  $9 \div 3 - \frac{7}{3} \times 3 - 2 \times 7 = ?$
14.  $7 \times \frac{1}{2} - \frac{3}{2} \times 8 \div 4 - 3 = ?$
15.  $\frac{8}{6} \times \frac{1}{12} \div \frac{1}{8} + \frac{4}{6} - \frac{3}{6} = ?$

### Sewing Problems and Review of Fractions

**OBJECTIVE:** To show your ability in applying lessons in fundamentals.

#### LESSON 44

1. What will it cost to make a kimono gown of crepe at 28¢ a yard, if it measures  $1\frac{1}{2}$  yd. from shoulder to floor? Use  $\frac{3}{4}$  yd. of finishing braid for the neck, and  $\frac{1}{2}$  yd. for each sleeve at 5¢ a yard, and buttons and thread at 7¢.

2.  $\frac{7 \times 5 - 7}{8 \times 4 - 25} \times \frac{5}{6} = ?$
3.  $\frac{2}{3} \times \frac{4}{5} \times \frac{10}{15} \times 2\frac{5}{8} \times 3\frac{3}{14} = ?$
4. From  $9\frac{1}{2}$  yd. take  $7\frac{1}{3}$  yd.
5. At 15¢ a yard, find the cost of  $2\frac{2}{3}$  yd. of lace.

#### LESSON 45

1. Reduce to the lowest terms:  $\frac{64}{96}; \frac{350}{350}; \frac{375}{675}; \frac{63}{72}$ .
2. Change to a common denominator and add:  $\frac{5}{8}, \frac{4}{6}, \frac{7}{10}, \frac{3}{15}$  and  $\frac{5}{12}$ .

3. Find the cost of an apron 35 in. long, with a  $5\frac{1}{2}$ -in. hem, made of Berkley cambric, 36 in. wide, at 36¢ a yard. Use two widths. The bib and belt are made from the sides.
4. Buy  $3\frac{1}{2}$  yd. of poplin at 95¢ a yard, 8 buttons at \$1.50 a dozen. Count the change received if you gave the clerk \$10.
5.  $76\frac{2}{5} - 5\frac{5}{8} = ?$ ;  $3\frac{3}{5} \div 2\frac{1}{4} = ?$

### LESSON 46

1. If  $4\frac{2}{3}$  yd. of material cost \$14, what will  $5\frac{1}{3}$  yd. cost?
2. At 40¢ a yard for braid, what will 15 yd. 17 in. cost?
3. How many dresses can be cut from 21 yd., if it takes  $3\frac{1}{2}$  yd. for one dress?
4. Multiply  $3\frac{1}{2} \times 4\frac{2}{7} \times 6\frac{3}{8} = ?$
5. Divide  $76\frac{2}{5}$  by  $5\frac{5}{8}$ . Divide  $3\frac{3}{5}$  by  $2\frac{1}{4}$ .

### LESSON 47

1. How many children's dresses can be made from  $28\frac{1}{2}$  yd. of poplin, if it takes  $2\frac{2}{3}$  yd. for one dress?
2. At \$7.56 for one child's coat, what will 17 coats cost?
3. Find the cost of 4 yd. 17 in. of outing flannel at 35¢ a yard.
4. From 12 yd. 15 in. of material there were sold two pieces, one of  $5\frac{1}{2}$  yd. and another of 3 yd. 14 in. How many yards remained?
5. Add \$3.25, \$7 $\frac{1}{2}$ , \$9 $\frac{3}{4}$ , \$8.46.

### LESSON 48

The following problems give the cost of *one* article, and you are required to find the cost of a given number of articles.

1. If 1 yd. of lace costs 89¢, find the cost of 23 yd.
2. If one roll of paper costs 45¢, what will  $2\frac{2}{3}$  rolls cost?
3. What will 18 dozen eggs cost at 29¢ a dozen?
4. When sugar costs 6¢ a pound, what will  $25\frac{1}{2}$  lb. cost?
5. If buttons cost 75¢ a dozen, what will  $3\frac{1}{2}$  doz. cost?

## LESSON 49

The following problems give the cost of a *part* of an article, and you are required to find the cost of the *whole* article and then of a given number of articles.

1. If  $\frac{1}{2}$  yd. of cloth costs  $12\frac{1}{2}\text{¢}$ , what will 9 yd. cost?
2.  $\frac{3}{4}$  yd. of trimming costs 18¢. What will  $1\frac{1}{2}$  yd. cost at the same rate?
3. When  $\frac{2}{3}$  lb. of butter costs 12¢, find the cost of  $4\frac{1}{3}$  lb.
4. What will 10 yd. of lace cost, if  $22\frac{1}{2}$  in. cost 50¢?
5. Find the cost of 3 yd. of velveteen when  $\frac{2}{3}$  yd. costs \$1.20

## Chapter IV

### DECIMAL FRACTIONS

**OBJECTIVE:** To develop skill, ability, and understanding in working with decimal fractions; to increase speed and accuracy in the reading and writing of decimals; to understand the principles that underlie the changes necessary to convert common fractions to decimal fractions. Drill in the four fundamentals—addition, subtraction, multiplication and division—of decimal fractions in order to use them in practical problems.

A decimal fraction has ten or some power of ten for its denominator. The power of a number is the product of a number multiplied by itself. This process may be indicated by the use of a small figure, called an exponent, placed to the upper right of a number, thus  $10^2$ ,  $10^3$ , which means that  $10^2 = 10 \times 10$  or 100;  $10^3 = 10 \times 10 \times 10$  or 1,000, etc. The denominator of a decimal fraction is a tenth, or a hundredth, or a thousandth, etc. Common fractions may be changed to decimal fractions, and decimal fractions may be changed to common fractions. This will be explained in the following lessons.

#### LESSON 50

To simplify the reduction of common fractions to their decimal value, a common fraction may be considered as a form of division, the numerator being the dividend, and the denominator the divisor.

##### ILLUSTRATION:

.75

$\frac{3}{4}$  changed to decimal value.  $3 \div 4$  or  $4)3.00$ .

Since  $\frac{3}{4}$  is less than an integer, the quotient is less than an integer.

$\frac{1}{10}$  may be written .1, and is read one tenth.

$\frac{1}{100}$  may be written .01, and is read one hundredth.

$\frac{1}{1000}$  may be written .001, and is read one thousandth.

$\frac{1}{10000}$  may be written .0001, and is read one ten thousandth.

The first place to the right of the decimal point is tenths, the second place is hundredths, the third thousandths, etc.

.0401 is read, four hundred one ten thousandths.

To aid you in reading decimals, cover the decimal point and read the number as an integer and then name the denominator which has as many ciphers as there are places to the right of the decimal point. To illustrate, .76407 may be written  $\frac{76407}{100000}$ ,

and is read, seventy-six thousand four hundred seven, hundred thousandths.

Read the following numbers: .346; .0131; .00502; .702012; 16.0016; 7.0756; 91.30407; 9.4674; 7.6405; 29.358.

## LESSON 51

In order to add or subtract decimals, figures of the same denominator must be written under each other. Check as explained in addition of integers.

1. Write as the teacher dictates and add:  
.34; .0254; .706; .00503; .0704.
2. From 3.2407 take 1.72.
3. Add, 3.065; 7.36; .90758; 54.003; 25.067.
4. From 9.1 take 3.4067.
5. Add 7.42; 3.2005; 2.893; 5.8503; 24.79.
6. Subtract 8.5509 from 33.402.
7. Add 52.62; 4.534; 21.653; 43.523; 436.52.
8. Add 802.65; 42.324; 57.863; 4.783; 42.327.
9. From 792.57 take 84.635.
10. Add 5.262; 62.379; 83.523; 423.65; 852.6.

## LESSON 52

1. From 652.632 take 6.3278.
2. From 5.263 take 3.21.

3. Add 6.532; 42.622; 59.426; 86.438; 52.628.
4. From 126.452 take 64.036.
5. Subtract 4.783 from 8.631.
6. Add .0625; 1.43; 723.4; 45.2009; 261.45.
7. Add 162.436; 97.243; 2.4869; 96.426.
8. From 1.2469 plus 82.963 take 70.
9. Subtract 5,480.26 from 8,524.26.
10. Add 468.32; 64.538; 423.592; 321.42.

### LESSON 53

Change the following fractions to decimals. (Carry to 3 decimal places; if there is a remainder indicate this by the plus sign.)

1. $\frac{5}{8}$	5. $\frac{1}{8}$	9. $\frac{7}{20}$	13. $\frac{12}{20}$
2. $\frac{4}{7}$	6. $\frac{9}{7}$	10. $\frac{5}{16}$	14. $\frac{7}{18}$
3. $\frac{5}{9}$	7. $\frac{9}{4}$	11. $\frac{19}{16}$	15. $\frac{21}{32}$
4. $\frac{2}{5}$	8. $\frac{13}{16}$	12. $\frac{7}{16}$	

### LESSON 54

Change the following decimals to common fractions; that is—  
 $.75 = \frac{75}{100} = \frac{3}{4}$ .

1. .25	4. .8	7. .425	10. .55	13. .6
2. .90	5. .9375	8. .780	11. .255	14. .4375
3. .95	6. .325	9. .125	12. .225	15. .875

### Multiplication of Decimals

#### LESSON 55

**RULE:** The product in the multiplication of decimals contains as many decimal places as there are decimal places in the multiplicand and multiplier added together.

#### EXAMPLE:

$$\begin{array}{r} 3.04 \\ \times 1.6 \\ \hline 1824 \\ 304 \\ \hline 4.864 \end{array}$$

The multiplicand contains two decimal places and the multiplier one; therefore, the product has three decimal places. Count from right to left in placing the decimal point. Check as explained in multiplication of integers.

Work and check:

- |                            |                           |
|----------------------------|---------------------------|
| 1. $847.5 \times .64 = ?$  | 6. $.427 \times .39 = ?$  |
| 2. $36.42 \times 7.8 = ?$  | 7. $.432 \times 29 = ?$   |
| 3. $.276 \times 9.4 = ?$   | 8. $4.4 \times .44 = ?$   |
| 4. $6.32 \times .46 = ?$   | 9. $39.6 \times 4.7 = ?$  |
| 5. $73.26 \times .324 = ?$ | 10. $78.4 \times .65 = ?$ |

### Division of Decimals

#### LESSON 56

EXAMPLE:  $3.045 \div .25 = ?$

SOLUTION:

$$\begin{array}{r}
 .25 \qquad 3.045 \\
 \times 100 \quad \times 100 \\
 \hline
 25.00 \quad 304.500 \\
 \\ 
 \underline{12.18} \\
 25)304.50 \\
 \underline{25} \\
 54 \\
 \underline{50} \\
 45 \\
 \underline{25} \\
 200 \\
 \underline{200}
 \end{array}$$

If there is a decimal in the divisor, multiply both the divisor and the dividend by ten, or some power of ten. That will make the divisor an integer. Then divide as in the United States money system. The decimal point in the quotient is directly over the decimal point in the dividend. Division of decimals is not difficult after the divisor is changed to an integer and the dividend changed to correspond with the divisor change.

The power of a number is the product of a number multiplied by itself. Moving the decimal point one, two, three, or more places to the right, multiplies the number by 10, 100, 1000, etc.

Work to third decimal place, and check the following:

- |                         |                           |
|-------------------------|---------------------------|
| 1. $62.9 \div 3.7 = ?$  | 6. $46.7 \div .325 = ?$   |
| 2. $30.50 \div .61 = ?$ | 7. $9.72 \div 2.7 = ?$    |
| 3. $8.05 \div .35 = ?$  | 8. $83.7 \div .121 = ?$   |
| 4. $62.82 \div .82 = ?$ | 9. $47.5 \div .038 = ?$   |
| 5. $600 \div .06 = ?$   | 10. $28.897 \div 5.7 = ?$ |

## LESSON 57

- |                                     |                                |
|-------------------------------------|--------------------------------|
| 1. .75 of \$4.80                    | 6. $.33\frac{1}{3}$ of \$96.51 |
| 2. .5 of \$16.84                    | 7. $.16\frac{2}{3}$ of \$12.72 |
| 3. $.12\frac{1}{2}$ of \$12.00      | 8. $.62\frac{1}{2}$ of \$42.66 |
| 4. $.83\frac{1}{3} \times \$9.60$   | 9. .20 $\times \$416.90$       |
| 5. $.87\frac{1}{2} \times \$168.40$ | 10. .25 $\times \$648.84$      |

## LESSON 58

1. Write the following numbers in words; add the numbers, and write the sum in words: 36.04; 9.00; 547.01610; 5.046; 37.58.
2. From 6.473 take 3.9654.
3. Multiply 2.175 by 6.73.
4. Divide 62.23 by .23; and 19.26 by 3.1.
5. From the sum of 32.758, 21.205, 1.01, and .009, take the sum of 2.4, 10, 7.222, .7, and .1001.
6. Divide the difference between 78.205 and 31.1 by 2.25.
7. Divide the sum of 2.304, 19.32, 10.711, and  $\frac{1}{2}$  by the product of  $1\frac{1}{4} \times .32$ .
8. Multiply the sum of 2.299, 2.004, and 3.78 by the difference between 17.304 — 12.9.
9. Add the following: 7.225, .001, 19.70, .299, 1.32, and 4.4.
10. Subtract .37009 from 1.

## LESSON 59

1. Change  $\frac{4}{5}$ ,  $\frac{2}{3}$ ,  $\frac{5}{6}$ , and  $\frac{3}{4}$  to decimals, and add.
2. Change .5, .75, 3.75,  $.66\frac{2}{3}$  to common fractions.
3. Change  $.5, \frac{3}{5}, .75, .4$  to common fractions, and add.
4. Subtract .29798 from .723.
5. Subtract 2.32 from 2.9784 plus 1.105.
6. Multiply 2.9784 by  $\frac{1}{3}$ .
7. Divide 2.9784 by  $1\frac{1}{2}$ .
8. Multiply 1.358 by 7.2001. (Answer to have 4 places.)
9. Divide 23.25 by 7.5, and .285 by .12, change to common fractions, and add.
10. Change 2.875 and  $1.33\frac{1}{3}$  to common fractions, and multiply. Divide the product by  $\frac{5}{8}$ .

## DECIMAL FRACTIONS

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### LESSON 60

1. Write the following from dictation; then add:

26.407

9.35

14.0014

6.437

9.0906

7.43

16.0016

93.4405

7.007

5.005

2. Change  $\frac{3}{4}$ ,  $\frac{2}{5}$ ,  $\frac{5}{6}$ ,  $\frac{1}{3}$ , and  $\frac{4}{5}$  to decimals, and add.

3. Change  $.12\frac{1}{2}$ , .5, .2,  $.66\frac{2}{3}$ , and  $.37\frac{1}{2}$  to common fractions.

4.  $96.307$

$\times .56$

5. Change to decimals, and add:  $\frac{1}{4} + .205 + \frac{7}{8} + 1.09$ .

6.  $\$97.35 \times \frac{5}{6}$ .

7. From the sum of 92.20, 78.35, 2, and 45.01, take the difference between 99.99 and 29.08.

8. Divide the sum of 74.209, 21.902, and 3.6 by the sum of 2.701, 3.12, and 2.209.

9.  $7.3408 \div \frac{4}{7} = ?$

10.  $24.304 \times 2\frac{1}{4} \div 2 = ?$

### General Review

### LESSON 61

1.  $\$62.50 + \$7\frac{1}{8} + \$5\frac{3}{4} + \$6\frac{2}{5} = ?$

2. 9 yd. + 4 yd. + 52 in. + 4 yd. + 21 in. +  $5\frac{1}{2}$  yd. = ?

3. Find the cost of 4 yd. 24 in. of longcloth at 18¢ a yard.

4. Add: \$738.84; \$95.46; \$309.25; \$47.47; \$104.25.

5. 638,475

$\times 87$

Check

**Problems Involving Decimal Fractions, U. S. Money, and Common Fractions**

**LESSON 62**

1. Make out in bill form the following:

Gimbel Brothers, New York City, sold to M. O. Rockwell,  
Jersey City, N. J.

$8\frac{1}{3}$  yd. silk @ \$1.98

$7\frac{6}{7}$  yd. lining @ \$.98

$4\frac{1}{2}$  yd. trimming @ \$2.30.

<b>GIMBEL BROTHERS</b> <small>THIRTY-THIRD STREET AND BROADWAY NEW YORK</small>					
SOLD TO		June 1, 1940			
		M. O. Rockwell, Jersey City, N. J.			
DATE	QUAN.	UNIT	ITEM	UNIT PRICE	AMOUNT

A bill form

2. Change 125 in. to yards. Change  $13\frac{3}{4}$  yd. to inches.
3. Divide 186,759 by 48. Check.
4.  $75,823 \times 78 = ?$  Check.
5. Find the common denominator for  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{3}{4}$ ,  $\frac{5}{6}$ ,  $\frac{7}{8}$ , and  $\frac{7}{9}$ , and add.

**LESSON 63**

1. A man had 75 bbl. of sugar and sold .75 of them. How many barrels did he sell and how many barrels had he left?
2. If you have 50 questions and miss .20 of them, how many did you miss?

3. Of 475 girls in a school, .40 were tardy. How many were on time?
4. There are 54 in. in a lace remnant and  $.33\frac{1}{3}$  is cut off. How many inches are left?
5. What is  $.83\frac{1}{3}$  of \$160.20?
6. Add: \$24.15, \$146.08, \$40.125, and \$1.25.
7.  $\$986.16 - \$196.29 = ?$
8.  $785.26 \times .31 = ?$
9.  $678.10 \div .2 = ?$
10. Reduce  $\frac{364}{580}$  to lowest terms.

## Chapter V

# PERCENTAGE

**OBJECTIVE:** To understand percentage; to get acquainted with the terms used in percentage; and to learn how to apply percentage to everyday problems.

Percentage is simply so many hundredths of anything. For example, 5% of a dollar is  $\frac{5}{100}$  of \$1.00 or 5 cents; 6% of a ton of coal is  $\frac{6}{100}$  of 2,000 lb. or 120 lb. of coal.

## LESSON 64

Three terms are used in percentage: base, rate, and percentage. The base is the number on which the percentage is computed; it represents the whole or 100%. The rate shows how many hundredths are used. The percentage is the product of the base and the rate.

### ILLUSTRATION:

$$\$625 \text{ (base)} \times 5\% \text{ (rate)} = \$31.25 \text{ (percentage)}.$$

There are three cases in percentage. To find the percentage when the base and rate are given, is one case.

**RULE:** Base  $\times$  rate = percentage.

Base + percentage = SP (selling price) with a gain.

Base - percentage = SP (selling price) with a loss.

### EXAMPLE:

If silk costs \$1.76 a yard and is sold at a gain of 25%, what is the gain and selling price?

Two solutions are given to illustrate this case:

$$1. 25\% = \frac{25}{100} (\text{rate}) = \frac{1}{4} (\text{rate}).$$

$$\frac{1}{4} (\text{rate}) \times \$1.76 (\text{base}) = \$ .44 \text{ percentage (gain).}$$

$$\$1.76 \text{ cost} + \$ .44 \text{ percentage} = \$2.20 \text{ (selling price with gain).}$$

If this problem states a per cent as a loss, the steps for working are the same except that the loss is subtracted from the cost and that would equal the selling price with a loss.

$$\begin{array}{rcl}
 2. \$1.76 \text{ cost (base)} & & \$1.76 \text{ cost} \\
 \times .25 \text{ (rate)} & & \underline{\quad .44 \text{ gain}} \\
 \hline
 880 & & \$2.20 \text{ (selling price with gain).} \\
 352 \\
 \hline
 \$0.4400 \text{ gain (percentage)}
 \end{array}$$

### Percentage Problems

#### LESSON 65

1. I bought 15 yd. of silk at \$1.68 a yard, and sold it so as to gain 60%. Find the gain and the selling price.
2. From a 16-yd. piece of velvet at \$3.50 a yard, I sold  $7\frac{1}{2}$  yd. at a profit of  $16\frac{2}{3}\%$  and the rest at one half that per cent gain. Find the gain and the selling price.
3. If a girl earns \$23.50 a week and saves  $12\frac{1}{2}\%$  of it, how much will she save in a year, allowing two weeks for vacation without pay?
4. Silk is priced \$2.00 per yard; what will  $4\frac{1}{2}$  yd. cost if it is sold at a gain of  $12\frac{1}{2}\%$ ? What is the gain and the selling price?
5. At \$9.75 a yard, what will be the gain and selling price on  $14\frac{2}{3}$  yd. of tapestry if the profit is 40%?
6. A dozen goblets are bought at \$6.85. What is the gain and selling price if they are sold at  $67\frac{1}{2}\%$  profit?
7. A 23-yd. bolt of tubing is bought at \$4.37. What is the gain and selling price per yard if it is sold at  $62\frac{1}{2}\%$  gain?
8. A gross of water glasses is bought at \$7.20. What is the gain and selling price per glass if each is sold at 75% gain?
9. Find the gain and selling price of a blouse bought for \$2.98 and sold at a  $33\frac{1}{3}\%$  gain.
10. Mr. Allen earns \$125 per month. Find his savings for 1 yr. at  $33\frac{1}{3}\%$ .

## LESSON 66

In the second case in percentage, the percentage and rate are given, and it is necessary to find the base.

**RULE:** Percentage  $\div$  rate = base.

**EXAMPLE:**

6 is 25% of what number? 6 is the percentage, 25% is the rate.

Two solutions are given to illustrate this case.

$6 \div 25\% = (6 \div .25) = (6 \div \frac{25}{100}) = 6 \times \frac{100}{25} = 24$  the base; or  $6 \div 25\% = 6 \div \frac{1}{4} = 6 \times \frac{4}{1} = 24$  the base.

Another statement may aid those of you who are more familiar with common fractions.

$6 = 25\%$ ; thus  $6 = \frac{1}{4}$  of a number. Since  $\frac{1}{4}$  is the whole number,  $4 \times 6$  or 24 is the whole number or the base.

## LESSON 67

1. 23 is  $16\frac{2}{3}\%$  of what number?
2. \$19 is  $12\frac{1}{2}\%$  of the cost of a library table. Find the cost of the table.
3.  $33\frac{1}{3}\%$  of the cost of a yard of lace is 87¢. What is the cost of  $3\frac{1}{2}$  yd.?
4. 50% of a man's weekly wages is \$18.50. Find his monthly pay.
5. \$1.95 is 20% of my weekly expenses for room and board. Find the expenses for  $6\frac{1}{2}$  weeks.
6. When Margaret gives her mother her weekly pay check, her mother gives her \$5.00 which equals  $33\frac{1}{3}\%$  of her check. How much does she earn in one month? in 1 yr.? (1 mo. = 4 weeks.)
7. Margaret's monthly earnings in Problem 6 are 40% of her father's salary. Find her father's salary.
8. Jane spends 8% or \$76.96 of her yearly income on books, newspapers, and magazines. What is her income? What does she earn in a week?
9. A down payment of \$110 or  $12\frac{1}{2}\%$  was made on a car. What is the cost of the car? How much more must be paid?
10. Betty spends 18 hrs. per week or 45% of her leisure time taking care of children and during the remainder she does her homework. Find the time spent on her homework in one week.

## Review Problems

## LESSON 68

1. Change  $\frac{3}{8}$ ,  $\frac{4}{5}$ ,  $\frac{5}{6}$ ,  $\frac{9}{4}$ , and  $\frac{2}{3}$  to per cent.
2. Find the gain and the selling price of a 40-yd. bolt of cheesecloth that cost  $4\frac{1}{2}$ ¢ a yard, and sold at a  $33\frac{1}{3}\%$  gain.
3. (a) Add  $3\frac{1}{4}$  yd.,  $6\frac{2}{3}$  yd.,  $17\frac{3}{8}$  yd., 6 yd.  $22\frac{1}{2}$  in., and 10 yd. 12 in. (b) Find the cost at \$3.20 a yard and the selling price if the material were sold at a gain of 25%.
4. If 9 yd. of cloth cost \$2.70, what will be gained by selling it at a  $16\frac{2}{3}\%$  profit?
5. From  $14\frac{5}{8}$  yd., 7 yd. 15 in. were sold. How many yards and inches were left?
6. A dress-shop manager bought 1 doz. dresses at \$5.95 each. If he sells them at a 25% loss, what is his total loss? What is the selling price of 1 dress?
7. A set of dishes sold for \$32.95 on January 3. January 6 the store marked all merchandise down 4%. What was the loss and selling price of that set of dishes?
8. A clerk in a store was cut 12% of her week's pay. Find the cut and changed pay check, if she had received \$18.50 a week.
9. The clerk in Problem 8 decides to save 3% of her earnings. Find her weekly and yearly savings (4 weeks per month), if she works 50 weeks a year.
10. If the clerk in Problem 9 had to use 40% of her yearly savings for a doctor bill, how much will she have left? How much does she owe the doctor?

## LESSON 69

In the third case in percentage, the percentage or part, and the base or whole are given to find the rate.

## SOLUTION:

$$\text{Percentage} \div \text{base} = \text{rate.}$$

## SECOND SOLUTION:

## FIRST SOLUTION:

13 is what per cent of 39?

$$13 \div 39 = .33\frac{1}{3} \text{ or } 33\frac{1}{3}\%.$$

13 is what part of 39? It is  $\frac{13}{39}$  or  $\frac{1}{3}$ ; therefore, 13 is  $\frac{1}{3}$  of 39 or  $33\frac{1}{3}\%$  of 39.

1. 24 in. is what part of 36 in.? What per cent?
2. I owed \$210 and paid \$105. What per cent did I pay?
3. If \$17 is paid on a coat which cost \$51, what per cent remains unpaid?
4. A bushel of potatoes cost \$5.20. What per cent of a bushel can be bought for \$1.30?
5. 19¢ is what part of 95¢? What per cent?
6. John spent \$25 of his \$75 bank account. What per cent did he spend? How much has he left?
7. Mary was absent 25 days out of 19 weeks of school. Find the per cent of the time that she was absent.
8. 23 yd. of tubing for pillow slips was bought for \$6.21. What per cent of the tubing can be sold for \$4.05? What is the price per yard?
9. I owed \$300 and have paid \$275. What per cent is paid? What per cent remains unpaid?
10. Mary has \$2.00 to spend for school supplies, and she spends only \$1.65. Find the per cent spent and the per cent left.

### Review of the Cases of Percentage

#### LESSON 70

1. A merchant paid \$3.00 a dozen for dress shields and sold them at a gain of 30% on a pair. Find the gain and the selling price per pair.
2. 36 yd. of outing flannel cost \$6.93. At what price must it be sold per yard to gain 7½¢ on a yard?
3. From a piece of lace  $1\frac{2}{3}$  yd. long,  $22\frac{1}{2}$  in. were sold. How much was left?
4. Find the cost of 2 doz. work aprons made of chambray at 31¢ a yard, and buttons at \$1.44 per gross, if each apron requires 6 yd. of chambray and  $\frac{1}{2}$  doz. buttons. Find the gain and selling price of the aprons at  $12\frac{1}{2}\%$  gain.
5. If  $\frac{1}{4}$  yd. of taffeta ribbon costs 84¢, how many yards can be bought for \$4.80?
6. The loss on a dress is \$1.98 and is  $12\frac{1}{2}\%$  of the cost. Find the cost. What is the selling price?
7. A tailored suit is sold at a loss of \$7.48 which is  $37\frac{1}{2}\%$  of the cost. What was the cost? What is the selling price?

8. A doctor bill of \$30 took  $37\frac{1}{2}\%$  of Mary's monthly earnings. What are her monthly wages?
9. Mother spent \$9.38 or  $62\frac{1}{2}\%$  of her weekly allowance for food. How much is her allowance? How much has she left?
10. James pays \$10 a week for board and room. This is  $54\%$  of his weekly wages. Find his weekly pay. How much is left? Find his yearly earnings.

## LESSON 71

1. Mary buys a fur coat for \$495 and pays \$200 down. What per cent remained unpaid? What per cent was paid?
2. Mrs. Jones spends \$45 of her \$100 emergency fund. What per cent does she spend? How much is left?
3. Jane went to Chicago, a distance of 85 miles. When she was 45 miles from Chicago, she ran out of gas. What per cent of the distance had she traveled?
4. Of the 1,500 pupils in a school only 225 were absent less than 6 days in 1 semester. What per cent of the pupils were absent more than 6 days? How many pupils were absent more than 6 days?
5. Mr. Burns spent \$250 of his \$400 on traveling expenses. Find the per cent left and the per cent spent.

## LESSON 72

1. Mr. Brown's yearly salary of \$1,500 is spent as follows: \$525 for food, \$270 for rent, light, and heat, and \$240 for clothes. Find the per cent spent for each of these items.
2. Mr. White had \$500 in the bank. He spent \$150 for his son's hospital bill. What per cent has he left?
3. Mother made pillow slips paying \$1.50 for material and 35¢ for hemstitching. She sold them for \$3.00. What per cent was spent for the articles? What per cent is her profit?
4. What per cent of a 500-mile trip is completed at the end of 375 miles?
5. Aunt Anna spent \$200 for charity. ~~What per cent of the \$850 has she left?~~

**Discounts**

**OBJECTIVE:** To learn how to figure the cost of an article when one or more discounts are allowed.

The word *discount* as it is used in the following several lessons means a sum which the seller allows the buyer to deduct from the marked price of the goods or from the price as stated in the bill. Discount is usually figured as a percentage of the stated amount or marked price.

Some dealers allow two or more discounts, called *chain discounts* or series discounts. This method of discount is figured as follows: Find the discount allowed at the first rate, and subtract that from the cost; then find the discount on the remainder at the given rate, and subtract. This is the new cost. Continue this method until all the rates of discount are used. *Do not add the discounts* and use their sum as the *rate of discount*.

**LESSON 73**

1. Employees in an electrical supply shop are allowed a 40% discount. If an electric roaster is sold at \$24, what did the employee pay for it?

2. 35% of the cost for a pair of stockings is allowed as discount for an employee. What will a \$1.59 pair of stockings cost an employee?

3. What will a \$2.50 novel cost a clerk if she has a 20% discount?

4. A department store employee is allowed a 15% discount. What will a \$12 suit cost her?

5. What will a \$7.50 book cost an employee with a discount of 25%?

**LESSON 74**

1. A buyer for a dress shop purchased 1 dozen dresses at \$3.95 each, and sold them at  $62\frac{1}{2}\%$  profit. What was the selling price of 1 dress? What was her total profit?

2. Mary sold 5 of her books valued at \$3.00 each at a 16% loss. What was her total loss?

3. My father bought an \$880 automobile at a 6% cash discount, and sold it again at a 9% gain. How much did he gain if he paid cash?

4. Jane bought a typewriter for \$75, and received a 3% discount, and when she paid the balance, she received another 2% discount. Find the cost of the typewriter.

5. A 4% discount was allowed on a dining-room rug marked \$98.99. A month later the same rug was again reduced 3%. Find the final selling price.

### Chain or Series Discounts

## LESSON 75

- For a cash payment, a \$97.50 bedroom set is given 5%, 7%, and 9% discounts. Find the cash payment.
- What will the cash payment amount to if 6%, 8%, and 10% discounts are given on a \$115 radio?
- Find the amount of cash payment if 9%, 7%, and 6% discounts are given to a \$825 car.

	<i>Article</i>	<i>Cost</i>	<i>Discounts</i>			<i>Cash Payment</i>
4.	Fur Coat	\$249	2%	3%	4%	
5.	Refrigerator	\$275	3%	1%	4%	
6.	Oil Painting	\$329	5%	2%	1%	
7.	Opera Glasses	\$450	1%	4%	2%	
8.	Telescope	\$395	4%	1½%	3%	
9.	Encyclopedia	\$425	1½%	1%	2½%	
10.	5K Emerald Ring	\$400	3%	1½%	2%	

## LESSON 76

- What are the gain and selling price on 18 yd. of lace bought at \$3.45 a yard and sold at a 25% gain?

2. A merchant bought  $12\frac{3}{4}$  yd. of velvet at \$2.40 a yard, and sold it at a profit of  $16\frac{2}{3}\%$ . Find the gain and selling price per yard.
3. If you buy a fur coat for \$485 and sell it at a gain of 20%, what are the gain and the selling price?
4. I bought a dining-room suite of furniture for \$860, and was given 15% and 20% discounts. Find the net price.
5. On a \$250 davenport, I was allowed 5% and 6% discounts for cash. What did I pay for the davenport?
6. I bought a kitchen stove for \$167.50. On a down payment I was allowed a 4% discount, and in 30 days I paid the balance and was allowed a 7% discount on the balance. How much did I pay for the stove?
7. A kitchenette was purchased for \$105, but 2% and 5% discounts were allowed. What did the kitchenette cost?
8. I bought a radio for \$97.50 and sold it at a  $12\frac{1}{2}\%$  gain. Find the gain and selling price.
9. A dealer bought a piano for \$300 and sold it at a 15% gain. The buyer resold it at a  $12\frac{1}{2}\%$  gain. Find the final selling price.
10. If a \$7,000 home was sold at a 20% gain, and resold 7 years later at a  $12\frac{1}{2}\%$  loss, find the gain and selling price; then the loss and the final selling price.

#### Tariff on Imports

**OBJECTIVE:** To give you an understanding of terms used in reference to tariff on imports and to apply your knowledge of percentage to calculating import duties.

An import duty is a tax placed by the government upon merchandise from a foreign country which enters into United States trade. The rate of duty placed upon one kind of article will not be the same as that placed upon another article. For instance, the rate of duty placed upon a handkerchief differs from that placed upon a tablecloth. All of the different rates are listed in a law known as the Tariff Act.

An *ad valorem* rate of duty is a tax which requires the payment to the government of a certain percentage of the value of the merchandise before it is permitted to be placed on sale in the United States; a specific rate of duty is a tax which requires the

payment to the government of a certain number of cents or dollars for each unit of quantity (yard, pound, ton, dozen, etc.) before it is permitted to be placed on sale in the United States; a compound rate of duty is a tax which requires the payment to the government of a certain percentage of the value of the merchandise and a certain number of cents or dollars for each unit of quantity before it is permitted to be placed on sale in the United States.

In the computation of duty on entries, *ad valorem* rates will be applied to the value in even dollars, fractional parts of a dollar amounting to less than 50 cents being disregarded, and 50 cents or more being considered as \$1. *If the rate of duty upon such entries is specific and \$1 or less per unit, fractional quantities, if less than one half, will be disregarded, and if one half or more, will be treated as a whole unit.* If the specific rate is more than \$1 per unit, duty will be assessed upon the exact quantity, and the fractional part thereof, if any, expressed in the form of a decimal extended to two places.

Certain merchandise which is not native to the United States and, therefore, hard to obtain in this country, such as rubber, coffee, crude minerals, etc., is listed on what is known as the "Free Schedule" and may enter the United States without duty payment. These importations represent about 57% of the United States imports.

A city or town at which duty assessment may be made is called a "port of entry." A port of entry is located at a place which will best serve the people of a given district and at the same time prevent smuggling; that is, the improper entry of merchandise into the United States. A Collector or Deputy Collector of Customs orders the checking and examination of all merchandise sent through these ports of entry. The checking and examination of the merchandise is done by inspectors, examiners, or other customs-service personnel before the merchandise is released to be placed on sale.

Usually an invoice is sent by the shipper showing the value, weight, and quantity of the merchandise, the number of packages the place of manufacture, the place from which shipped, and other required information. When a shipment exceeds \$100 in value,

an invoice certified before a United States consul in the foreign country (known as a Consular Invoice) is required to be executed to show the information listed in the preceding sentence.

When merchandise is not called for or the duty is not paid, it is placed in a bonded warehouse (a warehouse which has given bond to secure the United States against loss) for a given period of time after which it is sold at public auction.

Gross weight is the weight of merchandise including the container and packing material. Net weight is the weight of merchandise without the container or packing material. Tare is the weight of the container and packing material.

For ordinary purposes, breakage or leakage is allowed when the final assessment of duty is made.

### Problems on *Ad Valorem* and Specific Duty

#### LESSON 77

1. China clay is shipped from England to Sheboygan, Wisconsin. The rate of duty is \$2.50 per ton (2240 lb.). When the clay is weighed, it is found that the shipment contains 1,265,072 lb. What duty will be assessed at Sheboygan?

2. Glass perfume bottles are shipped from Czechoslovakia (Germany) to Baltimore, Md., the rate of duty is 75% *ad valorem*. If the bottles are valued at \$2,560, what duty will be paid?

3. Paper novelties, valued at \$342, are imported from Japan. They arrive at Seattle, Washington, and are forwarded from there to Milwaukee, Wisconsin, where duty at the rate of 35% *ad valorem* is assessed. What duty will be paid at Milwaukee? If I made a profit of 125%, at what price were the novelties sold?

4. Cuban products are permitted a 20% reduction from the rates of duty charged on products of other countries. A shipment of 10 tons (2240 lb.) of sugar from Cuba enters New Orleans. The rate of duty is 1.7125¢ per pound from which the reduction of 20% is made. What duty will be paid at New Orleans?

5. What is the duty on lace valued at \$2,560 if the rate of duty is 90% *ad valorem*?

6. A man's wool suit weighs  $2\frac{1}{2}$  pounds. In England the value of the suit is \$35. The merchandise carries a compound rate of

duty of 50% *ad valorem* and 50¢ per lb. Find the duty on one suit and then on 12 doz. suits. Note:  $(2\frac{1}{2} \text{ lb.} = 3 \text{ lb.}$  in this problem for specific duty).

7. In Canada the value of a 100-piece set of china dishes is \$60. The dishes carry a compound rate of duty of 70% *ad valorem* and 10¢ per dozen pieces. Find the duty on one set of dishes and then on 125 sets of dishes.

8. I purchased wool blankets in England at 75¢ each. The blankets weigh  $\frac{1}{2}$  lb. each. They are subject to a compound rate of duty of  $37\frac{1}{2}\%$  *ad valorem*, and 33¢ per lb. when imported into the United States. To make a profit of 15%, what is the profit on 1 blanket? What will my profit be on one gross of blankets?

9. In Italy I purchased 2 doz. bottles of olive oil. Each bottle weighs  $1\frac{1}{2}$  lb. and contains 8 lb. of olive oil. When they arrived, two bottles were broken. The rate of duty on olive oil is 8¢ per lb. on the contents and bottle. Allowance is made for the two bottles broken. What duty will I be required to pay?

### Gross and Net Prices

#### LESSON 78

Gross price is the cost of an article without any deductions. It includes expenses, commissions, import duty, etc.

Net price is the cost of an article after all discounts have been deducted, or the actual amount a merchant or individual pays.

	<i>Gross Price</i>	<i>Discount</i>	<i>Net Price</i>
1.	\$125.00	6%	\$117.50
2.	\$235.00	8%	
3.	\$195.00	$4\frac{1}{2}\%$	
4.	\$300.00	$4\frac{1}{2}\%$	
5.	\$ 79.85	$7\frac{1}{2}\%$	

The gross profit is equal to the selling price of an article minus its cost.

The net profit is equal to the difference between the gross profit and the expense of carrying on the store, usually termed the overhead.

Find the gross and net profits of the articles in the following problems:

	<i>Selling Price</i>	<i>Cost of Article</i>	<i>Gross Profit</i>	<i>Overhead or Expense</i>	<i>Net Profit</i>
6.	\$ 79.85	\$ 46.85		\$25.00	
7.	\$129.75	\$ 96.45		\$21.15	
8.	\$235.00	\$145.00		\$26.00	
9.	\$394.35	\$186.00		\$49.80	
10.	\$295.25	\$122.15		\$58.55	
11.	\$ 98.96	\$ 52.18		\$22.00	
12.	\$585.45	\$329.79		\$79.85	
13.	\$432.00	\$285.00		\$32.00	
14.	\$791.79	\$486.75		\$95.35	
15.	\$ 84.95	\$ 46.95		\$27.50	
16.	\$696.75	\$464.50		\$132.25	

**Profit and Loss**

**OBJECTIVE:** To apply your knowledge of percentage to problems in profit and loss.

Profit is a *gain* on the cost of an article, figured at a given rate and *added* to the cost, making the selling price more than the cost. If an article is sold at a *loss*, the loss is figured on the cost at a given rate and *subtracted* from the cost, and then the selling price is *less* than the cost.

**LESSON 79**

1. A \$59.85 bed was sold at a 25% loss. What was the selling price?
2. A \$7,000 home was sold at a  $33\frac{1}{3}\%$  gain. Find the selling price.
3. A piano accordian bought at \$450 was sold at a 20% loss. Find the selling price.
4. A set of books valued at \$97 was sold at a 22% loss. What was the selling price?
5. An automobile that was bought for \$879 was sold at \$625. What is the per cent of loss?
6. A dining-room set was bought for \$64.95 and was sold at \$9.03 gain. What is the per cent of gain? the selling price?
7. What is the selling price of a \$129 bedroom set, if it is sold at a 26% loss?
8. What is the selling price of a desk if it had been bought at \$24.79 and is sold at a  $66\frac{2}{3}\%$  loss?
9. Find the per cent of gain if a \$79 oil painting had been sold for \$97.96?
10. Find the per cent of loss on a bicycle that bought for \$22.50 and sold at \$19.12.

### Review of Percentage Problems

**OBJECTIVE:** To find what progress you have made in percentage. Problems involving profit and loss, insurance, commission, taxes, discount, interest, customs and duties, bonds, etc., are all worked by percentage.

## LESSON 80

1. If a hat which cost \$5.00 is  $33\frac{1}{3}\%$  of a girl's weekly pay, what did she earn in a week? In 17 weeks?
2. A house and lot which cost \$8,960 was sold to Mr. A, who could pay only  $37\frac{1}{2}\%$  cash. How much did he pay in cash and how much remained unpaid?
3. A school dramatic society had \$4,050 in the bank and gave \$1,350 of it for a picture. What per cent of their funds did they use?
4. I pay 20% of my salary for rent,  $37\frac{1}{2}\%$  for food, 30% for clothing and incidental expenses, and have \$135 left. What is my yearly salary?
5.  $37\frac{1}{2}\%$  of a man's income is \$675. What is his income?

## LESSON 81

1. I bought  $15\frac{1}{2}$  yd. of material at \$3.44 a yard and sold it in two lots: 8 yd. to one customer at a gain of  $12\frac{1}{2}\%$ , and the remainder to another customer at a gain of  $16\frac{2}{3}\%$ . Find the entire gain.
2. A book dealer sold 586 books at \$3.80 each and received a commission of 22%. What was his commission and what amount was sent to the publishers?
3. On a trip of 1,560 miles, 20% was driven the first day,  $12\frac{1}{2}\%$  the second; how many miles remained to complete the trip?
4. A school girl is given an allowance of \$5.20 a week. She spends 25% for carfare, 20% for paper and materials, 5% for candy, 10% for club dues, and saves the remainder. Itemize the expense of each article, and find what is left.
5. What per cent of a 720-mile trip is 420 miles?
6. Furniture valued at \$3,200 is insured for 3 years at  $\frac{1}{4}\%$  (.0025). What is the premium per year?

7. If property is taxed at \$29.18 on each thousand dollars, what is the tax on property assessed at \$3,500?
8. United States Government bonds yield 4½% interest. If a man has \$10,560 in Government bonds, what is his annual interest?
9. A dealer bought 250 barrels of flour at \$9.20 a barrel and sold it for \$2,000. What was the gain or loss?
10. By selling property for \$750 more than it cost, a man gained 15%. What did the property cost?

### LESSON 82

1. A merchant bought \$300 worth of goods, 25% of which he sold for \$100. How much did he gain on the part sold? What percentage was left?
2. \$15 is 3% of what amount? \$50 is 8½% of what amount?
3. A grocer who owed \$95.60 paid 18% of his debt at one time and three times that amount at another time. Find the balance.
4. Of 150 yd. of cloth, 62½% were sold. What per cent of the cloth remained unsold, and how many yards remained unsold?
5. If a boy's salary is \$640 a year and his expenses are \$480, what percentage of his salary does he save?

### Miscellaneous Review

### LESSON 83

1. A merchant buys goods for \$348 and sells them at a gain of 33½%. What does he gain? If he invests his profits in goods that cost him \$200, how much does he still owe?
2. What will be the cost of a dress when the following materials are used: 5 yd. of serge at \$1.75 a yard, 3 yd. of lace at 75¢ a yard, 1 yd. of net at \$1.00, \$1.25 for findings, and \$6.50 for labor.
3. Bob buys goods for \$498 and gets 6% discount by paying the bill within 60 days. How much does he gain by paying within that time?
4. I bought 8 yd. of taffeta silk at \$1.60 a yard and sold it at a gain of 12½%. Find the gain and the selling price.
5.  $8,349,847 \times 87 = ?$  Check.

## LESSON 84

1. One yard of broadcloth sells for \$2.97. What will  $6\frac{2}{3}$  yd. and  $4\frac{1}{3}$  yd. cost at that price?
2. Find the gain on  $7\frac{1}{2}$  yd. of linen that costs \$1.98 a yard and sells at a gain of  $33\frac{1}{3}\%$ .
3. I bought 9 yd. of fillet lace at \$1.96 a yard. What did I gain by selling it at a profit of  $14\frac{2}{7}\%$ ?
4.  $\$8\frac{1}{4} + \$7.50 + \$8\frac{2}{3} + \$7\frac{5}{8} + \$6.42 = ?$

## LESSON 85

1.  $3.706 \times .017 = ?$  Check.
2. A man had \$2,025 in the bank and drew out \$450. What per cent did he draw out, and what per cent did he leave in the bank?
3. Our school enrolled 464 pupils, of which  $6\frac{1}{4}\%$  were absent on account of a storm. How many were absent and how many were present?
4. 
$$\begin{array}{r} 837,654 \\ \times 98 \\ \hline \end{array}$$
  
Check.
5.  $968,475 \div 37 = ?$  Check.
6. Make out a bill as shown on page 44, using the following items:  
 2 $\frac{1}{2}$  yd. of silk at \$1.50 per yard.  
 3 $\frac{3}{4}$  yd. of percaline at 25¢ per yard.  
 4 $\frac{1}{2}$  yd. of lawn at 12¢ per yard.  
 9 buttons at 72¢ a dozen.  
 Discount 5% for cash and receipt the bill.
7. A home was sold for \$6,500. The seller paid a real-estate agent 5%. How much did the owner receive? The buyer paid \$25 for having the abstract of title examined and \$2 for recording the deed. As soon as he took possession of the property, he paid \$200 to have it painted. What was the total cost of the property to the buyer?

**Commission Problems**

**OBJECTIVE:** To develop an understanding of another application in percentage.

Commission is compensation paid to agents, salesmen, or other employees for sales, and is figured at a given rate. Sometimes a commission is paid over and above the regular salary as a stimulus to employees to give extra services to their employers.

**LESSON 86**

1. Henry is allowed 2% commission on all his sales. He sells 5 refrigerators at \$112 each. What is his commission?
2. Bob sells books on commission. On sales over \$20 he receives 2%, on those under \$20 he receives 1%. What does he earn by making the following sales: \$83.50, \$16.25, \$50, \$22.50?
3. Mr. Hardy earned 5% on houses sold and 3% on lots. One month he sold 2 lots at \$750 and one at \$1,500, and a house at \$12,500. What was his commission?
4. Mr. Hardy earns on the average \$325 per month. If  $\frac{1}{2}$  of his sales are houses and  $\frac{1}{3}$  are lots, how much does he sell during one year?
5. Mr. Frank gave his clerks 1% commission on all sales made during a certain month. What did he pay to the following clerks: A — \$790, B — \$1,252, C — \$865, D — \$1,010?

**LESSON 87**

1. Gene is given  $\frac{1}{2}\%$  commission on all sales he makes, in addition to his regular pay of \$32 a week. If his sales amounted to \$758.50, what is his pay and commission in one week?
2. A candy jobber makes a commission of 3% on sales. Find his commission on the following sales: \$58.70; \$97.50; \$42.30?
3. In his bookstore, Mr. Grant allows a commission of 18% on all books sold. What does he receive in a month from weekly sales of \$690, \$834, \$792, \$536?
4. An automobile salesman makes a commission of 12% on his sales. Find his commission for cars sold at \$695, \$875, \$1,500, \$650, \$775, and \$575?

5. For selling magazines, Tommy earned 1¢ on every 5¢ magazine and 2¢ on every 10¢ magazine. What did he earn if he sold fifteen 5¢ magazines and forty-three 10¢ magazines?

### Simple Interest

**OBJECTIVE:** To develop ability to understand the arithmetic necessary to compute interest problems.

Interest is a premium paid for the use of money and is figured on the amount of money borrowed at a given rate per year for stated time. The sum borrowed is called the base or principal. The interest plus the sum borrowed is called the *amount*.

### LESSON 88

Interest + principal = amount.

Use 360 days for 1 year; 30 days for a month.

**EXAMPLE:**

Find the interest on \$420 for 1 yr., 2 mo., 15 days at 6%. The cancellation method used in this solution is easily understood. Change the time to days and use as a part of a year.

**SOLUTION:**

\$420 (base)  $\times \frac{6}{100}$  (rate)  $\times \frac{435}{360}$  (time) = \$30.45 interest (percentage).

1. Find the interest on \$840 at 6% for 2 yr., 9 mo., 24 days.
2. At  $3\frac{1}{2}\%$ , find the interest on \$356 for 7 mo., 30 days.
3. Find the interest on \$560 at 4% for 2 yr., 6 mo.
4. Find the interest on \$300 at 3% for 4 yr., 3 mo., 25 days.
5. At 5% interest, find the interest and amount due on a \$950 note borrowed for 3 yr., 6 mo.

### LESSON 89

1. Find the interest on \$565 at 4% for 2 yr., 6 mo., 25 days.
2. At 6%, what is the interest on \$8,700 for 4 yr., 3 mo., 25 days?
3. If a merchant buys goods for \$670, and sells them at a gain of  $37\frac{1}{2}\%$ , what is his gain?

4. If I buy goods for \$500 and get a discount of 6% if the bill is paid within 30 days, how much do I gain?

$$5. 423.6 \times .27 = ?$$

### LESSON 90

1. A bolt of velvet containing 12 yd. was bought for \$42 and sold for \$4.25 a yard. Find the gain on 1 yd. and on 12 yd.

2. I bought 36 yd. of silk for \$67.94;  $\frac{1}{3}$  of it was damaged so that it could not be sold, and the rest was sold for 75¢ a yard. How much was the loss, and what per cent?

3. What is the interest on \$320 for 1 yr., 8 mo., at 6%?

4. I bought 16 yd. of velvet for \$2.50 a yard. I sold 9 yd. of it at a profit of  $16\frac{2}{3}\%$  and the rest at one half that rate of profit. Find the total gain.

5. What is the interest on \$560 for 2 yr., 3 mo., at 5%?

### LESSON 91

1. How much interest at 6% is earned on \$555 in 3 yr., 4 mo.?

2. At 4%, what is the interest for 1 yr., 5 mo. on \$10,500?

3. Find the interest on \$4,650 at 5% for a period of 2 yr., 3 mo., 15 days?

4. At  $5\frac{1}{2}\%$  interest, what is the amount due on \$8,560 for 2 yr., 2 mo.?

5. What is the interest on \$420 for 1 yr., 4 mo., 20 days, at 4%?

6. Find the interest on \$960 at 6% for 3 yr., 3 mo., 20 days.

7. What is the interest on \$11,748 at 5% for 4 yr., 2 mo.?

8. At  $4\frac{1}{2}\%$ , what is the interest on \$8,750 for 6 yr., 4 mo.?

9. What is the interest on \$575 at 4% for 2 yr., 3 mo.?

10. Find the interest on \$900 at 6% for 4 yr., 20 days.

### LESSON 92

1. Find the interest on \$785 at 6% for 3 yr., 5 mo., 20 days.

2. At 5%, what is the interest on \$5,000 for 1 yr., 9 mo., 15 days?

3. How much is the interest on \$945 at 6% for 2 yr., 10 days?

4. Find the interest due on \$750 at  $4\frac{1}{2}\%$  for 3 yr., 3 mo., 10 days.

5. What is the interest on \$955 at 5% for 2 yr., 5 mo., 10 days?

6. Find the interest on \$6,500 at 4% for 3 yr., 3 mo.
7. What would the interest be on \$780 at 6% for 2 yr., 5 mo., 15 days?
8. At 5% interest, what is the amount due on \$5,800 for 1 yr., 8 mo., 25 days?
9. How much interest would be due on \$8,500 at 4% for 2 yr., 2 mo., 20 days?
10. Find the interest due on \$9,250 at 6% for 3 yr., 3 mo., 15 days.

#### Supplementary Interest Problems

Principal  $\times$  Rate  $\times$  Time = Interest

$$P R T = I \qquad P R T = I \qquad P R T = I$$

or                      or

$$P = \frac{I}{R T} \qquad T = \frac{I}{P R} \qquad R = \frac{I}{P T}$$

#### LESSON 93

1. The interest at the end of 1 yr., 1 mo., and 10 days, is \$42 and the rate is 4%. What is the principal?
2. What is the principal if the interest is \$57.75 at  $3\frac{1}{2}\%$  at the end of 2 yr., 6 mo.?
3. Find the rate if the interest on \$424 is \$57.24 and the time is 2 yr., 3 mo.
4. The interest on \$3,864 amounts to \$400.89 in 2 yr., 3 mo., 20 days. Find the rate.
5. Find the time in which \$3,500 would increase to \$3,815 at the rate of 3%.
6. If Jane receives  $2\frac{1}{4}\%$  interest, how long would it take her to increase her \$400 to \$415?

**Compound Interest****OBJECTIVE:** To learn how to compute compound interest.

Compound interest is figured on the amount borrowed at the close of a one-year, a six-month, or a three-month period. The interest for the first period is added to the principal and that sum or amount is used as the new principal; then the interest for the second period is figured on the new principal and it is again added to the last amount making another new principal, and so on. If the third decimal place is 5 or more, add 1 to the second decimal place.

**LESSON 94****EXAMPLE:**

Find the compound interest on \$6,000 for 2 yr., 6 mo., at 5%. Compound interest, when figured for 6 months, 4 months, or 3 months, is  $\frac{1}{2}$ ,  $\frac{1}{3}$ , or  $\frac{1}{4}$  of the per cent of interest for one year.

**SOLUTION:**

$$\$6,000 \times .025 (2\frac{1}{2}\%) = \$150 \dots \text{interest for first 6 months.}$$

$$\$6,000 + \$150 = \$6,150 \dots \text{amount for first 6 months.}$$

$$\$6,150 \times .025 = \$153.75 \dots \text{interest for second 6 months.}$$

$$\$6,150 + \$153.75 = \$6,303.75 \dots \text{amount for second 6 months.}$$

$$\$6,303.75 \times .025 = \$157.59 \dots \text{interest for third 6 months.}$$

$$\$6,303.75 + \$157.59 = \$6,461.34 \dots \text{amount for third 6 months.}$$

$$\$6,461.34 \times .025 = \$161.53 \dots \text{interest for fourth 6 months.}$$

$$\$6,461.34 + \$161.53 = \$6,622.87 \dots \text{amount for fourth 6 months.}$$

$$\$6,622.87 \times .025 = \$165.57 \dots \text{interest for fifth 6 months.}$$

$$\$6,622.87 + \$165.57 = \text{amount for 5th 6 months.}$$

1. How much interest will be earned on \$15,000 at the rate of 4%, if it is compounded quarterly for 2 yr., 3 mo.?
2. What will be the amount of accumulated interest and principal in  $2\frac{1}{2}$  yr. on \$8,500, if the interest is compounded every 4 mo. at the rate of 3%?
3. \$500 is placed in a bank and \$100 is added each 6 mo. Find the compound interest for 2 yr. How much interest would be earned at 4% compounded semiannually?

4. 4% interest is to be compounded quarterly on \$950. What would this amount to in  $3\frac{1}{2}$  yr.?
5. Interest on \$12,500 is compounded semiannually at 4%. Find the compound interest for 5 yr.
6. Find the amount of principal and interest accumulated in 4 yr. on \$5,500 if it is compounded every 4 mo. at 3%.
7. How much interest will be accumulated in 6 yr. on \$850 if the interest on it is compounded semiannually at the rate of 5%?
8. 4% interest is to be compounded quarterly on \$2,800. To what will this amount in  $4\frac{1}{2}$  yr.?
9. The interest on \$7,800 is compounded every 4 mo. at 3%. What will it amount to in 6 yr.?
10. A man put \$500 into the bank toward his son's education. Interest on this sum was compounded at the rate of 3% semi-annually. Find the compound interest at the end of 10 yr.

### Exact Interest

Exact interest is computed for the exact time in days between the date on which money is borrowed until and including the date that it is due, but not including the date on which it is borrowed. The principal times the rate, times the exact number of days, *divided by 365* equals the exact interest. Note that for exact interest we figure 365 days to the year. To find the exact number of days between dates, refer to page 73, Lesson 97.

### LESSON 95

#### EXAMPLE:

Find the exact interest on \$250 from January 12 to April 16 at 5%.

#### SOLUTION:

The exact number of days is 94.

$$\$250 \text{ (base)} \times \frac{5}{100} \text{ (rate)} \times \frac{94}{365} \text{ (time)} = \$3.22 \text{ (interest).}$$

Find the *exact* interest on the following problems:

1. Find the interest on \$824 at 6% from April 3 to July 6.
2. Find the interest on \$526 at 4% from February 12, 1932, to June 6, 1932.
3. On June 1, 1938, Mr. B. borrowed \$250 at 5% and agreed to pay on September 24, 1938. Compute the interest.

4. What is the interest on \$798 at  $3\frac{1}{2}\%$  from Jan. 6, 1936 to May 28, 1936?
5. What is the interest on \$1,129 at  $5\frac{1}{2}\%$  from May 21, 1937 to August 18, 1937? at  $4\%$ ? at  $6\frac{1}{2}\%$ ?

### Common Fractions, Decimals, Percentage

**OBJECTIVE:** To review the steps necessary to change common fractions to decimal fractions, to the United States money system, and to percentage.

The processes of changing common fractions to their decimal value and to their value in the United States money system and then to their percentage value are useful for solving many problems.

## LESSON 96

The following illustrations are arranged to show how decimals, percentage, and United States money are closely related, and how changing from one to the other follows in logical sequence.

After you have studied these subjects separately many of you may not realize how closely they are related. A study of these illustrations will aid you in making similar changes when they are needed in problems.

$$\frac{3}{4} = 3 \div 4 = 4) \underline{3.00}; \text{ then } \frac{3}{4} = .75. \text{ Fractional part changed to decimal value.}$$

$$\$ \frac{3}{4} = \$3. \div 4 = 4) \underline{\$3.00}; \text{ then } \$ \frac{3}{4} = \$ .75. \text{ Fractional part of one dollar changed to cents.}$$

$$\frac{3}{4} = 3 \div 4 = 4) \underline{3.00}; \text{ then } \frac{3}{4} = \frac{75}{100} = 75 \text{ per cent, } 75\%. \text{ Fractional part changed to per cent; written with the per-cent sign (\%).}$$

Decimals	U. S. Money	Per Cent
$\frac{1}{3} = .33\frac{1}{3}$	$\therefore \$ \frac{1}{3} = \$ \frac{33\frac{1}{3}}{100}$ or $\$ .33\frac{1}{3}$ or $33\frac{1}{3}\%$	
$\frac{2}{3} = .66\frac{2}{3}$	$\therefore \$ \frac{2}{3} = \$ \frac{66\frac{2}{3}}{100}$ or $\$ .66\frac{2}{3}$ or $66\frac{2}{3}\%$	
$\frac{1}{4} = .25$	$\therefore \$ \frac{1}{4} = \$ \frac{25}{100}$ or $\$ .25$ or $25\%$	
$\frac{3}{4} = .75$	$\therefore \$ \frac{3}{4} = \$ \frac{75}{100}$ or $\$ .75$ or $75\%$	
$\frac{1}{5} = .20$	$\therefore \$ \frac{1}{5} = \$ \frac{20}{100}$ or $\$ .20$ or $20\%$	
$\frac{1}{6} = .16\frac{2}{3}$	$\therefore \$ \frac{1}{6} = \$ \frac{16\frac{2}{3}}{100}$ or $\$ .16\frac{2}{3}$ or $16\frac{2}{3}\%$	
$\frac{5}{8} = .83\frac{1}{8}$	$\therefore \$ \frac{5}{8} = \$ \frac{83\frac{1}{8}}{100}$ or $\$ .83\frac{1}{8}$ or $83\frac{1}{8}\%$	
$\frac{1}{7} = .14\frac{2}{7}$	$\therefore \$ \frac{1}{7} = \$ \frac{14\frac{2}{7}}{100}$ or $\$ .14\frac{2}{7}$ or $14\frac{2}{7}\%$	
$\frac{3}{7} = .28\frac{4}{7}$	$\therefore \$ \frac{3}{7} = \$ \frac{28\frac{4}{7}}{100}$ or $\$ .28\frac{4}{7}$ or $28\frac{4}{7}\%$	
$\frac{1}{8} = .12\frac{1}{8}$	$\therefore \$ \frac{1}{8} = \$ \frac{12\frac{1}{8}}{100}$ or $\$ .12\frac{1}{8}$ or $12\frac{1}{8}\%$	
$\frac{3}{8} = .37\frac{1}{8}$	$\therefore \$ \frac{3}{8} = \$ \frac{37\frac{1}{8}}{100}$ or $\$ .37\frac{1}{8}$ or $37\frac{1}{8}\%$	
$\frac{7}{8} = .87\frac{1}{8}$	$\therefore \$ \frac{7}{8} = \$ \frac{87\frac{1}{8}}{100}$ or $\$ .87\frac{1}{8}$ or $87\frac{1}{8}\%$	
$\frac{1}{9} = .11\frac{1}{9}$	$\therefore \$ \frac{1}{9} = \$ \frac{11\frac{1}{9}}{100}$ or $\$ .11\frac{1}{9}$ or $11\frac{1}{9}\%$	
$\frac{2}{9} = .22\frac{2}{9}$	$\therefore \$ \frac{2}{9} = \$ \frac{22\frac{2}{9}}{100}$ or $\$ .22\frac{2}{9}$ or $22\frac{2}{9}\%$	
$\frac{3}{10} = .30$	$\therefore \$ \frac{3}{10} = \$ \frac{30}{100}$ or $\$ .30$ or $30\%$	
$\frac{7}{10} = .70$	$\therefore \$ \frac{7}{10} = \$ \frac{70}{100}$ or $\$ .70$ or $70\%$	

Decimals	U. S. Money	Per Cent
$\frac{9}{10} = .90$	$\therefore \$\frac{9}{10} = \$\frac{90}{100}$ or $\$ .90$	or $90$
$\frac{9}{11} = .09\overline{9}$	$\therefore \$\frac{9}{11} = \$\frac{9\frac{1}{11}}{100}$ or $\$ .09\overline{9}$	or $9\overline{9}$
$\frac{1}{3} = .08\overline{3}$	$\therefore \$\frac{1}{12} = \$\frac{8\frac{1}{3}}{100}$ or $\$ .08\overline{3}$	or $8\overline{3}$
$\frac{1}{16} = .06\overline{25}$	$\therefore \$\frac{1}{16} = \$\frac{6\frac{1}{4}}{100}$ or $\$ .06\overline{25}$	or $6\overline{25}$
$\frac{1}{20} = .05$	$\therefore \$\frac{1}{20} = \$\frac{5}{100}$ or $\$ .05$	or $5$
$\frac{1}{25} = .04$	$\therefore \$\frac{1}{25} = \$\frac{4}{100}$ or $\$ .04$	or $4$

## **Chapter VI**

### **PAY ROLLS AND TIME SHEETS**

**OBJECTIVE:** To learn how to read punch cards and to compute time sheets, deductions for Social Security, overtime, pay checks, etc. You will find a working knowledge of these processes always useful in figuring your own time and wages, and it may help you to secure a position where you must do this figuring for your firm.

Pay rolls and time sheets are daily, weekly, or monthly statements on which accurate records are kept, showing the time and the services rendered by each employee of a company. These records are compiled from punch cards used with an automatic electric clock by means of which time, overtime, or piecework is recorded. Pay rolls and time sheets are frequently separate.

If you work for a firm where punch cards are used, your name will appear on a card together with a clock number, days of the week, space for filling in the hours worked. These cards are kept in certain assigned places, and when you enter the building you hold your card in the clock which electrically punches the time when you entered the building to begin work. You use the same procedure when you leave your work. This gives your employer a correct record of the days, hours, and minutes that you were at work.

## LESSON 97

Figure the exact number of days between the following dates:  
EXAMPLE:

How many days between June 18 and November 16?

June has 30 days

— 18 days

12 days left in June

31           in July

31           in August

30           in September

31           in October

16           in November

Total 151 days

1. February 12, 1919 to December 18, 1919.
2. February 11, 1936 to June 6, 1937.
3. January 3, 1922 to December 24, 1922.
4. October 16, 1925 to May 18, 1926.
5. March 5, 1929 to July 22, 1929.
6. September 1, 1927 to April 18, 1928.
7. August 16, 1931 to October 21, 1931.
8. June 3, 1917 to February 18, 1918.
9. July 17, 1937 to January 3, 1938.
10. November 15, 1935 to March 16, 1936.

## LESSON 98

1. Using the punch card shown on page 74, find the number of hours Mary worked. At 52¢ per hour, find her pay for a week.
2. Since Mary has a Social Security account, her employer must retain 1% of her wages to pay to the government for her. How much of her wages is paid to the government each week? How much does she receive?
3. One week Mary worked  $4\frac{1}{2}$  hours overtime. If she worked the same number of hours as in Problem 1, plus the  $4\frac{1}{2}$  hours overtime, how much did she earn that week if overtime is worth time and a half, that is,  $1\frac{1}{2}$  times the rate of 1 hour?

No. 34	
Mary White NAME	
WEEK ENDING	
Monday	In 8:00 Out 12:00 In 1:00 Out 5:15
Tuesday	In 7:45 Out 12:00 In 1:00 Out 5:00
Wednesday	In 8:15 Out 12:00 In 1:15 Out 5:15
Thursday	In 8:00 Out 12:15 In 1:15 Out 5:00
Friday	In 8:15 Out 12:15 In 1:00 Out 5:15
Saturday	In 8:00 Out 12:00 In Out
Sunday	In Out In Out

FORM K 14-15

A punch card

9. Rose works 6 hours per day for the first 3 days. For the following 2 days she puts in 3 hours a day overtime. On Saturday she has 5 hours of overtime plus her regular 4 hours. At 48¢ per hour and time and a half for overtime, what is her weekly salary?

10. Ruth alternates her working hours, working one day 8 hours and the next day 6 hours. If she works 6 days a week, what is her weekly wage at 55¢ per hour?

4. In Problem 3, how much would be deducted for her Social Security account? How much would she have left?

5. Jane works 8 hr. a day for  $5\frac{1}{2}$  days. Find her pay at  $51\frac{1}{2}$ ¢ per hour.

6. Ruth does piecework in an apron factory. Using the following tabulation, and at  $3\frac{1}{2}$ ¢ per piece, find the amount she receives each day and for the week.

Day	No. of Pieces
Monday	96
Tuesday	104
Wednesday	119
Thursday	92
Friday	98
Saturday	54

7. Jane is paid by the day. If she has a 6-day week, find her weekly wages at \$3.45 per day.

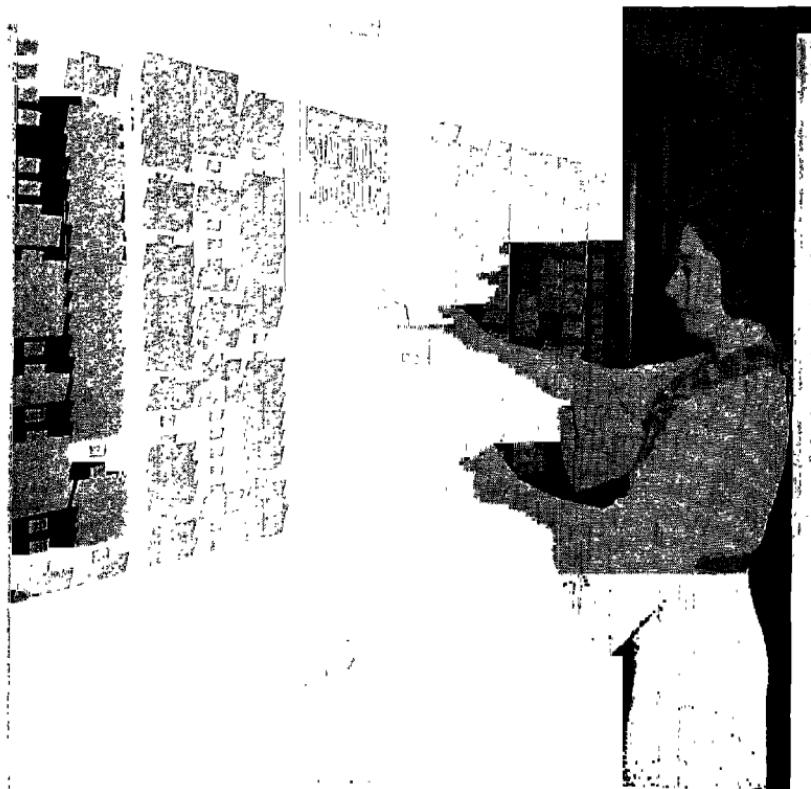
8. In Problem 7, Jane wishes to be paid by the month. What would she receive in 1 month? (4 weeks = 1 mo.)

**LESSON 99**

1. Gladys worked overtime three hours each on a Tuesday, Thursday, and Saturday, and was paid time and a half for it. If her regular week is 40 hr. at 50¢ per hour, what was her wage this week?
2. Ruth works from 8:00 a.m. to 5:30 p.m. with one hour off for lunch. She takes off  $1\frac{1}{2}$  hours three days a week for music lessons. What is her wage at 52¢ per hour if she works 6 days?
3. Emma earns \$6.00 per day and works  $5\frac{1}{2}$  days a week. What is her wage after 1% has been deducted for Social Security tax?
4. Betty works 8 hours a day and  $5\frac{1}{2}$  days per week. What will she earn in a month's time if she receives 50¢ per hour?
5. While working at piecework, Betty finds that she can do on an average of 105 pieces per day. If she is paid 4¢ a piece and works  $5\frac{1}{2}$  days, what is her average weekly wage?
6. Mr. White works on an average 7 hours a day, 6 days per week. His average salary is \$48.30 a week. What is his hourly rate of pay?
7. Roy is an apprentice. He works 8 hours a day and 6 days per week, and is paid 32¢ per hour. What is his weekly wage?
8. Elmer works on an average of 46 hours a week and earns 98¢ per hour. If 1% is deducted for Social Security, and 50¢ every two weeks for insurance, what does he earn in one month?
9. Hazel is a salesgirl and works from 9:30 to 5:30 with one hour free for lunch. She receives 42¢ per hour and works 5 days per week. What does she earn?
10. Bob works nine hours a day, five days each week, and he receives \$1.20 per hour. If he puts 25% of his wages in the bank each week, how much will he have saved at the end of  $\frac{1}{2}$  year?

**LESSON 100**

1. John received a 20% increase in his monthly wages. If the increase plus the wages equal \$120, find the previous wages.
2. On every \$25 sale, a clerk receives 10% commission. If her sales for the week amounted to \$138, find her commission for the week.
3. Mary received a 15% increase on her \$15 a week earnings. What is her increased salary?



Girl employee checking in at a time clock

4. June left a position where she earned \$22 per week to take one that paid \$25.50. Find the percentage of increase.
5. A clerk earned \$28 in a week, but 20% of this was commission. Find her weekly pay exclusive of commission.

### LESSON 101

1. Mary earns \$19 a week. 1% of her pay is deducted for Social Security. Find the balance.
2. Jane earns \$6.00 on Monday,  $\frac{1}{2}$  as much on Tuesday, \$4.00 on Wednesday,  $\frac{3}{4}$  as much on Thursday, and \$5.00 on Friday. If

1% is deducted for Social Security, find the amount of her pay check.

3. Susan is paid \$75 per month. How much is deducted for Social Security at 1%. How much is her check?
4. If Betty earns \$10 a day, every other day, find out her yearly earnings. (360 days = 1 yr.)
5. Esther receives \$28 every 2 weeks. How much does she receive in 1 year?

### Time Problems

**OBJECTIVE:** To acquire skill in figuring the difference between given dates.

### LESSON 102

Find the difference between given dates; for example, between August 7, 1937 and November 11, 1875.

$$1 \text{ year} = 12 \text{ months.}$$

$$1 \text{ month} = 30 \text{ days.}$$

#### EXAMPLE:

Years	Months	Days
1937 - 1 yr. =	$8 + 12 \text{ mo.} = 20 \text{ mo.}$	$7 + 1 \text{ mo. or } 30 \text{ days} =$
	$20 - 1 \text{ mo.} =$	
1936	19	37
1875	11	11
61	8	26

#### EXPLANATION:

$$1937 \text{ yr.} - 1 \text{ yr.} = 1936 \text{ yr.}$$

$$8 \text{ mo.} + 1 \text{ yr. or } 12 \text{ mo.} = 20 \text{ mo.}$$

$$20 \text{ mo.} - 1 \text{ mo.} = 19 \text{ mo.}$$

$$7 \text{ days} + 1 \text{ mo. or } 30 \text{ days} = 37 \text{ days.}$$

Subtract 1 yr. (12 mo.) from 1937 to add to the 8 mo. because it is not possible to subtract a larger number (11 mo.) from a smaller number (8 mo.). 1 mo. or 30 days must be subtracted from 20 mo. to add to 7 days because it is not possible to subtract 11 days from 7 days.

<i>1. Years</i>	<i>Months</i>	<i>Days</i>
1923	8	17
1832	4	25

<i>2. Years</i>	<i>Months</i>	<i>Days</i>
1632	3	18
1492	9	12

3. Mary's father was born on Feb. 29, 1888. How old was he on March 30, 1927?

4. Tom was born on Dec. 29, 1919, and Betty was born May 20, 1921. How much older is Tom than Betty?

5. Betty's grandmother was born Sept. 1, 1852. How old was she on April 6, 1938?

### LESSON 103

1. Mrs. A left for a world cruise on October 14, 1936, and returned home 398 days later. What year, month, and day did she return?

2. Ruth Ann started high school on Sept. 7, 1932, and graduated 1,365 days later. What month, day, and year did she graduate?

3. If Jane was 17 on March 25, 1938, when was she born?

4. On July 13, 1929, Mary's father bought a car that he traded in 3 yrs. 3 mo. 19 days later. What day did the barter take place?

5. Elaine was born on Feb. 12, 1916, and graduated from college on June 14, 1937. How old was she when she received her degree?

6. Mrs. Taylor's grandmother was born Aug. 3, 1861; her mother was born July 15, 1887; Mrs. Taylor was born Feb. 5, 1912; her daughter was born June 13, 1940. How old was each of these persons on July 1, 1941?

## LESSON 104

## EXAMPLE:

How much time passes between 1:45 a.m. and 12:45 p.m.?

## SOLUTION:

$$\begin{array}{r}
 & \quad \quad \quad 11:60 \\
 \text{From } 1:45 \text{ a.m. until noon} & = 12:00 \\
 & - 1:45 \\
 & \hline
 & 10:15 \text{ or } 10 \text{ hr. and } 15 \text{ min.} \\
 \text{From noon until } 12:45 \text{ p.m.} & = \underline{\quad} 45 \text{ or } \quad 45 \text{ min.} \\
 \text{Total} & = 10:60 \text{ or } 10 \text{ hr. and } 60 \text{ min.} \\
 & \text{Since } 60 \text{ min.} = 1 \text{ hour,} \\
 & \text{then } 10 + 1 = 11 \text{ hours difference.}
 \end{array}$$

Work the following problems:

1. How much time elapses between 7:45 a.m. and 9:55 p.m.?
2. Bobby slept from 8:00 p.m. until 7:45 a.m. How long did he sleep?
3. Mother started her washing at 6:25 a.m. and finished at 8:32 a.m. How long did it take her to do her washing? How many minutes?
4. Sister baked a cake that was put into the oven at 8:48 a.m. If it is to bake 55 min., what time should the cake come out of the oven?
5. May started to school at 7:27 a.m. and came home at night at 4:35 p.m. How long was she away from home?
6. Junior goes to kindergarten. He leaves at 12:50 p.m. and returns at 3:48 p.m. How long is he in school?
7. Patsy is doing her homework. If she works from 6:45 p.m. to 7:50 p.m. on her English, and until 9:15 p.m. on her arithmetic, how long does she work on each?
8. How much time elapses from 6:45 a.m. until 9:35 a.m. the following morning?
9. How many hours and minutes pass between 11:30 a.m. and 7:40 p.m. the following day?
10. My parents retire at 10:15 p.m. and awake at 6:25 a.m. If the children are in bed 2 hr. before the parents, and they get up 1 hr. and 20 min. later, compare the sleeping hours of the parents and children.

## LESSON 105

## Time Table

60 seconds (sec.)	= 1 minute (min.)
60 minutes	= 1 hour (hr.)
24 hours	= 1 day (da.)
7 days	= 1 week (wk.)
4 weeks	= 1 month (mo.)
12 calendar months	= 1 year (yr.)
52 weeks	= 1 year
365 days	= 1 common year
366 days	= 1 leap year
10 years	= 1 decade
20 years	= 1 score
100 years	= 1 century (cen.)

Thirty days hath gay September,  
 April, June, and cold November;  
 All the rest have thirty-one,  
 Except the second month alone,  
 Which has but twenty-eight and fine,  
 'Til leap year gives it twenty-nine.

## How a Day Is Gained in Leap Year

To be exact, there are 365 days, 5 hr., 48 min., 49.7 sec. in one year. Thus, in four years *approximately* one day is gained. How much is gained *exactly*? How many minutes and seconds too much is added in a leap year?

## Leap Year

Each year that is divisible by four without a remainder is a leap year, excepting the years which end a full century, which, to be a leap year, must be divisible by four hundred without a remainder. The years 1900 and 1800 were not leap years, but 1600 was a leap year and 2000 will be a leap year.

This dropping of leap years at some of the century years compensates, *again approximately*, for the excess minutes and seconds added in the leap years.

### Arabic and Roman Numerals

**OBJECTIVE:** To familiarize yourself with the two systems of numerals used and to practice reading and changing from one system to the other.

Arabic numerals or figures, consisting of 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9, were first used in India, and in the early part of the ninth century were introduced to Europe by the Arabs.

Roman numerals originated from arbitrary signs which later were formed into letters most nearly resembling these signs. They are upright or erect to distinguish them from the italic or slant characters, and are expressed in letters such as L, IV, I, etc. They are frequently used on clock dials, for dates on cornerstones of buildings, to head chapters in books, for dates on college and university diplomas, etc.

### LESSON 106

Arabic	Roman	Arabic	Roman	Arabic	Roman
1—I		14—XIV		90—XC	
2—II		15—XV		100—C	
3—III		16—XVI		200—CC	
4—IV		17—XVII		300—CCC	
5—V		18—XVIII		400—CD	
6—VI		19—XIX		500—D	
7—VII		20—XX		600—DC	
8—VIII		30—XXX		700—DCC	
9—IX		40—XL		800—DCCC	
10—X		50—L		900—CM	
11—XI		60—LX		1000—M	
12—XII		70—LXX		2000—MM	
13—XIII		80—LXXX			

Write the following Arabic numbers as Roman numbers:

- |         |         |         |                     |
|---------|---------|---------|---------------------|
| 1. 1492 | 4. 598  | 7. 1919 | 10. Date of pupil's |
| 2. 763  | 5. 1776 | 8. 1498 | birthday.           |
| 3. 1928 | 6. 1917 | 9. 679  |                     |

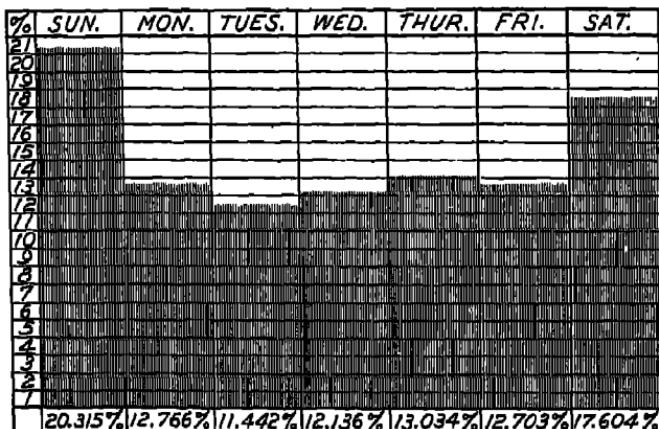
## Chapter VII

### GRAPHS

**OBJECTIVE:** To learn to read graphs, to understand their meaning, and to use them in solving problems. Graphs are so commonly used that they may be considered almost a part of our language.

Statements of related facts, when expressed in words, are difficult to understand, but when these same facts are compared by means of graphs you see at a glance just what the words did not express to you. Graphs then are used to express related facts. Pictographs, bar, line, broken-line, and circle graphs are in common use.

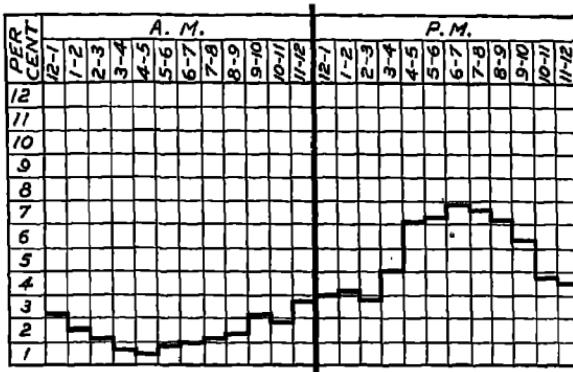
Circle graphs are used for budget making for the family finances, or are used as a dollar representing the expenses and the costs, usually given in percentage, of various departments of the government, etc.



This is one type of bar graph, showing a comparison, in percentages, of automobile-accident fatalities by the days of the week

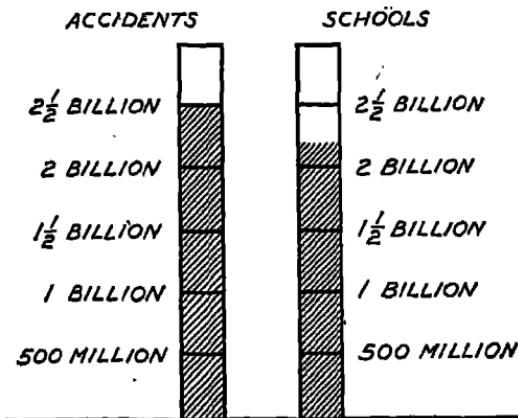
Line graphs may be straight, curved, or broken, and are used to compare magnitude and importance of events for various periods of time, variation in costs of commodities, etc.

Bar graphs may be either vertical or horizontal. They are used for unrelated comparisons or those less closely related.



Graph showing, in percentages, the fatal automobile accidents during the 24 hours of a day

Above is a second type of bar graph. Read the percentages of accidents which happened during various hours, from the graph.

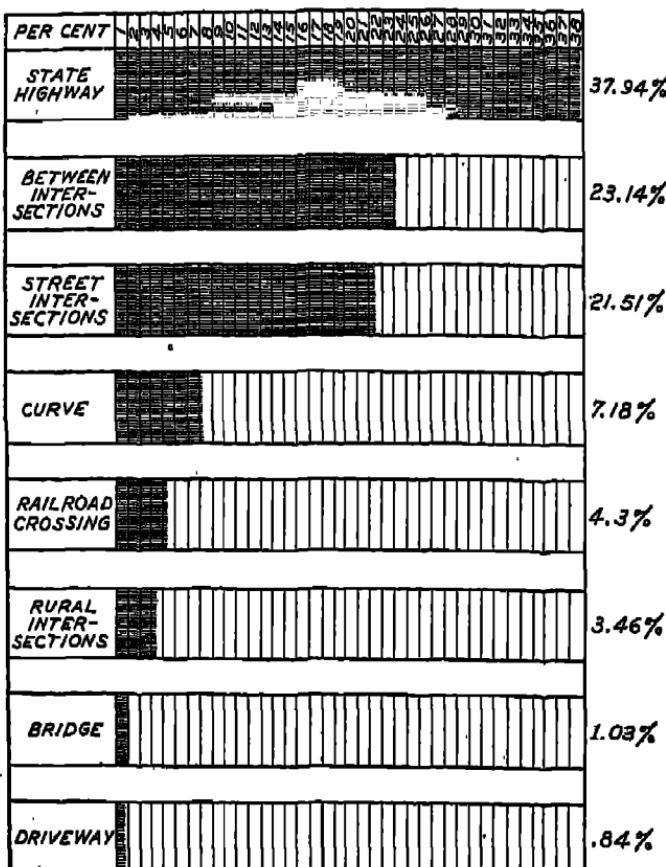


Graph comparing cost of automobile accidents with the cost of the elementary and secondary education in the United States

The graph above is a third type of graph. It compares the cost of automobile accidents and public school education for one

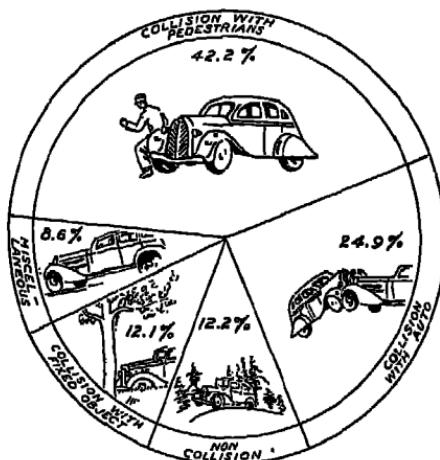
## APPLIED MATHEMATICS FOR GIRLS

year in the United States. The annual cost of accidents is \$2,500,000,000, while that of schools is \$2,200,000,000.



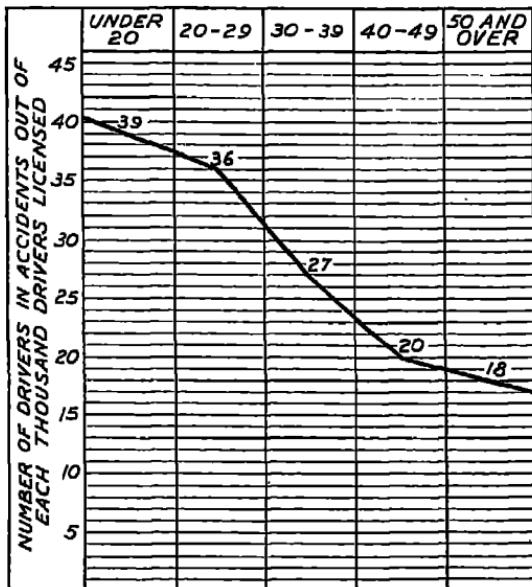
Graph showing road locations of fatal automobile accidents

Above is a fourth type of graph, also known as a bar graph. It represents in percentages the road location of fatal automobile accidents in the United States during a recent year.



A circular percentage graph for comparing the parts of a whole. The above shows the percentages of types of automobile accidents.

The above graph is a kind very widely used, especially for budget planning and personality analyses.



A graphic line chart illustrating accident statistics by ages of drivers

**LESSON 107**

1. Compare the percentage of automobile accidents occurring on Saturday and Thursday.
2. How would you explain the great increase in accidents over week ends and the lowest number on Tuesday?
3. Compare the percentage of accidents happening from 1 to 2 a.m. and 1 to 2 p.m.
4. Compare the cost of automobile accidents to the cost of schools in the United States every year.
5. How many more accidents happen on state highways than at railroad crossings?
6. How does the percentage of accidents occurring at rural intersections compare with those on state highways?
7. Compare the percentage of accidents happening on curves and on bridges.
8. How does the percentage of collisions with pedestrians compare with collisions with a fixed object?
9. What is the average number of drivers in every thousand licensed who have accidents?
10. How does the number of drivers in accidents aged from 40 to 49 compare with those under 20?

**LESSON 108**

1. Keep an account of the attendance of your class for one week on a line graph.
2. Jane enjoys walking. Make a bar graph comparing the distance she walks each day for one week. Sunday, 4 miles; Monday, 7 miles; Tuesday, 8 miles; Wednesday,  $6\frac{1}{2}$  miles; Thursday, 7 miles; Friday, 7 miles; Saturday, 14 miles.
3. Show in graph form the comparison between the population of the following cities: Atlanta, Georgia, 280,400; Buffalo, New York, 584,400; Kansas City, Missouri, 412,600; Minneapolis, Minnesota, 477,700; Milwaukee, Wisconsin, 624,243; St. Louis, Missouri, 830,300.
4. Compare by graph the ages of the following presidents at their inauguration: George Washington, 57; Andrew Jackson, 61; Abraham Lincoln, 52; Ulysses S. Grant, 46; Theodore Roosevelt,

42; Woodrow Wilson, 56; Herbert Hoover, 54; Franklin D. Roosevelt, 51.

5. Graph the prices of the following books: *Man, the Unknown*, \$3.50; *The Arts*, \$5.00; *The Citadel*, \$2.50; *Madame Curie*, \$3.00; *Mathematics for the Millions*, \$3.75; *Return to Religion*, \$1.75.

## LESSON 109

1. Change the circular automobile graph to a bar graph.
2. (a) The following figures compare the school attendance on each day of the week. Draw a line graph to illustrate. Monday, 60%; Tuesday, 85%; Wednesday, 98%; Thursday, 95%; Friday, 80%. (b) Why has Monday's attendance such a marked decrease?
3. Using your arithmetic grades for the past week, illustrate the increase and decrease in your daily grades with a line graph.
4. The front page of your daily newspaper is filled with reports of accidents, robberies, affairs of state, and weather and climatic reports of different kinds. Use these four divisions, and draw a circular graph comparing the amount of space given to each type. The fifth item might be titled "Miscellaneous."
5. Find the vital statistics of your daily newspaper and draw a line graph illustrating the ages of death on that certain day.
6. Mr. and Mrs. Robin Spring have 8 children. Their ages are: 2B, 3B, 5G, 9G and 9B (twins), 11G, 12B, and 15G. The letters stand for boy or girl. Draw a circular graph depicting the ages and sex (use different colors). To draw a circular graph, add the ages, and the total will be the number of parts into which you divide the circle; then proceed from that point.
7. Turn to the supplement of your geography; select 10 cities, and compare their populations, using a line graph.
8. The price of a bedroom suite in each of five stores was as follows: \$59.00, \$75.95, \$80.50, \$62.75, and \$68.85. Compare these prices, using a bar graph.
9. The girls of a club compared their weekly wages. Mary had \$18.00, Ruth \$15.00, Esther \$13.00, Alice \$12.50, Elaine \$23.00, and Helen \$14.00. Compare these earnings, using a line graph.
10. Using the figures in Problem 9, draw a bar graph.

## Chapter VIII

### SEWING PROBLEMS

**OBJECTIVE:** To gain speed, accuracy, and skill in applying the fundamental processes of arithmetic to practical problems in dressmaking and allied trades.

#### The Tape Measure

A tape measure is a graduated tape several feet long, marked for divisions into inches, half inches, quarter inches, and eighth inches. It is used by dressmakers, milliners, tailors, and home-makers.

#### LESSON 110

Memorize the following table of parts of a yard. You will need to use it constantly in sewing or in buying and selling yard goods.

36 in. = 1 yd.	9 in. = $\frac{9}{36}$ yd. = $\frac{1}{4}$ yd.
18 in. = $\frac{18}{36}$ yd. = $\frac{1}{2}$ yd.	6 in. = $\frac{6}{36}$ yd. = $\frac{1}{6}$ yd.
12 in. = $\frac{12}{36}$ yd. = $\frac{1}{3}$ yd.	24 in. = $\frac{24}{36}$ yd. = $\frac{2}{3}$ yd.
3 in. = $\frac{3}{36}$ yd. = $\frac{1}{12}$ yd.	27 in. = $\frac{27}{36}$ yd. = $\frac{3}{4}$ yd.
4 in. = $\frac{4}{36}$ yd. = $\frac{1}{9}$ yd.	20 in. = $\frac{20}{36}$ yd. = $\frac{5}{9}$ yd.
4 $\frac{1}{2}$ in. = $\frac{4\frac{1}{2}}{36}$ yd. = $\frac{1}{8}$ yd.	30 in. = $\frac{30}{36}$ yd. = $\frac{5}{6}$ yd.

$$22\frac{1}{2} \text{ in.} = \frac{22\frac{1}{2}}{36} = \frac{45}{2} \div 36 = \frac{45}{2} \times \frac{1}{36} = \frac{5}{8} \text{ yd.}$$

$$31\frac{1}{2} \text{ in.} = \frac{31\frac{1}{2}}{36} = \frac{63}{2} \div 36 = \frac{63}{2} \times \frac{1}{36} = \frac{7}{8} \text{ yd.}$$



A tape measure is an important tool when you do dressmaking

**NOTE:** If you have not mastered common fractions, you can work out the parts of a yard in class with the aid of a tape measure. Place a pin at 36 in. and one at 18 in.; then fold the tape measure so that the 1-in. mark meets the 36-in. mark; this will show that 18 in. equals  $\frac{1}{2}$  yd. Place a pin at 12 in. and see how many times 12 in. is contained into 36 in. This shows that 12 in. equals  $\frac{1}{3}$  yd. and that 24 in. equals  $\frac{2}{3}$  yd. In like manner use 9 in., 6 in., etc., and use the measure to find their equal parts of a yard.

### LESSON 111

1. 1 yd. = how many inches?
2.  $\frac{1}{2}$  yd. = how many inches?
3.  $\frac{1}{3}$  yd. = how many inches?
4.  $\frac{1}{4}$  yd. = how many inches?

5.  $\frac{1}{8}$  yd. = how many inches?
6.  $\frac{1}{6}$  yd. = how many inches?
7.  $\frac{2}{3}$  yd. = how many inches?
8.  $\frac{3}{4}$  yd. = how many inches?
9.  $\frac{5}{8}$  yd. = how many inches?
10.  $\frac{6}{7}$  yd. = how many inches?
11.  $\frac{7}{8}$  yd. = how many inches?
12.  $2\frac{1}{3}$  yd. = how many inches?
13.  $1\frac{1}{2}$  yd. = how many inches?
14.  $1\frac{2}{3}$  yd. = how many inches?
15.  $3\frac{1}{4}$  yd. = how many inches?
16.  $1\frac{5}{8}$  yd. = how many inches?
17. 78 in. are how many yards and inches?
18. 54 in. are how many yards and inches?
19. 39 in. are how many yards and inches?
20. 85 in. are how many yards and inches?
21. 90 in. are how many yards and inches?
22. 118 in. are how many yards and inches?
23. 150 in. are how many yards and inches?

### Mental Review of the Tape Measure

#### LESSON 112

1. How many inches are there in your tape measure?
2. How many inches in a yard?
3. One inch is what part of a yard? 2 in., 3 in., 7 in.?
4. What fractional part of a yard is 6 in., 8 in.?
5. How many inches in  $1\frac{1}{2}$  yd.,  $1\frac{1}{3}$  yd.,  $1\frac{1}{4}$  yd., 2 yd.?
6. How many inches in 2 yd. 4 in.?
7. How many inches in 3 yd. 5 in.?
8. How many yards in 103 in.?
9. How many inches in  $\frac{2}{3}$  yd.,  $\frac{3}{4}$  yd.,  $\frac{5}{8}$  yd.,  $\frac{1}{2}$  yd.,  $\frac{1}{4}$  yd., and  $\frac{1}{8}$  yd.?
10. How many yards in 104 in., 144 in.?
11. Reduce 63 in. to yards.
12. Reduce 150 in. to yards.
13. How many yards and inches in 90 in.?
14. How many yards and inches in 78 in.?
15. How many yards and inches in 54 in.?

16. How many yards and inches in 120 in.?
17. Change 3 yd. 12 in. to inches.
18. Change 1 yd. 4 in. to inches.
19. Change 2 yd. 9 in. to inches.
20. Change 5 yd. to inches.

### Tape-Measure Problems

**OBJECTIVE:** To master the processes of addition, subtraction, multiplication, and division of yards and parts of yards as studied in the lessons on the tape measure. The mastery of these problems will help you to solve many sewing problems which will follow in this book as well as those you will meet at home and at work.

### LESSON 113

Problem in addition, and its solution:

$$1. \frac{3}{4} \text{ yd.} + 21 \text{ in.} + 1\frac{1}{2} \text{ yd.} = 6 \text{ yd.}$$

SOLUTION:

$\frac{3}{4}$ yd. 27 in.	
21 in.	
$\frac{1}{2}$ yd. 24 in.	
$\frac{4}{4}$ yd. 72 in.	
$\frac{72}{6}$ in. = 2 yd.	
$\frac{6}{6}$ yd.	

Problem in addition and subtraction, and its solutions:

$$2. \frac{5}{6} \text{ yd.} + 3\frac{1}{4} \text{ yd.} + 7\frac{1}{8} \text{ yd.} - 12 \text{ yd. } 11 \text{ in.} = 3 \text{ yd. } 32 \text{ in.}$$

SOLUTIONS:

$$\begin{aligned} \frac{5}{6} \text{ yd.} &= 5 \text{ yd. } 30 \text{ in.} \\ 3\frac{1}{4} \text{ yd.} &= 3 \text{ yd. } 9 \text{ in.} \\ 7\frac{1}{8} \text{ yd.} &= \underline{7 \text{ yd. } 4 \text{ in.}} \\ &\quad 15 \text{ yd. } 43 \text{ in.} \end{aligned}$$

ONE SOLUTION: ANOTHER SOLUTION:

$$\left. \begin{array}{l} 15 \text{ yd. } 43 \text{ in.} \\ 16 \text{ yd. } 7 \text{ in.} \end{array} \right\}$$

$$\begin{aligned} &\quad 15 \text{ yd. } 36 \text{ in.} \\ &\quad 16 \text{ yd. } 7 \text{ in.} \\ &- 12 \text{ yd. } 11 \text{ in.} \\ &\quad \underline{3 \text{ yd. } 32 \text{ in.}} \end{aligned}$$

Problem in multiplication, and its solution:

3. Multiply 5 yd. 12 in. by 3.

SOLUTION:

$$\begin{array}{r} 5 \text{ yd. } 12 \text{ in.} \\ \times 3 \\ \hline 15 \text{ yd. } 36 \text{ in.} \end{array}$$

$$\text{But } 36 \text{ in.} = \underline{1 \text{ yd.}}$$

$$\text{Hence } 15 \text{ yd. } 36 \text{ in.} = \underline{16 \text{ yd.}}$$

Problem involving addition and subtraction, and its solution:

4. One customer buys 12 yd. 6 in.; another  $2\frac{1}{4}$  yd.; another  $6\frac{5}{8}$  yd., from a 42-yd. bolt of material. Find the number of yards sold and the number of yards that remained unsold.

SOLUTION:

1st step

$$\begin{array}{r} 12 \text{ yd. } 6 \text{ in.} \\ 2 \text{ yd. } 27 \text{ in.} \\ 6 \text{ yd. } 30 \text{ in.} \\ \hline 20 \text{ yd. } 63 \text{ in.} \\ 63 \text{ in.} = \underline{1 \text{ yd. } 27 \text{ in.}} \\ \hline 21 \text{ yd. } 27 \text{ in. sold} \end{array}$$

2nd step

$$\begin{array}{r} 42 \text{ yd.} = 41 \text{ yd. } 36 \text{ in.} \\ - 21 \text{ yd. } 27 \text{ in.} \\ \hline 20 \text{ yd. } 9 \text{ in. unsold} \end{array}$$

Problems involving division, and their solution:

5. 3 yd. 12 in.  $\div$  6.

SOLUTION:

$$3 \text{ yd. } 12 \text{ in.} = 108 \text{ in.} + 12 \text{ in.} = 120 \text{ in.}$$

$$120 \text{ in.} \div 6 = 20 \text{ in.}$$

6. A 42-yd. bolt of gingham was made into aprons using  $2\frac{1}{4}$  yd. for each apron. How many aprons were made, and how many yards were left?

FIRST SOLUTION:

$42 \text{ yd.} \div 2\frac{1}{4} = 18\frac{2}{3}$ . 18 aprons were made and  $\frac{2}{3}$  of an apron was left.  $\frac{2}{3}$  of an apron is  $\frac{2}{3} \times 2\frac{1}{4} \text{ yd.} = 1\frac{1}{2} \text{ yd. or } 54 \text{ in.}$

## SECOND SOLUTION:

$$42 \text{ yd.} = 1512 \text{ in. } 2\frac{1}{4} \text{ yd.} = 81 \text{ in.}$$

$1512 \div 81 = 18\frac{4}{5}$ . 18 aprons were made and  $\frac{2}{5}$  of an apron was left.  $81 \text{ in.} \times \frac{2}{5} = 54 \text{ in. or } 1\frac{1}{2} \text{ yd.} = \text{amount of cloth left.}$

## LESSON 114

Solve the following problems which are similar to those shown in the examples under Lesson 113:

1.  $6\frac{1}{2} \text{ yd.} + 23 \text{ in.} + 2\frac{3}{4} \text{ yd.}$
2. From the sum of  $5\frac{3}{4} \text{ yd.}$  and  $7\frac{7}{8} \text{ yd.}$  take  $6 \text{ yd. } 14 \text{ in.}$
3. Multiply  $3 \text{ yd. } 15 \text{ in. by } 4.$
4. One customer buys  $5 \text{ yd. } 10 \text{ in.}$ , another  $2\frac{3}{4} \text{ yd.}$ , another  $5\frac{5}{8} \text{ yd.}$  from a 42-yd. bolt of cloth. How many yards were sold, and how many yards were left?
5.  $4 \text{ yd. } 18 \text{ in.} \div 6 = ?$        $12\frac{3}{4} \text{ yd.} \div 4 = ?$
6. How many aprons can be cut from a 42-yd. bolt of cloth if each apron requires  $2\frac{1}{2} \text{ yd.}?$  How many yards of cloth will be left?
7. From  $15\frac{2}{3} \text{ yd.}$  take the sum of  $5 \text{ yd. } 6 \text{ in.}$  and  $7\frac{7}{8} \text{ yd.}$
8.  $5\frac{1}{2} \text{ yd.} + 3\frac{3}{4} \text{ yd.} - 45 \text{ in.} = ?$
9.  $19 \text{ in.} + 3\frac{5}{8} \text{ yd.} + 2\frac{5}{8} \text{ yd.} = ?$
10.  $3 \text{ yd. } 3 \text{ in.} \times 6 = ?$        $4\frac{5}{6} \text{ yd.} \times 3 = ?$

## LESSON 115

1. Multiply  $3\frac{1}{2} \text{ ft. by } 9.$
2. 9 in. is what part of  $3\frac{3}{4} \text{ ft.}?$
3.  $2\frac{1}{2} \text{ ft.} - 7 \text{ in.} + 1\frac{1}{2} \text{ yd.} - 1\frac{1}{2} \text{ ft.}$
4. Divide  $\frac{7}{8} \text{ yd. by } 2.$
5.  $6 \text{ ft. } 9 \text{ in.} \div 3.$
6. From  $3 \text{ yd.}$  take  $2 \text{ ft.}$
7.  $5 \text{ yd. } 18 \text{ in.} - 8 \text{ ft. } 21 \text{ in.}$
8.  $1 \text{ yd. } \frac{1}{2} \text{ ft.} \times 2 + 8 \text{ in.} - 2 \text{ ft.}$
9.  $1 \text{ ft. } 3 \text{ in.} \times 6.$
10.  $2 \text{ ft. } 6 \text{ in.} + 29 \text{ in.} + 1\frac{1}{4} \text{ ft.}$

## LESSON 116

NOTE: When 13 in., 17 in., or 19 in. of material is given in a problem, unless the material is expensive, it is correct to use the nearest aliquot part of a yard. For example: 13 in. may be considered as 12 in. or  $\frac{1}{3}$  yd., 17 in. as 18 in. or  $\frac{1}{2}$  yd., 23 in. as 22 $\frac{1}{2}$  in. or  $\frac{5}{8}$  yd.

When material is expensive, this method of figuring would not be advisable. In examples 4 and 5, by taking 13 in. as  $\frac{1}{3}$  yd. instead of  $\frac{13}{36}$ , there is a difference of half a cent, and it is often found that an amount gained in one place is lost in another, and the small differences balance accounts.

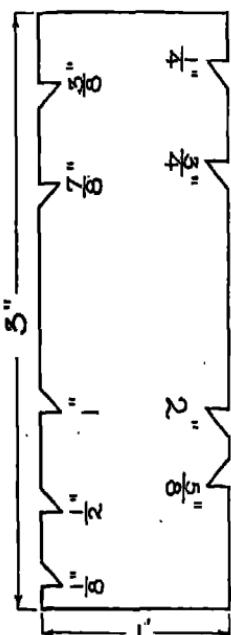
1. At 88¢ a yard, find the cost of 6 yd. 22 in. of lace.
2. What will 3 yd. 19 in. of ribbon cost at 24¢ a yard?
3. What will 4 yd. 17 in. of longcloth cost at 28¢ a yard?
4. Find the cost of 2 yd. 31 in. of satin at \$2.40 a yard.
5. What will 2 yd. 17 in. of ribbon cost at 30¢ a yard?
6. Find the cost of 15 yd. 13 in. of material at 39¢ a yard.
7. At 72¢ a yard, find the cost of 2 yd. 7 in. of voile.
8. At \$1.50 a yard, find the cost of 3 yd. 11 in. of broadcloth.
9. Find the cost of 3 yd. 28 in. of sateen at 36¢ a yard.
10. Find the cost of 2 yd. 13 in. of braid at 21¢ a yard.
11. What will 6 yd. 6 in. of elastic cost at 7¢ a yard?
12. What will 4 yd. 12 in. of serge cost at \$1.98 a yard?
13. At \$3.87 a yard, find the cost of 3 yd. 20 in. of velvet.
14. At \$1.98 a yard, find the cost of 7 yd. 18 in. of silk jersey.
15. Find the cost of 5 yd. 11 in. of grosgrain ribbon at \$1.20 a yard.

#### Making Gauges

OBJECTIVE: To train yourself for accuracy when working with parts of an inch.

## LESSON 117

To make a seam and hem gauge, bring a tape measure and scissors to class. Mark off on a piece of paper, 1 by 3 in., the following:  $\frac{1}{8}$  in.,  $\frac{1}{4}$  in.,  $\frac{3}{8}$  in.,  $\frac{1}{2}$  in.,  $\frac{5}{8}$  in.,  $\frac{3}{4}$  in.,  $\frac{7}{8}$  in., 1 in., and 2 in. From the upper corners mark in on a



A seam and hem gauge

*straight line and draw a slant line down; from the lower corners, mark in on a straight line and draw the slant line up.* The distance from the corner to the straight line is the measure used. After practicing on paper, use a stronger material, such as pressboard or stiff cardboard, to make gauges used in sewing classes. The measurements must be very accurate, or the gauge is of no value to the pupil. Cut out as indicated in the drawing. It is necessary for the instructor to examine the gauge before permitting its use.

#### Abstract and Concrete Problems

Numbers are classified as abstract, concrete, or denounce. Abstract numbers are not applied to any particular name, as three (3), four (4), etc.

Concrete numbers are used in word problems and are applied to some name in the problem as  $\frac{2}{3}$  yd., 3 books, 4 boxes, etc.

Denounce numbers are units of some table of measure as 3 quarts, 5 miles, 4 inches, etc.

Abstract problems have the signs which indicate or show the various steps or operations necessary to solve the problem, as  $7 \times 8 - 6 \div 5 = 10$ .

Concrete problems use *no signs* to give the correct operations, but pupils must be able to interpret the words of the problem in such a way as to use the correct sign in the solution of the problem.

#### EXAMPLE:

A bookstore allows a clerk in the store a 15% discount on books bought. Find the cost, the discount, and the amount that the clerk will pay for 3 books at \$1.75 each.

**SOLUTION:**

$\$1.75 \times 3 = \$5.25$  cost of books.  $\$5.25 \times \frac{15}{100}$  discount =  
 $\$ .79$ .  $\$5.25 - \$ .79 = \$4.46$  cost for the clerk.

**Interpretation of Concrete Problems**

**OBJECTIVE:** To overcome difficulties met in reading and working concrete or word problems such as you must solve in daily life.

Every problem in arithmetic is solved by using one or more of the fundamental operations; that is, addition, subtraction, multiplication, or division. To solve abstract examples, when these operations are indicated by the correct signs, is not difficult, but often it is not easy to select the correct process from the wording in concrete or word problems. It is worth while to spend some time on the interpretation of a problem in order to choose the correct procedure. Follow these suggestions when working a set of problems, and pick out *key word* for each problem.

(Do not work problem, but use key words for answers instead of arithmetical answers.)

**LESSON 118***How to attack a problem:*

1. Read the problem several times.
2. What facts are given?
3. What *process* is used and what is *its sign*?
4. What is the question asked?
5. What is the estimated result?
6. Do the results check according to the conditions of the problem?

The following arithmetical shorthand symbols are used to indicate the four fundamental operations, whether in integers, fractions, decimals, or percentage. Look for the *word* that indicates the correct operation; this word is the *key* to the solution of the problem. *Look for the key word.*

The following words are used to indicate the four fundamentals used in problems:

Addition + . . . add, added to, credit, increase, increased by, more or more than, plus, sum, total, whole.

Subtraction — balance, cut, deduct, decrease, debit, difference, from, less, less than, loss, minus, remain, take from.

**Multiplication**  $\times \dots @$ , at, doubled, product, of, to find a given per cent of a given number, times, to find the cost. trebled.  
 $(\frac{2}{3} \times 15 = 10; \frac{2}{3} \text{ of } 15 = 10; 66\frac{2}{3}\% \text{ of } 15 = 10.)$

**Division**  $\div \dots$  divided, distributed equally, equa' shares, when a certain per cent of a number is given to find the whole, to find the average, to find a quotient.

Some confusion is caused by the use of a variety of forms to obtain the same answers. For example:  $3)12$ ;  $12 \div 3 = 4$ ;  $\frac{1}{3}$  of  $\underline{4}$

$12 = 4$ ; and  $\frac{1}{3} \times 12 = 4$ ;  $\frac{1^2}{3} = 4$ .

Constant drill in the use of these arithmetical symbols is very valuable. *Reading* is to *arithmetic* what *reading* is to English; in both cases better understanding is acquired and both subjects become more interesting.

### Miscellaneous Word Problems

#### LESSON 119

1. Mary's mother plans to buy hangers for clothing. Mary has 8 dresses, 4 blouses, 3 coats; her mother has 6 dresses, 5 Hoover aprons, and 4 coats; 12 are needed for her father's clothing; allow 2 dozen extra hangers. How many hangers are bought? How many dozen? At 2 for 5¢ find the cost of the hangers.
2. John's church trustees are ordering hangers for their auditorium. There are 6 stands with 55 hangers on each, and 3 stands with 35 hangers each. Find the total number of hangers bought. How many dozen? At 3 for 9¢, find the cost of the hangers.
3. The Ladies' Aid bought large cups for dinner. They used 432 cups for a dinner and ordered 2 dozen extra. How many cups were ordered? How many dozen?
4. In the third problem, the cups are bought at  $4\frac{1}{4}\%$  each. Find the total cost. Count the change from \$25.
5. If the cups in Problem 4 are bought at 10¢ each, how much will they cost?

## Tucking and Hemming Problems

**OBJECTIVE:** To figure the exact width of material to be cut for a ruffle or flounce.

## LESSON 120

**GENERAL RULE:** For hems of  $\frac{1}{2}$  in. or more,  $\frac{1}{4}$  in. is allowed for the first turn of the hem, and for narrower hems  $\frac{1}{8}$  in. is allowed;  $\frac{1}{2}$  in. is allowed for the top seam, varying with the quality of material, and when tucks are made, twice the depth of a tuck is used. Therefore, if a flounce when finished is to be 5 in., add to the 5 in. all that which is taken up in *tucks, hems, turns, and seams*.

**EXAMPLE:**

How much material is used in making a flounce 5 in. deep, having a  $\frac{1}{4}$ -in. hem, allowing  $\frac{1}{4}$  in. for the first turn of the hem and  $\frac{1}{8}$  in. for the seam, and making three  $\frac{1}{8}$ -in. tucks?

**SOLUTION:**

Add

$$\begin{array}{r}
 5 \text{ in.} \quad \text{flounce} \\
 \frac{1}{4} \text{ in. seam} \\
 \frac{1}{8} \text{ in. turn of the hem} \\
 \frac{1}{8} \text{ in. hem} \\
 \underline{\frac{2}{8} \text{ in. tucks}} \quad (\frac{1}{8} \times 2 \times 3 = \frac{3}{4} \text{ in. for tucks}) \\
 5 \text{ in. } \frac{1}{4} \text{ in.} = 5 \text{ in.} + 2 \text{ in.} = 7 \text{ in.}
 \end{array}$$

Use the foregoing form in the solution of the following tucking and hemming problems. Remember to add the turns for hems and seams, or headings, even if they are not stated in the problems.

1. A 9-in. flounce made of lawn has six  $\frac{1}{8}$ -in. tucks and a  $\frac{1}{4}$ -in. hem. Allow for the seam and turn of the hem, and find the width of the flounce before it was tucked and hemmed.
2. How wide must the material be cut to make a 6-in. ruffle, having three  $\frac{1}{16}$ -in. tucks and a 1-in. hem?
3. Find the width of material for a flounce if, when finished, it is 10 in. deep and has six  $\frac{1}{8}$ -in. tucks and a 1-in. hem. Allow for the seam and turn of the hem.

4. A ruffle 4 in. wide had two  $\frac{1}{8}$ -in. tucks, a  $\frac{1}{2}$ -in. hem, a  $\frac{1}{4}$ -in. seam, and  $\frac{1}{8}$  in. for the first turn of the hem. How wide was the material before it was tucked and hemmed?

5. A flounce, 6 in. when finished, has three  $\frac{1}{4}$ -in. tucks, a 1-in. hem, and a heading of  $\frac{1}{2}$  in. How wide must the material be cut?

6. Figure the width of material for a flounce used on a bedspread, if, when finished, it is 18 in. wide, with a  $1\frac{1}{2}$ -in. hem,  $\frac{1}{4}$  in. for a seam, and  $\frac{1}{8}$  in. for the first turn of the hem.

7. A ruffle for a baby dress is  $1\frac{1}{2}$  in. wide. When finished, it is to have three  $\frac{1}{8}$ -in. tucks, a  $\frac{1}{4}$ -in. hem,  $\frac{1}{8}$  in. for the first turn of the hem. What width of material is to be used?

8. A valance for a chair which is 14 in. wide has a 1-in. hem. Allow  $\frac{1}{4}$  in. for the first turn of the hem and  $\frac{1}{4}$  in. for a seam. How wide is the valance cut?

9. Make a ruffle for curtains  $1\frac{1}{2}$  in. wide with a  $\frac{1}{4}$ -in. hem,  $\frac{1}{8}$  in. for the first turn of the hem, and a  $\frac{1}{4}$ -in. seam. How wide must the material be cut?

✓ 10. How wide must material be cut to make a ruffle  $2\frac{1}{2}$  in. wide when finished, if it has a  $\frac{1}{4}$ -in. hem,  $\frac{1}{8}$  in. for the first turn of the hem, and a  $\frac{1}{4}$ -in. seam?

### LESSON 121\*

✓ 1. A pair of curtains with a straight edge of 8 yd. is to be trimmed with ruffles. For fullness  $1\frac{1}{2}$  times the straight edge is allowed. The 2-in. ruffle is to be cut from 27-in. material. How much material is needed for the ruffle? Find the cost at 49¢ per yard.

2. For 2 pairs of bedroom curtains measuring 6 yd.,  $1\frac{1}{2}$  times the length is allowed for fullness, and ruffles are  $1\frac{1}{2}$  in. wide. What is the yardage for the ruffles if the material is 24 in. wide?

✓ 3. A bedspread measuring 7 ft. long and 4 ft. wide, has a flounce on 3 sides. Allowing  $1\frac{1}{2}$  times for fullness of the flounce, find the material needed for the flounce if it is 9 in. deep and of the same 48-in. material. Find the entire cost of a bedspread using rayon at \$1.23 per yard.

4. If the bedspread in Problem 3 is pleated instead of Shirred, and  $\frac{3}{8}$  in. is allowed for one pleat, how many pleats must be put in?

5. A flounce for a bedspread measured  $21\frac{1}{2}$  ft. After fitting to the spread, it was only 17 ft. What was allowed for fullness?

\*For Problems 1, 2, 3, see the general rule on page 100. For Problem 4, see directions on page 105.

### Ruffling Problems

**OBJECTIVE:** To find the yardage needed for a ruffle for a dress, a valance for a bedspread, or a flounce for a chair, after finding the width of the ruffle.

The tucking and hemming problems in Lessons 120 and 121 gave the steps necessary to find the width of material to be used for flounces. The following problems are to find the yardage for ruffles.

### LESSON 122

**GENERAL RULE:** For ordinary ruffling allow  $1\frac{1}{2}$  times the straight edge for fullness. When less fullness is desired,  $1\frac{1}{3}$  or  $1\frac{1}{4}$  times the straight edge may be allowed. The amount of fullness required depends upon the garment and upon the quality of the material used.

#### EXAMPLE:

How much material is required to make a ruffle for a skirt which measures 3 yd. around the bottom, if the ruffle is 6 in. deep and the material is 27 in. or  $\frac{3}{4}$  yd. wide? Allow  $1\frac{1}{2}$  times for fullness.

#### SOLUTION:

3 yd. (straight edge)  $\times 1\frac{1}{2}$  (fullness) =  $4\frac{1}{2}$  yd. (length of ruffle).  $4\frac{1}{2}$  yd.  $\div \frac{3}{4}$  (width of material) = 6 times; hence, 6 widths or strips. 6 in. (width of the ruffle)  $\times$  6 (strips) = 36 in. or 1 yd. of material is needed to make a 6-in. ruffle for a skirt measuring 3 yd. around the bottom with material 27 in. wide. A fraction of a width is counted as a whole width.

The yardage for lamp-shade material is found in the same way. The measurement of the lower edge of the shade, times the allowance for the fullness, divided by the width of the material, times the height of the lamp shade, equals the required yardage.

1. Find the amount of material required to make  $3\frac{1}{2}$  yd. of ruffling, 9 in. deep, from material which is 24 in. wide.
2. If a piece of material is 36 in. wide, find the amount of ruffling, 6 in. deep, for a skirt 2 yd. around the lower edge. Allow  $1\frac{1}{2}$  times for fullness.

✓ 3. A child's skirt which measures  $1\frac{3}{4}$  yd. at the bottom is to have a 4-in. ruffle. How much material is required, if the material is 24 in. wide? Allow  $1\frac{1}{3}$  times for fullness.

4. A skirt measuring  $2\frac{1}{4}$  yd. at the bottom is to have a ruffle 9 in. deep, of material 27 in. wide. Find the amount of material used, allowing  $1\frac{3}{4}$  times for fullness.

5. A skirt  $1\frac{1}{2}$  yd. at the bottom is to have a 3-in. ruffle. Allowing  $1\frac{1}{4}$  for fullness, how much material is needed if it is 18 in. wide?

### Smocking Problems

**OBJECTIVE:** To figure the amount of material used in smocking.

#### LESSON 123

The general rule for smocking is to allow three times the width of the design, but when less fullness is desired, twice the width of the design is allowed. If the design is to be 2 in. wide, 6 in. of the material is used.

1. How many inches of material are used to make a 3-in. smocking design?

2. How wide is a smocking design if 6 in. of material is used?

3. How much material is required for a smocking design  $2\frac{1}{2}$  in. wide?

4. A smocking design measuring 5 in. requires how much material if  $2\frac{1}{2}$  times is used for fullness?

5. A smocking design when finished measures  $3\frac{1}{2}$  in. How wide was the material before smocking?

6. Three times the fullness is allowed for a 6-in. smocking design. If 2 doz. blouses are made, what is the width of the material needed for the designs?

✓ 7. What is the total width of material used for 12 blouses with a 3-in. smocking design,  $1\frac{1}{4}$  doz. blouses with 4-in. designs, and  $\frac{1}{2}$  doz. with 5-in. designs, if twice the fullness was allowed for each design?

8. The total width of smocking designs for  $1\frac{1}{2}$  doz. baby dresses was 387 in. before smocking and 252 in. after smocking. How much material was used for each design?

9. For a 3-in. smocking design 3 times its width was allowed for fullness. How much material was used? How wide must a

design be if the same amount of material is used, but only two times the width is allowed for fullness?

10. A smocking design which measures  $4\frac{3}{8}$  in. requires  $2\frac{1}{2}$  times the width of the design. Find the width of the material before smocking.

### Review of Sewing Problems

#### LESSON 124

1. Mother bought a dress on sale which had sold for \$22.50. It was reduced  $33\frac{1}{3}\%$ . Find the sale price.

2. A 24-yd. bolt of rayon was bought for \$14.16. If the material was sold at a profit of  $33\frac{1}{3}\%$ , find the profit. Another merchant bought the bolt and sold it at a gain of  $33\frac{1}{3}\%$ . What was the bolt sold for?

3. On Monday a purse was marked \$2.98. At a sale on Tuesday, it was bought for \$2.59. Find the per cent of reduction.

4. A  $3\frac{1}{2}$ -yd. remnant was bought for \$1.00. Before the sale it was marked 59¢ per yard. How much was saved by buying the remnant?

5. Using the remnant of Problem 4, Mrs. Martin made a dress exactly like one that sold for \$5.98. She spent 50¢ for trimming and findings. How much did she save?

6. At a clearance sale, Mrs. B. bought a pair of draperies at \$8.98. The cost was \$5.00 before reduction. What per cent were they reduced?

7. A 4-yd. remnant was sold for \$1.59. How much was gained by buying the remnant instead of the material at the regular price of 59¢ per yard?

8. Jane bought a suit at \$17.85. Her cousin made a suit. The material cost \$7.95, and trimmings and thread cost \$.75. What did the cousin save?

9. Mrs. Lane bought an 18-yd. bolt of pillow tubing for \$4.50. How much did she save if it later sold at 29¢ a yard?

10. Mrs. James bought a 22-yd. bolt of tubing at 18¢ per yard. It was marked to sell at 16¢. Find the loss. How much did a person save on 15 yd., if the tubing sold at 18¢ a yard instead of 26¢ a yard?

11. A  $3\frac{3}{4}$ -yd. remnant for a dress was sold at \$1.59. If the material was sold at 49¢ per yard, what was saved on each yard?
12. The dress for Problem 11 sold for \$2.98. How much was saved if the trimmings were 38¢?
13. A homemade dress costs \$4.64; a ready-made dress costs \$9.30. How many homemade dresses could be bought for the price of two ready-made dresses?
14. On Red Tag Day, a set of breakfast dishes was bought at \$4.49. The following day the set was marked \$5.39 or the regular price. What was the difference in per cent between the sale price and the regular price?
15. From a bolt that had sold at 72¢ per yard,  $4\frac{1}{2}$  yards were left. If the remnant was sold at  $12\frac{1}{2}\%$  less on the yard, what was the selling price of the remnant?

### Belt Problems

**OBJECTIVE:** To train for accuracy when making belts which require exact measurements as to width and length. Belts are used for bloomers, slacks, skirts, etc.

#### LESSON 125

##### EXAMPLE:

Find the length of a belt for children's bloomers, if the waist measure is 26 in., and the belt is  $1\frac{1}{2}$  in. wide when finished. Either the front or the back belt must be made longer, to allow for lapping.

##### SOLUTION:

*Divide the entire belt by 2 and to one half add  $1\frac{1}{2}$  in. for lap or placket and  $\frac{1}{2}$  in. for turning in; to the other half add  $\frac{1}{2}$  in. for turning in.*

$$26 \text{ in.} \div 2 = 13 \text{ in.}$$

$13 \text{ in.} + 1\frac{1}{2} \text{ in. (for placket)} + \frac{1}{2} \text{ in. (turned in)} = 15 \text{ in.}$  for the longer belt.

$$13 \text{ in.} + \frac{1}{2} \text{ in. (turning in)} = 13\frac{1}{2} \text{ in.}, \text{ for the shorter belt.}$$

$$15 \text{ in.} + 13\frac{1}{2} \text{ in.} = 28\frac{1}{2} \text{ in.}, \text{ entire length of belt.}$$

The above will vary if the placket is to be wider or narrower than  $\frac{1}{2}$  in.

**EXAMPLE:**

Find the width of the belt, if, when finished, it is to be  $1\frac{1}{4}$  in. wide.

**SOLUTION:**

Multiply  $1\frac{1}{4}$  in. by 2, add  $\frac{1}{2}$  in. for turning in, to find the entire width of the belt before making.

$$1\frac{1}{4} \text{ in.} \times 2 + \frac{1}{2} \text{ in.} = 3 \text{ in., width of belt.}$$

Therefore, the belt, when cut, will be  $28\frac{1}{2}$  in. long and 3 in. wide.

**LESSON 126**

- ✓ 1. If a waist measure is 24 in., what will be the length of each belt for a pair of shorts? If the finished belt is  $1\frac{1}{2}$  in. wide, how wide was it cut?
2. What is the total length of a belt before finishing, if the waist measure is 25 in.? How wide must the belt be cut, if, when finished, it measures  $1\frac{1}{2}$  in.?
3. How many belts can be cut from a piece of material 36 in. wide if each belt is to be  $1\frac{1}{2}$  in. wide when finished?
4. How long must a belt be cut to fit the back of a pair of slacks that measures 13 in. if there is to be a  $\frac{1}{2}$ -in. placket on each side?
5. The waist measure is 22 in. How long must the belt be cut? How wide must it measure if, when finished, it is  $1\frac{3}{4}$  in.?
6. Find the length of a skirt belt if the waist measures 29 in., and the width of the belt when finished is  $1\frac{3}{4}$  in.
7. Find the total lengths for the following belts: 1 doz., 25-in. waist measure;  $\frac{1}{2}$  doz., 32-in. waist measure; and  $1\frac{1}{2}$  doz., 26-in. measure.
8. Find the total widths of the following belts:  $\frac{1}{2}$  doz.,  $1\frac{1}{4}$  in. wide;  $\frac{1}{2}$  doz.,  $1\frac{1}{3}$  in. wide; and 3 doz., 3 in. wide.
9. A factory was cutting belts. How many yards would be needed for the following belts:  $\frac{1}{4}$  doz., 26-in. waist measure;  $\frac{1}{2}$  doz., 35-in. waist measure; and  $1\frac{1}{2}$  doz., 28-in. waist measure?
10. The following belts are cut from a piece of material 59 in. wide. How many yards of the material are needed if there are  $\frac{1}{2}$  doz., 3-in. widths;  $\frac{2}{3}$  doz., 2-in. widths; and  $\frac{5}{12}$  doz.,  $2\frac{1}{2}$ -in. widths?

**Pleating Problems**

**OBJECTIVE:** To learn to figure the amount of material needed to make pleats.

Material must be cut three times the width of a pleat to make a single pleat; a box pleat requires twice as much as a single pleat, and a double box pleat twice as much as a box pleat. From material or paper make single pleats, box pleats, and double box pleats for illustration.

**LESSON 127****EXAMPLE:**

How much material is required to make a single pleat 2 in. wide?

**SOLUTION:**

$$2 \text{ in.} \times 3 = 6 \text{ in. (material used.)}$$

1. How many single pleats  $1\frac{1}{2}$  in. wide can be made out of one yard?
2. How much material is needed to make eight 2-in. pleats?
3. How many box pleats 2 in. wide can be made out of material 72 in. wide?
4. If it takes 81 in. to make 9 box pleats, how many inches will it take to make 7 box pleats of the same size?
5. How many 2-in. box pleats can be put into 78 in.?
6. How many 2-in. single pleats can be put into 72 in.?
7. How many 1-in. double box pleats can be put into 42 in.?
8. How much material is required to make ten single pleats 2 in. wide? How many box pleats of the same width can be made out of the same piece of material?
9. Mary made 12 single pleats out of 36 in.; how wide was one pleat? How many double box pleats of the same width can she make from the same piece of material?
10. How many single pleats, 1 in. wide, can be made from a piece of material 24 in. wide? 8 in. wide? 14 in. wide?
11. The front of a child's dress was cut 28 in. wide, but when pleated it measured just 16 in. How many 1-in. pleats were made in the dress front?

12. If it takes 72 in. to make 16 single box pleats, how many double box pleats could be made out of the same piece of material?

### Bias Problems

**OBJECTIVE:** To learn to compute yardage used when cloth is cut bias.

Milliners and dressmakers use material cut on the bias for folds, cords, binding, facing, and trimming. A bias strip is about  $1\frac{1}{2}$  times the width of the material; that is, material 24 in. wide will have a true bias of  $1\frac{1}{2} \times 24$  in. = 32 in.

Find the yards or parts of a yard used to make a given number of yards of bias.

### LESSON 128

**EXAMPLE:**

How much material 18 in. wide is needed to make 3 yd. of bias facing 1 in. wide (through the bias) when the full length is used?

**SOLUTION:**

$$18 \text{ in.} \times 1\frac{1}{2} = 24 \text{ in. (length of bias).}$$

3 yd. or 108 in.  $\div$  24 (in.) =  $4\frac{1}{2}$  (times); therefore,  $4\frac{1}{2}$  strips or 5 strips are needed. (The 1 in. through the bias will measure  $1\frac{1}{2}$  in. on the selvage.) Five (strips) times  $1\frac{1}{2}$  in. =  $6\frac{1}{2}$  in. or 7 in. of material is used. (A part of a strip is counted as a whole strip.)

A bias strip cut from the corner is shorter than the full-length bias by twice the width through the bias; each succeeding strip toward the corner is shortened in the same manner.

1. How much material 1 yd. wide is used to make 6 yd. of bias trimming, if the bias is 3 in. through the bias?
2. Which makes the wider band, 3 in. through the bias or 3 in. on the selvage?
3. If one ruffle is cut on the bias and another on the straight of the cloth, which requires the greater number of widths?
4. Elaine bought  $\frac{3}{8}$  yd. of material, 59 in. wide, for a bias trimming. How many yards of bias can she make from the material if the bias is to be  $1\frac{1}{2}$  in. through the bias?
5. Susan bought  $\frac{4}{15}$  yd. of 18-in. material for a bias band. How many yards of bias can she make from the material if it is to measure 2 in. through the bias?

## Extra Bias Problems

## LESSON 129

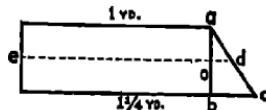
- How much 39-in. material is used to make 10 yd. of bias trimming, if the bias is  $1\frac{1}{2}$  in. through the bias?
- How much 59-in. material is used to make 15 yd. of bias trimming, if the bias is 3 in. through the bias?
- Mother wished to make  $8\frac{2}{3}$  yd. of bias from 59-in. material. If the bias is  $1\frac{1}{2}$  in. through the bias, how much material should she buy?
- Ruth wishes to make 12 yd. of bias from 36-in. material. If the bias is 2 in. through the bias, how much material should she buy? At 39¢ per yard, find the cost of the bias.
- Mary buys  $\frac{1}{2}$  yd. of material to be used for bias bands. How many yards of bias can she make if the material is 36 in. wide and the bias is 1 in. through the bias?

## Goods Cut Bias and Straight (Optional Lesson)

**OBJECTIVE:** To find the cost of material one end of which is cut on the bias and the other on the straight of the goods.

## LESSON 130

Velvet and silk may be bought with one end cut on the bias and the other on the straight of the goods. The cost of the material is figured on the longer side.



One end of material cut on the straight and the other end on the bias

To find the amount of the material used when one end of the material is cut on the bias and the other on the straight, fold the triangle  $abc$  so the  $c$  touches  $a$  and then measure through the middle from  $d$  to  $e$  which equals the yardage paid for; or, add the lengths of the long and the short sides and divide their sum by two, and the result is the yardage used. Multiply the yardage by the cost per yard to find the cost.

**EXAMPLE:**

Find the cost of material when one end is cut on the bias and the other on the straight. The short side measures 1 yd. and the long side  $1\frac{1}{2}$  yd., at \$3.60 a yard.

**SOLUTION:**

$$\begin{aligned}1 \text{ yd.} + 1\frac{1}{2} \text{ yd.} &= 2\frac{1}{2} \text{ yd.} \\2\frac{1}{2} \text{ yd.} \div 2 &= 1\frac{1}{2} \text{ yd. bought.} \\1\frac{1}{2} (\text{yd.}) \times \$3.60 &= \$4.05.\end{aligned}$$

- Find the cost of velvet that has one end cut on the bias and the other on the straight. The longer side measures  $1\frac{3}{4}$  yd. and the shorter  $1\frac{1}{2}$  yd., and it sells at \$3.52 a yard.
- Find the cost of a piece of ribbon which measures 27 in. on the long side and 18 in. on the short side, and sells at \$1.20 a yard.
- Brocaded silk, which costs \$6.40 a yard, measured  $1\frac{1}{4}$  yd. on the long side and  $1\frac{1}{8}$  yd. on the short side. Find the cost of the silk used.
- Panne velvet costs \$4.80 a yard. Find the cost of a piece which has a straight end and a bias end, the long side measuring  $1\frac{1}{2}$  yd. and the short side  $\frac{3}{4}$  yd.
- At \$3.92 a yard, find the cost of silk which has one bias end, the longer side measuring  $3\frac{1}{2}$  yd. and the shorter side  $2\frac{3}{4}$  yd.

**General Review of Sewing Problems****LESSON 131**

- What is the cost of 10 ornaments, at 96¢ a dozen?
- If  $\frac{1}{2}$  yd. of lace costs 84¢, how many yards can be bought for \$9.80?
- Trimming costs \$1.15 a yard and is sold for \$1.50 a yard. What is the gain on  $3\frac{3}{4}$  yd.?
- What is the cost of a dress requiring  $2\frac{1}{2}$  yd. of serge at \$1.98 a yard, 2 yd. of silk at \$1.89 a yard, 2 yd. of lawn at 25¢ a yard, 2 emblems at 15¢ each, 4 large buttons at \$1.20 a dozen,  $\frac{1}{3}$  doz. small buttons at 72¢ a dozen, 2 spools of sewing silk at 10¢ a spool, and labor \$6.00?

5. A coat requiring 3 yd. of serge at \$2.90 a yard,  $2\frac{1}{4}$  yd. of gray crepe at \$2.20 a yard,  $\frac{3}{4}$  yd. of black silk at \$1.88 a yard, small buttons 20¢, and a large button 17¢, retailed at \$39.50. What is saved by the owner making the above coat? What per cent of the cost is saved?
6. Ribbon costing \$3.00 a bolt (10 yd. to a bolt) is sold at 40¢ a yard. What is the gain on 2 bolts?
7. I bought  $\frac{1}{2}$  doz. hat ornaments for \$2.40. The ornaments were not popular and sold at 25¢ each. Find the loss.
8. Find the number of inches in  $\frac{3}{4}$  yd.,  $\frac{5}{8}$  yd., and  $\frac{4}{6}$  yd.
9. How much material will be required to make a 9-in. ruffle for a skirt that measures 2 yd. at the bottom? Allow  $1\frac{1}{2}$  times for fullness, and use material 1 yd. wide.
10.  $(\frac{3}{4} \times \$24.40) + .16\frac{2}{3}$  of \$468.72 = ?
11. From \$10, take  $\$5\frac{1}{2}$  and \$3.40.
12.  $\$7\frac{2}{5} + \$3.67 + \$3\frac{5}{8} + \$3\frac{3}{4} = ?$

### Review of Sewing Problems and Fundamentals

#### LESSON 132

1. A remnant of lace costs \$ $\frac{1}{2}$ . How many remnants at that price can be bought for \$37.50?
2. What will 42 in. of braid cost when  $2\frac{1}{2}$  yd. cost 15¢?
3.  $9\frac{1}{4} \times 6.45 - 23.42 = ?$
4. If I waste 13 minutes each day in school, how much time have I wasted the past three school months? Change the minutes to hours and the hours to days.
5.  $44.54 \times 5.25 = ?$
6.  $\$2\frac{3}{4} + \$6.95 + \$3\frac{5}{8} + \$4\frac{3}{8} + \$9.16 = ?$
7. What will it cost to make a child's dress out of  $2\frac{1}{2}$  yd. of material at 78¢ a yard, trimmed with 6 yd. of lace at 28¢ a yard and  $2\frac{1}{2}$  yd. of insertion at 30¢ a yard? Allow 15¢ for thread and buttons.
8.  $\frac{5}{8}$  of a yard of velvet costs \$1.55. What will  $10\frac{3}{4}$  yd. cost at that rate?
9. If Mr. A owes \$56.25 and can pay  $\$3\frac{3}{4}$  each week, how many weeks will it take him to pay the debt?
10.  $4.21 \times 3.2 = ?$     $15.38 \times 2.7 = ?$

## LESSON 133

1. Change to improper fractions and work by cancellation:  
 $7\frac{1}{2} \times 6\frac{2}{3} \times 2\frac{3}{5} \times 2\frac{5}{8} = ?$
2. From 6 yd. 15 in. take  $3\frac{2}{3}$  yd.
3. Change to decimal fractions and add:  $5\frac{2}{3}, 7\frac{1}{2}, 6\frac{5}{8}, 3\frac{3}{4}$ .
4.  $9\frac{1}{4}$  yd. of material were sold from a piece of cotton that contained 42 yd. How much remained?
5.  $\$7\frac{2}{3} + \$5\frac{1}{2} + \$5\frac{3}{4} + \$5\frac{5}{8} = ?$
6.  $6\frac{2}{3} + 7\frac{5}{8} + 4\frac{2}{3} = ?$
7. 94 in. +  $3\frac{2}{3}$  yd. + 7 yd. 24 in. = ?
8. \$8.50 is the cost of 7 yd. of cloth. Find the cost of  $3\frac{1}{2}$  yd.
9.  $468,497 \times 8 = ?$
10. Find the cost of 2 yd. 12 in. of ribbon, if  $\frac{2}{3}$  yd. costs 20¢.

## LESSON 134

**NOTE:** In part-time, trades, or vocational schools, a definite period of time is allowed for dressmaking or millinery, which is called *trade time*. The time varies in different schools. Usually three or four periods of 45 minutes each, or one half day is allowed. Students report to academic classes other periods of the day. The students must keep a correct record of the hours spent in sewing or millinery, just as workers in business must keep their time sheets to indicate the amount of pay due them. Accuracy and speed are sought in these trade classes.

1. How much trade time is spent on a garment from 9:15 Tuesday morning to 3:15 Thursday afternoon of the following week? (Variable answer.)
2. If I buy two pieces of grosgrain ribbon, one measuring  $13\frac{3}{4}$  yd. at \$1.25 a yard and the other  $9\frac{2}{3}$  yd. at 87¢ a yard, what do I pay for both pieces?
3.  $764.9 + .34 = ?$
4.  $64,324 \times 87 = ?$  Check.
5. In a class of 40 pupils, 36 were present. What fractional part was present?

## Sewing Problems

**OBJECTIVE:** To gain speed and accuracy in the use of fundamentals as applied to practical business problems.

**LESSON 135**

1. If I buy  $\frac{7}{8}$  yd. of taffeta for trimming at \$1.60 a yard, and  $3\frac{1}{2}$  yd. of serge at \$1.70 a yard, what change do I receive from the \$15 given to the clerk?

2. If  $\frac{3}{4}$  yd. of lace will trim one collar, how many collars can be trimmed with  $4\frac{1}{8}$  yd.?

3. I bought a remnant of lace, containing  $3\frac{1}{8}$  yd., for \$5.25. At what price must it be sold per yard to gain 25%?

4. I bought  $18\frac{1}{2}$  yd. of farmers' satin for \$1.98 a yard, and  $15\frac{1}{2}$  yd. of percaline at 28¢ a yard. Find the cost of both.

$$5. 18\frac{1}{4} + 7\frac{5}{8} + 8\frac{5}{8} = ?$$

6. After spending  $\frac{3}{4}$  of my money, I have \$24 left. How much did I have to begin with?

7. Out of a class of 40 pupils, 36 pupils were present. What percentage was absent?

8. At 12 o'clock noon, how many hours and minutes have passed since 4:10 p.m.?

9-10. Make out a bill, using the following items. Discount 25% for cash. Receipt the bill.\* Figure according to given prices.

2 $\frac{1}{2}$ yd. Silk.....	@ \$1.98 per yard
3 $\frac{3}{4}$ yd. Percaline.....	@ \$.24 per yard
4 $\frac{1}{2}$ yd. Lawn.....	@ \$.20 per yard
16 $\frac{1}{2}$ yd. Cheesecloth.....	@ \$.12 $\frac{1}{2}$ per yard
8 $\frac{1}{2}$ yd. Gingham.....	@ \$.46 per yard
20 yd. Cashmere.....	@ \$1.98 per yard
12 $\frac{1}{2}$ yd. Challis.....	@ \$1.50 per yard
6 Spools Thread.....	@ \$.75 per doz.
16 cards Hooks and Eyes.....	@ \$.07 per card

Find the net cost.

**LESSON 136**

1. At the rate of 4 buttons for 15¢, what will 2 $\frac{1}{2}$  doz. buttons cost?

2. Find the cost of  $\frac{5}{8}$  yd. of velvet at \$2.40 a yard, and  $3\frac{3}{4}$  yd. of serge at \$1.68 a yard.

\*See page 118, Problem 8-4.

3.  $\$0\frac{1}{2} + \$6\frac{3}{4} + \$9.45 + \$8.75 + \$3\frac{3}{8} = ?$

4. Find the cost of  $\frac{1}{8}$  yd. of silk at \$1.75 a yard.

5. Add and check: 86,475

64,389

59,768

43,842

14,569

6. A 36-yd. piece of lawn costs a merchant \$4.32. He sold it for \$2.16 more than he paid for it. What was the price per yard?

7. A merchant bought 4 pieces of lawn: 2 pieces of  $35\frac{1}{2}$  yd. each, and 2 pieces of  $23\frac{1}{4}$  yd. each. How many yards did he buy and what was the cost at 18¢ a yard?

8. From a remnant of cambric containing  $18\frac{5}{8}$  yd., a merchant sold  $12\frac{1}{2}$  yd. to one customer. How many yards remained in the piece?

9. What is the cost of 16 yd. of velvet if  $\frac{1}{2}$  yd. costs \$1.12?

10. Lace bought for \$1.40 per yard, sold for \$2.20 per yard. Find the gain on  $3\frac{1}{2}$  yd.

### LESSON 137

1. From a 54-in. piece of serge, 24 in. were sold. Find the cost of the remainder at \$1.75 a yard.

2. How many hat forms can be bought for \$6.00 if one costs 25¢?

3. My bill at a store is \$350. I receive a discount of 10%. What do I save?

4. The average attendance in a school is 450 pupils. On Wednesday it stormed and only  $33\frac{1}{3}\%$  of that number were present. How many were present?

5.  $\$1\frac{1}{2} + \$2\frac{1}{4} + \$1\frac{1}{2} = ?$

6. If a man owes \$325 and pays 25% of it, how much does he pay? How much remains to be paid?

7. 40% of the cost of a yard of material is 70¢. What is the cost of  $3\frac{1}{2}$  yd.?

8.  $9 \times 9 - 1 + 20 - 1 \div 9 \times 6 - 2 \div 8 = ?$

9. If  $9\frac{1}{2}$  yd. of cloth cost \$9.50, what will  $2\frac{1}{2}$  yd. cost?

10.  $(12\frac{1}{2}\% \text{ of } \$2.40) + (16\frac{2}{3}\% \text{ of } \$1.20) = ?$

## Review Problems

## LESSON 138

1. I buy a remnant of  $\frac{3}{4}$  yd. for \$1.05. How many yards can be bought for \$5.00?
2. A piece of lace is worth 85¢ a yard. What is the value of  $1\frac{1}{2}$  yd.?
3. I buy  $1\frac{1}{2}$  yd. of velvet at \$3.00 per yard and  $4\frac{1}{2}$  yd. of grosgrain silk at \$1.20. Find the entire cost.
4. A chiffon scarf  $1\frac{1}{3}$  yd. long was bought at \$1.50 a yard. After decorating it, the scarf was sold for \$5.00. What was the gain?
5. A remnant of lace cost  $\frac{3}{5}$ . How many similar remnants can be bought for \$12.60?
6. What will 45 in. of lace cost at \$3.28 a yard?
7. At 75¢ per dozen, what will 54 dress ornaments cost?
8. At \$1.92 a dozen, find the cost of 7 lace ornaments.

## Shop Training

**OBJECTIVE:** To acquire skill in computing yardage of material, cost of buttons, thread, etc., and time for making garments in a shop.

## LESSON 139

To St. Joseph's HospitalDate Jan. 20, 1939Subject Costs

20 doz. garments

Material ..... - Yd. @ 39¢ per yard =

Cutting ..... - Hr. @ 68¢ per hour =

Sewing ..... - Hr. @ 52¢ per hour =

Buttons	}	=
Findings		
Thread		

Zippers

Overhead..... =

Fill the blanks in the above bill from the following problem:

A garment-manufacturing company received an order for 20 doz. garments. At  $3\frac{1}{2}$  yd. per garment, find the yardage and cost

of material. At 50¢ per dozen for buttons and 5 buttons per garment, find their cost. Two garments can be sewed with one 10¢ spool of thread. No zippers are used. The time for cutting is 14 hr. and the time for sewing is 210 hr. The overhead, which includes the employers cost of light, rent, heat, insurance, office, etc., amounts to \$250. If the garments are sold at \$4.59, what is the profit per garment? Total profit?

### Jane's Tailored Suit

**OBJECTIVE:** To figure the cost of a tailored suit for yourself.

#### LESSON 140

1. Jane made a suit; she bought 54-in. wool crepe at \$1.98 per yard, and used  $1\frac{1}{8}$  yd. for the skirt and 2 yd. for the jacket. How much did the material cost?
2. How much would the material for an extra skirt cost? For a jacket?
3. Jane used 2 spools of thread at 9¢ per spool, 8 buttons at 19¢ a piece, the pattern at 15¢, and 1 yd. of belting at 20¢ per yard. How much did these items cost?
4. Jane wanted a lining in the jacket which costs 58¢. Consulting Problem 1, how much was the lining per yard?
5. Jane saw a suit in a department store like the one she had made, for \$15.95. Consulting Problems 1, 3, and 4, how much did she save? How much did her suit cost?
6. If Jane's suit would have cost \$15.95 if bought ready made, how much per hour did Jane earn while making the suit, if she put in 10 hours of work on the job?
7. Figure the cost of a suit or dress that you or your mother made.

**Clothing Budget for a Sixteen-Year-Old Girl**

**OBJECTIVE:** To encourage you to keep an accurate account of the cost of your wardrobe so that you may know how to get the maximum value for every dollar you spend for clothes.

You can make many of these garments yourself and thus they will cost you less than the ready-made price.

**LESSON 141**

---

*Dresses:*

- Woolen dress, 4 yd. @ \$1.50; trimming \$1.00
- Knit suit @ \$5.00
- Linen dress,  $2\frac{1}{2}$  yd. @ \$.98, 1 yd. @ \$1.20;  
buttons \$.80
- Percale dress,  $3\frac{1}{2}$  yd. @ \$.24,  $\frac{1}{4}$  yd. @ \$.28
- Rayon dress, 4 yd. @ \$.79
- Silk dress, 4 yd. @ \$1.69
- Heavy woolen skirt, 2 yd. @ \$1.98
- Lightweight woolen skirt, 2 yd. @ \$1.49
- 2 cotton blouses,  $1\frac{3}{4}$  yd. @ \$.39; buttons \$.25
- 1 silk blouse, 2 yd. @ \$1.19
- 2 sweaters, @ \$1.98 each

*Princess Slips:*

- 1 white, lace trimmed @ \$1.98
- 3 light @ \$.98 each

*Underwear:*

- 3 brassieres @ \$.59 each
- 3 pair panties @ \$.55 each
- 3 combination snuggies @ \$.85 each
- 2 pair summer pajamas @ \$1.29 per pair
- 2 pair winter pajamas @ \$1.59 per pair
- Flannel robe @ \$7.95
- Housecoat @ \$1.98

*Coats:*

- Summer coat @ \$12.50
- Winter coat @ \$18.75
- Sweater @ \$4.00
- Jacket @ \$6.50

*Hats:*

Summer @ \$1.75

Winter @ \$1.88

Beret @ \$ .59

*Shoes:*

2 pair sport shoes @ \$4.95 per pair

1 pair dress slippers @ \$3.75

*Stockings:*

4 pair @ \$ .85 per pair

4 pair @ \$ .55 per pair

4 pair @ \$ .35 per pair

*Miscellaneous:*

Rubbers, handkerchiefs, repairs, cleaning, gloves,  
handbags, notions, etc., \$15

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1. Find the total cost of the girl's clothing budget.
2. Make an inventory of your present clothing, find the total cost, and compare with Problem 1.

### Review of Sewing Problems.

#### LESSON 142

1. How many pincushions can be made out of  $\frac{1}{4}$  yd. of poplin, 36 in. wide, if it takes 4-in. squares to make one side of the cushion? (Allowance must be made for seams.)
2. How many sewing aprons, 30 in. long and 27 in. wide, can be made out of 6 yd. of lawn? Find the cost of the aprons at 20¢ each.
3. If it takes  $2\frac{1}{2}$  yd. of sheeting for one kitchen apron, how many aprons can be made out of 1,080 in.?
4. How wide must ruffling be cut if it is to be 6 in. wide when finished, with a 1-in. hem and three  $\frac{1}{8}$ -in. tucks? Allow for seams and turns.
5. What will 3 yd. 24 in. of cloth at 24¢ a yard cost?
6. How many children's dresses can be cut from a 42-yd. bolt of cloth if it takes  $3\frac{1}{2}$  yd. for each dress?
7. When  $10\frac{2}{3}$  yd. of braid are used to make a hat, how many hats can be made from 64 yd. of braid?

8. Find the cost of the above hat if the braid costs 15¢ a yard and 75¢ was charged for labor.
9. If it takes  $2\frac{1}{3}$  yd. of ribbon to make a bow, how many yards will it take for 5 bows? Find the cost at 30¢ a yard.
10. If  $\frac{2}{3}$  yd. of baby ribbon is used to make a rosette, how many yards are needed for making 4 rosettes?

### LESSON 143

1. A dressmaker had a piece of trimming  $2\frac{7}{8}$  yd. long from which she cut 15 in. at one time and  $1\frac{1}{2}$  yd. at another. How much was left?
2. An ensemble suit required 2 yd. of flat crepe at \$2.98 a yard;  $2\frac{1}{2}$  yd. of white sport silk at \$4.30 a yard;  $4\frac{1}{2}$  yd. of hem-stitching at 6¢ a yard; snaps and ribbon, 5¢; 2 spools of silk thread at 10¢ a spool; 1 yd. of lining at \$1.29 a yard; pleating 95¢; and  $2\frac{1}{2}$  yd. of lining at 20¢ a yard. What will all of the material cost?
3. How much is saved by making the suit in Problem 2 yourself if it retailed in a shop for \$45?
4. Buttons which cost \$6.48 a gross of cards were sold at 10¢ a card. How many cards must be sold to gain \$2.75?
5. From a piece of lace  $2\frac{5}{8}$  yd. long, 19 in. were sold. How much remained?
6. Lace is worth \$1.28 a yard. What will  $1\frac{1}{2}$  yd. cost?
7. If 2 yd. of cloth cost \$3.00, what part of a yard can be bought for 30¢?
8. Ornaments that cost \$10.08 per gross of cards are sold at 10¢ a card. How many cards must be sold to gain \$4.20?
9. What will be the cost of 5 yd. 6 in. of velvet at \$4.25 a yard, and  $7\frac{1}{2}$  yd. of lace at \$1.96 a yard?
10. What will three remnants cost measuring  $6\frac{1}{2}$  yd. 48 in., and  $8\frac{2}{3}$  yd. respectively, at an average price of 75¢ a yard?

### LESSON 144

1. If  $1\frac{1}{2}$  doz. buttons cost 96¢, what was the cost of 6 doz.?
2. A dressmaker made use of four pieces of silk: the first measured 4 yd. 18 in.; the second 7 yd. 23 in.; the third  $4\frac{1}{2}$  yd.; and the fourth  $2\frac{1}{2}$  yd. How many yards and inches did she use in

all? How much did she save if she paid \$1.98 per yard as an average price instead of \$1.38 for the first, \$3.60 for the second, \$2.80 for the third, and \$1.98 for the fourth?

**3-4.** Make out a bill for the following:

$8\frac{3}{4}$  yd. of linen at \$1.98 a yard.

$7\frac{5}{8}$  yd. of gingham at 36¢ a yard.

$4\frac{1}{2}$  yd. of velvet at \$3.50 a yard.

Make yourself the customer. Buy of Gimbel Brothers, Philadelphia, Pa. Receipt the bill.

When a bill is paid, the clerk stamps "Paid" with date and the firm's signature, and adds his initials, as follows: Paid May 8, 1940, Gimbel Bros., T. J.

5. Change  $15\frac{3}{4}$  yd. to inches. Change 156 in. to yards and inches.

6. At 55¢ a yard, find the cost of  $3\frac{3}{5}$  yd. of broadcloth.

7. Mrs. A went shopping. She bought 2 yd. of ribbon at 35¢ a yard, 4 yd. of sateen at 29¢ a yard, 3 buttons at 5¢ each, and paid \$8.50 for a hat. She had \$10. How much more did she need to pay her bill?

8. How many folders can be cut out of  $4\frac{1}{2}$  yd. if it takes  $\frac{3}{4}$  yd. for one folder?

9. Make yourself the customer and receipt the following bill:  $2\frac{1}{2}$  yd. lace at \$1.50; findings, 50¢; 1 yd. net, 45¢; hemstitching, 6¢; 1 pr. shields, 25¢;  $1\frac{1}{2}$  yd. lace, \$1.60 a yard; 27 in. chiffon, \$1.60 a yard; 4 yd. silk poplin, \$1.98 a yard;  $1\frac{1}{2}$  yd. chiffon, \$1.40 a yard; trimming \$1.00, and labor \$8.00.

10. Find the cost of  $2\frac{3}{4}$  yd. of braid when  $\frac{3}{4}$  yd. costs 15¢.

### LESSON 145

1. Find the cost of  $3\frac{1}{2}$  yd. of velvet at \$2.60 a yard, and  $4\frac{3}{4}$  yd. at \$3.80 a yard.

2. I bought three remnants of taffeta silk measuring  $4\frac{3}{4}$  yd.,  $3\frac{3}{4}$  yd., and  $6\frac{5}{8}$  yd., respectively. At an average price of \$1.50 a yard, what did they cost?

3. I used four pieces of ribbon. The first measured 4 yd. 13 in., the second 5 yd. 23 in., the third  $10\frac{5}{8}$  yd., and the fourth 76 in. How many yards and inches in all?

4. Find the cost of the above at 48¢ a yard.

5. If I pay \$4.20 for  $\frac{2}{3}$  yd. of broadcloth, how much must I pay for  $3\frac{1}{2}$  yd.?
6. I bought 16 yd. of velvet at \$3 a yard, sold 9 yd. at a profit of  $16\frac{2}{3}\%$ , and the remainder at a profit of one half that rate. What was the gain?
7. How wide must material be cut to make a 5-in. flounce having a  $\frac{3}{4}$ -in. hem,  $\frac{1}{4}$  in. for the first turn of the hem,  $\frac{1}{2}$  in. for the seam, and three  $\frac{1}{4}$ -in. tucks?
8. Find the cost of velvet, one end of which is cut on the bias and the other end on the straight, the long side being  $2\frac{1}{2}$  yd. and the short side  $1\frac{3}{4}$  yd., at \$2.40 a yard.
9. If  $\frac{7}{8}$  yd. of lace is sold from a piece of lace 40 in. long, how much is left?
10. Mrs. Bell bought  $4\frac{7}{8}$  yd. of serge at \$1.96 a yard and  $2\frac{1}{4}$  yd. of silk at \$1.50 a yard. What did she pay?

## **Chapter IX**

### **SALES TECHNIQUE**

**OBJECTIVE:** To develop facility in applying your knowledge of arithmetic to the practices of the business world.

Business practices which involve arithmetic are merely the fundamentals you have learned in integers, common fractions, decimal fractions, percentage, etc., applied to particular cases.

Salesmen and saleswomen in department stores and other business establishments are trained to feel that they are hosts and hostesses to the public, and they want their customers to consider them as such. One expects the same courtesies in a place of business that he would receive in a home.

Merchandise stores, telephone companies, insurance companies, shoe stores, etc., all have regular training courses in which prospective employees are required to study the technique of that particular establishment. In these schools all details are explained, and when the salesman or saleswoman faces his or her customer, the customer is approached in a trained and business-like manner.

Printed slips are used in business; these vary in each department or firm. Every salesperson is given detailed instructions in filling out these slips before he is permitted to serve customers.

#### **Cash-Take Sale**

Forms similar to the one shown are used in stores in which there are no cash registers in the various departments. The original is kept by the cashier, with the voucher attached. The duplicate is enclosed in the customer's package. Tissues are held by the saleswoman until her book is finished and turned in to the cashier. The cashier hands in the unused tissues with her cash

YOU ARE MAKING FOUR COPIES BEAR DOWN ACCORDINGLY		<b>27090-6</b>	
AUTHORIZATION NAME OF C. O.		CHARGE	DATE
CHARGE NAME	AMOUNT C. O.	CLASS	MONTH YEAR
TO <b>HILDA</b>	<b>578</b>	<b>10</b>	<b>2/9</b>
ADDRESS <b>HOUSE 16-09</b>		CHARGE NAME <b>HILDA SMITH</b>	CHARGE NAME <b>HILDA SMITH</b>
		AMOUNT C. O. <b>1810 STATE ST.</b>	AMOUNT C. O. <b>ROCHESTER</b>
		AMOUNT C. O. <b>NEW YORK CITY</b>	AMOUNT C. O. <b>NEW YORK CITY</b>
		AMOUNT C. O. <b>1810 STATE ST.</b>	AMOUNT C. O. <b>ROCHESTER</b>
		AMOUNT C. O. <b>NEW YORK CITY</b>	AMOUNT C. O. <b>NEW YORK CITY</b>

### **House charge sent sales slip**

C.O.D. sales slip

Cash-take sales slip

checks. The sample shows that a package belonging to the customer has been enclosed with the supervisor's O.K.

### **Straight C.O.D. Sale**

When making a straight C.O.D. sale, write the name and address of the customer in the "charge to" space, and have it O.K'd by the supervisor. Then send the entire check to the packing room with the merchandise purchased.

### **House Charge Sent**

In this form write the name and house number in the "charge to" space, and the name and address in the "send to" space. The check is O.K'd for discount. Parts of the check are handled as a "charge send" check.

## **Commercial Bills**

LESSON 146

It is necessary in any business to know how to make out correct commercial bills. Since leading department stores have

MARSHALL FIELD & COMPANY CHICAGO				
EVANSTON		OAK PARK		LAKE FOREST
May 1, 1940				
<b>The Girls' Trades and Technical High School</b> 812 North 19th Street Milwaukee, Wisconsin				
QUANTITY	UNIT	ITEM	UNIT PRICE	AMOUNT DUE
12 $\frac{1}{2}$	yards	Alderman Striped Jamawoo		
1 $\frac{1}{2}$	"	Longecloth	.88	
1 $\frac{1}{2}$	"	Cheesecloth	.18	
10 $\frac{1}{2}$	"	Grosgrain Ribbon	.48	
1 $\frac{1}{2}$	"	Embroidery	.88	
7 $\frac{1}{2}$	doz.	Buttons	.80	

#### A typical department-store bill



An intelligent and courteous saleswoman has no difficulty in selling her goods

their own bill forms, typical forms are used to familiarize you with their use, calling attention to the form, the receipting of the bill, etc. Fractional parts of cents less than  $\frac{1}{2}$  are dropped;  $\frac{1}{2}$  or more is counted as an extra count.

1. Make out a bill for the following materials used in making a slip and a dress.

Materials for the slip:  $2\frac{1}{2}$  yd. of lining at 40¢ a yard,  $\frac{1}{2}$  doz. snaps at 10¢ a dozen, and the cost of making \$1.25.

Materials for the dress:  $4\frac{1}{2}$  yd. of silk at \$2.40 a yard, 1 pr. dress shields 25¢, weights 10¢, snaps, binding, and ribbon 10¢,  $2\frac{1}{2}$  yd. hemstitching at 6¢ a yard, 1 spool of cotton thread at 5¢, labor \$9.75.

2. What is saved by making these garments at home?

3. Find the cost of the following and make out in bill form:

24 yd. of lawn at 18¢ a yard.

54 yd. of percaline at 24¢ a yard.

12½ yd. of chambray at 36¢ a yard.

7½ yd. of embroidery at 25¢ a yard.

2 doz. spools of thread at 5¢ a spool.

4. Find the cost of:

10½ yd. of gingham at 36¢ a yard.

37½ yd. of crinoline at 10¢ a yard.

8½ yd. of dimity at 36¢ a yard.

11½ yd. of muslin at 18¢ a yard.

16 yd. of nainsook at 29¢ a yard.

5. Find the cost of a hat using the following items:

¾ yd. silk at \$1.96 a yard.

1 flower ornament \$1.20.

Labor \$1.00.

### Statements and Invoices

#### LESSON 147

A statement is a printed form sent to customers who have made use of their charge account during the month. Statements usually are sent out at the beginning or end of each month. If several orders have been placed in one month and are not paid for by the end of the month, a statement is sent to the purchaser. On the statement are listed the dates and the costs of the several purchases together with their total. Some firms also include a reference number on these forms. These are the numbers of the individual bills for the several purchases which are a part of some bookkeeping systems.

An invoice is an itemized bill given or sent to a customer with the goods ordered. On an invoice are listed the quantity of articles purchased, the names of the articles, their prices, and the discounts, if any are allowed.

A typical monthly statement. The items charged to the customer are explained in the invoices on page 126.

## **EXPLANATION OF INVOICES:**

1.  $15 \times \$5.00 = \$75.00$   $\times 25\%$  discount or  $\$18.75$ .  
 $\$75.00 - \$18.75 = \$56.25$ .  
 $\$56.25 + \$3.00$  express =  $\$59.25$ .....\$.59.25
  2. 2 gross of flashlights at  $\$1.50$  =  
 $288$  flashlights  $\times \$1.50 = \$432.00$   
 $\$432.00 \times 25\%$  discount =  $\$108.00$   
 $\$432.00 - \$108.00 = \$324.00$  cost  
 $\$324.00 + \$5.00$  express =  $\$329.00$ ..... $\$329.00$   
 $\$388.25$

**Pay last amount in column**

1. \$ 5.00	\$75.00
X15	-\$18.75
\$75.00 cost of 15 kegs of nails	\$56.25
X.25	+\$3.00 express
\$18.75 discount	\$59.25

## APPLIED MATHEMATICS FOR GIRLS

ESTABLISHED 1864 INVOICE INCORPORATED 1864

**PATTERSON BROTHERS**  
HARDWARE, METALS, TOOLS, SUPPLIES  
15 PARK ROW NEW YORK  
BARCLAY T-8280

SOLD TO	Prairie Construction Co. A. E. Corwood 68 Elm Grove Little Rock, Arkansas	April 3, 1940		
		ARTICLE	LIST PRICE	DISCOUNT
15	Small Kegs 24 Drills @ 5.00 each Express	75.00	25%	56.25 3.00 59.25

*Save time! We have 70,000 items in stock.*

A typical invoice

2.	\$1.50	\$432.00	\$ 59.25
X288		-\$108.00	+\$329.00
\$432.00 cost of flashlights		\$324.00	\$388.25 Bal.
X.25 discount		+\$5.00 express	
\$108.00		\$329.00	

ESTABLISHED 1864 INVOICE INCORPORATED 1864

**PATTERSON BROTHERS**  
HARDWARE, METALS, TOOLS, SUPPLIES  
15 PARK ROW NEW YORK  
BARCLAY T-8280

SOLD TO	Prairie Construction Co. A. E. Corwood 68 Elm Grove Little Rock, Arkansas	April 84, 1940		
		ARTICLE	LIST PRICE	DISCOUNT
2 gross	Hardy's 6-in Flashlights @ 1.50 each Express	432.00	25%	584.00 5.00 589.00

*Save time! We have 70,000 items in stock.*

A typical invoice

1. On November 28, the Big and Little Food Market placed an order for twenty-five 24 $\frac{1}{2}$ -lb. bags of Mills' Treat Flour at \$.98, and 2 gross of All Day canned goods at \$10 per gross. Make out the invoice and statement if the orders are placed with Art's Wholesale Grocery with a 25% discount.

2. On February 12, the Bookworm Shop placed an order with Granddad's Library Publishing Company for 100 *Rearley's Home on Main Street* at \$1.25; and on February 18, 75 *Ramour's Who Brings Home the Bacon?* at \$.75. Make out the invoices and statements if the orders have a 25% discount, and the postage and insurance on each order is \$.85.

### Counting Change

**OBJECTIVE:** To train yourself, when shopping, to count the change with the clerk as the change is handed to you, in order to avoid mistakes.

#### LESSON 148

The connection between home arithmetic and arithmetic taught in school, is well illustrated by the method of counting change in stores and shops. You as customers pay little or no attention to a clerk when he is counting change and then you blame the clerk for not giving you the correct change, when it is really your own fault. The following problems are given in which the change is to be actually counted in order to awaken interest in correct shopping.

##### EXAMPLE:

Count the change received from the clerk if 43¢ is spent out of one dollar. Note that you are not to say \$1.00 - \$.43 = ?

##### SOLUTION:

43¢ and 2¢ is 45¢ and 5¢ is 50¢; and 50¢ make a dollar.

1. A customer buys 3 $\frac{2}{3}$  yd. of silk at \$2.15 a yard, and 4 yd. of trimming at 75¢ a yard. Count the change she receives from \$15.
2. I spent \$4.72 out of \$10. Count the change.
3. I spent \$2.23 out of \$3.00. Count the change.
4. Count the change received if \$1.83 is spent out of \$5.00.
5. I spent \$13.46 out of \$20. Count the change.

This lesson may be supplemented with similar oral problems in which members of the class act as saleswomen and customers.

### LESSON 149

1. A dress coat costs \$3.87. Count the change received from \$10.
2. Mrs. Jones's grocery bill was \$8.39. Count out her change from \$10.
3. Mr. Smith was given \$6.92 in change from \$10. Count it out for him.
4. A woman spent \$2.43 out of \$5.00. What was her change?
5. A man paid for a \$3.85 hat with a check for \$22.63. Count his change.
6. Peter bought marbles for 6¢, a tablet for 5¢, and a pencil for 3¢. What is his change from 25¢?
7. A bill of \$6.87 was paid with a \$15 check. Count the change.
8. Articles costing \$6.38 were paid for with \$10. Count the change given if the customer asked for three 50¢ pieces.
9. Mary's teacher bought drawing paper for her 43 pupils at 3¢ per sheet. Count her change from \$5.00.
10. Mrs. Lee buys 2 doz. eggs at 28¢ per doz., a pail of honey at 50¢, and a bushel of apples at \$1.25. Count her change from a \$4.00 check.

### LESSON 150

1. What was the change from \$10 for two \$2.00 books and four 15¢ cards?
2. Jerry was allowed a 20% discount on a \$6.50 book. What was his change from \$10?
3. On a trip Mr. and Mrs. Brown each had a \$1.35 meal, Mary's was \$1.15, John's was \$1.40. Count the change from \$20.
4. What is Tommy's change from \$5.00, for a \$1.75 book, two 10¢ pads of paper, five 5¢ pencils, three 5¢ notebooks, and a 25¢ theme folder?
5. Mrs. White made the following transactions starting with \$20: bought vegetables for \$2.13; with 50¢, paid 12¢ for bread; with \$5.00, paid \$3.52 for cereals and canned goods. Count her change for each, and tell what remains.

## Millinery and Infant Clothing Problems

## LESSON 151

1. What will the following baby-carriage robe cost:

2 yard Crepe.....	@ \$2.00 per yd.
1 yd. Cotton felt.....	@ .50 per yd.
1 spool Sewing silk.....	@ .10
8 yd. Ribbon.....	@ .25 per yd.
Embroidery cotton.....	@ .40
Labor.....	@ 2.00

2. Find the cost of the following bill and receipt the same:

Established 1891		<i>L &amp; L Hat Shop</i>		Phone 6R 4477	
		MANUFACTURERS OF LADIES' HIGH GRADE HATS 104 WEST MAIN STREET Buffalo, New York			
		<u>Sold to Lorraine Jacob</u>		<u>8740-A North Eighth Street</u>	
All charges must be made within three days after receipt of goods.					
Invoice No.	Terms		Shipped via		
Date	Quantity	Item		Unit Price	Amount
8/7/38	1	Straw Body		\$2.00	
8/7/38	5	Ornaments		each 1.00	
8/7/38	1	Skein Gold Thread		.13	
8/7/38	1	Spool Silk		.10	
8/7/38	1½	Yd. Ribbon		.25	
		Labor		\$2.00	

A typical millinery invoice

3. Find the cost of this baby coat:

1½ yd. Silk crepe.....	@ \$1.66 per yd.
1½ yd. Lining.....	@ .80 per yd.
8 skeins Silk.....	@ .08 per skein
2 spools Sewing silk.....	@ .08 per spool
1 doz. Snaps.....	@ .10 per doz.
Labor.....	@ 2.50

4. Find the cost of a hat requiring the following:

Straw body.....	@ \$1.50
½ yd. Gold braid.....	@ 6.00 per yd.
2 Flowers.....	@ .75
Labor.....	@ 2.50

5. Find the cost of the following baby bunting:

2½ yd. Eiderdown.....	@ \$1.50 per yd.
2 yd. Ribbon.....	@ .35 per yd.
4 yd. Ribbon.....	@ .10 per yd.
2 yd. Cord.....	@ .05 per yd.
½ doz. Snaps.....	@ .10 per doz.
1 yd. Elastic.....	@ .08 per yd.
Labor.....	@ 1.00

### Millinery Problems

#### LESSON 152

- If 9 bolts of ribbon (10 yd. in a bolt of No. 150 ribbon) cost \$4.50 wholesale, what will be the cost of 5 bolts?
- How many hat forms can be bought for \$9.80, if one gross costs \$28.80?
- If 17 yd. of hat braid cost \$4.42, what part of a yard can be bought for 20¢?
- How many hats, each requiring 6½ yd. of ribbon, can be trimmed with 75 yd. of ribbon?
- At the rate of 10 hat forms for \$2.20, what is the cost of 7 doz. frames?

#### LESSON 153

- Make out a bill for the following articles, figuring at the prices given:

30 yd. Cretonne.....	@ \$ .45 a yard
16½ yd. Rose messaline.....	@ .68 a yard
17 yd. Rose flaxon.....	@ .45 a yard
27 yd. Lace.....	@ .18 a yard
2 cards Hooks and eyes .....	@ .05 a card
1 spool Silk.....	@ .10 a spool
3 spools Cotton thread.....	@ .05 a spool
4 yd. ¼-in. Elastic.....	@ .03½ a yard
3 doz. Weights.....	@ .06½ a dozen

#### LESSON 154

- What will 12½ yd. of lace cost at the rate of \$7.00 for ¾ yd.?
- At \$72 for 2 gro. of ornaments, what will 7½ doz. cost?

3. With silk velvet at \$3.50 a yard, what will be the cost of 3 hats requiring respectively  $1\frac{3}{4}$  yd.,  $2\frac{1}{4}$  yd., and  $1\frac{5}{8}$  yd. of velvet?
4. A hat required  $\frac{1}{4}$  yd. of velvet at \$3.75 a yard and 18 in. of velvet at \$3.25. What was the cost of the velvet?
5. In making a hat I used a piece of lace 15 in. long. What was the cost of the lace, if it retailed at \$3.96 a yard?

**Dozen and Gross**  
(Refer to tables)

### LESSON 155

1. If 1 hat form costs \$1.79, find the cost of 1 gross of hat forms.
2. If 1 doz. cans of corn cost \$1.80, how much does 1 gross cost?
3. If 5 cards of 12 buttons each cost 45¢, what will be the cost of 3 gross?
4. The cost of 2 gross packages of pins is \$22.04. Find the cost of 8 packages of pins.
5. A card of snaps costs 7¢. How much will  $\frac{1}{2}$  gross cost?
6. If 1 book costs \$2.50, find the cost of  $2\frac{1}{2}$  doz.
7. The cost of 3 doz. books is \$81. Find the cost of 1 book.
8. If 2 doz. dresses cost \$71.52, find the cost of 3 dresses.
9. One dress costs \$3.98. Find the cost of  $3\frac{1}{4}$  doz.
10. If 1 peck of potatoes costs 25¢, find the cost of 2 bushels at this rate. How much would you save by buying the 2 bushels at 75¢ per bushel?

#### Christmas Sale

**OBJECTIVE:** To awaken a desire to help needy people by putting on various stunts, making candy, birdhouses, and other articles for sale. Parents become interested and help the pupils in this very worthy cause.

### LESSON 156

1. Tom's class was having a Christmas sale for a needy family. Each of the 31 children gave 15¢. If their goal was \$25, how much did the class have to raise in some other project?
2. If 10 of the 31 mothers donate cakes, how much is there still to raise if each cake is sold for 50¢?

3. The class gave a 5¢ entertainment for which 175 tickets were sold. How much was taken in by the show if \$2.75 was used for expenses?

4. Each of the 18 girls in the class made 1 pan of candy of 24 pieces. If the candy was sold at 4 pieces for 5¢, find the profit. Find the shortage.

5. Each of the boys made a birdhouse which was sold at 15¢. What did the birdhouses bring?

6. The teacher suggested putting on a penny amateur hour. For this 225 tickets were sold. Was the class still indebted? What was the difference between the \$25 and the amount the class collected?

7. On an average, what amount did each pupil give to the needy family?

8. If Tom's class gave 5 times as much as his sister's class, how much did her class give?

9. Of the 10 rooms in the school, 5 classes gave \$5, 4 classes \$10, and Tom's class \$25. How much was given from the school if the teachers each gave \$2.00 (ten teachers)?

10. On an average, how much did each of the 10 families receive?

### Bazaars

#### LESSON 157

1. A 15-yd. piece of material was donated to a church for its bazaar. If 65¢ was charged for each apron (2 yd. each), find the total gain.

2. The church bought 100 yd. of tubing for pillow slips at 20¢ per yard. If each pair of pillow slips required 2 yd. and sold for \$1.75, find the gain.

3. The contents for a children's grab bag was bought for \$10. If \$22 was taken in, what was the per cent of profit?

4. 25 pans of homemade candy, 24 pieces to a pan, were donated. If the candy sold at 4 pieces for 5¢, find the profit.

5. 500 dinners were served at 40¢ per person. What is the per cent of profit if \$78 is the amount of expenses?

6. 50 dresses were sold at \$1.59. Find the total profit if the expense of each dress is 89¢.

7. 10 boxes of candy bars were bought at 80¢ per box. If the bars, 24 to a box, were sold at 5¢ each, find the total profit.
8. 10 gal. of ice cream were bought at 66¢ per gallon. If there are approximately 30 cones per gallon, find the amount of profit at 5¢ per cone.
9. Prizes for the various games cost \$15. If \$39 were taken in, find the per cent gained.
10. A \$10 quilt was raffled at 10¢ a chance. If 387 people took a chance, what was the total profit?

### Review Problems

#### LESSON 158

1. Mr. B. paid \$18.36 for  $1\frac{1}{2}$  doz. ornaments. At what price per ornament must he sell them to gain 35¢ on each ornament?
2. Buttons that cost 54¢ a doz. were sold at 9¢ each. Find the gain on the buttons.
3. What is the cost of  $94\frac{1}{2}$  in. of lace at 30¢ a yard?
4.  $\$8\frac{1}{2} + \$2\frac{1}{2} + \$7\frac{5}{8} + \$4.67 = ?$
5.  $638,475 \div 37 = ?$  Check.
6. At 89¢ a yard, find the cost of 108 in. of poplin.
7. What will  $7\frac{1}{2}$  yd. of galatea cost, if  $2\frac{1}{2}$  yd. cost \$1.25?
8. What will 9 buttons cost at \$1.80 a dozen?
9. If Mrs. A bought a pair of slippers for \$5.25, 5 yd. of serge at \$2.25 a yard, and a hat for \$6.50, how much change did she receive if she gave the clerk \$25?
10. 
$$\frac{63 \times 72 \times 42 \times 96}{9 \times 12 \times 81 \times 4 \times 7} = ?$$

#### LESSON 159

1. Find the time from 9:10 a.m. Monday to 3:15 p.m. Friday.
2. If 36 yd. of outing flannel cost \$7.02, at what price per yard must it be sold so as to gain  $5\frac{1}{2}\%$  per yard?
3. White linen braid was bought at 84¢ a dozen bolts and sold at 12¢ a bolt. What was the gain on 6 doz. bolts?
4. From a 40-yd. piece of chambray, a merchant sold  $6\frac{1}{2}$  yd. to one customer,  $12\frac{1}{4}$  yd. to another, and  $17\frac{1}{4}$  yd. to a third. How many yards remained?
5. What is the cost of 126 in. of lace at 48¢ a yard?

## LESSON 160

1. Find the cost of a pair of bloomers 23 in. long, made of sateen at 28¢ a yard. Use  $1\frac{5}{8}$  yd. of elastic at 8¢ a yard.
2. Add  $8\frac{3}{4}$  yd.,  $7\frac{1}{2}$  yd., 2 yd., 24 in., 6 yd., 3 in., and  $4\frac{5}{8}$  yd.
3. At 36¢ a yard, find the cost of  $2\frac{1}{2}$  yd. of sateen used in making a pair of bloomers, and 2 yd. 14 in. for an apron.
4. If lace is bought at  $12\frac{1}{2}$ ¢ a yard and sells at  $14\frac{1}{2}$ ¢, how much is gained on  $15\frac{5}{8}$  yd.?
5.  $8\frac{5}{8} + 1\frac{1}{8} + 3\frac{3}{4} + \frac{5}{8} = ?$

## LESSON 161

1. Find the cost of  $2\frac{1}{2}$  doz. buttons if  $\frac{3}{4}$  doz. cost 18¢.
2. If I buy 3 pairs of gloves at \$1.25 a pair and a pair of shoes at \$6.50, what change do I receive from a \$20 bill?
3. If I buy a hat for \$5.25 and sell it for \$15, how much do I gain?
4. At  $87\frac{1}{2}$ ¢ a yard, what will 16 yd. of ribbon cost?
5. If it takes  $2\frac{1}{2}$  yd. of silk to make a blouse, how many can be made out of 40 yd.?

## LESSON 162

1. A remnant of applique, containing  $6\frac{3}{4}$  yd., sold for \$6.75. What will 30 in. cost at the same rate?
2. How much material is required to make a 4-in. ruffle, with a 1-in. hem, for a child's dress measuring 40 in. at the bottom. The ruffle is to be cut from material 27 in. wide, allowing  $1\frac{1}{2}$  times for fullness.
3. If 6 doz. buttons cost 90¢ what will  $2\frac{3}{4}$  doz. cost?
4.  $\$9.68 + \$7\frac{1}{4} + \$5\frac{5}{8} + \$6\frac{5}{12} + \$7.56 = ?$
5. What will 7 yd. 24 in. of ribbon at 48¢ a yard, and 1 yd. 20 in. of lace at \$1.17 a yard cost?

## LESSON 163

1. At the wholesale price of \$1.00 for 6 hat forms, what will be the cost of 2 doz. forms?
2. The wholesale price of felt-hat forms is \$5.00 per dozen. What is the cost of 8 forms?

3. At the rate of 8 articles for \$1.00, what is the cost of 5 doz. articles?
4. At the rate of \$7.50 per yard, what is the cost of 19 in. of lace?
5. What part of a yard can be bought for 30¢, if 2 yd. cost \$3.00?

## Chapter X

# PUBLIC UTILITIES

**OBJECTIVE:** To learn how to read your water, electricity, and gas meters, to calculate the cost of operating various appliances, and, incidentally, to learn how to use these appliances economically. This knowledge and ability will increase your efficiency in house-keeping or in business.

### How to Read a Water Meter

A meter is a device for measuring and automatically recording and indicating a quantity measured. Meters are used for measuring water, electricity, gas, etc.

#### LESSON 164

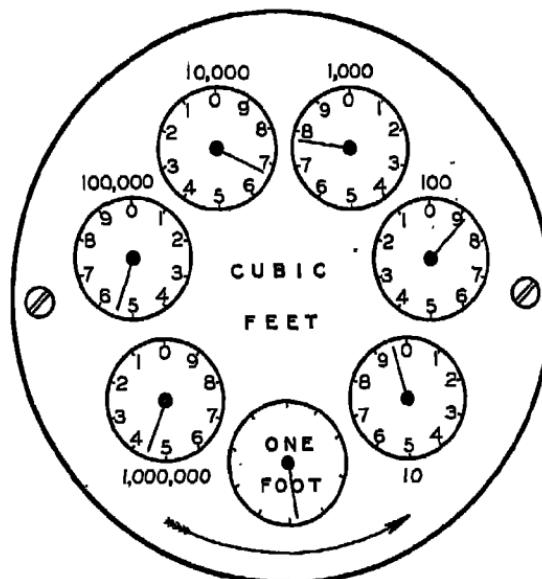
The arrow at the bottom of the illustration on page 137 indicates the most certain method of reading; that is, from low to high.

The one-foot circle indicates one cubic foot graduated in tenths. This circle is used by inspectors to ascertain quickly whether the meter is working, but in all service readings it should be entirely disregarded.

**RULE:** Start with the circle of the lowest denomination and read each circle using the lowest of the two figures between which the hand points.

When the hand is so near a figure as apparently to indicate it exactly, refer to the next lower circle, and if the hand has passed the 0, the figure indicated is correct; otherwise take the next lower.

The first or right-hand figure of the answer is taken from circle 10, the second from circle 100, the third from circle 1,000, etc.



The face or recording dial of a typical water meter

**EXAMPLE:**

<i>Meter Circle</i>	<i>Cu. Ft.</i>
10.....	9
100.....	80
1,000.....	700
10,000.....	6,000
100,000.....	50,000
1,000,000.....	<u>400,000</u>
Total reading.....	456,789

From the total reading subtract the previous reading. The difference, then, is the number of cubic feet of water you have used since the previous reading of the meter.

Since you buy water at so much per 100 cubic feet, divide the number of cubic feet used by 100 and multiply the result by the price per 100 cubic feet (for instance, 6¢ in some cities). To the cost of the water you may have to add a meter-reading or service charge of 50¢.

## SOLUTION:

If the present reading is 456,789 cu. ft., and the previous reading was 454,889 cu. ft., the difference is:

$$\begin{array}{r} 456,789 \\ - 454,889 \\ \hline \end{array}$$

1,900 cu. ft. used during the period.

$1900 \div 100 = 19$  = number of times you have used 100 cu. ft. of water.

6¢ or \$ .06 = cost per 100 cu. ft.

$19 \times \$ .06 = \$1.14$  (cost of water used)

+ .50 (service charge)

\$1.64 (amount of your bill)

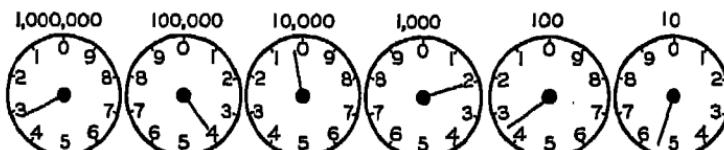
<b>PROTECTED WIRING MEAN LESS FIRES</b>	14-6	4328	PENALTY OF 5% AFTER AUG. 20th
		Tap 48214	OFFICE HOURS 8 A.M. - 4 P.M. ... Saturday 8:00 A.M. - 12 M.
		2424 W. Mineral St.	
<b>To MILWAUKEE WATER WORKS, Dr.</b> <small>DIVISION OF COLLECTIONS - CITY HALL</small>			
Meters Water — For Quarter Ending July 31, 1938			
PREVIOUS READING HUNDRED CU. FT.	PRESENT READING HUNDRED CU. FT.	CONSUMPTION HUNDRED CU. FT.	RATE per cu. ft. \$ .06
765	785	21 .50	\$ 1.75
<i>For Rate see other side</i>			
PENALTY OF 5% TOTAL			
<small>EXP. Water will be shut off without further notice if this bill remains unpaid 10 days after penalty has been added and will not be turned on again until all arrears are paid together with the sum of Two Dollars for turning off and on.</small>			
<small>United Telegraphic Wire Will Not Be Returned on Mail Remittance</small>			
<b>BRING THIS BILL</b>			
<b>PENALTY OF 5% TOTAL</b>			
<small>Failure to receive this bill will exempt consumer from penalty.</small>			
<small>Send THIS BILL with remittance.</small>			
<b>MILWAUKEE WATER WORKS</b>			

A typical water bill

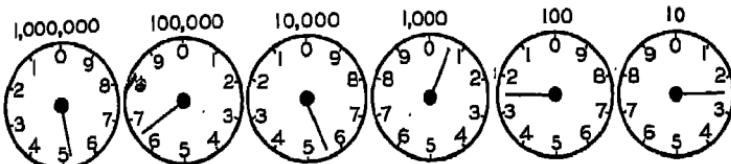
### Water-Meter Problems

#### LESSON 165

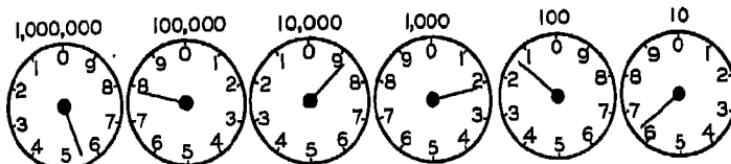
1. Read the following meter and find the cost if the previous reading was 338,784 cu. ft. The cost of 100 cu. ft. is 6¢; add a service charge of 50¢.



2. Find the cost of the bill if the previous reading was:

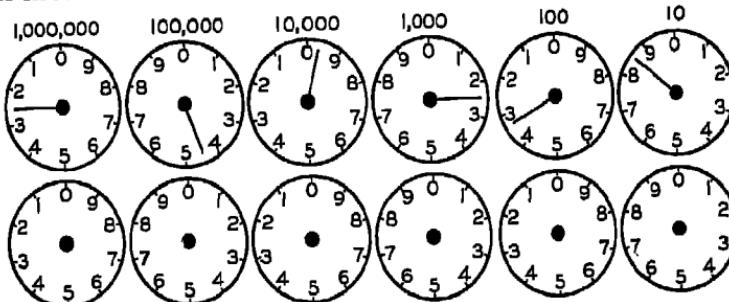


and the present reading is:



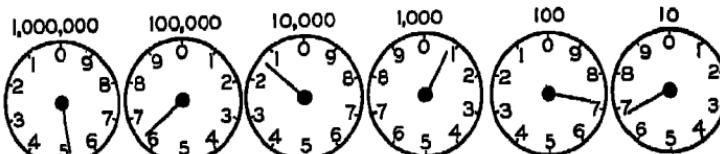
and the cost is 6¢ for 100 cu. ft. of water, with a service charge of 50¢.

3. The previous reading of a meter is shown in the first row of circles below.

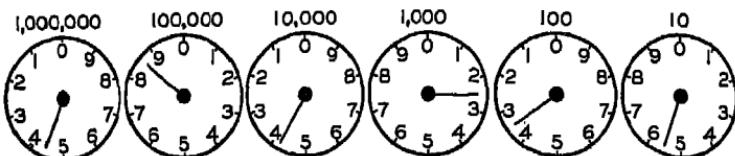


Fill in the second row of circles to show the present reading so that the difference between the two readings is 2,408 cu. ft.

4. Mrs. Jones's water meter reads as follows:



Mrs. Smith's water meter reads as follows:



If the previous reading of Mrs. Jones's meter was 556,242 cu. ft., and the previous reading of Mrs. Smith's meter was 474,221 cu. ft., find the cost of each bill including the service charges. Whose bill was the higher, and how much higher?

5. Read the meter at home, and find the cost, at 6¢ per 100 cu. ft., of all the water that your meter measures.

6. In Problem 4, find the cost of each person's bill if a 5% penalty is added for not paying on time.

7. Find the quarterly charge for water service to a family if the previous reading was 773 hundred cu. ft. and the present reading is 790 hundred cu. ft., at 6¢ per hundred cu. ft. Add 50¢ for service charge.

8. Find the cost of water for a family if the previous meter read 758 hundred cu. ft. and the present reading is 773 hundred cu. ft., with a quarterly charge of 50¢, and a charge for metered water at 6¢ per hundred cu. ft.

9. What will water cost for a quarter of a year if the present meter reads 882 hundred cu. ft. and the previous meter read 836 hundred cu. ft.? There is a 50¢ service charge, and water costs 6¢ per hundred cu. ft.

### Measuring Electricity

#### LESSON 166

The meter or "watt-hour meter" is a device which measures the amount of electricity passing through an electric installation. It consists of a series of dials with pointers which are run by a small electric motor. This motor revolves at a speed exactly in proportion to the amount of energy (wattage) used. Whenever a lamp or appliance is in use, the motor moves the pointers or hands on the dials and shows exactly how much electricity is

consumed. Each meter is made with the greatest care, and is periodically tested to insure its continued accuracy.

Readings are made in kilowatt (1,000 watt) hours. The meter tells how much work has been done in one hour by the equivalent of 1,000 watts (a kilowatt); that is, if a 1,000-watt appliance is used for one hour it consumes 1 kilowatt hour of electricity.\* A 100-watt lamp burns 10 hours before it uses a kilowatt hour.

### Reading a Meter

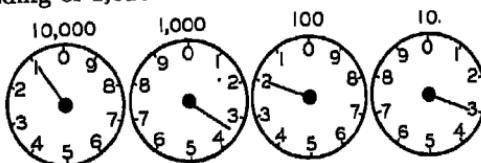
The right-hand dial governs the one on its left in each instance. The pointer on the right dial moves clockwise, the one to the left counterclockwise, and the next to the left clockwise, and so on.

A complete revolution of the pointer on the right-hand dial indicates 10 kilowatt hours; the pointer on its left indicates, in one revolution, 100 kilowatt hours; the next pointer similarly indicates 1,000 kilowatt hours; while the pointer on the dial on the extreme left in one complete revolution indicates 10,000 kilowatt hours.

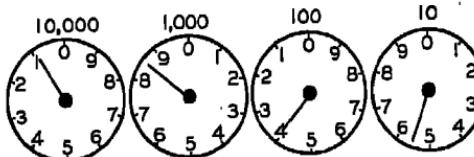
When a hand on any of the dials is between two figures such as 2 to 3, 3 to 4, etc., the smaller number is always read. The meter is read from right to left.

#### EXAMPLE:

The following diagram of Mrs. Smith's meter on February 1, shows a reading of 1,323 kilowatt hours:



On March 1, Mrs. Smith's meter appeared as shown in the circles below. The reading then was 1,845 kilowatt hours.



\*If an overload is given, an element will burn out or a fuse will blow out as a warning. Replacing the burnt-out fuse by a new fuse restores the current for service.

To obtain the consumption, subtract the previous reading from the present. If the dial is plain, as in the drawing, you have a direct reading and the difference is the actual consumption in kilowatt hours. Thus,  $1,845 - 1,323 = 522$  kilowatt hours, the amount of current used in Mrs. Smith's house during February.

If no one is home when the meter reader calls at your house, he may leave a card for you to fill out showing the meter reading to be mailed to the electric company. That is a problem similar to the example just given.

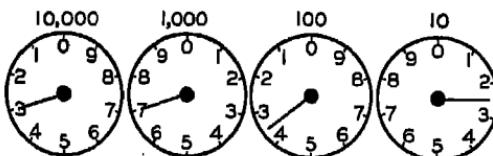
A discount is allowed on your bill if you pay it before a specified date.

For practice, bring some old electricity bills to school. Note the meter readings shown, the rate, the gross bill, and the net bill after deducting the discount.

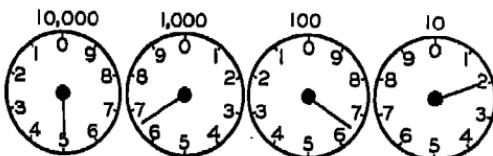
## LESSON 167

Read the following electric meters:

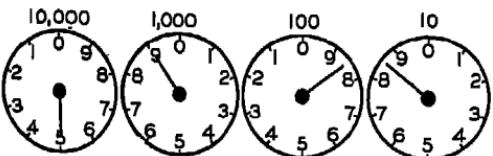
1.



2. Previous reading:

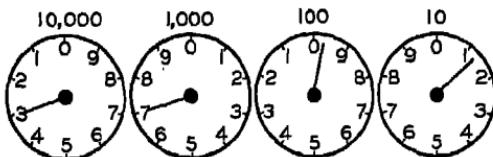


Present reading:



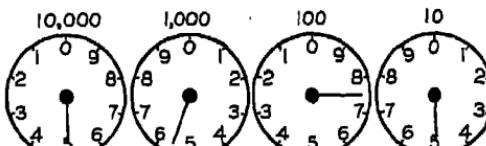
At 3.6¢ per KWH, find the cost of the above reading.

3.

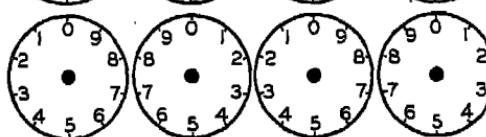


If the previous reading was 3692 KWH, find the cost of the bill at 3.6¢ per KWH.

4. Previous reading:



Present reading:



Fill out the above circles so that the difference between the two is 77 KWH.

5. At 3.6¢ per KWH, find the cost of the electricity used in Problem 4.

### Electrical Appliances

#### LESSON 168

Electrical household appliances transform electrical energy into light, heat, or mechanical energy. The cost of operation depends upon the number of watts of electricity consumed per hour. In general, heat-producing appliances consume much more current than motors.

Based on the cost of electrical current in one city, you can for one cent operate one of the following devices for the length of time given:

Lamp (25 watts), 11 hr., 7 min.; lamp (100 watts), 2 hr., 47 min.; 12-in. fan (50 watts), 5 hr., 33 min.; vacuum cleaner (200 watts), 1 hr., 23 min.; iron (660 watts), 25 min.; roaster (460 watts), 36 min.

Solve the following problems supposing the cost of current is  $2\frac{1}{2}$ ¢ per kilowatt hour. Note that a 60-watt bulb uses 60 watt hours of current in one hour.

1. The Jackson home has the following lights in the living room: an indirect ceiling fixture with three 60-watt bulbs; three wall fixtures each with a 25-watt bulb; a direct-indirect reflector floor lamp with one 300-watt bulb and three 25-watt bulbs. What does it cost to burn all of these lights from 7 o'clock to 10 o'clock?

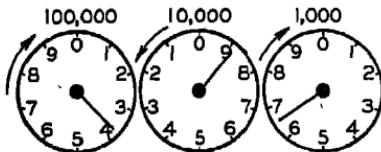
2. How much current is consumed by a 460-watt roaster in cooking the dinner, if it takes three hours to roast the meat? How much will this current cost?

3. A washing-machine motor consumes about 200 watts of current per hour. How much per hour does it cost to operate this machine?

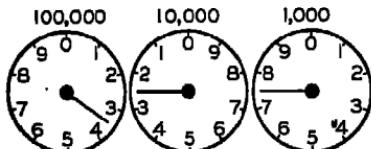
#### Reading a Gas Meter

A gas meter is similar to a water meter. However, there are only three dials to be read. The dial on the right registers up to 1,000 cu. ft. Each figure represents so many hundred cu. ft. The middle dial shows how many thousand cu. ft. up to 10,000; and the dial on the left shows how many times you have used 10,000 cu. ft. up to 100,000. In reading, begin on the left.

#### LESSON 169



The meter shown above now reads:  $30,000 + 8,000 + 600 = 38,600$  cu. ft. of gas used. At the previous reading, it appeared as below showing 32,700 cu. ft.



$38,600$  cu. ft. -  $32,700$  cu. ft. =  $5,900$  cu. ft., the amount of gas used since the previous reading.

**Computing the Gas Bill**

The following schedules of prices charged by one gas company illustrates a step rate. The more gas you use the lower the rate.

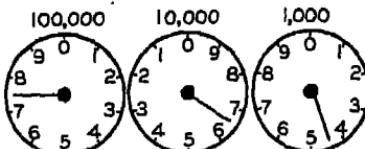
	<i>Quantity</i>	<i>Gross</i>	<i>Discount</i>	<i>Net</i>
First	200 cu. ft. or less	.50	0	.50
Next	1,300 cu. ft. per 1,000	.80	.10	.70
Next	48,500 cu. ft. per 1,000	.75	.10	.65
Next	150,000 cu. ft. per 1,000	.70	.10	.60
Next	1,800,000 cu. ft. per 1,000	.65	.10	.55
Next	2,000,000 cu. ft. per 1,000	.55	.10	.45
Next	1,000,000 cu. ft. per 1,000	.50	.10	.40
Next	1,000,000 cu. ft. per 1,000	.48	.10	.38
Next	2,000,000 cu. ft. per 1,000	.45	.10	.35
Next	2,000,000 cu. ft. per 1,000	.42	.10	.32
Next	10,000,000 cu. ft. per 1,000	.40	.10	.30

Using the above schedule of prices, the cost of 1,400 cu. ft. will be found by the following method:

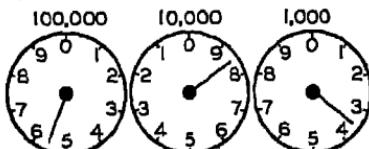
<i>Gross</i>	<i>Net</i>
200 cu. ft..... .50	.50
1,200 ÷ 1,000 =	$1.2 \times .70 =$ .84
$1.2 \times .80 =$ .96	Total \$1.34
Total \$1.46	

1. Read the following meter and determine the cost of the gas used.

Present reading:



Previous reading:



2. If the present gas-meter reading is 36,900 cu. ft., find the cost if the previous reading was 35,600 cu. ft.

3. If the December reading was 28,700 cu. ft., find the cost of gas that is used in each of the following months if the readings were as follows:

End of January—30,300 cu. ft.

End of February—32,900 cu. ft.

End of March—34,800 cu. ft.

4. Consulting Problem 3, find the cost of gas used in the months following, if the readings were as follows:

End of April—35,900 cu. ft.

End of May—37,500 cu. ft.

End of June—38,800 cu. ft.

5. When your gas bill comes, or if you have a receipt for your previous bill, read your meter about the same time the meter reader does and figure the approximate cost of the gas. Compare costs when your bill arrives.

### Reducing Your Gas Bill

#### LESSON 170

Following is a tabulation of burner ratings in cubic feet per hour and the cost of gas at the rate of \$1.00 per 1,000 cubic feet and 70¢ per 1,000 cubic feet, which is in effect in some cities. Rates vary from city to city.

	<i>Cu. Ft. per Hr.</i>	<i>Cost at \$1.00 per M Cu. Ft.</i>	<i>Cost at 70¢ per M Cu. Ft.</i>
<b>1. Gas Range:</b>			
16-in. Oven burner.....	40	.4¢	2.8¢
Giant burner.....	25	2½	1.75
Small burner.....	22	2.2	1.54
Simmer burner.....	3	.3	.21
<b>2. Water Heater:</b>			
Ordinary circulating type.....	60	6	4.2
Automatic storage			
Fast recovery .....	40	4	2.8
Slow recovery.....	20	2	1.4
<b>3. Incinerator:</b>			
Two-bushel size.....	40	4	2.8

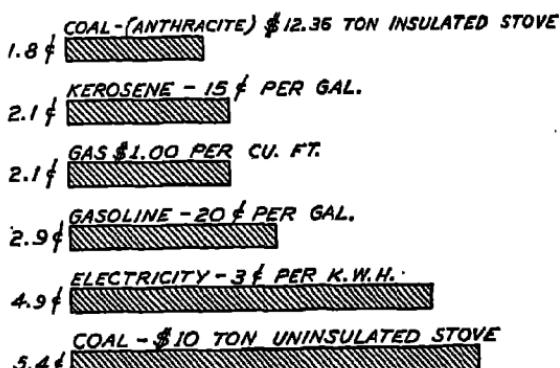
	<i>Cu. Ft.</i>	<i>Cost at per Hr.</i>	<i>Cost at 70¢ per M</i>	<i>Cost at per M Cu. Ft.</i>
<b>4. Laundry Gas Appliances:</b>				
a) Laundry stove				
Single burner.....	22	2.2	1.54	
Double burner.....	35	3.5	2.45	
b) Washing machine.....	25	2.5	1.75	
c) Ironing machine.....	17	1.7	1.19	
d) Clothes drier.....	35	3.5	2.45	
<b>5. Heaters:</b>				
a) "Radiant Fire" (10 section) ..	50	5.0	3.5	
b) Space heater.....	30	3.0	2.1	

Using the table of consumption and costs shown above:

- How much money would you waste if you kept a saucepan on the small burner for two hours if the simmer burner would have been adequate?
- If your water heater were lighted an hour a day, how much would it cost in 30 days?
- How much could you save in cooking a dinner (2 hr.) if you used a triple saucepan in place of three single pans?

#### Cost Comparison of Various Fuels

The figures in cents indicate the average cost of fuel used in cooking a meal for a family of 4 to 6.



A bar graph showing the comparative costs of various fuels used in cooking a meal

The foregoing information is based on experiments by the Bureau of Home Economics, United States Department of Agriculture, Washington, D. C.; Purdue University, Ind.; two electric-stove manufacturers; one gas-stove manufacturer; and the American Gas Association.

### The Telephone

#### LESSON 171

The telephone is so essential in business and so useful in the home that everyone should learn how to use it properly and to avoid its abuse. Skill in using the telephone is a valuable asset in any kind of commercial work. Moreover, the telephone companies offer employment to a great many people, including, besides operators and their supervisors, all the usual office positions—stenographers, clerks, cashiers, etc.

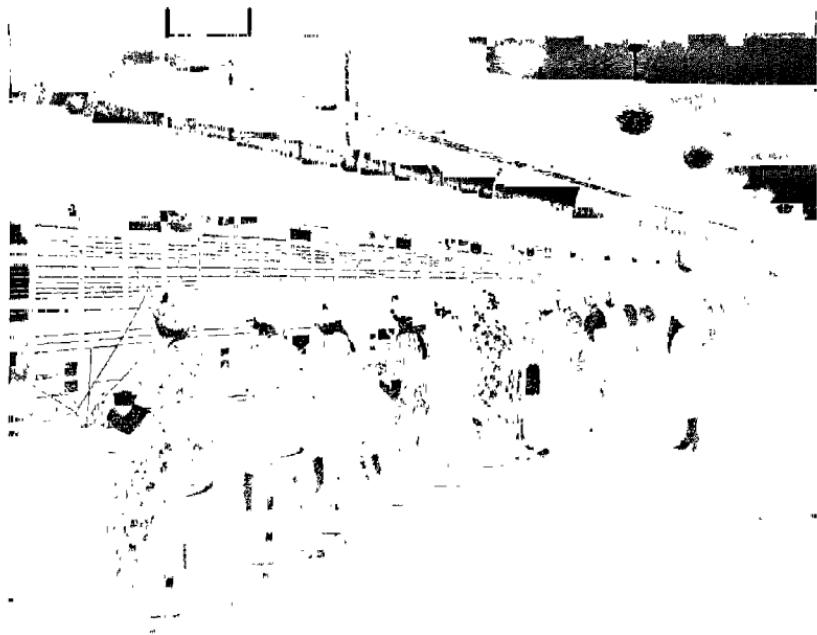
 <p><b>TO WISCONSIN TELEPHONE COMPANY NO.</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td><b>LAST DISCOUNT DATE</b></td> </tr> <tr> <td>JUNE 15</td> </tr> </table>		<b>LAST DISCOUNT DATE</b>	JUNE 15	<p><b>WISCONSIN TELEPHONE COMPANY</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td><b>Discount Dates, Title, Rate and Location With Your Bell Number Last Discount Date June 15</b></td> </tr> </table>		<b>Discount Dates, Title, Rate and Location With Your Bell Number Last Discount Date June 15</b>
<b>LAST DISCOUNT DATE</b>						
JUNE 15						
<b>Discount Dates, Title, Rate and Location With Your Bell Number Last Discount Date June 15</b>						
ADDRESS REGISTER TO A PERSON AT... OFFICE desired 1 MAY 1935		May 28, 1935				
Local Services For One Month Beginning With Date of Bill Directory Advertising For One Month Beginning With Date of Bill Additional Local Messages To Date of Bill Toll Service and Telegraph (Statement Enclosed) Other Charges or Credits (Statement Enclosed)		MRS. NETTIE STEWART DAVIS 739 N. 22ND ST MILWAUKEE WIS. 4 00 AM. 25 Net 3 75 0				
		MRS. NETTIE STEWART DAVIS 739 N. 22ND ST MILWAUKEE WIS. 4 00 PM. 25 Net 3 75 0				
		Dir. .... 25 Local Serv. Dir. Adv. Add'l Mus. Tolls, Etc. Chg. or Cr. Balance ... Total ...				
Paid by Check No. _____ Date _____						

A typical telephone bill

An itemized list of long-distance calls, etc., accompanies the monthly bill.

The statement for long-distance service indicates the cost of calls from one city to another. This cost depends on the class of call, whether it is Station-to-Station or Person-to-Person. It is to be noted, of course, that billing forms, periods of service covered, discount practices, and classes of service offered, vary in different communities.

The teacher will dictate twenty numbers from the telephone book. Write these numbers from dictation. This is a lesson in



A section of a switchboard in a long-distance telephone office

listening which is required of a switchboard operator or an order clerk in a store.

If there is time, members of the class may practice giving prefixes and numbers distinctly. But to gain proficiency you must practice this by yourself.

## LESSON 172

1. Mr. A pays \$4.00 a month with \$.25 discount if his bill is paid on or before the discount date. Find the amount of his bill if there are 4 long-distance calls at \$.35 each and 1 call at \$.45.

2. J. C. Brown pays \$4.00 a month for telephone service; a \$.25 discount is allowed if the bill is paid before the discount date. Find the amount of his bill using the long-distance calls and telegrams on page 150, including the indicated tax.

3. The A.B.C. Grocery Company had the following items charged to its telephone bill. There was a service charge of \$4.00 less a \$.25 discount if paid on or before a given discount date;

## APPLIED MATHEMATICS FOR GIRLS

WISCONSIN TELEPHONE COMPANY TOLL SERVICE AND OTHER CHARGES			
2300 WEST PLACE CALLED		AMOUNT	CODE TAX
APR			
26	CIGO	.35	N
30	NEW YORK	1.40	N .15
MAY			
4	SUPERIOR	.80	N .10
9	MADISON	.35	N
11	APPLETON	.35	N
19	EAU CLAIRE	.60	N .10
25	MARINETTE	.50	N .10
U. S. GOVERNMENT TAX		45	
TOTAL			
SCHEDULE OF U. S. GOVERNMENT TAX			
TELEPHONE MESSAGE RATE IS 10¢ PER MINUTE, EXCEPT NIGHT CALLS WHICH ARE 15¢ EACH			
** 10¢ EACH DAY TIME, 15¢ EACH NIGHT CALL, 15¢ EACH FOR EACH CALL			
** 15¢ EACH DAY TIME, 20¢ EACH NIGHT CALL, 20¢ EACH FOR EACH CALL			
EXPLANATION OF CODE			
N-DAYTIME OR DUSK TO DARK RATE			
P-NIGHT OR DARK TO DAWN RATE			
T-TELEGRAM, CABLEGRAM OR TELEGRAPH			
HIGH AND SUPER HIGH RATE CITY TO TEL/P. N. TO ALSDA, BALLY AND BIRMINGHAM			
ALL HOUSE ON RIVER			
G (IN PLACE CALLED COLLECT)-BALANCE RECEIVED COLLECT			

A typical long-distance telephone bill

one \$ .95 call plus \$ .10 tax; four \$ .35 calls; one \$ .40 call, and one \$ .15 call. Find the entire bill.

4. The following bill was not paid on time to be allowed the \$ .25 discount. Find the amount of the bill if the rate was \$4.00, and toll service and telegrams \$1.65.

5. Mrs. A has a telephone for which she pays a \$2.25 rate for 2 calls a day, and \$ .03 each for excess calls. What was her bill for a month in which she had 13 excess calls, 3 long-distance night calls at \$ .35 each, and 4 long-distance night calls at \$ .75 each, with a \$ .10 tax on each of the four last calls?

## Chapter XI

### THE FAMILY BUDGET

**OBJECTIVE:** To teach you as a future homemaker how to spend your income wisely. To give you some practice in computing interest on money that you borrow directly or borrow indirectly in buying on the installment plan.

A homemaker is the financial manager of a business establishment; that is, she must plan to meet the expenses of the family according to the family income. This means that she must understand how to budget the money she handles. A family budget is a careful plan to make the family income cover all needs. There are certain necessary expenses to be paid each month, such as those for food, shelter, clothing, education, health, insurance, and savings. Authorities differ as to the percentage of income to be used for each of these items, but they all insist on the necessity of savings for emergencies and old age. Merely balancing the expense account with the income does not provide for these vital necessities.

The father of a family provides the money for the home, but the mother adds very much indeed to the family income, not only by the work which she does so willingly, but especially through competent management.

Most of the chapters of *APPLIED MATHEMATICS FOR GIRLS* present information needed in managing a home. This chapter gives you some practice in making a budget. It also shows by example how you can save by buying for cash when possible, and it provides you with a basis for choosing the best of several ways to obtain credit when necessary.

It is impossible to place too much emphasis upon the necessity of reading carefully and understanding thoroughly all contracts which require the signature of the purchaser. When you sign

your name to any contract, you are obliged to make payments on time or pay extra interest. Take time to consider whether or not your income will warrant the purchase.

### LESSON 173

1. (a) On an income of \$150 per month (2 adults, 3 children), find the cost of each of the following items, using the given per cent.

Food.....	34	per cent
Rent, light, and heat.....	19	per cent
Clothing.....	16	per cent
Operating expense.....	13.5	per cent
Savings.....	17.5	per cent

- (b) Use \$125, \$180, \$210 as incomes, and figure the cost of each item, using the given per cent.

2. Find the amount spent on each of the six items listed below:

Income	1	2	3	4	5	6
\$200	28%	25%	12%	15%	12%	8%
\$300	24%	23%	12%	15%	16%	10%
\$400	20%	22%	13%	18%	16%	11%
\$500	17%	20%	14%	20%	17%	12%

1. Food.
2. Shelter includes rent, taxes, and property insurance.
3. Clothing.
4. Operating expenses include heat, light, telephone, furniture, household supplies, auto expenses, or transportation.
5. Advancement includes medical and dental care, education, charity, entertainment, miscellaneous.
6. Savings include bank accounts, investments, and insurance.

## Installment Buying

## LESSON 174

A young couple have enough money saved to buy the most necessary items of furniture, but they want \$120 to purchase odd pieces to complete their home equipment.

They borrow this on a contract to repay in 20 months at \$6.00 a month with interest on the unpaid balance. At the end of the first month they will be required to pay back \$6.00 on the principal with interest charged at the rate of  $2\frac{1}{2}\%$  per month on the \$100 and 2% on the \$20. At the end of the fourth month the loan will be paid down to less than \$100, and thereafter only the  $2\frac{1}{2}\%$  monthly rate will apply. Therefore, their payments will be as follows:

<i>Months</i>	<i>Months</i>	<i>Months</i>	<i>Months</i>
1....\$8.90	6....\$8.25	11....\$7.50	16....\$6.75
2.... 8.78	7.... 8.10	12.... 7.35	17.... 6.60
3.... 8.66	8.... 7.95	13.... 7.20	18.... 6.45
4.... 8.54	9.... 7.80	14.... 7.05	19.... 6.30
5.... 8.40	10.... 7.65	15.... 6.90	20.... 6.15

If they follow the minimum schedule of payments, as above, the interest charge over 20 months (nearly 2 years) will total \$31.28. However, they are encouraged to make larger payments of principal and thus save interest. If they pay the loan out in ten equal payments of \$12 each, the interest charge would be \$16.36. In five equal monthly payments of \$24 each, the interest charge would be \$8.90. Since the interest is collected only on the balance remaining unpaid at the end of each month, it is possible for the borrower to reduce the amount of the interest charge by making his monthly payments as large as possible.

In the case just explained, the borrowers have paid a very high rate of interest. If they could have done without the additional pieces of furniture till they had saved enough money to buy them, they would have saved more than a fourth of the cost.

It would be useful to get the actual carrying charge which a merchant makes on an installment purchase, but many times the

purchaser cannot learn the markup which is included in the price to cover this. However, by insisting on a discount for cash, the purchaser should be able to get the furniture dealer to reduce the price an amount at least equivalent to the cost of a loan repaid in 10 months.

It would also be interesting to observe the saving one can make by accumulating the money in advance to pay cash.

Interest rates on merchandise loans vary in different states.

## LESSON 175

### Time-Payment Problems

1. The cash price of an electric range is \$150 with a \$10 carrying charge to be paid in 36 equal payments: Find the monthly payments.
2. An electric refrigerator was bought which sold for \$150 cash, or in 24 months with a 10% down payment and the balance at 6% per year. What was the monthly payment?
3. Mr. James Sargent buys an automobile which costs \$742. He turns in a used car valued at \$350, and makes a \$52 cash payment. Find the balance due. The balance plus \$20.01 interest and service charge are paid in 12 monthly installments. What are the monthly payments?
4. Additional costs to the above car are fire and theft insurance \$7.50, liability insurance \$35, and a state license fee of \$14. Find the extra charges. Liability insurance protects the owner in case he accidentally damages another car or in an accident injures another person.
5. Mr. A buys a \$900 automobile on which he makes a down payment of \$250 cash and turns in a used car valued at \$310. Find the balance due. The finance charge and insurance are \$92.96; add this to the balance due and find the monthly payments if paid in 16 months.
6. Mr. Brown buys a new automobile for \$750. He gets an allowance of \$300 for his old car. The bank lends him the remainder at  $4\frac{1}{2}\%$  interest. How much interest does he pay the bank in a year?

BAILEY MOTOR CAR CO.			
AUTHORIZED DEALER		DEALER	
Phone WEst. 0090 2529 W. State Street ST. PAUL, MINNESOTA			
STATEMENT OF NEW - USED CAR DEAL WITH			
Name John Doe	Address St. Paul, Minnesota	Date 8/15/39	
Make Ford Model V-8	Type 88 Dx Fordor	Year 1938	
Motor No. 4507578	Serial No.	License No.	
Passenger		Cash Price of Car \$ 900.00	
Accessories and other charges (Total)			
Total Extras		\$	
Total Cash Price		\$ 900.00	
Deposit on Order		\$ 250.00	
Used Car Allowance		\$ 310.00	
Less - Dealer Due on Used Car		\$	
Total Credit		\$ 350.00	
DESCRIPTION OF USED CAR TRADED IN		Cash Due on Delivery	
Make Ford	Year 1935	\$ 340.00	
Motor No. 1517449	Type Dx 4 Dr.	\$ 92.56	
License No.	Model V-8	Amount of Contract \$ 432.56	
SUBSEQUENT LIEN NOTE ON OPEN ACCOUNT			
Renta Details	Date 193	\$	
Total Amount Due On Car After Delivery		\$ 452.56	
TERMS OF Installment Contract			
16 monthly	Payments of \$	Each	
	Payments of \$	Each	
	Payments of \$	Each	
First Monthly Payment Due on February 81		111 9	
Insurance Coverage included in Finance Charge \$140.00 Deductible collision			
SPECIAL REMARKS:- Purchaser states that he is over 21 years of age			
Associates Discount Corp.			
OTHER TERMS OF SALE NOT REDUCED TO WRITING ARE NOT BINDING ON DEALER			
I, <u>John Doe</u> , do hereby acknowledge receipt of a copy of the above statement at the time purchased the above described car.	SALES		
BAILEY MOTOR CAR CO.	<u>John Doe</u>		
By <u>Fred Smith</u> witness	Address <u>4415 So. 60th St</u>		
Witness <u>Charles White</u>	City <u>St. Paul</u>		

A typical form used when buying a car on the installment plan

7. In Problem 6, Mr. B. pays  $\frac{1}{12}$  of the interest each month. How much is this?

8. In Problem 6, Mr. B. pays also  $\frac{1}{12}$  of the principal each month. How much is this? How much is his total monthly payment (principal plus interest)?

9. Mr. B. must also pay for insurance on his car. If the insurance is \$50 a year and the license \$15, how much do these items add to his monthly payments?

10. If it costs Mr. B. \$12 a month for gasoline, oil, and repairs, how much money must he be able to spend on a car in a year before he can safely make the contract you have been studying in Problems 6 - 9?

### Credit Unions

#### LESSON 176

A credit union is a cooperative society, organized in accordance with the provisions of a state law with three primary purposes: (a) to promote thrift among the members through a system of savings which specializes in the smallest units of saving, and, by a weekly saving plan, makes saving a habit; (b) to use the funds so accumulated for the benefit of those who accumulate them by creating credit for the members at a low rate of interest for *provident purposes*; and (c) to educate the members in matters pertaining to the investment and care of their savings.

Credit unions are organized within existing groups, such as employees of a company or local government, members of an organization, a church parish, or neighbors.

The money is accumulated exclusively from members and is used for loans exclusively to members, and all resulting profits are divided among the members as interest or dividends. A member may deposit an amount as small as 25¢ at a time and build up a fund with such small installments. A member may borrow any sum approved by a credit committee made up of members. Small amounts may be obtained without security, and larger sums may be secured with collateral or over the signatures of one or two other members of the credit union who will be responsible for the repayment of the loan in case of failure on the part of the borrower to do so.

Interest rates differ in the various credit unions, but the maximum rate is 1% a month on the *balance remaining unpaid*. Repayment of the loan is made within the time agreed upon between the borrower and the officers of the credit union. In this system, each payment on the loan reduces not only the principal but also the interest.

## THE FAMILY BUDGET

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For instance, if a member of a credit union wishes to buy clothing, or furniture, or an automobile, etc., he may borrow the entire amount from his credit union and then repay the loan in monthly installments. The following tabulation states in detail the process of repaying a loan of \$100 in ten months, at 1% interest a month on the unpaid balance.

<i>Month</i>	<i>Principal Repaid</i>	<i>Interest Paid</i>	<i>Total Payment</i>
1st	\$10.00	\$1.00	\$11.00
2nd	10.00	.90	10.90
3rd	10.00	.80	10.80
4th	10.00	.70	10.70
5th	10.00	.60	10.60
6th	10.00	.50	10.50
7th	10.00	.40	10.40
8th	10.00	.30	10.30
9th	10.00	.20	10.20
10th	10.00	.10	10.10
	\$100.00	\$5.50	\$105.50

If the loan of \$100 is paid in 5 months, the monthly payments of principal and interest are as follows:

<i>Month</i>	<i>Principal Repaid</i>	<i>Interest Paid</i>	<i>Total Payment</i>
1st	\$20.00	\$1.00	\$21.00
2nd	20.00	.80	20.80
3rd	20.00	.60	20.60
4th	20.00	.40	20.40
5th	20.00	.20	20.20
	\$100.00	\$3.00	\$103.00

## LESSON 177

1. In the preceding example, how much interest is saved by paying off the loan in 5 months instead of 10 months?
2. A young couple borrow from a credit union at 1% per month, \$500 to furnish their home. They plan to pay the loan off in 20 months. What is the principal for each payment? Total the interest that is paid in that amount of time.
3. A college student borrows \$250 to pay for her semester at school. Because she earns \$15 weekly by caring for the dormitory, she can afford to pay her loan in 5 months and still have a balance of \$15 a month for herself. Find the amount of interest she pays to the credit union at 1% per month.
4. Joan starts a gift shop. To do this she must have \$150 which she gets from the credit union in her town. She expects to have the loan paid off in 5 months. Determine the monthly payments including interest. This credit union charges  $\frac{1}{4}$  of 1% a month on the unpaid balance.
5. Mr. A wishes to pay his taxes and for this purpose he borrows \$250 to be paid in 10 months. If he pays \$25 monthly, what is the principal payment of each month? How much could he have saved had he been able to pay his taxes without borrowing the sum: (a) if interest is charged at  $2\frac{1}{2}\%$  per month on the unpaid balance; (b) at  $\frac{3}{4}$  of 1% per month on the unpaid balance?

**Buying a Home on the F.H.A. Plan**

## LESSON 178

The Federal Housing Act sponsors a system of buying homes on the long-time, part-payment plan. The chief features of this plan are: (1) low financing charges; (2) long-term loans extending over periods of 25, 20, or 15 years; (3) advancement by lender of a *large* part of the total value (up to 80 or 90%); (4) repayment in monthly installments (about like rent) suited to the borrower's income; (5) inclusion of taxes, assessments, and fire insurance in the monthly payment; (6) elimination of second mortgages and the need for periodic and expensive refinancing; (7) protection of the lender by a system of mutual mortgage insurance; (8) improvement of housing standards and conditions.

The following "steps" toward home ownership are typical of a purchase made under the plan recommended by the Federal Housing Administration.

1. Decide upon the amount of money to be invested according to salary.
2. Choose a type of home best suited to the family needs.
3. Talk things over with an architect, builder, and real-estate firm.
4. Consult the F.H.A. and apply for an insured mortgage at a bank, finance company, life-insurance company, or building-and-loan association.
5. The amount of the loan, charges, etc., can be arranged with the lender who will be guided by F.H.A. limits.
6. Cash is not necessary for a down payment if you own a lot; a lot may be accepted as the down payment.
7. When the loan is made, it is necessary to provide money for the first year's taxes, assessments, and fire insurance. After the first year, the taxes, insurance, etc., are included in each monthly payment and are paid in advance.

You have decided to buy a \$3,500 home on a rental basis. The three examples given below show how you can pay for it according to your income. The payments shown in A are to be made at the time of closing and signing a mortgage contract. Read very carefully and ask questions in order to understand the terms of the agreement before signing your name.

#### A: Preliminary Expense

1st Year's Mtg. Insurance ( $\frac{1}{2}\%$ ).....	\$ 17.50
3-yr. Fire Ins. Premium.....	27.00
Tax on Lot.....	10.00
Special Assessment on Lot.....	200.00
Recording Fee.....	3.50
Survey (if needed).....	10.00
Examination Fee.....	<u>10.50</u>
	\$

The following plans with monthly payments according to the buyer's annual income are of interest to you as a buyer. The item

"Payment and Interest" includes a payment on the principal and interest for one month on your debt. The interest rate is  $\frac{1}{2}$  of 1% per month. The "Tax" item which you pay each month is  $\frac{1}{12}$  of the annual tax.

	B 25 years for income	C 20 years for income	D 15 years for income
Payment and Interest	\$1,400	\$1,500	\$1,700
F.H.A.	1.44	1.44	1.44
Fire and Tornado Ins.	.75	.75	.75
Tax	10.00	10.00	10.00
	\$	\$	\$

### Questions on F.H.A. Loans

1. What is the down payment for A?
2. Find monthly payment for B.
3. What are payments for one year for B?
4. If you own a home, you pay taxes and insurance on your home. What do these amount to in one year according to B?
5. The difference between the payments for one year and the sum of taxes and insurance for a year equals the payment on your home. What is the actual payment on the home for B?
6. Find the monthly payment with the D plan.
7. Find the yearly payment with the D plan.
8. What are the taxes and insurance with the D plan?
9. The sum of the taxes and insurance taken from the yearly payment in D equals the payment on the home. What is it?
10. Use C as an optional problem.

The above problems give you a working knowledge of paying for a home. With this plan you pay taxes monthly. Some states, cities, and counties are considering plans by which all taxpayers may pay taxes in monthly installments instead of paying them yearly in a lump sum.

## Chapter XIII

# IMPROVEMENTS OF THE HOME

**OBJECTIVE:** To train yourself to solve the many mathematical problems of a homemaker; for example, to estimate the cost of furnishing a bungalow or an apartment, of papering or painting a room, of seeding or sodding a lawn, of laying a cement walk, of upholstering your furniture.

### A Five-Room Apartment

Many girls' schools maintain a small furnished apartment in connection with a homemaking course. This model apartment is large enough for a small family. Here the girls may be trained to select the furniture and accessories. They are able to make such articles as curtains, cushions, portieres, table runners, and couch covers. And as practical training in management, they care for this home and entertain their parents and each other as guests.

Here is a schedule of estimated costs for the furnishing of a model 5-room apartment:

### Apartment Furnishings

#### Living Room:

Davenport.....	\$ 50.00
Butterfly table.....	21.00
Coffee table.....	8.75
Wing chair.....	39.50
Windsor chair.....	12.50
Ladder-back chair.....	10.00
Modernistic bookcases 2 @ \$6.50	

Hooked rug.....	81.00
Floor lamps, 2 @ \$5.00	
Table lamp.....	5.00
Drapes.....	16.00
1 pr. Portieres.....	12.50
Curtain pole.....	3.00

**Dining Room:**

Dining-room table.....	\$ 30.00
Dining-room chairs, 6 @ \$2.50 each	
Serving table.....	8.50
China cabinet.....	20.00
Whatnot shelves, 2 @ \$2.50 each	
China set (complete).....	86.50
Silverware.....	85.00
Drapes.....	14.00
Hooked rug.....	89.00
Tablecloth and napkins (Linen set).....	15.00
1 Tablecloth 2 yd. (linen) @ \$3.95 a yard	
2 Tablecloths 1½ yd. (mercerized) @ \$.98 a yard	
½ doz. Napkins (mercerized) @ \$2.00 a dozen	

**Bedroom:**

Twin beds - walnut spindle.....	\$150.00
Walnut chiffonier.....	29.00
Dressing table.....	29.00
Bedroom chairs, 2 @ \$2.50 each	
Braided rugs.....	9.00
Curtains.....	4.00
Dresser lamps, 2 @ \$2.50 each	
2 Bedspreads @ \$4.50	
2 Mattress covers @ \$.60 each	
2 Quilted pads @ \$1.50 each	
2 Cotton blankets @ \$.75 each	
2 Double wool blankets @ \$12.50 each	
½ doz. Sheets 2½ yd. long @ \$.49 a yard	
3 pr. Pillow slips, 2 yd. each @ \$.29 a yard	
Dresser covers, 1½ yd. @ \$.59 a yard	

**Kitchen:**

Stove.....	\$125.00
Refrigerator.....	159.00
Linoleum.....	50.00
Kitchen furniture: table, chairs, cabinet.....	86.00
Kitchen clock (electric).....	4.50
Utensils.....	25.00
$\frac{1}{2}$ doz. Glass towels 1 yd. long @ \$ .25 a yard	
1 doz. Dish towels 1 yd. long @ \$ .12 a yard	

**Miscellaneous:**

Carpet sweeper.....	\$ 4.00
Vacuum cleaner.....	40.00
Runner (hall).....	5.00
Curtains (bathroom).....	1.75
$\frac{1}{2}$ doz. Guest towels @ \$ .30 each	
$\frac{1}{2}$ doz. Bath towels @ \$ .50 each	
$\frac{1}{2}$ doz. Hand towels @ \$ .35 each	

**LESSON 189**

1. Find the cost of each room in the apartment.
2. Find the total cost of the furnishings for the apartment.
3. Visit furniture stores, or furniture departments in stores, and consult catalogs and newspaper advertisements to find the current prices of furnishings for a home. Figure the cost of furniture, equipment, draperies, curtains, cushions, lamps, etc., for an apartment or bungalow. Buy furnishings of good quality, but not too expensive, and limit the cost to about \$1,200.
4. Business houses take stock or inventory once a year in order to find out the stock on hand. Good homemakers list the furnishings of a home in order to estimate the amount of insurance they ought to carry to cover loss in case of fire or burglary.

Make an inventory of your own home, including bedding, books, carpets or rugs, china, clothing, draperies, furniture, lamps, laundry, laundry equipment, linen, musical instruments, pictures, refrigerator, silver, stoves, and vacuum cleaner.

### Upholstering Problems

The average housewife feels incompetent to upholster a piece of furniture. The following suggestions and a study of the materials used in upholstery may be helpful. Some of the materials used by an upholsterer are velour, cotton, wool, silk, and mohair.

Materials which are 50 in. wide usually cost from \$3.50 to \$7.50 a yard (these prices vary from year to year). Further prices are as follows:

- Mohair cloth, 50 in. wide, \$4.75 to \$7.50 a yard.
- Frieze, 50 in. wide, \$4.50 a yard, and up.
- Cretonnes, 28 in. to 50 in. wide, 81¢ a yard, and up.
- Denims, \$1.50 a yard, and up.
- Damask, \$3.50 a yard.

### LESSON 190

Some materials come in 24-in., 28-in., 32-in., and 50-in. widths. When estimating the amount of material, it is necessary to allow for waste in matching designs in patterns in upholstery material as well as in wallpaper, carpets, draperies, etc.

#### EXAMPLE:

What will it cost to upholster a chair, the inside back of which is 20 in. long, the seat 29 in., the arm 15 in., and the outside back 18 in., with frieze 34 in. wide at \$4.50 a yard?

#### SOLUTION:

20 in. + 29 in. + 30 in. + 18 in. = 97 in. = 2 yd. 25 in.  
Use 3 yd. to allow for waste, etc.  $\$4.50 \times 3 = \$13.50$ .

Figure the cost of the tape or cord, tacks, lining, twine, spring, webbing, and padding (hair, moss, or cotton felt; tow or oakum is sometimes used). Estimate the cost of material to cover a chair in your own bedroom. Use cretonne at 89¢ a yard. Measure the yards or inches of tape or cord, lining, twine, spring, webbing, and padding as needed, and obtain the costs of these from an upholsterer at the time they are to be used.

### Slip Covers

A neat slip cover transforms a shabby chair or davenport into a beautiful piece of furniture. To achieve this result, however, it

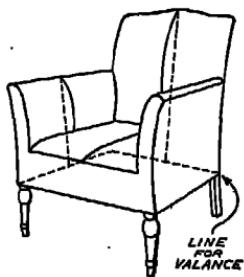
is necessary to be exact in your measurements and careful in cutting and sewing. Upholsterers say that the average amount of material to cover a large chair is 9 yd. of 36-in. material, or 6 yd. of 50-in. material. An average davenport requires about 10 yd. of 36-in. material, or 13 yd. of 50-in. material. Since chairs and davenports vary in size and shape, it will prove helpful to know how to find the exact amount of material needed.

### Measuring the Chair

#### LESSON 191

1. The depth of the valance (the draping from the seat to the floor) is equal to  $\frac{1}{2}$  of the distance from the top of the cushion to the floor (6 or 8 in.). Mark this line around the chair. To the

depth of the valance add  $1\frac{1}{2}$  in. for the hem, and  $\frac{1}{2}$  in. for the turn at the top. To provide for fullness, measure the distance around the chair and multiply it by 3. This product is then divided by the width of the material; the quotient is then multiplied by the depth plus the hem and seam of the flounce.



2. Measure from the valance line to the mid-point of the top of the back, then down to the seat.

3. Add 4 in. for tucking in and continue measuring over the seat and down to the valance in front. Add 6 in. for the hem and seams.

4. Next, measure from the point where the seat joins the arms, up over the arm and down to the valance. Add 6 in. If the width of the material will cover both arms (allowing for seams), this amount will take care of both arms. If the arm is wider than one half the width, multiply the last measurement taken by 2.

5. Add the various measurements taken to find the total number of inches or yards needed. If figured material is used, allow extra for matching.

**Slip-Cover Problems**

1. How much 50-in. material will be needed to make a slip cover to fit a chair that has a valance line of 98 in. (valance is to be 8 in. deep). From the back valance line over to the seat is 52 in.; from the back of the seat to the front valance line is 31 in. The arm measures 36 in. and is 30 in. wide. If cretonne is 79¢ per yard, find the cost.
2. Measure one of your chairs at home, and find out how much material will be needed to cover it.

**Lamp Shades**

To make a lamp shade, the following materials are necessary: frame; foundation materials or interlining; covering of chiffon, silk, or parchment; trimmings, including braid, fringe, bead, ruching; ornaments, such as silhouettes, butterflies, stencil design, painted design, and flowers.

**LESSON 192**

To find the number of yards of material for the foundation, first divide the circumference of the base by the width of the material, to find the number of strips used (a part of a strip is considered as a whole); then the number of strips multiplied by the height of the shade equals the number of yards used for lining. Cut a paper pattern to fit the frame before cutting the material. If chiffon or net is used for the outside, an interlining is necessary.

To find the amount of chiffon or silk for the outside, if it is plain, the same method is used to find the yardage as for the lining. But, if chiffon is used, and it is to be gathered or pleated, the circumference at the base is multiplied by two for Shirring and by three for the single pleats to allow for the desired fullness. This result is divided by the width of the material to find the number of strips used, and the number of strips multiplied by the height of the shade equals the number of yards or parts of a yard used.

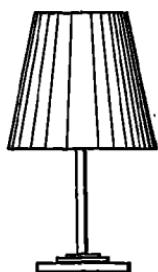
To find the number of yards of trimming, if braid is used, add the top and bottom circumferences, allowing for the seams. If ruching is made for trimming, the sum of the circumferences

times 2, or 3, or 5 allows for the desired fullness. Divide this number by the width of the material to find the number of strips. The number of strips, multiplied by the width of the ruching when finished, plus  $\frac{1}{2}$  in. for the seam, equals the number of yards of material used for ruching.

### Lamp-Shade Problems

- Find the amount of materials and cost of the following lamp shade: frame at \$1.25, the lower circumference of which measures 52 in., the upper circumference 30 in., and the height 14 in.; lining 27 in. wide at 45¢ a yard; 27-in. silk for interlining at \$1.30 a yard; pleated chiffon 36 in. wide at \$2.50 a yard; braid at 30¢ a yard; and 4 ornaments at 75¢ each.
- Make a lamp shade for your own room, supplying the dimensions, materials, and trimmings, and find the cost.

### LESSON 193



- The circumference of the top of the lamp shade is 25 in. and that of the bottom is 38 in. If the lamp shade is 11 in. high, find how much material must be purchased if the material is 27 in. wide ( $1\frac{1}{4}$ -in. allowance for fullness) at 49¢ per yard.
- If the circumferences of a lamp shade are  $24\frac{3}{4}$  in. and  $1\frac{1}{6}$  yd., and the lamp shade is  $1\frac{1}{2}$  ft. high, find the amount of material needed if  $1\frac{1}{3}$  is allowed for fullness and the material is 36 in. wide at 96¢ per yard.
- Mary has a pair of bedroom lamps that she wishes to recover. If she allows  $1\frac{1}{2}$  for fullness how much 27-in. material will she need, if the circumferences at top and bottom are 15 in. and the lamps are 7 in. high?
- In Problem 3, Mary bought material at 59¢ per yard and braid at 15¢ per yard for trimming. How much did it cost to recover one lamp? both lamps?
- How much 59-in. material must be purchased for three 13-in. lamp shades if  $1\frac{1}{3}$  times is allowed for fullness and if the lower circumference is 42 in.?

### Floor Coverings

Sometimes it is advisable to cover an old pine floor with linoleum instead of laying a new hardwood floor.

Inlaid linoleum costs from \$1.69 to \$4.00 a square yard; printed or stamped linoleum costs from 69¢ to \$1.29 a square yard.

#### EXAMPLE:

What will it cost to cover a floor 12 ft. by 15 ft. with inlaid linoleum at \$1.59 a square yard?

#### SOLUTION:

$$12 \text{ ft.} \times 15 \text{ (ft.)} = 180 \text{ sq. ft.}$$

$$9 \text{ sq. ft.} = 1 \text{ sq. yd.}$$

$$180 \text{ sq. ft.} \div 9 = 20 \text{ sq. yd.}$$

$$\$1.59 \times 20 = \$31.80, \text{ cost of linoleum.}$$

### LESSON 194

- Find the cost of linoleum for a room 15 ft. 9 in. long and 12 ft. 6 in. wide, at \$1.29 a square yard.
- What will it cost to cover a kitchen and a bathroom with inlaid linoleum when the kitchen measures 12 ft. by 14 ft., and the bathroom 8 ft. by 7 ft., if the linoleum costs \$1.95 per square yard?
- What would it cost to cover the same kitchen and bathroom in Problem 2 with printed linoleum at 89¢ per square yard?
- Find the cost of a good quality of printed linoleum at \$1.69 a square yard for a hall 18 ft. by 12 ft.
- At \$2.15 per square yard, what will it cost to cover a floor 20 ft. by 18 ft. with inlaid linoleum?
- At \$1.29 per square yard, what will it cost to cover a floor 16 ft. by 14 ft. with stamped linoleum?

### Hardwood Floors

### LESSON 195

Birch, beech, maple, and oak are used for hardwood floors. These woods are bought by the square foot. Figure the square feet in a given floor and add  $\frac{1}{2}$  to that amount for matching.

Flooring to cover an old floor is less expensive than for a new floor because a thinner flooring can be used.

**EXAMPLE:**

What will it cost to lay a hardwood floor in a kitchen which is 10 by 12 ft., with No. 1 maple at \$65 per 1,000 sq. ft.? Add  $\frac{1}{3}$  to square surface for matching the lumber.

**SOLUTION:**

$$10 \text{ ft.} \times 12 \text{ (ft.)} = 120 \text{ sq. ft.}$$

$$\frac{1}{3} \text{ of } 120 \text{ sq. ft.} = 40 \text{ sq. ft.}$$

$$120 \text{ sq. ft.} + 40 \text{ sq. ft.} = 160 \text{ sq. ft.}$$

$$160 \text{ sq. ft.} \div 1,000 \text{ sq. ft.} = .16$$

$$\$65 \times .16 = \$10.40 \text{ cost of lumber.}$$

Add to the cost of the lumber the cost of the labor, and the cost of the finish, such as oil, shellac, and varnish, to estimate the complete cost of the floor.

### Flooring Problems

1. What will it cost to lay a hardwood floor in a room 15 by 14 ft., with maple at \$75 per 1,000 sq. ft.? Add  $\frac{1}{3}$  to square surface for matching the lumber.
2. What will it cost to lay a hardwood floor in two rooms that together are 22 by 45 ft. at \$80 per 1,000 sq. ft.? Add  $\frac{1}{3}$  to square surface for matching the lumber.
3. How many square feet of hardwood will be needed to cover a church 105 ft. long and 63 ft. wide? At \$75 per 1,000 sq. ft., find the cost. (Add the proper allowance for matching the lumber.)
4. A department store is recovering all its 3 floors with hardwood. If the store is 24 ft. long and 90 ft. wide, what will be the cost at \$78 per 1,000 sq. ft.?
5. In Problem 4, at \$2.95 per gallon, how much would it cost to varnish all 3 floors if one gallon covers 600 sq. ft.?

### Carpeting

#### LESSON 196

Carpet comes in strips which are usually 27 in. wide and it is sold by the yard. In carpeting a room it happens frequently that

*the width makes it necessary to split the last strip. In this case it is necessary to buy and pay for the full strip.* In figuring the amount of carpet, the rule is to divide the width of the room by the width of the carpet in order to determine the number of strips. The number of strips is then multiplied by the length of the room expressed in yards. The product is the number of yards of carpet needed.

This does not allow for waste in matching. A small pattern will cause very little waste; a large pattern may be sewed up with no waste if the length of the pattern can be divided into the length of a strip without a remainder. Thus the waste on the job may be practically nothing or it may be, in some cases, two or three yards. Solve the following problems with no allowance for waste.

**EXAMPLE:**

How much will it cost to cover a room 15 ft. 9 in. by 16 ft. with 27-in. carpet at \$2.75 per yd.?

**SOLUTION:**

$$15 \text{ ft. } 9 \text{ in.} = 189 \text{ inches.}$$

$$189 \div 27 = 7 = \text{number of strips.}$$

$$16 \text{ ft.} = 5\frac{1}{3} \text{ yd.}$$

$$5\frac{1}{3} \times 7 = 37\frac{1}{3} = \text{number of yards.}$$

$$\$2.75 \times 37\frac{1}{3} = \$102.33 = \text{cost.}$$

### Carpeting Problems

1. How many yards of carpet will it take to cover a room 18 by 21 ft., if the carpet is  $\frac{3}{4}$  yd. wide?
2. How much will the carpet in Problem 1 cost at \$2.75 per yd., when 5% is allowed for cash payment?
3. How many yards of carpet will it take to cover a room 15 ft. long and 14 ft. wide if the carpet is 27 in. wide? At \$1.98 per yd., find the cost of the carpet.
4. At the price per yd. in Problem 2, find the cost of carpeting a room 17 ft. long and 20 ft. wide.
5. A church wishes to carpet its aisles. The main aisle is 6 ft. wide and 30 yd. long, each of the 2 side aisles are 3 ft. wide and

30 yd. long, and each of the 2 front aisles is 6 ft. wide and 25 ft. long. How many yards of 27-in. carpeting must be ordered?

6. Six churches have agreed to pay for the carpeting of a hall 100 ft. long by 80 ft. wide. At \$1.98 per yd. for 27-in. carpeting, what must each church pay?

7. If one of the churches can pay only one half of its share, the other five churches divide the remaining amount among themselves. What is the final payment of each of the five churches?

### Papering a Room

#### LESSON 197

Paper hangers charge for hanging paper by the roll; removing old paper and sizing the walls and ceiling are extra charges.

The entire cost can be estimated by adding the cost of labor to the cost of paper and border.

Various methods are used to estimate the amount of paper for the walls and ceiling of a room without allowances for the matching of patterns in the paper.

#### ONE METHOD:

The perimeter of a room (length of four walls)  $\div$  by the width of the paper = number of strips for the walls.

Length of roll  $\div$  the height of room = number of strips in a roll.

Number of strips in a room  $\div$  number of strips in a roll = the number of rolls.

Figure the ceiling in the same way.

#### EXAMPLE:

Find the cost of paper for the walls and ceiling of a room 12 by 12 ft. and 8 ft. high, at 35¢ a roll and 15¢ a yard for the border. The paper is  $1\frac{1}{2}$  ft. wide.

#### SOLUTION:

48 ft.  $\div$   $1\frac{1}{2}$  = 32 = number of strips for the walls.

24 ft. (length of roll)  $\div$  8 = 3 = number of strips in a roll.

32 strips  $\div$  3 = 10 plus. Hence 11 rolls for the walls.

12 ft.  $\div$   $1\frac{1}{2}$  = 8 = number of strips in ceiling.

24 ft.  $\div$  12 = 2 = number of strips in one roll.

8 strips  $\div$  2 = 4 = number of rolls for the ceiling.

11 rolls + 4 rolls = 15 rolls for walls and ceiling.

$35\frac{1}{2} \times 15 = \$5.25$  = cost of paper.

$48 \text{ ft.} \div 3 = 16$  = number of yards of border.

$15\frac{1}{2} \times 16 = \$2.40$  = cost of border.

$\$5.25 + \$2.40 = \$7.65$ , the cost of paper and border.

Some dealers allow 20 sq. ft. for openings, and some allow 3 ft. for each opening (doors and windows). One dealer's rule is to allow 2 rolls for 3 doors or windows.

#### ANOTHER METHOD:

Length (perimeter) of walls  $\times$  height of room = sq. ft. in walls.

Length  $\times$  width of room = sq. ft. in ceiling.

Sq. ft. in walls + sq. ft. in ceiling = sq. ft. in room.

Total number of sq. ft.  $\div$  36 (sq. ft. in one roll) = number of rolls.

Cost of one roll multiplied by the number of rolls equals the cost of the paper.

Length of walls in ft.  $\div$  3 = number of yards of border.

Cost of border per yard  $\times$  number of yards = cost of border.

Cost of paper + cost of border = cost of both.

#### Papering Problems

1. Find the cost of paper for the walls and ceiling of a room, 16 by 12 by 9 ft., the paper at  $47\frac{1}{2}$ ¢ a roll.

2. What will it cost to paper the walls of a room measuring 19 by 15 ft. and 10 ft. high above the baseboard? Allow 4 in. on each roll for matching. What will paper for this room cost at  $25\frac{1}{2}$ ¢ a roll?

3. Paper is required for two rooms; one is 9 by 12 ft., and the other is 8 by 11 ft. Both rooms are 9 ft. high. How many rolls will be necessary, and what will be the cost of the paper at  $35\frac{1}{2}$ ¢ a roll?

#### LESSON 198

1. Find the cost of paper for 2 rooms each 15 by 14 ft. and 8 ft. high, if the paper is  $49\frac{1}{2}$ ¢ per roll. The border costs 18¢ per yard. (Allow 20 sq. ft. for openings.)

2. Find the cost of the paper for a room 18 by 22 ft. and  $8\frac{1}{2}$  ft. high. The paper costs 42¢ per roll. (Deduct 20 sq. ft. for openings.)

3. How many rolls of paper are needed for 2 rooms that are  $8\frac{1}{2}$  ft. high? One is 22 by 16 ft. and the other is 12 by 16 ft. (Deduct for openings in each room.) At 45¢ per roll, find the cost.

4. A large hall is to be papered. It is 20 ft. high, 100 ft. long, and 80 ft. wide. At 49¢ per roll, what is the cost of the papering of the hall? (Deduct 80 sq. ft. for openings.)

5. Fifteen rooms of a hotel are to be repapered. Since all of the rooms are 13 by 12 ft. and 8 ft. high, find the total cost at 53¢ per roll. (Deduct 20 sq. ft. for each room.)

### Painting Walls and Woodwork

When a home is being remodeled, or a new one built, it is well for the woman who is to occupy that home to make a study of the interior decoration. Though she does not actually do the work herself, she can estimate the cost of the material required, and, by adding the cost of labor, she can determine whether or not the contractor's estimate is reasonable.

The purpose of staining woodwork is to give it the desired color and, in some cases, to bring out the beauty of the grain. Varnish is used to preserve the stain and the wood. Each kind of wood requires a different kind of treatment. Manufacturers of paint and varnish are ready to give information as to the use of paint, stain, varnish, shellac, etc.

Paint for walls or woodwork is sold by the gallon. One gallon of paint will cover about 350 sq. ft. of surface, with two coats. A gallon of varnish will cover about 600 sq. ft., with one coat.

Before the walls are painted, they must be sized with a glue material which fills the pores of the plaster and causes the paint to "stick" without peeling. It takes two or three coats of paint for walls after they are sized. Walls are glue-sized before paper is hung. Rough plaster is better suited for tints and paints, while the smooth finish is better for paper. If walls are to be painted, a better quality of plaster is more economical.

## LESSON 199

One gallon of mixed paint is calculated to cover from three to four hundred square feet of surface, with two coats (350 sq. ft. to a gallon). The cost of outside paint is from \$2.50 to \$3.75 a gallon; interior paints cost less.

Doors and windows are not deducted when estimating the square surface to be painted for outside paint, but for inside paint, openings are deducted.

Divide the surface in square feet by 350 to obtain the number of gallons of paint required, and the number of gallons times the cost per gallon equals the cost of the paint.

## EXAMPLE:

Find the cost of paint for the outside of a cottage 24 by 20 by 18 ft.

## SOLUTION:

$$24 \text{ ft.} \times 2 = 48 \text{ ft.} = \text{length of 2 side walls.}$$

$$20 \text{ ft.} \times 2 = 40 \text{ ft.} = \text{length of 2 end walls.}$$

$$48 \text{ ft.} + 40 \text{ ft.} = 88 \text{ ft.} = \text{length of 4 walls.}$$

$$88 \text{ ft.} \times 18 \text{ (height of cottage)} = 1,584 \text{ sq. ft. in the walls.}$$

$$1,584 \text{ sq. ft.} \div 350 \text{ (1 gal. of paint covers 350 sq. ft.)} = 4 \text{ gal. plus or 5 gal. of paint.}$$

$$\$2.50 \text{ (cost of 1 gal.)} \times 5 = \$12.95 = \text{cost of paint.}$$

Add the cost of the labor to the cost of the paint to get the entire cost. An experienced painter can tell about how many days it will take him to do the work and in that way can compare the cost as he figures it by the job and the cost of material plus the labor. It is both interesting and profitable to estimate costs on all work done for a home.

## Painting Problems

Figure by parts of a gallon:

1. Find the cost of paint for the walls and ceiling of a kitchen  $8\frac{1}{2}$  by  $6\frac{1}{2}$  by 7 ft. above the baseboard. Deduct 26 sq. ft. for openings; use two coats of paint at \$1.95 a gallon.

2. What will it cost to varnish the floor of the above kitchen with two coats of varnish at 45¢ a quart?

3. How many gallons of paint are needed to paint the outside of a house 45 by 22 ft.? The average height is 18 ft. If the paint costs \$2.59 per gallon, find the cost.

4. What would be the cost of painting a kitchen (walls and ceiling) 14 by 12 by 8 ft., if the paint costs \$1.95 per gallon? (Deduct 30 sq. ft. for openings.)

5. At \$1.95 per gallon what will be the cost of painting 2 rooms, 7 by 12 by 8 ft. and 8 by 12 by 8 ft., with 2 coats of paint? (Deduct 30 sq. ft. from total for openings.)

6. At 95 cents per quart, what would it cost to varnish the floors of the following rooms: 15 by 14 ft. and 18 by 16 ft.? (1 coat.)

7. What will it cost to paint the rooms described in Problem 6 if they are  $8\frac{1}{2}$  ft. high, with 2 coats of paint at \$2.59 per gallon? (Deduct 30 sq. ft. from total for openings.)

### Sodding Problems

#### LESSON 200

It is cheaper to scatter seeds and make sod than to lay sod, but when it is necessary to have a lawn in a short time, sodding is advisable. In order to have sod do well, it is necessary to have 3 to 4 in. of good black soil before the sod is laid.

Top soil is sold by the load, which consists of 2 cu. yd., and costs about \$3.50 a load. Sod is sold at about 15¢ a square yard. To this you must add the cost of labor for laying the sod and bringing the lot up to the required level, the amount depending upon the time required to do the work.

1. Find the cost of sodding a lot 30 by 40 ft., using one load of top soil, two days' labor at \$4.25, and sod costing 15¢ a square yard.

2. What will it cost to sod a lot 18 ft. by 4 yd. having fertile soil? (You do the work yourself.)

3. At 15¢ per square yard, find the cost of sod for a lot 45 by 28 ft.

4. Find the total cost of sodding for the following pieces of ground: 12 by 3 ft.; 12 by 8 ft.; and 30 by 4 ft., at 15¢ per square yard.

5. 1,500 sq. ft. of sod is bought. Find the cost at 15¢ per square yard.



It is well to know how to estimate the cost of a new walk

### Problems in Cement Work

#### LESSON 201

Cement sidewalks usually are 6 ft. wide and 4 in. deep, and cost, according to the depth, from 22¢ to 25¢ per square foot. Driveways are 8 ft. wide, about 6 in. deep, and cost from 24¢ to 26¢ a square foot. Basement floors are from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  in. deep, costing from 16¢ to 18¢ a square foot. Excavating or grading to bring sidewalks to the required level is figured extra.

The cost of cement work varies according to the depth necessary to secure the right foundation for the cement.

#### EXAMPLE:

What will it cost to lay a cement sidewalk for a 35-ft. lot, with a walk 6 ft. wide at 18¢ a square foot and a driveway 8 ft. wide at 24¢ a square foot?

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### SOLUTION:

35 ft. - 8 ft. = 27 ft. for sidewalk.

27 ft. X 6 = 162 sq. ft. in walk.

18¢ X 162 = \$29.16, cost of walk.

8 ft. X 6 = 48 sq. ft. for driveway.

24¢ X 48 = \$11.52, cost of driveway.

\$29.16 + \$11.52 = \$40.68, cost of walk and driveway.

1. Find the cost of a cement walk for a 45-ft. lot with a driveway 8 ft. and walk 6 ft. wide. Use the above prices.

2. What will it cost to put a cement floor in a laundry which is 12 by 14 ft., at 17¢ a square foot?

3. For a basement 45 by 25 ft., find the cost of a cement floor at 16¢ per square foot.

4. Find the cost of a cement floor in a garage that is 25 by 15 ft., at 24¢ per square foot.

5. For a sidewalk 6 by 25 ft., find the cost at 18¢ per square foot.

## Chapter XIV

### TAXES

**OBJECTIVE:** To acquire an understanding of the principles of taxation and the ability to compute your own taxes or those of your employers.

The city, county, state, and the United States governments in order to function properly, must have administrative departments that keep the machinery of these governments running smoothly. Under the common council and the mayor, the county board, the state legislature, and Congress, the various service departments make possible the economical and efficient operation of government.

The city, county, state, and federal governments must be supported. Money for these expenses is raised through various systems of taxation.

The real-estate valuation is made by the assessor and the tax rate is fixed at a certain amount on each \$1,000 of property valuation. That rate must be high enough to cover the budget set up by the various departments of the government. An assessor is elected or appointed by the town, city, or county to appraise property; that is, to set the value on property.

Incomes are taxed in some states on \$1,000 or more, with deductions for heads of families and their dependents. Surtax is computed on net income in excess of a certain amount and is used for old-age assistance, mother's pensions, common-school aids, teachers' pensions, etc.

All persons whose income reaches a specified minimum amount must pay a federal income tax unless he is entitled to sufficient exemptions for dependents, etc., to offset the tax.

All industries pay federal as well as state taxes on their profits. Franchise taxes are paid by corporations for the privileges of doing business in the state under the state laws.

State inheritance taxes vary in different states. The federal inheritance tax is, of course, collected at a fixed rate throughout the nation. If the inheritance is left to more than one heir, each heir pays his share of the tax.

Luxury tax is paid by means of stamps placed on each article sold.

Some states collect a sales tax: 3 cents on \$1.00; 2 cents on 50 cents; 1 cent on 15 to 50 cents. This tax is paid by the customer at the time of the purchase and is used by the state government for special purposes.

Other taxes are customs and duties, license fees for automobiles, gasoline tax, hunting and fishing licenses, dog licenses, marriage license. A poll tax, collected in some states, is a fixed amount, usually only a few dollars, paid by each adult citizen.

### **Taxation Problems**

#### **LESSON 202**

1. The expenditures for the county schools is \$12,544.68. The state pays \$3,525.16 of that cost. What is paid by the county?
2. (a) What per cent is paid by the county; (b) what per cent by the state?
3. The total tax levy for all purposes in your city is \$20,707,-032.75; the total assessed valuation of real estate, improvements, and personal property is \$846,913,415. What is the rate of tax per \$1,000?

#### **EXPLANATION:**

Total tax levy divided by the total assessed value equals the tax rate per \$1,000 which is \$24.44+ or \$24.45. Verify this rate by working the above problem.

4. Mr. Brown's property is worth \$12,000 and is assessed at  $\frac{2}{3}$  of its value. Find the taxes on this property at the rate given in Problem 3.

5. The rate of taxes on a \$500 piece of property was .028. What are the taxes?

6. Find the sale tax on each of the following purchases, and total taxes paid: \$3.56, \$12.92, \$8.56 and \$16. Use the rates for sales tax payments given as an example in the introduction to this chapter.

7. On a tax bill sent the owner of a property assessed at \$3,600 the taxes were \$121.18; \$93.46 was for general city purposes; the remainder was for county and state tax. Find the county and state tax.

8. John Rogers pays \$120.50 taxes on a town home, \$14 tax on a lake property, \$14 automobile license, \$27.73 state income tax, \$1 for dog license, \$1.18 sales tax, \$4 hunting and fishing licenses, \$35 ad valorem and specific duties on a shipment of tobacco, and \$10 gasoline tax. Find the entire amount paid.

9. The following county institutions are located in the town of Wauwatosa. These institutions house and care for an average of 5,110 dependent sick and dependent young and old.

<i>Institution</i>	<i>Cost to County</i>
County Hospital.....	\$784,541.66
Dispensary and Emergency Hospital.....	277,665.96
Care for Mental Cases.....	722,818.98
Sanitarium and Preventorium.....	341,188.45
County Infirmary.....	194,413.35
County Children's Home.....	<u>346,830.93</u>

Find the total cost to the county for maintenance of the above institutions.

10. What is the cost per person cared for?

11. A house, appraised at \$3,600, is assessed at  $\frac{2}{3}$  of its value. What is the amount of taxes at the rate of \$24 per \$1,000?

12. What is the tax rate per \$1,000, if the property assessed valuation is \$8,000 and the amount of taxes is \$201.60?

13. What is the rate of taxes in mills per \$1.00 on property appraised at \$12,000, assessed at  $\frac{2}{3}$  of its valuation, and the taxes are \$200?

14. Paul Brown has property assessed at \$8,500 and the tax rate is \$28 per \$1,000. He paid \$16 for his automobile license, \$10 gasoline tax, and \$19.50 state income tax. Find the sum of his taxes.

## More Tax Problems

## LESSON 203

In the cities of the United States, the tax rate varies; in some cities, property may be assessed at 100% of its value; in others, the assessment may be made at a rate as low as  $33\frac{1}{3}\%$ , or 50%, according to each city's laws, customs, and budget plan.

## EXAMPLE:

A property valued at \$10,000 was assessed at 90% of its value. The taxes amounted to \$37.25 per \$1,000 or \$335.25.

$$\begin{aligned} \$10,000 \times 90\% &= \$9,000 \\ \$9,000 \div 1000 &= 9 \\ \$37.25 \times 9 &= \$335.25 \end{aligned}$$

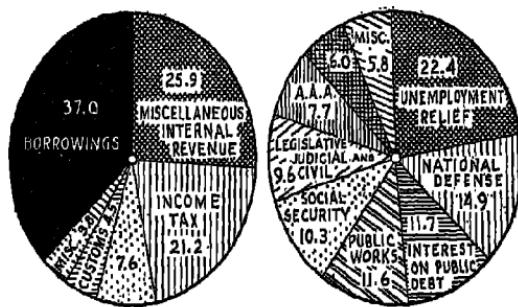
Find the taxes on the following properties:

<i>Value</i>	<i>Per Cent of Assessment</i>	<i>Rate per \$1,000</i>
1. \$ 8,000	80	\$28.75
2. 16,000	50	30.25
3. 5,500	60	26.50
4. 7,500	$33\frac{1}{3}$	32.75
5. 12,500	40	24.25
6. 11,000	90	22.75
7. 3,600	75	37.50
8. 9,000	$66\frac{2}{3}$	27.50
9. 6,000	70	34.25
10. 15,300	$33\frac{1}{3}$	31.75

## LESSON 204

The comparison on page 202 shows the relationship between the percentage value and the degrees of a circle. Using the figures accompanying the budget outline, work the following problems:

1. Find the amount of money that the government collects from income tax ( $\$5,520,000,000 \times 21.2\%$ ).
2. How much more money must be collected to meet the total expense after the 37% of borrowings is collected?
3. What is the difference between the amount collected by social-security taxes and that paid out for social security?

U. S. Government Budget  
1939-1940

Income . . . \$5,520,000,000

	Deg. in Circum.	Per cent of Circle
Borrowings.....	37.0	133.2
Miscellaneous Internal Revenue.....	25.9	93.2
Income Tax.....	21.2	76.3
Social Security Tax.....	7.6	27.4
Customs.....	4.5	16.2
Miscellaneous.....	3.8	13.7
	100.0	360.0

Expense . . . \$8,995,000,000

	Deg. in Circum.	Per cent of Circle
Unemployment Relief.....	22.4	80.6
National Defense.....	14.9	53.6
Interest on Public Debt.....	11.7	42.1
Public Works.....	11.6	41.8
Social Security.....	10.3	37.1
Legislative, Judicial, and Civil.....	9.6	34.6
A.A.A.....	7.7	27.7
Veterans' Pensions.....	6.0	21.6
Miscellaneous.....	5.8	20.9
	100.0	360.0

4. Determine the amount of money necessary to pay the unemployment relief item.
5. What approximate fractional part of the total income is the relief-expense item?
6. What is the amount spent for national defense?
7. Find a fraction that will show that the national-defense item is almost as large as that of the relief expense. (This can be done by making a fractional comparison of the two percentages.)
8. According to the budget, how much will the period covered by this budget add to the national debt?
9. Find the average amount that any one state will contribute to the government's income.
10. Using the circular graph on page 202 as a guide, draw a bar graph illustrating the same idea.

#### Federal Income Tax

Every citizen of the United States and every foreigner residing in the United States must make an annual report of his income to the Federal Government if he comes under one of the following classifications:

1. Single. If his gross income is \$800 or more.
2. Married. If his gross income is \$2,000 or more.

There are further details; for instance, the reporting of the incomes of both husband and wife, etc. Gross income is the total income from all sources; net income is the remainder after various deductions are made. The tax is figured on a net taxable income.

From his gross income, one may deduct contributions made to religious, charitable, or educational organizations and to certain other agencies of public welfare; also interest paid on debts and taxes paid. Other deductions allowed include losses in business transactions and losses from debts which others owe to you and you cannot collect. Subtract the sum of all these items from the gross income and the remainder is the net income.

From this net income deduct what are called "exemptions." The first of these is an "earned-income credit." For persons whose income is \$3,000 or less this credit is 10% of the net income. A single person is allowed a personal exemption of \$800 and a married person or the head of a family \$2,000. (This may be

claimed by either husband or wife but not by both.) Finally, there is a credit of \$400 allowed for each dependent member of the family. The sum of all these exemptions is to be deducted from the net income. This gives you the balance of net income which is taxable.

If there is any balance left after the last subtraction, the normal tax to be paid is 4% of that balance. According to the Revenue Act of 1940, add 10% to the normal tax. This latter is a Defense Tax which applies to incomes until January 1, 1945.

### Mr. Brown's Income Tax

Let us find out just how Henry J. Brown, a single man with no dependents, figures his federal income tax. Mr. Brown is allowed an exemption of \$800.

#### LESSON 205

1. Mr. Brown's salary is \$2,300; he receives \$242 interest from bonds and \$160 interest on other investments. Find his total gross income.

2. Deductions are allowed for contributions as follows: \$15 to the Community Fund, \$5 to the Red Cross, \$2 to the antituberculosis fund, \$22 to his church, and \$4 to aid handicapped children. Find the total of his contributions.

3. Mr. Brown is allowed deductions of \$18.46 for his state income tax and \$37.45 for a loss on a bad debt. Find the total of these two deductions.

4. Find the total deductions in Problems 2 and 3.

5. Subtract the total deductions in Problem 4 from the total income in Problem 1. This difference is Mr. Brown's net income.

6. 10% of the net income in 5 equals the earned-income credit. What is Mr. Brown's earned-income credit?

7. Mr. Brown's earned-income credit plus his personal exemption equals his total exemption. What is his total exemption?

8. Deduct the total exemption in 7 from the net income in 5 and that difference equals the net taxable income. Find the net taxable income.

9. 4% of the net taxable income equals the United States Normal Income Tax for Mr. Brown. Add 10% to the normal tax for Defense Tax. What is his total tax?

**FORM 1040 A**  
**TREASURY DEPARTMENT**  
**INTERNAL REVENUE SERVICE**  
*(Circular Stamp)*

**UNITED STATES  
INDIVIDUAL INCOME TAX RETURN**

FOR NET INCOMES OF NOT MORE THAN \$5,000  
DERIVED FROM SALARIES, WAGES, DIVIDENDS,  
INTEREST, AND ANNUITIES

NOTE.—If your daytime business, regardless of amount, from a profession or business  
including farming, or from rental or sale of property, use Form 1040.

To be filed with the Collector of Internal Revenue for your district or at before March 15, 1940

PRINT NAME AND HOME OR RESIDENTIAL ADDRESS PLAINLY BELOW

Henry J. Brown

(Please) (the given names of both husband and wife, if this is a joint return)

2175 Lulabelle St.

(Street and number, or rural route)

Blue Grass, Green Prairie, Minnesota

(Name of town) (State) (Zip)

**1939**

Do not write in these spaces

Serial No.

Amount

Paid in

(Cashier's Stamp)

Item and Description No.	INCOME	Cash—Check—M. O.
1. Salaries and other compensation for personal services. (From Schedule B)	\$ 2300 00	
2. Dividends		
3. Interest on bank deposits, notes, mortgages, etc.	160 00	
4. Interest on corporation bonds	242 00	
5. Other income (including income from annuities, fiduciaries, etc.). (From Schedule C)		
6. Total income in Items 1 to 5	\$ 2702 00	
<b>DEDUCTIONS</b>		
7. Contributions paid. (From Schedule D)	\$ 48 00	
8. Interest paid. (From Schedule E)		
9. Taxes paid. (From Schedule F)	18 46	
10. Other deductions authorized by law. (From Schedule G)	37 45	
11. Total deductions in Items 7 to 10	\$ 103 91	
<b>COMPUTATION OF TAX</b>		
12. Net income (Item 6 minus Item 11)		\$ 2598 09
13. Less: Earned income credit. (From Schedule H-1 or H-2)	\$ 259 80	
14. Personal exemption. (From Schedule A-1)	1000 00	
15. Credit for dependents. (From Schedule A-2)		1259 80
16. Balance of net income taxable (Item 12 minus items 13, 14, and 15)		\$ 1338 29
17. Income tax (4% of item 16)		\$ 53 53
18. Less: Income tax paid at source on tax-free covenant bonds		
19. Income tax paid to a foreign country or United States possession. (Add Form 110)		
20. Balance of tax (Item 17 minus items 18 and 19)		\$

Schedule A.—EXPLANATION OF CREDITS CLAIMED IN ITEMS 14 AND 15. (See Instructions 24 and 25)

II Personal Exemption		III Credit for Dependents		
Status	Number of Dependents You Are Entitled To File For	Credit Claimed	Name of Dependent and Relationship	Number of Dependents Showing On Your Under 18 Years Old From 18 Years Old
Single, or married and not living with husband or wife	12	\$ 1000 00		
Married and living with husband or wife				
Head of family (explain below)				

Reason for support  
if over 18 years old

NOTE.—One form marked "DUPLICATE COPY" must be filed with this original return (\$5 will be assessed if duplicate copy is not filed)

11-244

Income tax return of a single man with no dependents. Note that the Revenue Act of 1940 has changed the personal exemption of a single man to \$800. It also provides for a Defense Tax not shown on this return.

These lessons have followed the steps given in the directions of the United States Individual Income Tax Return, Form 1040A for 1939. This is the more common form used for taxable incomes of \$5,000 or less. Other forms are issued for those receiving higher salaries, or for persons conducting a business, etc.

**FORM 1040 A**  
TREASURY DEPARTMENT  
INTERNAL REVENUE SERVICE  
(Cashier's stamp)

**UNITED STATES**  
**INDIVIDUAL INCOME TAX RETURN**  
FOR NET INCOMES OF NOT MORE THAN \$5,000  
DERIVED FROM SALARIES, WAGES, DIVIDENDS,  
INTEREST, AND ANNUITIES

**1939**

(NOTE.—If you derive income, regardless of amount, from a profession or business, including farming, or from rents or sale of property, use Form 1040.)

To be filed with the Collector of Internal Revenue for the District or State March 15, 1939.

PRINT NAME AND HOME OR RESIDENTIAL ADDRESS PLAINLY BELOW

James A. Jordan

(Name) (Use given names of both husband and wife, if this is a joint return)

476 Howard St.

(Street and number, or road name)

Homer

(City)

(State)

(Zip code)

Do not write in these spaces

Serial No.

Date

(Cashier's Stamp)

Item and Instructions No.	INCOME	Cash—Check—M. O.
1. Salaries and other compensation for personal services. (From Schedule B)	\$ 3022 11	
2. Dividends	103 00	
3. Interest on bank deposits, notes, mortgages, etc.	15 00	
4. Interest on corporation bonds		
5. Other income (including income from annuities, fiduciaries, etc.). (From Schedule C)		
6. Total income in items 1 to 5	\$ 3140 11	
DEDUCTIONS		
7. Contributions paid. (From Schedule D)	\$ 53 00	
8. Interest paid. (From Schedule E)	44 80	
9. Taxes paid. (From Schedule F)	17 43	
10. Other deductions authorized by law. (From Schedule G)		
11. Total deductions in items 7 to 10	115 23	
COMPUTATION OF TAX		
12. Net income (item 6 minus item 11)	\$ 3024 88	
13. Lesser Earned income credit. (From Schedule H-1 to H-3)	\$ 302 49	
14. Personal exemption. (From Schedule A-1)	2500 00	
15. Credit for dependents. (From Schedule A-2)	400 00	
16. Balance of net income taxable (item 12 minus items 13, 14, and 15)	\$ 3202 49	
17. Income tax (4% of item 16)	\$ None	
18. Lesser income tax paid at source on tax-free covenant bonds	\$ None	
19. Income tax paid to a foreign country or United States possession. (Attach Form 1140)		
20. Balance of tax (item 17 minus items 18 and 19)	\$ None	

Schedule A—EXPLANATION OF CREDITS CLAIMED IN ITEMS 14 AND 15. (See Instructions 14 and 18)

13 Personal Exemption		14 Credits for Dependents		
Name	Number of Dependents Claimed in Item 13	Credit Claimed	Name of Dependent and Relationship	Number of Months During the Year Under 18 or Over 18 Years Old
Single, or married and not living with husband or wife		\$ None	Mary Jordan (Daughter)	12
Married and living with husband or wife	12	2500 00		
Head of family (explain below)				

Reason for support  
if over 18 years old

NOTE.—One form marked "DUPLICATE COPY" must be filed with this original return (\$5 will be assessed if duplicate copy is not filed).

10-2230

Income tax return of a married man with one dependent. The Revenue Act of 1940 has changed the personal exemption of a married man to \$2,000. It also provides for Defense Tax not shown on this return.

LESSON 906

## Mr. Jordon's Income Tax

1. Mr. Jordon's salary is \$3,022.11, he draws \$103 in dividends on his stock in an electric-railway corporation, and receives \$15 interest on a loan. Find his total income.

2. He contributes \$10 to the Community Fund, \$5 to the Boy Scouts, \$35 to his church, \$1 to the Red Cross, and \$2 to an orphanage. Find the total contributions.

3. He is allowed to deduct his state income tax of \$17.43 and \$44.80 for interest that he paid on a debt. Find the sum of the above deductions.

4. In Problems 2 and 3 you have found the deductions which are allowed. What is the sum of these deductions in 2 and 3?

5. Subtract the total deductions in Problem 4 from the total income in Problem 1; this equals Mr. Jordon's net income.

6. 10% of the net income is the earned-income credit. What is the earned-income credit?

7. Mr. Jordon is allowed to deduct the sum of his earned-income credit, his personal exemption as a married man, which is \$2,000, and also a credit of \$400 for a dependent child under 18 years of age. Find his total exemptions as given in this problem.

8. The difference between the total net income in 5 and the total exemptions in 7 is used to find his income tax. How much is this balance of net taxable income?

9. Mr. Jordon's normal income tax is 4% of the balance you have found in Problem 8. How much is it? Add 10% of this normal tax for Security Tax. How much is Mr. Jordon's total federal income tax?

#### A Head of a Family

For the first time, the United States Government, in 1940, asked those individuals, other than married persons living with husband or wife, who claimed exemption as head of a family with one or more dependents to fill out a blank on which was listed the costs for the year of the following: gas; electricity; heat (oil, gas, or coal); house (owned by whom?); property tax; part-time or full-time help needed in the home; auto insurance; improvements in the home; painting, cement floor, plumbing, roof, furnace repairs, electric wiring, etc.

Louis Graham is a single man who supports a young brother and sister both under 18 years of age. He claimed a personal exemption of \$2,500\* as the head of a family and a credit of \$800

\*Mr. Graham made his report before the Revenue Act of 1940 lowered the personal exemption to \$2,000 for a head of a family and \$800 for a single person.

for his two dependents. At the request of the federal income-tax officials, he compiled the following report of his household expenses. This information is not to be used in computing the tax; it is only for the information of the government.

**Income Report for General Household Expenses for 1939**

Food—Groceries, milk, meat, fruit for canning .....	\$400.00
Gas.....	30.59
Electricity—motor for oil burner for heating home and electricity for home.....	45.42
Telephone.....	45.00
Oil heat.....	<u>125.50</u>
	\$

*House owned by Louis Graham:*

Property tax (state, county, and city).....	\$123.95
Part-time housekeeper.....	200.00
Property insurance.....	17.50
Auto insurance (accident & collision) .....	<u>60.26</u>
	\$

*Improvements on the home:*

Painting house.....	\$ 70.00
Sewer.....	26.61
Cement floor in basement.....	62.00
Roof.....	68.00
Planting trees and shrubbery.....	52.00
Furnace repair (new coil in furnace).....	42.80
Wiring.....	<u>14.49</u>
	\$

10. What was the total of Mr. Graham's household expenses for the year 1939?

## Chapter XV

# INSURANCE

**OBJECTIVE:** To become familiar with the forms and terms used in insurance; to understand the respective merits of the various forms of insurance policies, particularly in life insurance, and to gain skill in computing premiums and values.

An insurance policy is a contract between the insured or the policyholder and the underwriter. The payments made by the insured on an insurance contract at stated intervals are called premiums.

### Fire and Casualty Insurance

Fire-insurance companies are organized to insure mainly against the loss of real or personal property; thus we have policies of fire and lightning, windstorm and hail, explosion, riot, earthquake, smoke and smudge, sprinkler leakage, consequential damage, profits, and use and occupancy. There are some other special forms of policies designed for particular hazards which are not common enough to classify. To the home-owner or the inhabitant of a dwelling or apartment the most common forms of policies issued by fire insurance and casualty companies are:

1. Fire, lightning, smoke, and smudge on dwelling and contents.
2. Windstorm and hail on dwelling and contents.
3. If jewelry and silverware of any value are owned, it is customarily the practice to insure against the loss of these articles through theft or damage caused by fire, etc.

Casualty insurance companies are organized in the main to insure against the responsibility (legal liability) placed on a person, firm, or corporation, by law, for injuries or property damage



If your home is insured, repair of damage caused by  
fire will be paid for by the insurance company

sustained by others because of the ownership or use of personal or real property. In this class are the following policies:

1. Automobile liability and property damage.
2. Residence public liability.
3. Boiler explosion.
4. Compensation.
5. Manufacturers' and contractors' liability and property damage.
6. Sports liability.

In addition, casualty-insurance companies also insure against direct loss of property. In this classification we have: burglary, larceny, and theft; plate glass; and personal accident and health policies.

The rates for the various types of insurance are, in most cases, governed by a semipublic rating bureau, which is a group of insurance men elected from among their own membership, or by a bureau composed of representatives of various companies. The Fire Insurance Rating Bureau is an example of the first case, and the National Bureau of Casualty and Surety Underwriters (which announces casualty rates) is an example of the second type.

There are some policies for which no set rates are maintained: the insurance underwriter determines the necessary amount of premium required properly to underwrite the risk, and the premiums for these special types will vary as occasion, physical hazards, and type of merchandise require.

Policies other than fire insurance are uniformly similar in most respects as a result of competition and in agreement between companies issuing these policies. The companies have found that a more or less uniform policy results in less confusion in the minds of the public.

### Property Insurance

Residences, hotels, apartments, churches, and schools may be insured against fire, tornado, lightning, etc., the policy being written for a one-, three-, or five-year period. The premiums of three- and five-year policies are computed according to the one-

year rate; that is,  $2\frac{1}{2}$  times the one-year rate for three years and 4 times the one-year rate for five years. For example: If the rate is \$1.00 per \$100 for one year, it is  $2\frac{1}{2}$  times that (\$2.50) for three years, and 4 times that (\$4.00) for five years.

The rates of fire insurance are dependent upon the character of the fire hazards. A frame building with wooden shingles has a higher rate than a brick building with a composition roof or a slate or tile roof. Fire losses are replaced according to the kind and the quality of goods damaged less the normal depreciation.

### Automobile Insurance

There are two types of automobile insurance, liability and collision insurance. Liability insurance covers damage to property of others and personal injury, and the rates are determined by the classification of the car. Cars are classified as to their weight, value, and the purposes for which they are manufactured, as cars used for trucking, bus service, pleasure, etc. Insurance against fire, theft, and windstorm also is based on the car's classification.

Collision insurance covers damage done to one's own car by sudden contact with a moving or stationary object. Few car owners carry this insurance because of the high premiums on it.

### Personal Insurance

Personal insurance includes accident, health, or life insurance. Policies may be taken out individually or in a group. In group insurance the workers in one establishment or other group are insured together. In this type, the premium may be the same for all, regardless of age, and no medical examination is required if each person is in reasonably good health. Personal life insurance which is taken independently requires a thorough physical examination and the premium rate increases with the age of the applicant.

Workmen's compensation is an insurance that must be carried by employers to help cover expenses incurred through accident while their employees are at work. That protection is required by the state.

### Life Insurance

Mr. Darwin P. Kingsley has said that:

"Life insurance is the hostage which man gives to a selfish world for the security of his family and himself; life insurance organizes generations as an army organizes individuals; life insurance is the short and simple answer to the socialists and theorists, who say that every man has a natural right to air, light, something to eat, and a chance in life; life insurance guarantees all this without beggary or robbery; life insurance is the supplement which a wise man adds to his marriage vow—it goes farther than 'until death us do part'; life insurance is civilization, morality, temperance, virtuous living, practical religion."

The primary guarantee by a life-insurance company is to pay a certain amount of cash immediately at the death of the policyholder provided death occurs while the policy is in force.

The policyholder agrees to pay to the insurance company a definite amount of money, called a premium, at regular intervals for a stated number of years, or for life.

A beneficiary is the person named in the policy, who is to receive the insurance money in event of the policyholder's death.

To show the importance of this life-insurance protection, let us consider the financial situation of a typical family. The husband earns a moderate salary, sufficient to give his wife and his young children all the necessities and a few of the luxuries of life; but he has been able to save up, perhaps, only about a thousand dollars. If he were to die, his wife and children would be practically penniless in a short time. Through life insurance, however, even a man of modest means can arrange to provide an adequate income for his family over a period of years after his death.

Life insurance helps to keep families together. It relieves them from the humiliation of dependence upon the help of relatives, friends, or public charity. It enables a father to continue to shelter his loved ones from financial adversity long after his death.

### Types of Policies

The two most important types of life-insurance policies are called "life" and "endowment" policies.

Life policies insure the policyholder for life and the insurance

is payable at death. Premiums are payable either for life (ordinary life policy), or for a specified number of years (limited-payment life policy).

Endowment policies do not run for life, but for a definite period of years only, such as 10, 15, 20, or 30 years, or to a certain age, such as age 55, 60, or 65. The face amount of insurance is paid to the beneficiary if the policyholder dies during the endowment period. If living at the end of the endowment period, the insurance is payable to the policyholder himself.

We have space for only a brief description of a few of the chief provisions of one policy, and shall select the "income endowment."

An income endowment policy provides that if the policyholder pays premiums each year until a specified age (generally 55, 60, or 65) the insurance company will then pay the policyholder a monthly income for the rest of his or her life, or a certain amount of cash, if preferred.

In event of the policyholder's death before the policy matures, the insurance is payable immediately to the beneficiary.

In addition to protecting beneficiaries, all life and endowment policies provide for a "savings fund" for the policyholder through the cash-surrender values. These values increase annually as premiums are paid. After a number of years the policyholder may withdraw the cash-surrender value. Of course, this terminates the policy, including the insurance protection for beneficiaries.

### Why Should Young People Insure?

1. Because they are probably in good health, and can pass the required medical examination now.
2. Because the premium rates are lower than they ever will be again.
3. Because insurance teaches habits of thrift so essential to their future success.
4. Because insurance is a definite, systematic saving plan, requiring a fixed amount of annual savings.
5. Because insurance is a *safe* plan. Every premium paid increases the guaranteed cash value, thus building up a fund available for later years.

Life insurance provides:

Money to pay off funeral expenses, debts, etc.

Minimum monthly life income for wife.

Extra monthly income for wife until children are grown.

Funds for college education.

A lump sum or a monthly life income for old age.

A safe, systematic plan to accumulate money in 10 to 40 years, by means of an endowment.

Business insurance provides money for the firm to compensate for loss of the brains and experience of a valuable partner or official.

#### Insurance Problems

### LESSON 207

1. What will it cost to insure a house for \$7,000 against loss by fire for 2 years at 3%?
2. A truckload of silk valued at \$24,000 was insured at 6%. What was the premium?
3. Mr. Day insured his store for \$25,000 and his stock for \$78,000. If the rate on the store was 2% and on the stock  $4\frac{1}{2}\%$ , what was the total premium?
4. Miss Carol insured her car for \$2,500 at  $1\frac{3}{4}\%$  for one year. What was the premium?
5. Mr. Dobbs insured his barn for \$3,000 at the rate of  $1\frac{3}{4}\%$ . What was the premium?
6. \$562.50 was paid for insuring a ship's cargo from San Francisco to Manila at the rate of  $4\frac{1}{2}\%$ . What was the face of the policy?
7. The premium paid for insuring Mrs. Lee's home at 3% for 3 years was \$126. For how much was the house insured?
8. A theater was insured at  $2\frac{1}{2}\%$  and the premium was \$2062.50. What was the face of the policy?
9. To insure a store for 3 years at  $2\frac{1}{2}\%$ , Mr. Green paid a premium of \$625. What is the face of the policy?
10. At what rate is a factory insured if the premium is \$893.75 and the amount is \$32,500?
11. If your life is insured for \$15,000 and the cost to you is \$525 a year, what is the rate of the premium?

12. If \$198.33 is paid for insurance at  $2\frac{3}{4}\%$ , what is the amount insured?
13. What is the rate if the premium is \$4,387.50 on a mill insured for \$135,000?
14. For how much is a house insured if the premium is \$55.50 and the rate is  $2\frac{1}{2}\%$ ?
15. A manufacturer paid an annual premium of \$3,134.90 on his mill insured at  $2\frac{7}{8}\%$ . For how much was the mill insured?

## Chapter XVI

## THE POSTAL SERVICE

**OBJECTIVE:** To become familiar with the many services of the postal system and to learn how to use them for yourself or your employer.

The United States Government, through the several departments of its post-office system, provides means for sending mail, packages, and money to all parts of the world. It also has established postal savings banks.

## **Money-Order Department**

A postal money order insures safety when sending money by mail. Take the amount of money to be sent to the post office, make out an application for a domestic money order, and present it, with the money, to the postmaster. He will give you a receipt.

36750	Mukwonago, Wis.	114560	
United States Postal Money Order		Mukwonago, Wis. 114560	
POSTMASTER: MUKWONAGO, WIS.		RECEIPT	
SEP 17 19		114560	
POSTMASTER AT MUKWONAGO, WIS.		RECEIPT	
PAYABLE ONCE AGAINST PAYMENT FOR PAYMENT MADE IN THIS MONEY ORDER OR PAYMENT MADE IN A NOT GOOD FOR MONEY ORDERS ISSUED BY THE SAME ISSUER OR BY ANOTHER ISSUER AND ALTERNATIVELY ON DELIVERY		114560	
FACSIMILE: W. F. MARTIN		RECEIPT	
RECEIVING PAYMENT:		RECEIPT	
RECEIVED		RECEIVED	

### Typical domestic money-order with receipt

for the amount sent and a money order to be placed in the letter. In case the letter containing the money order is lost, present your receipt at the post office and the postmaster will trace the money order, and after 36 days, if found not cashed, an application for duplicate can be made.

## APPLIED MATHEMATICS FOR GIRLS

Form 6002

**DO NOT RISK MONEY OR STAMPS IN ORDINARY MAIL BUT A MONEY ORDER**

**POST OFFICE DEPARTMENT**  
THIRD ASSISTANT POSTMASTER GENERAL  
DIVISION OF MONEY ORDERS

**No.** \_\_\_\_\_  
Stamp of Issuing Office

**Fee** \_\_\_\_\_

The Postmaster  
will insert:

here  
the offices down on, when the office  
named by the remitter does not trans-  
act money-order business.

Spaces above this line are for the Postmaster's record, to be filled in by him

**Application for Domestic Money Order**

Spaces below to be filled in by purchaser, or, if necessary,  
by another person for him

**Amount** \_\_\_\_\_  
USE FIGURES,  
DO NOT SPELL **4 Dollars 10 Cents**

**To be paid to** *Alfred Post Co.*

Name of person or firm for whom order is intended

**Where address to** *4321 - 105th Street*

**City and State** *Cleveland, Ohio*

**Sent by** *Richard Green*

(Name of sender)

**City and State** *678 - 9th Street*

Street

**Purchaser must send order and coupon to payee**

(For fees see other side)

610-2291

### Fees for Money Orders Drawn on Domestic Form

Payable in the United States, including Hawaii, Puerto Rico, and the United States Virgin Islands, or in Guam and Tutuila (Samoa); also for orders payable in Antigua, Bahamas, Barbados, Bermuda, British Guiana, British Honduras, British Virgin Islands, Canada, Canal Zone, Cuba, Dominica, Grenada, Jamaica, Montserrat, Nevis, Newfoundland, Philippines, Islands, St. Kitts, St. Lucia, St. Vincent, and Trinidad and Tobago.

For Orders From \$0.01 to	\$2.50	6 cents.
From \$2.51 to	\$5.00	8 cents.
From \$5.01 to	\$10.00	11 cents.
From \$10.01 to	\$20.00	18 cents.
From \$20.01 to	\$40.00	15 cents.
From \$40.01 to	\$80.00	18 cents.
From \$80.01 to	\$100.00	20 cents.
		22 cents.

Typical domestic money order application. The fees for the money order are printed on the back of the form shown at the top

Form 6701  
Stamp of issuing office

**Post Office Department**  
**THIRD ASSISTANT POSTMASTER GENERAL,**  
**DIVISION OF MONEY ORDERS**

U. S. MONEY	FOREIGN MONEY
No. ....	Amount, \$.....
No. ....	Amount, \$.....
No. ....	Amount, \$.....

**Payable in**

(Postmaster will write on this line "Great Britain" or "Italy," etc., in case may be.)  
(Space above this line is for the Postmaster's record, to be filled in by him.)

(Spaces below to be filled in with pen and ink by the applicant, or by some person for him not connected with the post office.)

## **Application for International Money Order**

For Ten dollars  
and No cents.

**Payable to** M. H. Gill & Son, Ltd.

(Write on this line name of person who is to receive the money.)

Residence or place of business of the person to whom the money is to be paid	<u>Town or city</u> <u>Dublin, C.8</u>	<u>Street</u>
	<u>No. 50 Upper O'Connell</u>	
	<u>County, Canton, Kreis, or Department.</u>	
	<u>Province</u>	
	<u>Country</u> <u>Ireland</u>	

**Sent by** F. J. O'Connell

(Write on this line the name of the remitter.)

Residence or place of business of the person by whom the money is sent	<u>No. 2043 - 42nd</u>	<u>Street</u>
	<u>Town or city</u> <u>New York</u>	
	<u>State of</u> <u>N. Y.</u>	

**FOR POSTMASTER'S RECORD IN ACTION TAKEN AS INDICATED BELOW**

Second advice issued	Original application to Department
Form 6862	
Form 6862	To Exchange Office.
Order paid abroad, date	Remitter notified.
Authority to repay received, No.	
Domestic money order issued in sum No.	To whom mailed
Vad authorization to Department	{ Payee, Department.
Write Department	

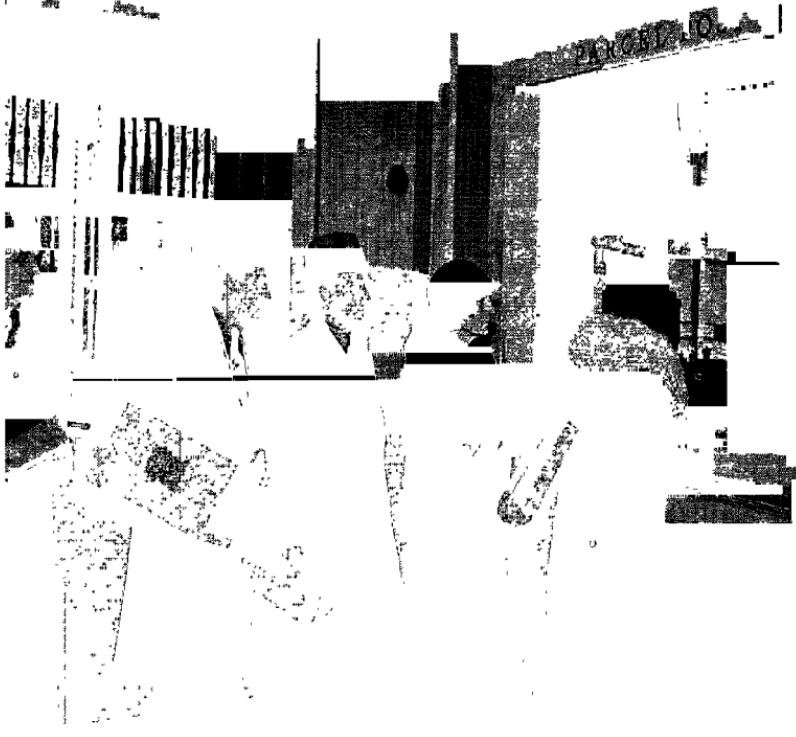
44-736

### Typical international money order application

Note the illustrations of the application blanks and money-order form on pages 217, 218, and 219. Instructions for indorsements are on the back of the money order.

## Parcel Post

The domestic parcel post offers a convenient, quick, and efficient means for the transporting of mailable parcels to any post



These packages are being mailed to various parts of the world and will arrive safely via parcel post

office in the United States and its possessions. This includes merchandise, farm and factory products, seeds, cuttings, bulbs, roots, scions, and plants, commercial books (including catalogues), and miscellaneous printed matter weighing more than 8 ounces. Up to and including 8 oz. is third-class matter, and the rate is  $1\frac{1}{2}$ ¢ for each 2 oz.

Weight and distance to be transported are considered in finding the cost of sending by parcel post, based on the zone system. The United States is divided into eight zones. These zones are as follows:

1st . . . up to 50 miles.	5th . . . 600 to 1,000 miles.
2nd . . . 50 to 150 miles.	6th . . . 1,000 to 1,400 miles.
3rd . . . 150 to 300 miles.	7th . . . 1,400 to 1,800 miles.
4th . . . 300 to 600 miles.	8th . . . more than 1,800 miles.

The charges on parcels sent locally are not determined by the first-zone charges, but have a separate local rate. Examples of how the rates vary with the zones are as follows:

Zones

<i>Weight</i>	<i>Local</i>	<i>1st</i>	<i>2nd</i>	<i>3rd</i>	<i>4th</i>	<i>5th</i>	<i>6th</i>	<i>7th</i>	<i>8th</i>
1 pound	.07	.08	.08	.09	.10	.11	.12	.14	.15
2 pounds	.08	.10	.10	.11	.14	.17	.19	.23	.26
10 pounds	.12	.18	.18	.27	.42	.59	.75	.95	1.14
40 pounds	.27	.51	.51	.87	1.47	2.18	2.85	3.65	4.44

Parcels more than 84 in. and not more than 100 in. in length and width combined, which weigh less than 10 lb. must be pre-paid at the 10-lb. rate.

#### Postal Registration

All valuable letters and parcels sent at letter rates should be registered. A return receipt for such mail may be obtained. Such letters and parcels must be presented to the post office or station for registration and not placed in a mailbox or mail drop.

The registration system provides for the careful transmission of money and other valuable mail to any post office in the world, furnishing receipts to the mailer and providing for an indemnity in case of loss.

The registration fee on a letter or parcel sent by first-class mail is based on a graduated scale, and it is in addition to the regular postage. The fee ranges from 15¢ to \$1.00, covering an indemnity from \$50 to \$1,000.

#### Air Mail

Air-mail service costs 6¢ for each ounce or fraction of an ounce, regardless of the distance it is to be sent.

### Mail Insurance

Third- or fourth-class mail may be insured against loss, rifling, or damage equivalent to its actual value or cost of repairs, up to \$200 when mailed at and addressed to any post office in the United States or its possessions, or on or to United States naval vessels, excepting the Philippine Islands, for which the limit is \$100.

A return receipt for an insured parcel may be obtained by paying an additional fee of 3¢ at the time of mailing. If a receipt is requested after a parcel is mailed, a fee of 5¢ is charged.

### Postal Savings

Anyone ten years old or older may open a postal savings account in his or her name by depositing one or more dollars in any post office authorized to accept postal savings.

Amounts less than \$1.00 may be saved by purchasing postal-savings stamps at 10¢ each. A savings card with ten savings stamps affixed will be accepted as a deposit of \$1.00 in opening an account or it may be redeemed in cash. Postal-savings cards will be furnished free of charge at any post office. Inquire at the post office for further information.

### Special Delivery

This means that second-class, third-class, and fourth-class mail all are given the same treatment as first-class mail in transit, in addition to the special delivery at the office of the addressee. The fees for special delivery are 15¢, 25¢, and 35¢ in addition to regular postage according to weight and amount. Special delivery of first-class mail costs, in addition to regular postage, 10¢ up to 2 lb.; 20¢, 2 to 10 lb.; and 25¢ for more than 10 lb.

### Special Handling

Anyone desiring "special-handling" service in transit (that is, first-class mail service), without the "special delivery" at the office of the addressee, may do so by paying a fee of 10¢ up to 2 lb.; 15¢, 2 to 10 lb.; or 20¢ for more than 10 lb., depending on the weight.

### Forwarding

A person desiring to have mail forwarded should file with the postmaster a written and signed request giving his or her present address and the full address to which the mail is to be forwarded, as well as specific information as to the time during which the order is to be observed. Convenient cards can be obtained from the post office or from the letter carrier.

### Return of Mail

The sender's name should always be placed in the upper left-hand corner of all mail (parcel post and all) to secure its return when it is not delivered. In the case of insured or registered mail, this precaution is absolutely necessary. The post office has special regulations whereby undeliverable mail is returned to the "Dead Letter Office" for disposition.

### Lack of Postage Penalty

Thoughtless or willful short payment of postage on first-class mail is penalized as follows: "All partly but not fully prepaid first-class matter which is short paid more than one rate (three cents) (local 2¢) shall be rated with the deficient postage plus an additional charge of one cent for each ounce or fraction thereof."

### Postal Problems

#### LESSON 208

1. What would be the charge for sending a 6-oz. package (third-class matter) to New York City from Chicago?
2. What is the cost for sending a letter (first-class mail) special delivery if it weighs 1 lb.?
3. How much would you pay to send a 2-oz. letter air mail to Washington, D. C.?
4. What would be the charge for sending a fourth-class package 650 miles if it weighs 10 lb.?
5. What would it cost to send a 2-lb. package 420 miles if it were sent fourth class?
6. If a package is to be sent 1,200 miles fourth class and it weighs 40 lb., what is the charge?

7. When sending a package weighing 10 lb. 175 miles, what is the charge for parcel post?
8. If the parcel in Problem 7 is sent special delivery, how much will the charge be?
9. What is the charge for sending a 2-lb. parcel fourth-class mail in the city?
10. When sending a 10-lb. parcel, fourth class, what is the charge if sent "special delivery" 560 miles?

## Chapter XVII

### BANKING

**OBJECTIVE:** To gain a practical knowledge of the service banks render to business, to learn what a bank can do for you, and to learn how to use the service of banks.

A bank, in the ordinary sense of the word, is an institution for the custody and lending of money. Thus it facilitates the exchange and transmission of funds by checks, drafts, and other commercial instruments. This function in our financial system is a trust rather more public than private.

The bank also acts as a guide to its clients in counseling sound business practice and advising against unwise credits and investments. The possession of a bank account is an indication of a person's financial responsibility, and, for this reason, it often serves as a reference. A person unfamiliar with banking need not hesitate to go to a bank to open an account or to seek any of the

150 OFFICE ON	
To CORN EXCHANGE BANK TRUST COMPANY, N. Y.	
Signature <u>Ruth Brown</u>	
Address <u>650 Park Ave, New York City</u>	
Business	<u>Stenographer</u>
Introduced by	<u>Janet Page</u> <input type="checkbox"/> Date <u>Feb. 6, 1939</u>

A typical signature card on file in a bank used to identify a depositor

services available. The officers and employees are always glad to explain the functions of the various departments of the bank.

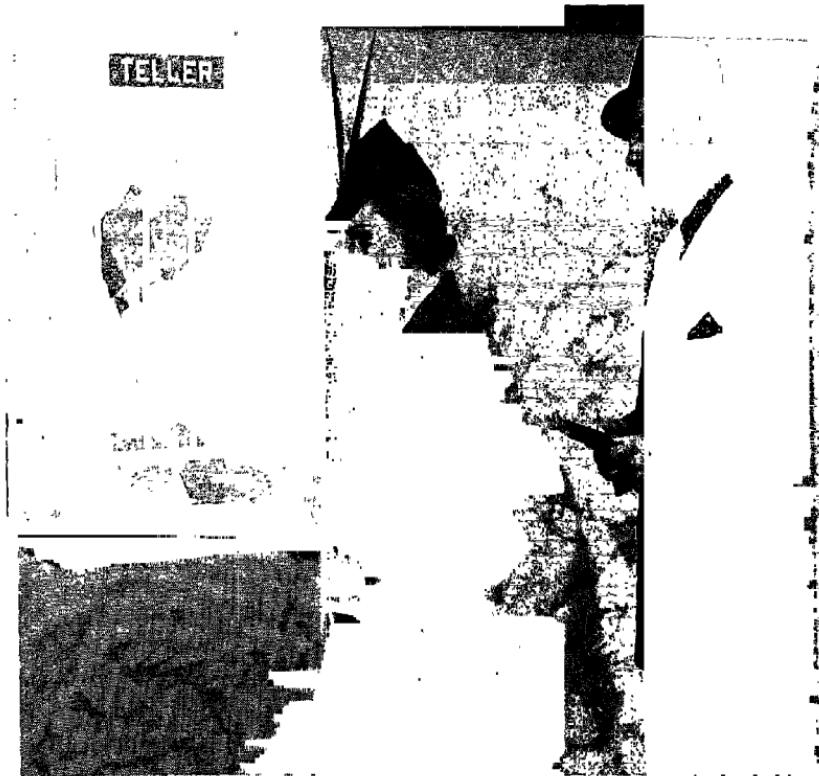
Often the first contact that a boy or girl has with a bank is the opening of a savings account. Usually a savings account can be started with a deposit of \$1.00. Parents often start an account for their small children and transact the business until the children are old enough to do it for themselves.

Most banks now are members of the Federal Deposit Insurance Corporation which protects each depositor against loss up to a maximum of \$5,000.

SAVINGS DEPARTMENT FIRST NATIONAL BANK IN ACCOUNT WITH				NO. 729
Ruth Ann Marting 709 South 52nd St.				
		DEPOSITS	AMOUNTS DRAWN	BALANCES
Dec. 1	37.00	25.75		25.75
Jan. 4	38.00	39.80		65.55
June 1	38.00	4.75		65.98
June 19	38.00		17.00	48.98
July 30	38.00	20.25		73.75
Sept. 8	38.00	42.50		116.25
Oct. 3	38.00	22.25		93.98
			2	

### A page in a savings-department bankbook

The depositor is given a bankbook in which is kept an account of the deposits and which serves as a receipt for the amount deposited. In case a bankbook is lost, the depositor must notify the bank immediately.



You may place money in a bank during banking hours, at which time a bank teller makes a record of it in your bankbook.

When a person wishes to add to his account, he makes out a deposit slip, which is handed with the money to the teller who records the amount in the depositor's bankbook, also called passbook. Money is withdrawn from checking accounts by check and from savings accounts by a receipt, a blank for which is furnished by the bank.

Usually, on all sums of ten dollars or more, on savings accounts, interest is paid every six months on the first of June and December or July and January. Amounts deposited during interest periods, if deposited during the first five calendar days in a month, ordinarily draw interest from the first of the month. Amounts withdrawn between interest days do not draw interest.

Money placed in a checking account does not draw interest but provides a safe and convenient method of paying bills and accounts.

**SAVINGS DEPARTMENT**  
**CLINTON TRUST COMPANY**

BOOK No. 729

DATE Feb. 28, 1939

DEPOSITED BY  
Reith Anna Martins

729 St. 52nd St.

ALL ITEMS ARE CREDITED SUBJECT TO ACTUAL FUND PAYMENT AND  
PROCEEDS THEREOF IN MARCH.

	DOLLARS	CENTS
CURRENCY	<u>5</u>	<u>00</u>
COIN	<u>3</u>	<u>25</u>
 CHECKS AS FOLLOWS:		
<u>First National</u>	<u>10</u>	<u>00</u>
<u>Quebec, N.Y.</u>	<u>6</u>	<u>50</u>
<u>Bonnie, Colo.</u>	<u>7</u>	<u>95</u>
 BALANCE AFTER THIS DEPOSIT IS MADE		
	<u>9</u>	<u>16</u>
	<u>2</u>	<u>3</u>
 SEE THAT ALL CHECKS AND DRAFTS ARE ENDORSED		

A savings-department deposit slip

**Clinton Trust Company**  
**NEW YORK**

DEPOSITED FOR ACCOUNT OF

Janet Page  
2724 St. Mineral St.  
Feb. 28

CHECKS ON BANKS IN OTHER CITIES		CHECKS ON THIS BANK		CUCOS ON OTHER NEW YORK BANKS	
DOLLARS	CENTS	DOLLARS	CENTS	DOLLARS	CENTS
12	50	3	25	7	50
				2	40
8	75				
2	4				

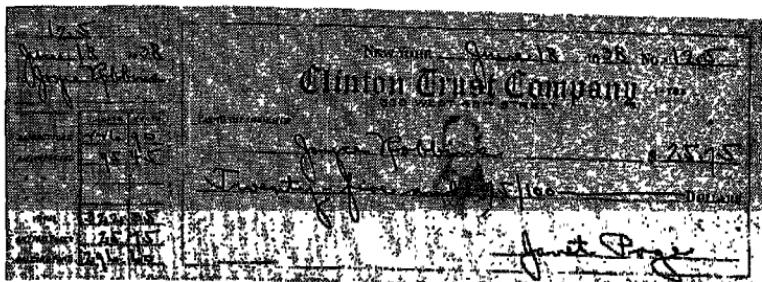
CHECKS ON BANKS IN OTHER CITIES	<u>45</u>	<u>25</u>
CHECKS ON THIS BANK	<u>3</u>	<u>25</u>
CHECKS ON OTHER NEW YORK BANKS	<u>9</u>	<u>90</u>
 CURRENCY	<u>12</u>	<u>00</u>
SILVER	<u>9</u>	<u>93</u>
 TOTAL DEPOSIT	<u>80</u>	<u>23</u>

A checking-account deposit slip

To write a check, fill out carefully the blank spaces in the stub and in the check proper so that no alteration can be made by anyone into whose hands the check may come.

When making deposits, be sure that all checks and drafts are properly endorsed.

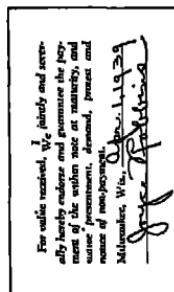
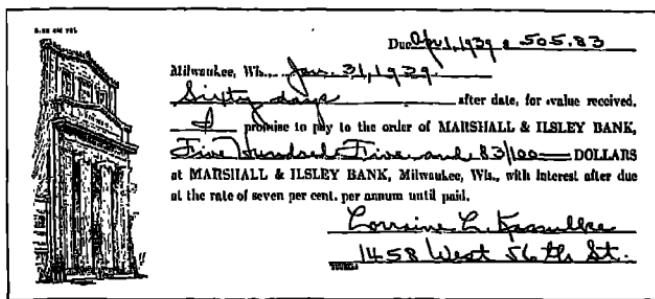
The stub remains in the checkbook for record. The check is detached at the perforated line. When checks are returned with the bank statement, the check and the stub are compared and the balance at the end of the month in the checkbook is verified with the bank statement. Errors must be reported to the bank immediately.



A bank check. At the left end is the stub which remains in the checkbook.

Before a check can be cashed, it must be endorsed by the one to whom it is made payable. The signature is written across the left end of the back of the check.

Money may be borrowed from a bank. The borrower signs a promissory note. Blanks for various types of notes are furnished by the bank.



A promissory note, properly endorsed on the back by another person who is known as the surety.

In the note on page 229, Lorraine Kassulke is the *borrower*. If another person endorses the note as security, he is termed the *surety* and is held responsible for the payment of the note in case it is not paid by the borrower. The date when the note becomes due is called the *date of maturity*.

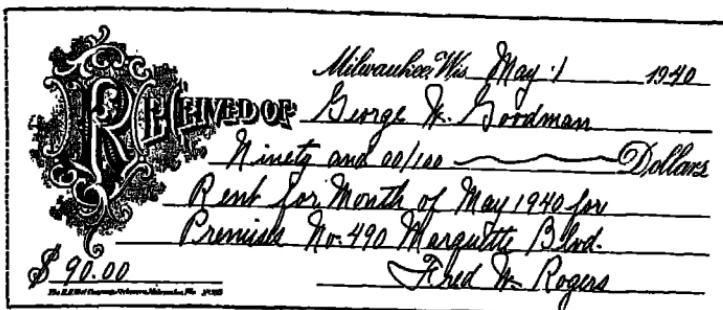
Form No. 244. MM. 12-24. E.
MILWAUKEE, WIS., January 20, 1932. Due April 20, 1932 \$500.00.
Ninety days after date I promise to pay to the order of
<b>MARSHALL &amp; ILSLEY BANK, AT ITS OFFICE IN MILWAUKEE,</b>
<b>Eight hundred nine and 00/100 DOLLARS,</b>
for value received, with interest at the rate of seven per cent. per annum, after maturity, having deposited with said Bank as collateral security, for payment of this or any other direct or indirect liability or liabilities of mine to said Bank, due or to become due, or that may be hereafter contracted or existing howsoever acquired by said Bank, the following property, viz:
\$1,000 Bond U.S. Treasury 2 1/2%--1945
.....
.....
The market value of which is now _____ I with the right to call for additional security should the value in the judgment of the President, Vice-President or Cashier of said Bank, decline; and on failure to supply the amount demanded, this obligation shall be paid by me in one sum payable on demand, with interest from the date of maturity at the rate of seven per cent. per annum, until paid, or until such time as the market value of the collateral thereto, at any Bankers' Board, or at public or private sale, at the option of said Bank, or its assigns, and with the right to be purchased itself at such Bankers' Board, or public sale, on the non-performance of this promise, or the non-payment of any of the liabilities above mentioned, or at any time or times thereafter, without advertisement or notice. And after deducting all legal or other costs and expenses for collection, sale and delivery, to apply the residue of the proceeds of such sale or sales so to be made, to pay any, either all or part of said liability, as said Bank, or its President or Cashier, shall deem proper, returning the overplus to the undersigned. In case of the insolvency of the undersigned, any indebtedness due from the legal holder hereof to the undersigned may be appropriated and applied herein at any time, as well before as after the maturity hereof.
Address: <i>John Becker</i> <i>2631 N. 4th St. Milwaukee, Wis.</i>

A promissory note giving a bond as collateral security

Another type of promissory note is one that is signed when stocks, bonds, real estate, etc., are given the bank as security. This is called *collateral*. The note is filled out similar to the one above and in addition lists the collateral given and states the agreement under which the collateral is left with the bank.

### Keep Your Receipts

One important advantage of paying bills by check is that the canceled check, which the bank returns to the depositor after it has been cashed, is a receipt or proof that the bill has been paid. A receipt or a canceled check ought to be kept on file for a reasonable length of time, as a protection to the one who has paid



A receipt similar to this can be issued in payment of a bill

a bill or any other debt. Care must be taken to see that a receipt gives the amount, the date when paid, and the signature of the one who receives the payment.

Serious trouble is caused by carelessness in this matter. Many bills have had to be paid a second and even a third time because the receipt was lost or mislaid.

Printed forms are used by most business firms, but just the word "Paid," followed by the date and signature of the one who receives the money, is sufficient.

#### Bank Discount

#### LESSON 209

When anyone borrows money from a bank upon signing a promissory note, the bank deducts the interest from the face of the note or the principal. That is, if you want to borrow money for 30 days, or 60 days, etc., the bank figures the interest due for that length of time and deducts it from the amount you borrow, giving you the balance. If your note is paid before the time it is due, the interest you paid for the balance of the time is refunded to you. The interest charged by the bank is called the bank discount. The difference between the face of the note, or the principal, and the interest is called the proceeds. Interest is figured at a certain per cent per year. In banking loans a year equals 360 days.

**EXAMPLE:**

Find the bank discount and proceeds for a loan of \$500 for 30 days at 6 per cent.

**SOLUTION:**

$$I = RTP$$

$$I = \frac{6}{100} \times \frac{30}{360} \times \$500 = \frac{5}{2} = \$2.50 \text{ Bank discount.}$$

$$P - I = \text{Proceeds.}$$

$$\$500 - \$2.50 = \$497.50 \text{ Proceeds.}$$

**Problems**

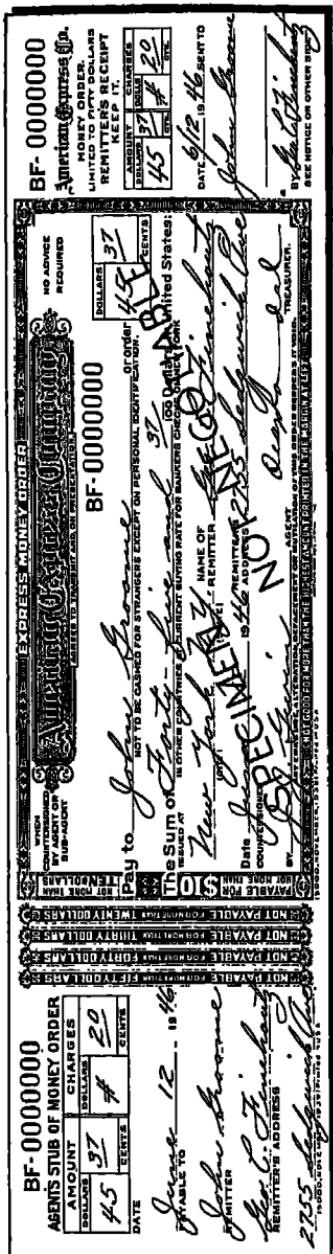
Find the bank discount and proceeds of the following problems:

<i>Problem</i>	<i>Principal or Face</i>	<i>Time in Days</i>	<i>Rate in Per Cent</i>	<i>Bank Discount</i>	<i>Proceeds</i>
1	\$ 800	60	6		
2	3000	30	5 $\frac{1}{2}$		
3	4500	70	6 $\frac{1}{2}$		
4	2200	80	4 $\frac{1}{2}$		
5	950	45	5		
6	7500	35	7		
7	2585	40	5 $\frac{1}{2}$		
8	6000	90	6		
9	1900	50	5		
10	8700	75	4 $\frac{1}{2}$		

**American Express**

**OBJECTIVE:** To study the value of checks and money orders issued by the American Express Company and make use of commercial arithmetic to find the value of these checks and money orders.

The American Express Company issues traveler's checks and money orders. Traveler's checks are sold in denominations of \$10, \$20, \$50, and \$100, at a cost of 75¢ for each \$100. The



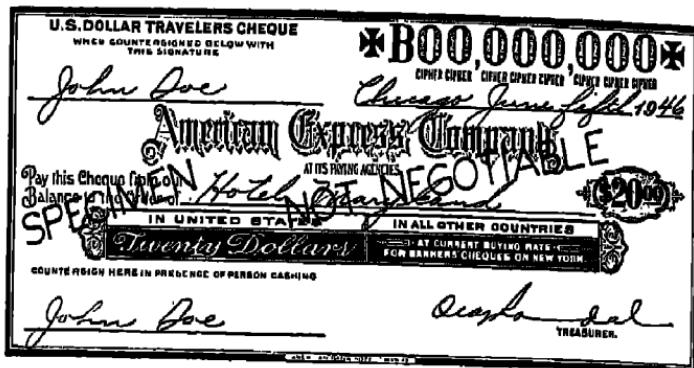
A typical American Express Company money order

purchaser signs all checks in the upper left corner of each check when they are bought, and countersigns them in the lower left when cashed. These signatures serve as identification.

If checks are lost or stolen before being countersigned, the amount involved will be refunded by the American Express Company. Traveler's checks are used to pay any traveling expenses, be they on trains, motor coach, steamship, automobile, or plane. They are accepted in every country in the world.

This company also renders services to travelers who may make their headquarters with the offices of that company and have mail or cablegrams sent to them. They also have interpreters stationed in principal foreign cities.

Money orders can be bought in drugstores and other places of business. At a small expense the orders may be used to pay gas, electric light, water, rent, telephone, lodge dues, taxes, insurance, home loan, installments on furniture, and many other expenses.



A typical American Express Company traveler's check

## LESSON 210

Domestic rates for American Express money orders to be sent anywhere in the United States, Canada, West Indies, Alaska, Hawaii, Puerto Rico, Virgin Islands, and the Philippines, are:

From	To	Cost	From	To	Cost
\$ 0.01	\$ 2.50	5¢	\$ 5.01	\$25.00	15¢
2.51	5.00	10¢	25.01	100.00	20¢
More than \$100.00 at above rates.					

1. What does Mr. Jones pay for \$300 in traveler's checks?
2. If a money order for \$47.28 is sent to the Philippines, what is the charge? (See foregoing rates.)
3. Miss Bell buys ten \$10 checks, five \$20 checks, and two \$100 checks. What does she pay for them?
4. How much does Mrs. Allen pay to send a money order worth \$87.50 to Quebec?
5. Fred sent a money order worth \$6.50 to Kenosha, Wisconsin. What did it cost him?

## Chapter XVIII

# ALGEBRA

**OBJECTIVE:** To introduce you to the advantage of algebra in solving problems in which an equation can be formed and in developing general formulas which can be used in solving individual problems.

Algebra is a branch of mathematics which simplifies many of the problems which seem difficult in arithmetic. When we think of algebra, we usually think of letters, such as  $a$ ,  $x$ ,  $y$ , etc. These letters are used just as you use numbers; you can add, subtract, multiply, and divide them. The following examples will give you a good idea of how the fundamental operations of arithmetic are performed and indicated in algebra.

### LESSON 211

#### EXAMPLE:

$$a + a = 2a.$$

The  $2a$  means 2 times  $a$ . In this case  $a$  may be any number. If  $a$  is 3 and we substitute 3 for  $a$ , the value of  $2a$  is  $2 \times 3$  which is 6.

$$4x + 3x = 7x.$$

$$5y - 2y = 3y.$$

$$6x \cdot 2 = 12x.$$

$$x + y = x + y.$$

$$y - 2 = y - 2.$$

In algebra, a dot (·) above the line is used often in place of  $\times$  to show multiplication. This avoids confusion with the  $x$  used as a term in the problem.

$$x \cdot x = x^2.$$

$$y \cdot 3x = 3xy.$$

$$x \cdot y = xy.$$

$$\frac{6x}{2} = 3x.$$

$$\frac{8x}{2x} = 4.$$

Cancel  $x$ 's just as though they were numbers;  $x = x$  if they are both in the same problem.

### Problems

Solve the following problems:

- |                    |                         |
|--------------------|-------------------------|
| 1. $3a + a =$      | 11. $8x \div 4x =$      |
| 2. $6a - 4a =$     | 12. $12r \div 8r =$     |
| 3. $x + 5x =$      | 13. $3x \cdot y - xy =$ |
| 4. $5x - 3x =$     | 14. $2xy \cdot 2y =$    |
| 5. $x + y =$       | 15. $2x + 4y - 3y =$    |
| 6. $3x \cdot x =$  | 16. $2y \div 4x =$      |
| 7. $2x \cdot y =$  | 17. $ra + r =$          |
| 8. $xy \cdot x =$  | 18. $xy + yx =$         |
| 9. $5y \cdot 2x =$ | 19. $5xy - 2yx =$       |
| 10. $3y \div 3 =$  | 20. $8xy \div 4xyz =$   |

## LESSON 212

Letters may have the same value as numbers, and the one may be substituted for the other. Work the problems below, substituting the following numbers for the corresponding letter:  $x = 4$ ,  $y = 7$ ,  $z = 12$ .

### EXAMPLES:

$$\begin{aligned} 4y + z - x &= \\ 4 \times 7 + 12 - 4 &= \\ 28 + 12 - 4 &= 36. \end{aligned}$$

$$\begin{aligned} \frac{2x}{z} &= \\ \frac{2 \times 4}{12} &= \frac{8}{12} = \frac{2}{3}. \end{aligned}$$

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

### Simple Equations

Word problems are made simple in algebra by the use of equations. An equation is an expression of equality between two groups of operations (meaning addition, subtraction, multiplication, or division) joined by an equal sign.

#### LESSON 213

##### EXAMPLE:

$$\begin{aligned}x + 2 &= 7 + 4 \\ \text{or } x - 2 &= 2x + 7\end{aligned}$$

To solve an equation, you must place all of the unknowns on one side and all of the knowns on the opposite side. This can be done by addition, subtraction, multiplication, or division, but the same operation must be done on both sides of the equation.

##### EXAMPLE:

$$\begin{array}{rcl}x + 2 & = & 7 + 4 \\ x + 2 & = & 11 \\ - 2 & = & - 2 \\ \hline x & = & 9\end{array}$$

Complete any operations that you can on either side of the equal sign.

Subtract 2 from both sides of the equation because you want the unknown alone.

$$\begin{array}{rcl}x + 2 & = & 11 \\ x & = & 11 - 2 \\ x & = & 9\end{array}$$

##### CHECK:

$$\begin{array}{rcl}x + 2 & = & 7 + 4 \\ 9 + 2 & = & 7 + 4 \\ 11 & = & 11\end{array}$$

To check, substitute the value of  $x$  in the first line of the equation. If one side proves equal to the other, the value of  $x$  is correct.

##### EXAMPLE:

$$\begin{array}{rcl}2x + 4 & = & 7 + 3 \\ 2x + 4 & = & 10 \\ 2x & = & 10 - 4 \\ 2x & = & 6 \\ x & = & 3\end{array}$$

Complete as many operations as you can

$2x$  means 2 times  $x$ , therefore divide both sides by 2.

CHECK:

$$2x + 4 = 7 + 3$$

$$2 \times 3 + 4 = 7 + 3$$

$$6 + 4 = 7 + 3$$

$$10 = 10$$

Check by substituting the value of  $x$  for  $x$  in the first line of the equation.

Write in equation form and solve:

1. If one dozen cans of corn cost \$1.80, how much does 1 can cost?

Let  $p$  = price of 1 can

Then  $12p = \$1.80$

$p = 15\frac{1}{2}$  price of 1 can

2. If 4 dresses cost \$7.92, find the cost of 1 dress.

3. 1 coat costs \$9.98. Find the cost of 6 coats.

4. 1 gross of canned spinach costs \$21.60. What is the cost of 4 cans?

Let  $c$  = cost of 1 can

$$144c = \$21.60$$

$$\begin{array}{r} c = \$21.60 \\ \hline 144 \end{array}$$

$$\begin{array}{r} .60 \\ 4 \cancel{\underline{\underline{21.60}}} \\ \hline 144 \\ 36 \end{array}$$

5. If 1 doz. bananas cost  $25\frac{1}{2}$ , find the cost of 3 bananas.

6. 5 fountain pens cost \$18.75. Find the cost of 12 pens.

### Comparison Between Algebra and Arithmetic

#### LESSON 214

Mary has 11 pieces of candy. She gives 3 pieces to Bobby and some to Betty. Counting the candy, she finds that she gave Betty 3 times as many pieces as she kept for herself. How many pieces does each have?

#### Algebra

Let  $x$  = Mary's pieces of candy.

Then  $3x$  = Betty's pieces of candy.

$$8x + x + 3 = 11.$$

Subtracting 3 from both sides:  $8x + x = 8.$

Collecting like terms:

$$4x = 8.$$

Dividing both sides by 4:

$$x = 2 = \text{Mary's pieces of candy.}$$

$3 \times 2 = 6 = \text{Betty's pieces of candy.}$

## Arithmetic

$11 =$  number of pieces of candy.

$3 =$  number of pieces given to Bobby.

$11 - 3 = 8 =$  number to divide between Mary and Betty.

1 part of the remainder goes to Mary.

3 parts of remainder go to Betty because she gets 3 times as much as Mary does.

$1 + 3 = 4$  parts. The remaining 8 pieces must be divided into 4 parts.

$8 \div 4 = 2$  pieces in 1 part.

$\therefore 2$  pieces are Mary's.

$2 \times 3 = 6$  pieces are Betty's.

Mother used  $1\frac{1}{2}$  doz. of eggs on Saturday. If she used 6 eggs for a sponge cake, and 5 times as many eggs for an angel food as for a white cake that she also made, how many eggs did she use for the angel food and how many for the white cake?

## Algebra

Let  $x =$  the number of eggs used in white cake.

Then  $5x =$  number used in angel food.

$$x + 5x + 6 = 18$$

$$6x = 18 - 6$$

$$6x = 12$$

$$x = 2$$

$\therefore$  white cake took 2 eggs

$\therefore$  angel food took 10 eggs

## Arithmetic

18 eggs = total number used.

6 eggs = number used in sponge cake.

$18 - 6 = 12 =$  number used in angel food and white cake.

1 part of remaining eggs goes into the white cake.

5 parts of remaining eggs go into angel food.

$1 + 5 = 6 =$  number of parts into which the remaining 12 eggs must be divided.

$12 \div 6 = 2 =$  number of eggs founds in 1 part.

$\therefore 5 \times 2 = 10 =$  number of eggs in 5 parts.

$\therefore$  white cake took 2 eggs, angel food took 10 eggs.

From the foregoing comparisons, we have demonstrated that algebra is much simpler than arithmetic.

### Practical Algebra Problems

Work these problems by arithmetic and then work them by algebra as in the foregoing illustrations.

1. If Jane helps Mary with the sewing of a dress, they finish it in 14 hours. If Mary works twice as long as Jane does, how many hours does each one work?

Let  $x$  = number of Jane's hours.

$2x$  = number of Mary's hours.

Equation:  $x + 2x = 14$ .

2. If Jane makes 3 times as many biscuits as Mary does, and Betty makes twice as many as Mary, how many does each one make if there are 60 biscuits?

3. If Mrs. Davis has twice as many pupils as Mrs. Lee, and Miss Roberts has  $1\frac{1}{2}$  times as many as Mrs. Davis, how many pupils has each teacher, if there are 108 pupils in these 3 classes?

4. Ruth's mother bought 11 yd. of material from which she made 3 dresses. The first dress required  $1\frac{1}{8}$  times as much as the second. The third required  $\frac{8}{9}$  as much as the first. How many yards were used for each dress.

5. Elaine spent \$19.85 for 4 articles. The first cost  $\frac{2}{3}$  as much as the third, and the second cost  $\frac{1}{2}$  as much as the third. If the fourth cost \$3.95, find the cost of the other three articles.

### Helpful Suggestions

To work concrete problems in algebra, these suggestions will help you to understand the problems.

1. Read the problem over very thoroughly at least twice.
2. Find the quantity about which least is known.
3. Substitute  $x$  for this quantity.
4. Examine your problem again.
5. Since the quantity for which you have substituted  $x$  is related to the rest of the quantities, pick out the specific relationships.
6. Form the equation.
7. Check the equation and balance it.

## Chapter XIX

# GEOMETRY

**OBJECTIVE:** To give you a review and some practice in applying the rules and formulas for measuring lines, surfaces, and solids which you have learned in your study of arithmetic.

The word *geometry* comes from two Greek words meaning "to measure the earth." In the study of geometry, we compare lines, angles, surfaces, and solids, and characteristics of such figures as the circle, square, rectangle, parallelogram, and triangle.

The rules, formulas, and problems in this chapter are such as you commonly find in arithmetic. They are contributions which geometry has made to arithmetic.

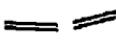
### Lines and Angles

#### LESSON 215

 A vertical line is a straight line whose direction is toward the center of the earth.

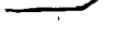
 A horizontal line is parallel with the horizon.

 An oblique line is a straight line whose direction is neither vertical nor horizontal.

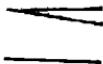
 Parallel lines are two or more lines in the same direction which will never meet.

 An angle is formed when two lines running in different directions meet.

 A right angle is one of the four equal angles formed by the intersection of two lines which are perpendicular to each other.

 An obtuse angle is greater than a right angle.

## APPLIED MATHEMATICS FOR GIRLS

 An acute angle is less than a right angle.

 A straight angle is the sum of two right angles or all the space about a point on one side of a straight line.

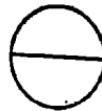
Using the clock as reference, tell the type of angle formed when hands show the following time:

- |         |          |           |           |
|---------|----------|-----------|-----------|
| 1. 3:00 | 6. 11:30 | 11. 12:15 | 16. 4:15  |
| 2. 8:00 | 7. 4:05  | 12. 7:15  | 17. 1:10  |
| 3. 6:00 | 8. 7:45  | 13. 3:50  | 18. 10:20 |
| 4. 2:45 | 9. 8:15  | 14. 1:30  | 19. 1:50  |
| 5. 5:45 | 10. 8:55 | 15. 9:15  | 20. 12:55 |

### Plane Surfaces

A surface has extension in two directions, length and width. The figures drawn on a surface are the circle, square, rectangle, etc.

### LESSON 216

 A circle is a surface bounded by a curved line called a circumference, all points of which are equidistant from the center. The diameter is a line which divides the circle into halves and passes directly through its center. The radius is equal to  $\frac{1}{2}$  the diameter; it is the distance from a point on the circumference to the center of the circle.

#### Facts About the Circle

$$\text{Circumference} = 3\frac{1}{7} \times \text{diameter} \text{ or } c = 3\frac{1}{7}d.$$

$$3\frac{1}{7} = \frac{\text{circumference}}{\text{diameter}} \quad \text{or } 3\frac{1}{7} = \frac{c}{d}.$$

$$\text{Radius} = \frac{1}{2} \text{ of diameter}$$

$$\text{Diameter} = 2 \times \text{radius} \quad \text{or } r = \frac{1}{2} d.$$

$$\text{Area} = 3\frac{1}{7} \times \text{radius} \times \text{radius} \quad \text{or } a = 3\frac{1}{7} r^2.$$

Using the foregoing facts, solve the following problems:

1. Find the circumference if the diameter = 2 in.

2. Find the circumference if the diameter =  $\frac{1}{2}$  ft.

3. Radius = 2 ft.; find the circumference.
4. If the circumference is 17 in., find the diameter.
5. Find the radius if the circumference is  $1\frac{1}{4}$  ft.
6. Find the area if the radius is 2 ft.
7. Find the area if the diameter is 6 ft.

Fill in the following information:

	<i>Radius</i>	<i>Diameter</i>	<i>Circumference</i>	<i>Area</i>
8.	21 in.			
9.		$2\frac{1}{2}$ in.		
10.			25 ft.	
11.			18 ft.	
12.		6 in.		

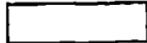
### Areas of Squares and Rectangles

#### LESSON 217



A square has 4 equal sides and 4 right angles.

A rectangle has 4 sides, the two opposite, being equal, and 4 right angles.



Area = length  $\times$  width.

To multiply the length  $\times$  the width, both must be expressed in the same unit of measure as in., ft., yd., rds. etc. A plot of land 1 ft. long and 1 ft. wide is equal to 1 sq. ft.; 1 yd.  $\times$  1 yd. = 1 sq. yd.; 3 ft.  $\times$  3 ft. = 9 sq. ft. = 1 sq. yd. (See tables in Chapter II.)

1. How many acres are found in a square plot of land that is 200 ft. on one side?

$$A = l \times w. \quad \text{From table (see p. 22) } 1 \text{ acre} = 43,560 \text{ sq. ft.}$$

$$A = 200 \text{ ft.} \times 200 \text{ ft.} \therefore \underline{40,000} = ? \text{ acres.}$$

$$A = 40,000 \text{ sq. ft.} \qquad \underline{43,560}$$

2. A book is  $5\frac{1}{2}$  in. wide and 8 in. long. What part of a square foot is the area of the book?

3. A room is 8 yd. by 9 yd. How many square rods are found in the room?

4. A sewing table is 5 ft. wide and 2 yd. long. How many square yards are found in the table?
5. 100 sq. in. = ? sq. ft.
6.  $4\frac{1}{2}$  sq. ft. = ? sq. in.
7. 32,670 sq. ft. = ? acres.
8.  $2\frac{3}{4}$  acres = ? sq. rd.
9. 27 sq. ft. = ? sq. yd.
10.  $18\frac{1}{2}$  sq. rd. = ? sq. yd.

### Triangles

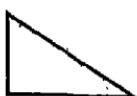
#### LESSON 218



The equilateral triangle is one that has three equal sides. It is also equiangular, which means that the 3 angles are also equal.



An isosceles triangle is one that has 2 equal sides.



A right triangle has 1 right angle.



Area of a triangle =  $\frac{1}{2}$  the altitude  $\times$  the base.

$$A = \frac{1}{2} ab.$$

$a$  = altitude is the height of the triangle.

$b$  = base is the side on which the triangle stands.

- Find the area of a triangle with 3-in. altitude and a  $2\frac{1}{2}$ -in. base.  

$$A = \frac{1}{2} ab \text{ or } A = \frac{1}{2} \times 3 \times \frac{5}{2} =$$
- If the area of a triangular lot is  $17\frac{1}{2}$  sq. ft., find the altitude if the base is 6 ft.
- If the sum of the sides of an equilateral triangle is equal to 75 in., find the length of the base. If the altitude is 21.6 in., find the area of the triangle.

Fill in the empty spaces:

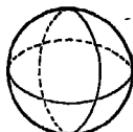
	<i>Altitude</i>	<i>Base</i>	<i>Area</i>
4.	3 ft.	22 in.	sq. ft.
5.	5 ft.		4.375 sq. ft.
6.	1 $\frac{1}{2}$ ft.	2 yd.	
7.		$\frac{1}{3}$ yd.	144 sq. in.
8.	640 rd.	5280 ft.	
9.	25 ft.	6 yd.	
10.		18 in.	2 $\frac{1}{8}$ sq. ft.
11.	8 $\frac{1}{4}$ ft.		1 sq. rd.
12.		$\frac{2}{3}$ ft.	24 sq. in.
13.	$\frac{7}{8}$ yd.		9.84 sq. ft.
14.		$\frac{1}{4}$ mi.	330,000 sq. ft.
15.	160 in.	76 ft.	sq. yd.

### Solids

#### LESSON 219

A solid is a body that occupies a definite amount of space. It has extension in three directions, length, width, and thickness. The sphere, cube, and cone are examples of solids.

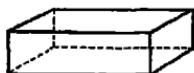
Volume is the space enclosed, measured by cubic units.



The sphere is a solid whose surface is at all points equidistant from the center.

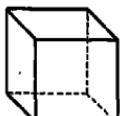
$$V = \frac{4}{3} \times \frac{22}{7} \times r \times r \times r. \quad r = \text{radius.}$$

$$V = \frac{88}{21} \times r \times r \times r \text{ or } v = \frac{88}{21} r^3.$$



The rectangular solid has six sides that are all rectangles.

$$V = \text{length} \times \text{width} \times \text{height} \text{ or } v = lwh.$$



The cube is a solid whose six sides are all equal squares; this means that the length, width, and height of a cube are all equal.

$$V = h \times h \times h.$$

A cylinder is a body bounded by a uniformly curved surface, its ends being equal and parallel circles.



$$V = \frac{22}{7} \times r \times r \times h \text{ or } v = \frac{22}{7} r^2 h.$$

( $r$  means the radius of the circular base.)



The cone is a solid with a circular base narrowing to a point at the top. Since the volume of a cone is equal to  $\frac{1}{3}$  the volume of a cylinder of the same base and height:

$$V = \frac{22}{7} \times r \times r \times h \text{ or } v = \frac{22}{21} r^2 h.$$

( $r$  means radius of the circular base.)

A solid is generally thought of as an object that is not hollow. But if we were to hollow it out and fill it with a different substance, we could still call it a solid. Since a solid occupies space, we can say that it has volume. Because a solid has 3 dimensions, volume is calculated in cubic feet or cubic yards. Volume is also expressed in pints, quarts, or gallons when it concerns liquids.

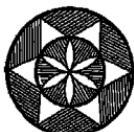
1. List a few solid objects of the types that are explained on the previous pages.
2. Find the volume of a coalbin that is 7 ft. long,  $6\frac{1}{2}$  ft. wide, and 6 ft. high. Since a ton of coal occupies 35 cu. ft., how many tons will the bin hold?
3. A cylindrical oil tank is 18 ft. high and has a radius of  $1\frac{1}{2}$  yd. How many gallons will the tank hold? (1 cu. ft. =  $7\frac{1}{2}$  gal.)
4. How much earth must be excavated to have a basement that is 8 ft. deep,  $13\frac{1}{2}$  yd. long, and  $7\frac{1}{2}$  yd. wide?
5. If a huge balloon has a 16-ft. diameter, find the amount of gas that can be put into the balloon.
6. A hot-water tank is 12 in. in diameter and 5 ft. high. How many gallons of water does it hold?
7. If a cubic foot of anthracite coal weighs 56 lb., how many tons can be stored in a bin 6 ft. long, 4 ft. wide, and 5 ft. high?

Fill in the following empty spaces and sketch a few of the objects:

	<i>Object</i>	<i>Type of Solid</i>	<i>Length (l)</i>	<i>Width (w)</i>	<i>Height (h)</i>	<i>Radius (r)</i>	<i>Volume</i>
8.	Church tower	Cone			100 ft.	15 ft.	? cu. ft.
9.	Basketball					5 in.	? cu. in.
10.	Barrel				8½ ft.	18 in.	? cu. ft.
11.	Box		2½ ft.	¾ yd.	5 in.		? cu. ft.
12.	Small room		6½ ft.	2½ yd.	78 in.		? cu. yd.
13.	Tank				9¾ yd.	5 ft.	? cu. ft.
14.	Ice-cream cone				5 in.	1½ in.	? cu. in.
15.	Dresser drawer		1 yd.	1½ ft.	½ ft.		? cu. ft.
16.	Globe					11 in.	? cu. ft.
17.	Block		18 in.	1½ ft.	½ yd.		? cu. ft.

Your interest in the chapters on algebra and geometry may lead to a bit of optional work. Look at familiar objects in nature, architecture, machinery, etc., and list the geometrical designs you find.

Draw a few geometrical designs using a ruler, compass (instrument to draw circles), and pencil. The following may give you some ideas:



## Chapter XX

# RATIO AND PROPORTION

**OBJECTIVE:** To show you a simple means of solving a class of problems that you have thought quite difficult if you have not learned the simple form of reasoning represented by ratio and proportion.

### LESSON 220

Ratio is a comparison between two numbers of the same kind. One can compare the lengths of two books, the heights of two buildings, the number of pieces of cake, etc.

If one book is 4 in. long and another 12 in., the second is 3 times as long as the first. The ratio is 4 to 12. It can be written as 4:12 or  $\frac{4}{12}$  which can be reduced to  $\frac{1}{3}$ . Therefore the ratio between the lengths is 1 to 3.

A little boy weighed 50 lb. and his sister weighed 75 lb. The ratio is 50:75 or  $\frac{50}{75}$  which is  $\frac{2}{3}$  when reduced.

Find the ratio between each of the following sets of numbers the first of which is always the numerator:

- |  |                                 |
|--|---------------------------------|
| 1. 35 lb. and 70 lb.                   | 8. 45 watches and 80 watches    |
| 2. 8 oz. and 14 oz.                    | 9. 60 cards and 24 cards        |
| 3. 2 ft. and 20 ft.                    | 10. 50 votes and 20 votes       |
| 4. 18 in. and 24 in.                   | 11. 75 homes and 125 homes      |
| 5. 2 ft. and 36 in.                    | 12. 22 families and 34 families |
| 6. 6 textbooks and 16<br>fiction books | 13. 7 boys and 28 boys.         |
| 7. 8 yd. and 6 yd.                     | 14. 28 votes and 56 votes       |
|  | 15. 16 ships and 48 ships       |

## LESSON 221

When two ratios are equal, we have a proportion. A proportion is often useful when we have three dimensions or terms in a problem and wish to find the fourth.

## EXAMPLE:

If a 12-ft. tree casts a 4-ft. shadow, how long is the shadow of a 6-ft. tree?

The ratio of the 4 ft. of shadow to the 12 ft. of the tree is 4:12 or  $\frac{1}{3}$ .

The length of the shadow of the 6-ft. tree is an unknown quantity which we shall represent by  $x$ . The ratio of the  $x$  ft. of shadow to the 6 ft. of the tree is  $x : 6$  or  $\frac{x}{6}$ .

Forming an equation (called a proportion), we have

$$1 : 3 = x : 6 \text{ (1 is to 3 as } x \text{ is to 6) or: } \frac{1}{3} = \frac{x}{6}$$

(one third equals  $x$  sixths).

In the proportion  $1 : 3 = x : 6$ , the inside terms (3 and  $x$ ) are called the means; the outside terms (1 and 6) are called the extremes. The product of the means equals the product of the extremes.

$$\text{Hence: } 3x = 6.$$

$$\text{Dividing both sides by 3 we get, } x = 2.$$

$\therefore$  The 6-ft. tree will cast a 2-ft. shadow.

**Note:** If you use the fractional form of the equation,  $\frac{1}{3} = \frac{x}{6}$ , multiply the numerator of each fraction by the denominator of the other for your new equation,  $3x = 6$ .

Make a proportion for each of the following problems and find the missing term.

1. A book is 10 in. long and 5 in. wide. Find the width of a book that is 8 in. long if the two are proportional.

2. If a family eats 2 loaves of bread in 3 days, how long will 8 loaves last?

3. How many dresses can be bought for \$59.25, if 3 dresses cost \$11.85?

4. If 6 women can complete as much work as 10 girls, how many girls are needed to do the work of 24 women?
5. 25 books cost \$62.50. Find the cost of 12 books.
6. A car travels 720 miles in 12 hr. How far will it go in 42 hr. at the same rate?
7. I earned \$84 in 3 weeks. How long will it take me to earn \$700?
8. 50 lb. of flour cost \$2.25. Find the cost of 85 lb.
9. There are 75 pupils in 3 classes. How many are there in 25 classes?
10. 9 cakes take 18 cups of flour. How many cakes will 46 cups of flour make?

## Chapter XXI

### REVIEW

#### Fundamentals

##### LESSON 222

Work and check:

1. Add: 83,695

47,594

58,346

7,972

5,063

49,852

2. Add: \$ 48.56

7.39

12.46

7.84

.95

4.65

123.48

3. From 346,847 take 37,968.

4. 46,847

  X 58

5.  $384,617 \div 17 = ?$

6. Change  $\frac{3}{4}$ ,  $\frac{4}{5}$ ,  $\frac{1}{2}$ , and  $\frac{7}{10}$  to common denominator; add.

7. From  $13\frac{5}{6}$  take  $7\frac{2}{3}$ .

8.  $9,348$

  X 12\frac{1}{2}

9.  $9\frac{1}{2} \times 5\frac{1}{4} \times 1\frac{1}{3} \times 2\frac{5}{8} = ?$

10.  $637,584 \div 13 = ?$

##### LESSON 223

Find the cost of:

1. 18 in. of ribbon at 25¢ a yard.

2. 40 in. of lace at 45¢ a yard.

3.  $1\frac{2}{3}$  yd. of cloth at 33¢ a yard.

4. 90 in. of trimming at 50¢ a yard.

5.  $1\frac{5}{8}$  yd. of unbleached domestic cloth at 12¢ a yard.

6.  $1\frac{3}{4}$  yd. of tape at 10¢ a yard.
7.  $3\frac{1}{4}$  yd. of ripplette at 20¢ a yard.
8.  $22\frac{1}{2}$  in. of longcloth at 32¢ a yard.
9. 1 yd. 6 in. of gingham at 38¢ a yard.
10. 1 yd. 9 in. of lawn at 16¢ a yard.

### Finding the Unknown Quantity

#### LESSON 224

1. $25 \times 4 =$	8. $285) \overline{97855}$
2. $88 \div 8 =$	
3. $38 \times 25¢ =$	9. $178) \overline{33588.6}$
4. $22 + 78 \div 10 \times 2 =$	
5. $17 + 6 \times 3 - 9 \div 5 =$	10. Add: 385
6. $285$ $\times 13$ $\underline{\hspace{2cm}}$	972 683.5 $\underline{\hspace{2cm}}$
7. $1,928$ $\times 19$ $\underline{\hspace{2cm}}$	9210.02 2 $\underline{\hspace{2cm}}$

11. Mrs. Brown made 5 dresses; she sold 3 at \$5.00 each and one at \$3.75. If the material costs \$5.65, how much did she get for her work?
12. Mary made 84 cookies and sold them at 10¢ a dozen. If she had 50¢ expenses, what was her gain?
13. A farmer owned 3 cows; each cow had 2 calves, how many head of cattle did he have?
14. A nurse spends 8 hr. a day taking care of 25 children. How much time could she spend with each one as an individual?
15. June owns 18 books, her brother has twice as many, and her sister has 7 books more than her brother. Find the total number of books.

## LESSON 225

Find the unknown quantities:

				Total
\$21.00				\$80.10
\$12.21	\$35.75	\$ 9.98	\$13.98	
\$ 9.00		\$10.00	\$12.95	\$46.45
\$19.95	\$13.00	\$18.25	\$16.75	
Total	\$82.23		\$66.17	\$266.42

## Review Problems

## LESSON 226

Work and check:

1.  $67,342$    2.  $58,301$    3.  $642,758$    4.  $43,768 \div 37 =$   
 $\underline{\times 96}$        $\underline{\times 79}$        $\underline{-359,689}$     5.  $90,364 - 74,324 \times 9 =$

6. In what fundamental problems are the following terms used: quotient, sum, dividend, subtrahend, multiplier, minuend, product, remainder, divisor, multiplicand?

7. The minuend is 34,674, the subtrahend 18,246; what is the remainder?

8. When 246 is the remainder and 43 is the subtrahend, what is the minuend?

9. Given 430,705 for the minuend and 136,966 for the subtrahend, what is the remainder?

10.  $953,467$                           11.  $346,847$   
 $\underline{-84,364}$                                    $\underline{-190,340}$

12. Find the product of 764 and 87.

13. When the quotient is 155 and the divisor is 32, what is the dividend?

14. If the dividend is 4,960 and the quotient is 155, what is the divisor?

15. Find the multiplier, when the multiplicand is 846 and the product is 10,458.

### Fractions

#### LESSON 227

Pick out the correct answers to the following problems and answer them with the corresponding letter:

1.  $\frac{1}{4}$  of 100 is (a) 20; (b) 25; (c) 50; (d) 25.
2.  $\frac{1}{3}$  of 60 is (a) 25; (b) 18; (c) 15; (d) 20.
3.  $\frac{1}{2}$  of 1000 is (a) 800; (b) 500; (c) 50; (d) 2000.
4.  $\frac{5}{8}$  of 640 is (a) 400; (b) 80; (c) 450; (d) 600.
5.  $\frac{2}{3}$  of 960 is (a) 32; (b) 64; (c) 320; (d) 640.
6.  $\frac{1}{3}$  of 780 is (a) 26; (b) 2340; (c) 234; (d) 260.
7.  $\frac{3}{4}$  of 1600 is (a) 120; (b) 800; (c) 400; (d) 1200.
8.  $\frac{4}{5}$  of 200 is (a) 40; (b) 160; (c) 200; (d) 120.
9.  $\frac{1}{16}$  of 160 is (a) 10; (b) 1; (c) 100; (d) 2.
10.  $\frac{4}{5}$  of 240 is (a) 120; (b) 60; (c) 12; (d) 100.
11.  $\frac{1}{4}$  of 64 is (a) 14; (b) 16; (c) 18; (d) 160.
12.  $\frac{4}{5}$  of 792 is (a) 700; (b) 792; (c) 790; (d) 795.
13.  $\frac{6}{10}$  of 222 is (a) 110; (b) 112; (c) 111; (d) 200.
14.  $\frac{2}{3}$  of 66 is (a) 60; (b) 22; (c) 44; (d) 33.
15.  $\frac{7}{8}$  of 32 is (a) 24; (b) 28; (c) 26; (d) 21.

#### LESSON 228

1. $\frac{1}{4} + \frac{1}{2} + \frac{1}{4} =$	7. $12\frac{5}{8} \times 2 =$
2. $\frac{5}{8} + \frac{1}{4} + \frac{1}{2} =$	8. $8\frac{1}{4} \div 2 =$
3. $\frac{3}{8} + \frac{5}{8} + \frac{7}{24} =$	9. $35 \times 1\frac{1}{3} \times 3\frac{3}{4} =$
4. $\frac{2}{3} + \frac{5}{8} + \frac{6}{16} =$	10. $185\frac{5}{9} - 17\frac{2}{3} =$
5. $\frac{21}{64} \div \frac{3}{17} =$	
6. $1\frac{1}{4} + 2\frac{1}{8} - 1\frac{1}{8} =$	

11. Farmer Jones had 800 chickens. If he sold  $\frac{3}{8}$  of them, find the number left.
12. Of the 32 pupils in Miss Bevin's class,  $\frac{4}{5}$  were tardy. How many were on time?
13.  $\frac{2}{3}$  of the 1,200 pupils in school were upper classmen. How many were in the lower classes?

14. A baker made 125 loaves of bread. If  $\frac{2}{5}$  were wheat,  $\frac{1}{5}$  rye, and the rest mixed breads, find the number of each kind made. At 9¢ a loaf, how much did the baker take in? (Gross profit.)

15.  $\frac{3}{8}$  of the 120 pupils walk to school. If the rest use 50¢ passes, how much will be taken in on Friday when the passes are sold?

## LESSON 229

Add:

$$\begin{array}{r} 1. \quad 2\frac{5}{8} \\ 3\frac{1}{4} \\ \hline 12\frac{1}{2} \end{array}$$

$$\begin{array}{r} 2. \quad 3\frac{1}{8} \\ 9\frac{1}{4} \\ \hline 16\frac{3}{8} \end{array}$$

$$\begin{array}{r} 3. \quad 22\frac{2}{5} \\ 5\frac{2}{3} \\ \hline 31 \end{array}$$

$$\begin{array}{r} 4. \quad \frac{1}{8} \\ 2\frac{5}{6} \\ \hline 18\frac{1}{2} \end{array}$$

Multiply:

$$\begin{array}{r} 5. \quad 222 \\ \times 18\frac{5}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 924 \\ \times 16\frac{2}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 6824\frac{2}{3} \\ \times 9 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 752 \\ \times 25\frac{1}{2} \\ \hline \end{array}$$

Divide:

$$9. \quad 22\frac{1}{3} \div 11 =$$

$$10. \quad 622\frac{5}{8} \div 16\frac{1}{2} =$$

Subtract:

$$\begin{array}{r} 11. \quad 783\frac{5}{8} \\ - 180\frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 12. \quad 65\frac{22}{25} \\ - 50\frac{4}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 13. \quad \frac{7}{8} \\ - \frac{1}{3} \\ \hline \end{array}$$

Multiply:

$$14. \quad \frac{7}{8} \times \frac{2}{3} \times \frac{27}{28} \times \frac{60}{81} =$$

$$15. \quad \frac{280}{869} \times \frac{60}{70} \times \frac{288}{888} \times \frac{41}{44} =$$

## Decimals

## LESSON 230

Solve and check:

$$1. \text{ Add: } 3.8, 22.07, 2.27, 100, 63.5 = \quad 8. \quad .21) \overline{2.9295}$$

$$2. \text{ Add: } 739, 287.3, .89, 2.06 =$$

$$9. \text{ Add: } 3.203$$

$$3. \quad 28.3 \\ - 5.002 \\ \hline$$

$$6. \quad 208 \\ \times .23 \\ \hline$$

$$107.198$$

$$4. \quad 289 - .308 =$$

$$2.002$$

$$5. \quad 2.789 \times 2.202 =$$

$$7. \quad .85) \overline{527.55}$$

$$17.$$

$$13.1$$

$$10. \begin{array}{r} 109.22 \\ \times 3.55 \\ \hline \end{array}$$

$$11. \begin{array}{r} 222.2 \\ \times 2.22 \\ \hline \end{array}$$

$$12. 384.55 \div 22.5 =$$

$$14. 1638.4 \div 200 =$$

$$13. 238.95 \div 300 =$$

$$15. 189.02 - 123.009 =$$

## LESSON 231

Fill in the correct common fraction and the correct answer:

<i>Decimal</i>	<i>Common</i>	<i>Fraction</i>	<i>Number</i>	<i>Answer</i>
1. .5	( $\frac{1}{2}$ )	of 300 =	(150)	
2. .66 $\frac{2}{3}$	( )	of 600 =	( )	
3. .25	( )	of 752 =	( )	
4. .33 $\frac{1}{3}$	( )	of 990 =	( )	
5. .75	( )	of 888 =	( )	
6. .15	( )	of 200 =	( )	
7. .12 $\frac{1}{2}$	( )	of 848 =	( )	
8. .2	( )	of 180 =	( )	
9. .8	( )	of 350 =	( )	
10. .62 $\frac{1}{2}$	( )	of 320 =	( )	
11. .9	( )	of 250 =	( )	
12. .1	( )	of 10 =	( )	
13. .4	( )	of 80 =	( )	
14. .37 $\frac{1}{2}$	( ), of	88 =	( )	
15. .6	( )	of 250 =	( )	
16. .7	( )	of 300 =	( )	

## LESSON 232

Answer each of the following as true or false:

1. .66 $\frac{2}{3}$  is the same as  $\frac{1}{3}$ .
2. .66 $\frac{2}{3}$  of 63 is 42.
3.  $\frac{5}{8}$  is equal to .62 $\frac{1}{2}$ .
4.  $.37\frac{1}{2} \times 40$  is 15.
5. .2 is the same as  $\frac{2}{5}$ .
6. .25 is  $\frac{1}{5} \times 200$ .
7.  $\frac{3}{8}$  is equal to .37 $\frac{1}{2}$ .
8. .5 of 36 is 16.
9. .9 of 300 cows is 260 cows.
10. .7 is equal to  $\frac{2}{4}\frac{1}{2}$ .
11. .4 of 600 tickets is 240 tickets.
12. .5 is equal to  $\frac{2}{4}\frac{1}{2}$ .
13.  $.37\frac{1}{2} = \frac{27}{80}$ .
14.  $.3 = \frac{24}{80}$ .
15. .8 of 240 is 182.

## Percentage

## LESSON 233

- |                             |  |
|-----------------------------|--|
| 1. $2\%$ of \$100 = ?       | 11. $50\%$ of 150 birds = ?            |
| 2. $3\%$ of \$200 = ?       | 12. $75\%$ of 72 chairs = ?            |
| 3. $5\%$ of \$800 = ?       | 13. $12\frac{1}{2}\%$ of \$64.80 = ?   |
| 4. $10\%$ of \$600 = ?      | 14. $7\%$ of \$70 = ?                  |
| 5. $4\%$ of \$16 = ?        | 15. $16\frac{2}{3}\%$ of \$60 = ?      |
| 6. $6\%$ of \$300 = ?       | 16. $33\frac{1}{3}\%$ of \$60 = ?      |
| 7. $9\%$ of \$72 = ?        | 17. $60\frac{1}{2}\%$ of \$60 = ?      |
| 8. $20\%$ of 100 books = ?  | 18. $33\frac{1}{3}\%$ of 90 horses = ? |
| 9. $40\%$ of 10 pencils = ? | 19. $37\frac{1}{2}\%$ of \$24.40 = ?   |
| 10. $25\%$ of 80 boxes = ?  | 20. $62\frac{1}{2}\%$ of 40 in. = ?    |

## LESSON 234

1. A man spent  $40\%$  of his money for a suit of clothes,  $33\frac{1}{3}\%$  for an overcoat,  $15\%$  for a pair of shoes. How much had he left if he had \$80 to begin with?
2. In a school with an enrollment of 1,200 pupils,  $35\%$  were sick. How many were sick, and how many were well?
3. What is the net price on a book listed at \$2.40 less a discount of  $15\%$ ?
4. What is the net price of a piano listed at \$950 less  $5\%$  and  $10\%$  discounts for cash payment?
5. A bill of dry goods listed at \$750 is offered at the net price of  $20\%$  and  $10\%$  off. What is the net price?
6. If \$10 is  $\frac{1}{8}$  of a girl's weekly earnings, what does she earn in 4 years if she works 48 weeks each year?
7. At 55¢ an hour (8 hours a day, 6 days a week), what does a man earn in 52 weeks?
8. Find the cost of  $3\frac{1}{4}$  yd. of Chantilly lace, at \$7.84 a yard.
9. Goods listed at \$785 was discounted at  $20\%$  and  $25\%$ . Find the net cost.
10. Find the interest on \$640 for 2 yr., 6 mo., 20 days at  $6\%$ .

## LESSON 235

1.  $8\% =$  what fraction?
2.  $16\frac{2}{3}\% =$  what fraction?

3.  $\frac{8}{25}$  is what per cent?
4. The whole of anything is what per cent?
5. What is 25% of \$3.20?
6. If I buy longcloth at 24¢ and sell it so as to gain 25%, what is the gain and selling price?
7. If I buy a chair for \$10 and sell it for \$18, what is the gain in per cent?
8. If a man buys groceries for \$12 and sells them at a gain of 33½%, for what does he sell the groceries?
9. If your bill for clothing is \$60 and you get a discount of 10% for cash, what do you pay?
10. What is 2% of \$120?

### Sewing Problems

#### LESSON 236

1. The regular price of a piece of taffeta silk was \$1.50; on sale it was 87¢ per yard. How much is saved by buying 3½ yd. on sale?
2. On a bill of \$50 I receive a discount of \$5. What per cent is this?
3. Your instructor sells 3½ yd. of cloth to one pupil and 7 yd. 22½ in. to another. How much will she receive for the two pieces at 84¢ a yard?
4.  $\$8\frac{3}{4} + \$3.76 + \$9\frac{1}{2} + \$3.045 + \$10\frac{1}{2} + \$0\frac{2}{5} = ?$
5. In a school of 276 pupils 33½% were graduated. How many pupils graduated?
6. Make out a receipted bill for the following: Buy from Gimbel Bros., New York, N. Y., 9½ yd. of silk at \$1.98 a yard, 6 doz. buttons at \$2.00 a doz., 1¾ yd. of lace at \$1.50 a yard, and 5 yd. of braid at 15¢ a yard.

#### LESSON 237

1. (To be dictated)  
Add: \$76.84; 784.39; 596.47; 7.53; 19.00; 0.53. Check.
2. From a piece of cloth measuring 10½ yd., 2¾ yd. were cut at one time, and 5 yd. 30 in. at another. How much was left?

3. Count the change received if a customer bought  $2\frac{1}{2}$  lb. of coffee at 35¢ a pound,  $3\frac{1}{2}$  lb. of tea at 50¢ a pound, and gave the clerk \$10.

4. When 15 yd. of hat braid cost \$3.90, what part of a yard can be bought for 13¢?

$$5. 7,683 \div 8 = ? \text{ Check.}$$

### Review of Sewing Problems and Fundamentals

#### LESSON 238

1. Change 2 yd. 15 in. to inches.
2. What will 24 in. of cloth cost at 18¢ a yard?
3. Change 48 in. to yards and parts of a yard.
4.  $8 \times 7 + 4 \div 5 \times 3 - 6 \div 5 = ?$
5.  $\$2\frac{1}{4} + \$1\frac{1}{2} = ?$
6. At 40¢ a yard, what will  $2\frac{1}{2}$  yd. of lace cost?
7. Add 3 yd. 18 in. and  $4\frac{1}{2}$  yd.
8. If 13 yd. of braid cost \$6.20, what will  $2\frac{1}{2}$  yd. cost?
9. Change  $3\frac{1}{2}$  yd. to inches.
10. If a girl saved  $\$3\frac{3}{4}$  each week, how much would she have in 2 yr. and 3 mo.? (52 weeks in one year.)

#### LESSON 239

1. Ornaments are priced at \$4.32 for  $\frac{1}{2}$  doz. What will be the cost of 15 ornaments?
2. What will be the cost of 108 in. of lace at 45¢ a yard?
3. Add:  $\$8\frac{1}{2}$ ,  $\$9.63$ ,  $\$7\frac{1}{2}$ ,  $\$9.47$ ,  $\$15\frac{1}{2}$ .
4. If 7 yd. of cloth cost \$8.40, find the cost of  $3\frac{2}{3}$  yd.
5. (a) Change 125 in. to yards and inches.  
(b) Change  $12\frac{1}{2}$  yd. to inches.
6.  $\frac{5}{8} + 2\frac{3}{4} + \frac{5}{8} = ?$
7.  $\frac{3}{4} \times \frac{5}{16} \times \frac{5}{8} = ?$
8.  $3\frac{2}{3} + \frac{5}{11} \times \frac{7}{8} = ?$
9.  $649\frac{3}{4}$   
     $- 27\frac{3}{4}$   
       $\hline$
10.  $9\frac{1}{3} \div \frac{23}{16} = ?$

#### LESSON 240

1. How much time is spent in trade from Monday 8:30 a.m. to Thursday 3:15 p.m.?
2. What will be the cost of two pieces of linen, one  $3\frac{1}{2}$  yd. long and the other 5 yd. 27 in. long at \$1.96 a yard?

3.  $\$8.47 + \$9.76 + \$5.43 + \$10.95 = ?$
4. Add  $7\frac{5}{8}$ ,  $3\frac{2}{5}$ ,  $7\frac{1}{2}$ , and  $9\frac{3}{8}$ .
5.  $46,789 \div 17 = ?$

### LESSON 241

1.  $2\frac{1}{2}$  yd. of longcloth cost 65¢. At that rate, find the cost of 24 in.
2. I bought three remnants measuring 6 yd. 14 in., 9 yd. 15 in., and 5 yd. 3 in., respectively. At an average price of 25¢ a yard, what did I pay for these remnants?
3. From  $17\frac{1}{2}$  yd. take  $8\frac{5}{8}$  yd.
4.  $531\frac{8}{5} + 148\frac{1}{5} = ?$

### LESSON 242

1. Change 3 yd. 14 in. to inches.
2. Change 1 yd. 19 in. to inches.
3. How many yards and inches are there in 126 in.?
4. What will 90 in. of lace cost at 45¢ a yard?
5. 846,758

X 387

Check.

### LESSON 243

1. Add  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{6}{15}$ ,  $1\frac{1}{6}$ .
2. Subtrahend  $48\frac{1}{2}$ , minuend  $345\frac{3}{4}$ ; find the difference.
3. Multiply  $\frac{22 \times 484 \times 268}{4 \times 11 \times 40 \times 11} = ?$
4. (a) Reduce 108 in. to yards.  
(b) Reduce 448 in. to yards.
5. (a) Change  $45\frac{3}{4}$  yd. to inches.  
(b) Change  $41\frac{1}{3}$  yd. to inches.

### LESSON 244

1. Find the cost of 3 yd.  $22\frac{1}{2}$  in. of lawn at 24¢ a yard.
2. How wide must a 4-in. flounce be cut in which there are to be three  $\frac{1}{16}$ -in. tucks and  $\frac{1}{2}$ -in. hem? Allow for turns and seams.

3. It takes 1 yd. 9 in. of Berkley cambric to make a waist. How many waists can be made from  $8\frac{1}{4}$  yd.?

4. Change 78 in., 48 in., 15 in., 30 in., 90 in., to yards and parts of yards. Add.

$$5. 3 \times 9 - 4 \times 2 \div 2 \times 5 - 25 \div 10 = ?$$

## LESSON 245

1. Add: \$147.50

35.70

61.80

130.50

16.70

Check.

2. What number multiplied by 581 will produce 2,100,315?

3. At  $10\frac{1}{2}\text{¢}$  for 1 yd., how many yards of percale can be bought for \$2.50?

4. A girl earns \$18.50 a week. She saves 10% of her money. How much does she save in 43 weeks?

5. At \$2.40 a day, how much could a girl earn during January and February of the present year, working 6 days a week?

6. Find the cost of a blue tweed coat for which the following materials were used: 3 yd. of tweed at \$1.29 a yard, 3 yd. of rayon lining at \$1.00 a yard,  $\frac{1}{2}$  yd. of Kasha cloth at \$2.88 a yard, 4 small buckles at 15¢ each, 1 large buckle at 20¢, 1 large button at 20¢, 1 small button at 20¢, 5 spools of sewing silk at 10¢ a spool, 4 spools of cotton thread at 10¢ a spool, lawn and tape, 41¢.

7. What is saved if this coat were made at home instead of being bought ready-made at a shop for \$29.50?

8. If 2 yd. of lace cost 75¢, what will 1 yd. cost?  $2\frac{1}{2}$  yd.?

9. If  $\frac{3}{4}$  yd. of material costs 20¢, what will  $1\frac{1}{2}$  yd. cost?

10. Add  $\$2\frac{1}{2}$ , \$.50,  $\$5\frac{1}{2}$ , \$9.73, and  $\$6\frac{2}{3}$ .

11. I have \$17.50, and spend \$3.50. What part have I spent? What percentage have I spent?

12. What will  $3\frac{1}{2}$  yd. and  $1\frac{1}{2}$  yd. of ribbon cost at 95¢ a yard?

13. Change  $\frac{5}{8}$  yd. and  $\frac{3}{4}$  yd. to inches and add.

## LESSON 246

1. How many inches in  $\frac{1}{2}$  yd.?
2. How many inches in  $\frac{3}{4}$  yd.?
3. How many inches in  $\frac{2}{3}$  yd.?
4. How many inches in  $\frac{1}{6}$  yd.?
5. How many inches in  $\frac{1}{8}$  yd.?
6. How many yards in 36 in.?
7. How many yards and inches in 40 in.?
8. How many yards in 72 in.?
9. How many yards in 108 in.?
10. How many yards in 54 in.?
11. What is the cost of 4 yd. at \$1.50 a yard?
12. What is the cost of  $2\frac{1}{2}$  yd. at 50¢ a yard?
13. What is the cost of  $13\frac{1}{3}$  yd. at 30¢ a yard?
14. Find the cost of 108 in. at 25¢ a yard.
15. Find the cost of 54 in. at 10¢ a yard.
16. Find the cost of 18 in. at \$5 a yard.
17. How many inches in your tape measure?
18. How many feet in 2 yd.?
19. If one book weighs  $\frac{1}{2}$  lb. and another  $\frac{1}{4}$  lb., how much do both weigh?
20. What is the cost of  $\frac{3}{4}$  lb. of butter at 36¢ a pound?

## LESSON 247

1. Change 105 in. to yards and inches.
2. Add  $2\frac{1}{2}$  yd. and 1 yd.  $22\frac{1}{2}$  in.
3. From  $2\frac{1}{2}$  yd. take 27 in.
4.  $4 \times 3$  yd. 12 in. = ?
5. Divide 2 yd. 20 in. by 4.
6. What part of a yard is 20 in.?
7. If 24 in. cost 36¢, what will 27 in. cost?
8. How many aprons can be made from 3 yd. of cloth, if it takes  $1\frac{1}{4}$  yd. for one apron. How many yards are left?
9. What is the cost of 8 hat frames at 75¢ apiece?
10. How many yards can be bought for \$1, if one yard costs  $33\frac{1}{3}$ ¢?

## Food Problems

## LESSON 248

Answer each of the following as a true or false statement:

1. 18 tbsp. = 1 c.
2. 1 lb. of butter is equal to 2 c.
3. 1 bu. contains 4 pk.
4. 5 qts. = 1 gal.
5. 15 oz. = 1 lb.
6.  $\frac{1}{2}$  bu. is equal to 1 pk.
7. 32 lb. is the same as 2 pk.
8.  $\frac{1}{4}$  c. contains 5 tbsp.
9. To bake a cake for 30 min. is the same as to bake it for  $\frac{1}{2}$  hr.
10. To boil for 3 min. is the same as boiling for 50 sec.
11.  $1\frac{1}{2}$  hr. = 90 min.
12. 8 tbsp. =  $\frac{1}{2}$  c.
13.  $\frac{1}{2}$  hr. = 1,800 sec.
14. 3 qt. = 1 gal.
15. 12 pk. = 3 bu.

## LESSON 249

Pick out the correct answers for the following problems and answer with the corresponding letter.

1. 1 qt. of milk costs 12¢. 1 gal. costs (a) 46¢; (b) 50¢; (c) 48¢; (d) 44¢.
2. 1 gal. of ice cream costs \$1.00. 1 qt. costs (a) 26¢; (b) 29¢; (c) 25¢; (d) 30¢.
3. A recipe calls for 5 eggs. If 10 times the recipe is made, how many eggs are needed? (a)  $2\frac{1}{2}$  doz.; (b) 2 doz.; (c) 50; (d) 48.
4. Eggs cost 26¢ a dozen, 5 doz. will cost (a) \$1.40; (b) \$1.35; (c) \$1.50; (d) \$1.30.
5. 1 can of corn costs 15¢. 1 doz. cans will cost (a) \$1.80; (b) \$1.90; (c) \$1.85; (d) \$1.75.
6. 1 can of soup costs 10¢. 1 gross will cost (a) \$14.30; (b) \$14.40; (c) \$14.35; (d) \$1.20.
7. Tomatoes are 3 lb. for 25¢. 12 lb. will cost (a) \$1.00; (b) \$1.50; (c) \$1.25; (d) 75¢.

8. Bananas are 5 lb. for 25¢. 20 lb. will cost (a) \$1.05; (b) \$1.00; (c) 95¢; (d) 75¢.
9. 60 min. is allowed to roast 1 lb. of meat. How long will it take for a 5-lb. roast? (a)  $4\frac{1}{2}$  hr.; (b) 4 hr.; (c) 5 hr.; (d)  $5\frac{1}{2}$  hr.
10. Apples are sold at 5 lb. for 30¢. Find the cost of 8 lb. (a) 50¢; (b) 40¢; (c) 35¢; (d) 48¢.
11. How many tbsp. in 2 cups? (a) 16; (b) 32; (c) 30; (d) 48.
12. How many ounces in 3 lb.? (a) 16; (b) 32; (c) 40; (d) 48.
13. How many cups in 8 lb. of butter? (a) 8; (b) 10; (c) 16; (d) 20.
14. There are 45 ginger snaps to 1 lb. How many are there to 5 lb.? (a) 225; (b) 215; (c) 220; (d) 230.
15. Radishes sell at 4 bunches for 5¢. How much will 20 bunches cost? (a) 28¢; (b) 20¢; (c) 25¢; (d) 30¢.

### LESSON 250

Complete the following statements:

1. A recipe calls for  $\frac{1}{4}$  cup butter; therefore 4 times the recipe uses ..... lb. of butter.
2. 5 tbsp. of sugar are put into a cake; therefore 8 cakes need ..... cups of sugar.
3.  $\frac{1}{4}$  lb. dried beef serves 3 people; so ..... lb. will serve 27 people.
4. 1 lb. of prunes serves 7 people, so 4 lb. will serve ..... people.
5. 4 people can eat 1 lb. of liver; therefore 10 people can eat ..... lb.
6. If there are 4 bananas to a pound, 10 lb. will have ..... bananas.
7. Each person receives 2 rolls; therefore ..... doz. must be made to serve 35.
8. 1 lb. of peas serves 3 people; 8 lb. will serve .....
9. 1 lb. of cooked cabbage serves 4; 10 lb. will serve .....
10. 1 lb. of ground meat serves 4;  $3\frac{1}{2}$  lb. will serve .....
11. 1 lb. of bacon has 24 slices;  $2\frac{1}{4}$  lb. has ..... slices.
12. 2 cups of rhubarb equal 1 lb.; 35 cups equal ..... lb.
13. 1 qt. of strawberries serves 4; ..... qt. serve 18.

14. 1 head of lettuce will garnish 8 salads; ..... heads will garnish 72 salads.

15. A Bermuda onion weighs about 10 oz.; ..... onions will be in 10 lb.



# APPENDIX I

## ARITHMETICAL DICTIONARY

**ABSTRACT NUMBER** — A number not joined to a name; just a number; for example, 10 or 5 (not 10 books or 5 pencils).

**ADD** — to put together ( $4 + 2 + 3 = 9$ ).

**ACRE** — 160 square rods.

**ARABIC NUMERALS** — figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

**AREA** — measurement of surface.

**ARITHMETIC** — the science and art of numbers.

**AVERAGE** — can be found by dividing the sum of the quantities by the number of quantities.

**BASE** — the amount of money on which percentage is figured; the foundation of a triangle.

**BIAS** — slanting across the threads of a cloth.

**BILL** — an account of money due for work done, materials, etc.

**BOLT** — a roll of cloth.

**BUDGET** — a plan for spending money or time.

**CALCULATION** — count.

**CALORIM** — the energy-producing value of foods.

**CANCEL** — strike out equal numbers.

**CHAIN DISCOUNT** — series of discounts.

**COMMISSION** — a percentage of the amount of sales a person makes; a part of the salary.

**COMPOUND INTEREST** — interest figured on the principal and accrued interest.

**CONCRETE NUMBER** — a number with a name, as 10 books or 5 pencils; a denominate number.

**CONCRETE PROBLEM** — word problem; a problem which deals with so many actual things, as vegetables or dollars or persons.

**COUNTER** — the numerator of a fraction; 3 is the numerator or counter of  $\frac{3}{4}$ .

**CROSS ADDITION** — adding without placing in a column.

**CROWN** — British coin worth \$1.20.

**CUBIC MEASURE** — having length, width, and thickness (2 in. long  $\times$  1 in. wide  $\times$  3 in. thick = 6 cu. in.).

## APPLIED MATHEMATICS FOR GIRLS

**DECIMAL FRACTION** - a fraction with a denominator of ten or a power of ten:

**DECREASED** - lessened.

**DEDUCT** - take away; subtract.

**DENOMINATE NUMBER** - having a definite name as 3 ft., 2 in., or 5 yd.; a concrete number.

**DENOMINATOR** - the name of a fraction; 4 is the denominator of  $\frac{1}{4}$ ; shows the number of parts into which a thing is divided.

**DIFFERENCE** - the amount being unlike; the difference between 15 and 10 is 5; process of subtraction; answer of a subtraction problem.

**DIGIT** - any of the figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 0; an abstract number.

**DISCOUNT** - the amount deducted from a certain price.

**DIVIDE** - to separate into parts.

**DIVIDEND** - the number or quantity to be divided.

**DIVISIBLE** - can be divided.

**DIVISOR** - a number or quantity by which another is divided.

**DOUBLE** - twice as much or two times as many.

**DOZEN** - 12 articles of the same kind.

**EAGLE** - (E) \$10 (ten dollars).

**EVEN NUMBER** - a number which can be divided by 2 without a remainder.

**EXACT INTEREST** - interest found for an exact number of days between given dates.

**EXPONENT** - A small figure written to the upper right of a number to show how many times that number is to be multiplied by itself.

**FARTHING** - an English coin, a fourth of a penny, worth about half a cent in U. S. money.

**FRACTION** - one or more of the equal parts of a whole as:  $\frac{1}{2}$  is one part of 2 equal parts.

**FOOT** - measurement equaling 12 in.

**FUNDAMENTALS** - the essentials of arithmetic; the basic things as addition, subtraction, multiplication, and division.

**GAIN** - in arithmetic it is usually the money left after expenses are paid; profit.

**GAUGE** - an instrument for measuring exact distances in seams and other parts of sewing problems.

**GRAPH** - a drawing showing the dependence of one thing upon others.

**GROSS** - 12 doz.; the amount of money taken in without any deductions of any kind.

**HEIGHT** - the distance up.

**IMPROPER FRACTION** — a fraction that is greater than 1 or in which the numerator is greater than the denominator, as:  $\frac{7}{4}, \frac{9}{2}$ .

**INCREASE** — to add, to make larger.

**INTEGER** — a whole number as 1, 5, 10, 18, 100.

**INTEREST** — money paid for the use of money.

**INVERT** — to turn upside down; to reverse the order as  $\frac{3}{4}$  is inverted to  $\frac{4}{3}$ .

**INVOICE** — a list of goods with their prices sent to a purchaser or receiver; a bill.

**KILOWATT** — a unit of electrical power equal to 1,000 watts.

**LENGTH** — the distance between two points.

**LOSS** — amount of money that a person lost in some enterprise.

**MEASUREMENTS** — tables used for measuring money, length, area, and volume.

**MILL** —  $\frac{1}{10}$  of a cent; 10 mills = 1 cent (U. S.).

**MINUEND** — a number or quantity from which another number is subtracted. (In  $700 - 200 = 500$ , 700 is the minuend.)

**MINUS** — the sign (−) meaning to subtract the quantity following it. If you owe someone 5¢, you have − 5¢.

**MIXED NUMBER** — a whole number and a fraction as  $7\frac{2}{3}, 2\frac{5}{6}$ .

**MONTH** — one of the twelve divisions of the year.

**MULTICIPAND** — the number that is to be multiplied. (In  $29 \times 3$ , 29 is the multiplicand.)

**MULTIPLIER** — the number the multiplicand is to be multiplied by. (In  $29 \times 3$ , 3 is the multiplier.)

**MULTIPLY** — take a number or quantity a given number of times (to multiply 5 by 2 means to take 5 twice, or add 2 fives); a process of increasing.

**NAMER** — denominator of a fraction. 4 is the namer of  $\frac{1}{4}$ .

**NET** — the amount left after all deductions have been made. (Net weight of a can of peaches is the weight of the peaches without the weight of the can.)

**NUMERATOR** — the counter of a fraction. 1 is the numerator of  $\frac{1}{3}$ .

**ODD NUMBER** — a number that has a remainder of 1 when divided by 2.

**PENCE** — the plural of penny.

**PENNY** — an English coin, valued at about 2¢; a U. S. bronze coin valued at .01 of a dollar.

**PER CENT (%)** — hundredths (10% of 100 is 10).

**PERCENTAGE** — part of arithmetic which deals with numbers expressed in per cents or hundredths.

**POUND** — a sum of British money worth 20 shillings or about \$4.86.

## APPLIED MATHEMATICS FOR GIRLS

**POWER OF A NUMBER** — the result of a number multiplied by itself a given number of times, for example,  $2^3 = 2 \times 2 \times 2 = 8$  or two raised to the third power.

**PRIME** — a number that cannot be divided without a remainder by any whole number except itself and 1; 7, 11, and 13 are prime numbers.

**PRINCIPAL** — the sum of money on which interest is paid.

**PRODUCT** — the number or quantity resulting from multiplying two or more numbers or quantities.

**PROFIT** — the gain.

**QUOTIENT** — a number obtained by dividing one number by another. (If you divide 12 by 6, the quotient is 2.)

**RATE** — pertains to interest in %. (Example, 6% is the rate of interest.)

**REMAINDER** — the part left over ( $10 - 6 = 4$  which is the remainder); process of subtraction.

**ROMAN NUMERALS** — numerals like XII, VI, IX used in the Roman and Greek systems of counting.

**SCHOOL WEEK** — 5 days.

**SELLING PRICE** — the price at which an article is sold.

**SHILLING** — a British coin worth about 24¢ in U. S.

**SQUARE MEASURE** — pertaining to area, having length and width (6 ft. long  $\times$  8 ft. wide = 48 sq. ft.).

**STATEMENT** — a kind of bill stating the date of purchase, balance to be paid, and references.

**SUBTRACT** — take away. (2 subtracted from six leaves 4.)

**SUBTRAHEND** — a number or quantity to be subtracted from another ( $10 - 8 = 2$ ).

**SUM** — the total of 2 or more numbers; answer of addition.

**SUPPLEMENTARY** — additional; more.

**TERMS (LOWEST)** — the lowest possible number to which a fraction can be reduced.

**TOTAL** — whole amount; process of addition.

**TRIPLE** — 3 times; to triple means to multiply by 3.

**UNIT** — a single thing; a standard of measurement.

**VALUE** — the amount an article is worth.

**WEEK** — 7 days; school week is 5 days.

**X** — times; the unknown in algebra.

**YIELD** – to give up or produce.

**YEAR** – 365 days or 366 days in leap year; when working with simple or compound interest, a year is equal to 360 days.

**ZERO** – the term used to represent nothing.

## Appendix II

### PRICES OF DRESS MATERIALS

Batiste, 29¢ to 54¢  
Broadcloth, cotton, 49¢ to 75¢  
Broadcloth, wool, \$3.00 to \$5.00  
Brocaded silk, \$2.25 to \$6.50  
Berkely cambric, 35¢  
  
Cashmere, \$1.98 to \$2.50  
Challis, cotton, 75¢ to \$1.00  
Challis, wool, \$1.74 to \$2.25  
Chambray, cotton, 36¢ to 57¢  
Chantilly lace, \$2.50 to \$7.50  
Cheesecloth, 5¢ to 15¢  
Chiffon, \$1.25 to \$1.50  
Chiffon, pleated, 4 in. wide, \$1.00 to \$2.50  
Corduroy, 89¢ to \$2.50  
Cotton felt, 35¢ to \$1.00  
Crepe cotton, 79¢ to \$1.19  
Crepe, flat, 75¢ to \$1.76  
Crepe, silk, \$1.25 to \$2.19  
Cretonne, 19¢, 29¢, to 85¢  
Crinoline, cotton, 10¢ to 25¢  
  
Dimity, 29¢ to 59¢  
  
Flannel, wool, 69¢ to 89¢  
Flannelette or outing, 22¢, 49¢, to \$1.09  
Flannelette, colored, 19¢ to 25¢  
  
Gingham, 29¢ to \$1.29  
Grenadine, \$1.25 to \$3.00  
  
Lace, cotton or silk, \$1.29 to \$2.50  
Lawn, 12¢ to 29¢  
Linen, 89¢ to \$1.98  
Lining, cotton, 19¢ to 49¢  
Lining, rayon, \$1.00 to \$1.39  
Lining, silk, \$1.39 to \$2.50  
Longcloth, 29¢ to 38¢

## APPENDIX II

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- Maline, 29¢ to 49¢
- Messaline, 40¢ to \$1.89
- Moire, silk, \$1.19 to \$3.40
- Muslin, bleached, 17¢ to 25¢
- Muslin, unbleached, 10¢ to 18¢
- Nainsook, 29¢ to 56¢
- Net, cotton and silk, 89¢ to \$1.59
- Percale, 16¢ to 39¢
- Percaline, 19¢ to 29¢
- Plaids, wool, \$1.98
- Poplin, cotton, black, 35¢ to 55¢
- Poplin, cotton and wool mixed, 89¢ to \$1.25
- Poplin, cotton, white, 59¢ to 69¢
- Poplin, silk, 75¢ to \$1.98
- Rayon acetates, 69¢ to \$3.98
- Rayon, celanese, 69¢ to \$1.15
- Rayon prints, 31¢, 39¢, 59¢, 79¢, \$1.00
- Ribbon, 10¢ to \$1.50
- Ribbon, grosgrain, 75¢ to \$1.20
- Ribbon, silk, 50¢ to \$1.25
- Ribbon, taffeta, 39¢ to 89¢
- Ribbon, velvet, \$1.29 to \$3.50
- Ripplette, cotton, 19¢ to 38¢
- Sateen, 29¢ to 56¢
- Satin, farmers'—lining, 98¢ to \$1.75
- Satin, silk, \$1.09 to \$4.98
- Satin, Skinner's—lining, \$1.25 to \$2.25
- Serge, cotton, 35¢, 68¢ to 79¢
- Serge, wool, \$1.25 to \$2.60
- Silk jersey, \$1.98
- Taffeta, 54¢ to \$1.79
- Taffeta, silk, 75¢ to \$1.80
- Tweed, wool, \$1.29 to \$2.25
- Velvet, \$1.75 to \$4.25
- Velvet, panne, \$4.50 to \$7.00 and \$8.00
- Velvet, silk, \$3.25 to \$6.56
- Velveteen, \$1.69 to \$1.98
- Voile, 59¢ to 89¢

## Appendix III

### WEIGHT MEASUREMENTS

Troy Weight		Apothecaries' Weight—Dry	
24 grains	= 1 pennyweight	20 grains	= 1 scruple
20 pwt.	= 1 ounce	3 scruples	= 1 dram
12 ounces	= 1 pound	8 drams	= 1 ounce
3.086 grains	= 1 carat	12 ounces	= 1 pound
480 grains	= 1 ounce	5760 grains	= 1 pound
5,760 grains	= 1 pound		

#### Abbreviations

scruple	= sc. or ʒ
dram	= dr. or ʒ
ounce	= oz. or ʒ
pound	= lb. or lb
minims	= M

#### Apothecaries' Weight—Fluid

		Avoirdupois Weight	
1 drop	= 1 minim	437½ gr.	= 1 oz.
60 minimis	= 1 fluid dram	7000 gr.	= 1 lb.
8 fluid drams	= 1 fluid ounce	16 dr.	= 1 oz.
16 fluid ounces	= 1 pint	16 oz.	= 1 lb.
8 pints	= 1 gallon	100 lb.	= 1 cwt.
1 tsp.	= 1 fluid dram	20 cwt.	= 1 ton (short)
1 dessert spoon	= 2 fluid drams	2000 lb.	= 1 ton (short)
1 tbsp.	= 4 fluid drams	100 lb.	= 1 keg (nails)
2 tbsp.	= 1 fluid ounce		
32 tbsp.	= 1 pint		

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