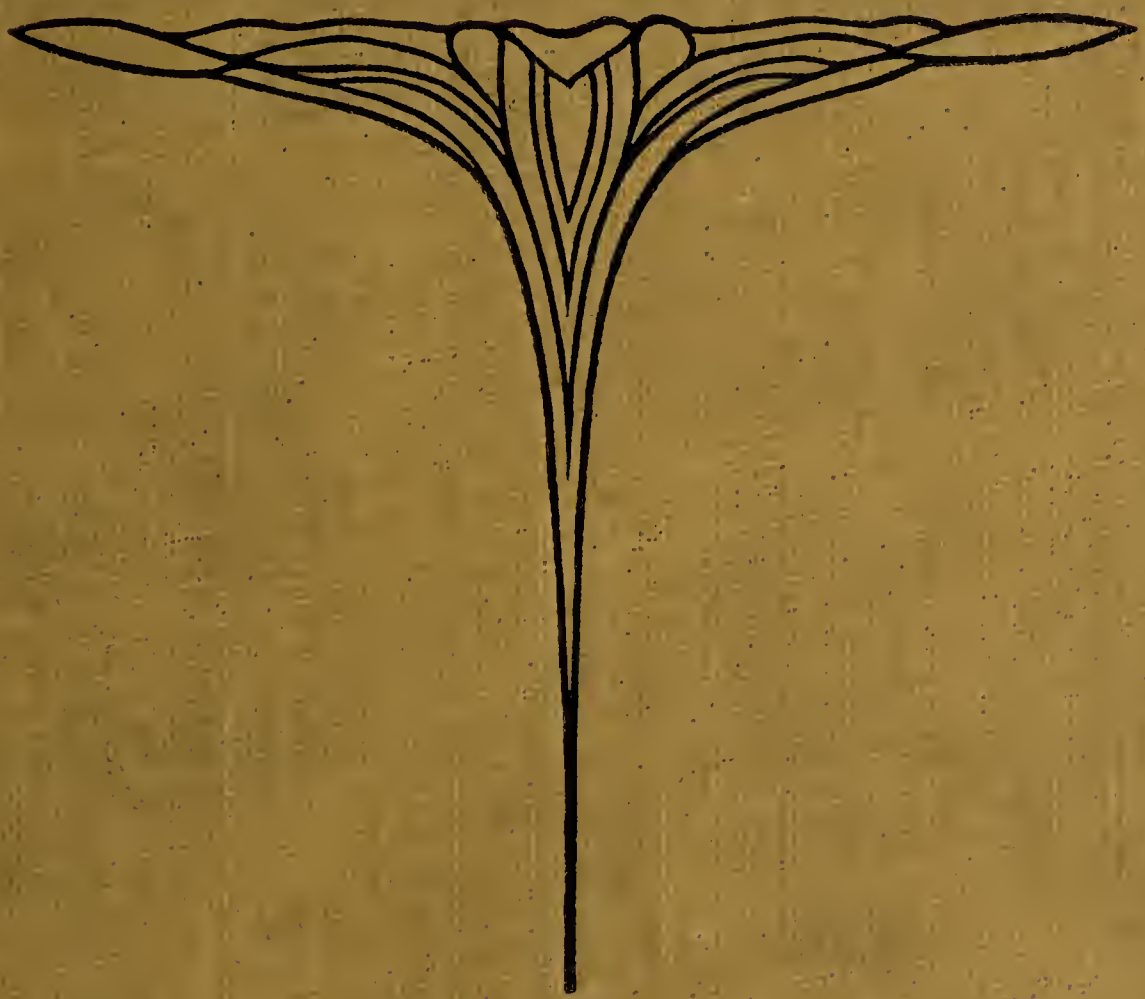
E WALSH-SUZZALLO ARITHMETICS

FOURTH YEAR BOOK



WALSH-SUZZALLO ARITHMETICS

BY

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By Grades

FOURTH YEAR

D. C. HEATH & CO., PUBLISHERS
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THE WALSH-SUZZALLO ARITHMETICS

Three-Book Course

I. Fundamental Processes
II. Essentials
III. Business and Industrial Practice

Two-Book Course

I. Fundamental Processes
II. Practical Applications

Course by Grades

I. Third Year Arithmetic
II. Fourth Year Arithmetic
III. Fifth Year Arithmetic
IV. Sixth Year Arithmetic
V. Seventh Year Arithmetic
VI. Eighth Year Arithmetic

D. C. HEATH & CO., PUBLISHERS

PREFACE

These books are designed to give an elementary school child all the arithmetical power necessary to cope with the situations of common everyday life. A social survey of the usual responsibilities of men has determined omissions and additions. The methods of learning and teaching employed have been indicated by an analysis of thousands of typical arithmetical errors collected in ordinary schools.

Because a standard of social efficiency has been applied throughout, it is expected that the immediate competency of the pupil leaving school will be greatly increased. Because a standard of pedagogical economy has likewise been rigidly observed, it is also expected that the pupils will develop this competency one to two years earlier.

In consequence, this series has been so arranged that a child may acquire an easy and accurate command over all fundamental processes, both simple and complex, by the end of the sixth year. The seventh and eighth school years are thus left free for a study of those business institutions and practices, the understanding of which is vital to an extended use of arithmetic in practical life.

This particular book, the first one in the series, covers

the fundamental elements of arithmetical manipulation and thought. Thus a child who goes no farther than the fourth or fifth grade will be so familiar with essentials that he can readily learn more arithmetic by himself.

No attempt has been made to project the pupil into unfamiliar situations. His experience is already greater than his power of mathematical interpretation. The teacher of primary arithmetic has accomplished enough when she has taught the child to solve his own problems. Hence, a special effort has been made to keep both examples and problems within the reach of the child.

While abstract work is the chief difficulty of the first school grades, it must ever be remembered that it is always a concrete and personally vital problem which provokes the need to compute. In all development of new technique, the teacher should start with an easy problem actually or orally expressed. Once the child has decided from the concrete situation what he is to do, he should be permitted to do it symbolically or abstractly. Mere drill on combinations, processes, and manipulations may well be abstract, provided the pupil feels the need of such perfection and knows that in the end his facility is to be used in the solution of real problems.

In this text, every new process is introduced by a problem that calls for its use. Similarly, the last drill upon a process is given in the form of oral and written problems. This is to remind the teacher that all abstract work, however important, is merely an intermediate stage in the

effective teaching of arithmetic. Ample provision must be made for concrete work at the beginning and end of all practice upon the mechanics of arithmetic.

The use of more than one way of working an example has been carefully avoided. We should be content with one concrete method of computation, particularly in the primary grades. To attempt to develop two different habits of response to the same situation leads to confusion and waste. Short methods of operation are given only in the higher grades.

Special attention is called to the device used to give the child a clear understanding of the manner in which formal processes are performed. Whenever a process is expressed in figures, each stage of the mental process accompanying it is also expressed in simple language. These parallel language statements take the form of simple directions given in the most economical and efficient order. If the child does not clearly see how the process has been conducted in the course of the teacher's demonstration, reference to the text makes it clear. In establishing a habit it is advantageous to follow an accurate, permanent, and consistent form. It is quite impossible for the teacher to give a great amount of attention to each individual in our large classes, and it is wise to develop in the child the power to understand and practice arithmetical manipulations by himself. In line with this effort to give the child power to care for himself, the child is constantly taught to test or check his work.

These texts are not a substitute for a good teacher; they are an important and necessary aid. They aim to be efficient and economical guides to both teacher and pupil. The topics, problems, and processes are representative of the arithmetical facts, power, and skill that will be most useful to the average citizen. The methods of treating them have been garnered from the most successful teaching practice.

CONTENTS

SECTION THREE

SECTION FOUR

ARITHMETIC

FOURTH YEAR

SECTION III

Reading and Writing Numbers

Read the following:

Oral Exercises

	A	*B*	*C*	*D*	*E*
a.	10,000	50,590	10,008	23,406	35,600
b.	11,000	61,725	11,017	44,444	52,983
c.	20,000	70,354	22,034	53,007	72,500
d.	31,000	83,976	36,090	85,021	93,811
e.	54,000	92,417	40,003	11,642	64,300

Written Exercises

Write in figures:

1. Sixty-one thousand.
2. Fifty-three thousand seven hundred.
3. Forty thousand sixty.
4. Thirty-two thousand nine.
5. Twelve thousand three hundred forty-five.
6. Seventy thousand seven.
7. Eighty-eight thousand eight hundred eighty-eight.

Addition and Subtraction

Written Exercises

1. Add. Test:

	A	*B*	*C*	*D*
a.	43,875	62,776	48,256	2,862
	2,250	2,342	38,451	2,473
	8,429	5,419	4,836	52,813
	885	763	629	694
	9,680	8,274	985	4,178
b.	13,336	12,643	84,195	47,386
	4,236	656	464	7,562
	48,512	5,472	7,358	3,625
	4,087	58,688	969	10,533
	6,472	4,865	4,272	8,524
c.	15,625	12,075	4,524	58,498
	7,405	4,437	7,525	4,295
	964	43,949	61,329	14,868
	38,228	5,350	2,316	5,564
	2,545	9,527	6,395	9,040
	21,864	20,685	4,567	6,977

2. Subtract. Test by adding upward:

a.	90,000	83,210	75,634	62,350
	7,086	75,065	9,876	48,907
b.	90,090	80,000	70,700	60,000
	83,956	1,234	36,895	5,080

3. Add:

	A	*B*	*C*	*D*
a.	$123.45	$907.48	$680.70	$159.24
	67.98	35.06	90.00	984.85
	76.59	243.65	77.96	76.54
	803.20	76.78	40.90	59.00
	47.00	90.12	465.58	266.13
	59.83	83.75	69.49	29.32
b.	$316.25	$949.34	$469.00	$ 52.63
	57.42	73.44	74.05	265.76
	54.58	750.27	526.51	83.74
	602.72	46.81	57.36	801.82
	59.50	245.54	425.83	724.00
	35.00	382.28	35.10	96.98
c.	$537.46	$456.56	$ 63.42	$ 37.42
	45.91	346.21	633.31	862.00
	48.91	86.90	678.92	375.89
	756.84	27.64	87.14	92.66
	88.00	78.04	694.00	348.15
	68.27	215.84	318.25	438.56

4. Subtract:

	A	*B*	*C*	*D*
a.	$385.34	$472.80	$316.25	$123.45
	198.76	73.86	158.87	67.89
b.	$907.48	$680.70	$469.00	$801.82
	244.65	465.58	74.05	724.98

Multiplication and Division

Drill Exercises

1. Give products:

	A	*B*	*C*	*D*	*E*
a.	2×20	3×20	4×20	5×20	2×91
b.	2×30	3×30	4×30	5×30	3×81
c.	2×40	3×40	4×40	5×40	4×71
d.	2×50	3×50	4×50	5×50	5×61
e.	2×60	3×60	4×60	5×60	6×51
f.	2×70	3×70	4×70	5×70	7×41

	F	*G*	*H*	*I*	*J*
a.	6×20	7×20	8×20	9×20	2×21
b.	6×30	7×30	8×30	9×30	3×31
c.	6×40	7×40	8×40	9×40	4×41
d.	6×50	7×50	8×50	9×50	5×51
e.	6×60	7×60	8×60	9×60	6×61
f.	6×70	7×70	8×70	9×70	7×71

2. Give quotients:

	A	*B*	*C*	*D*	*E*
a.	$30\overline{)270}$	$40\overline{)280}$	$50\overline{)450}$	$60\overline{)480}$	$20\overline{)160}$
b.	$70\overline{)350}$	$80\overline{)480}$	$90\overline{)810}$	$20\overline{)180}$	$30\overline{)180}$
c.	$80\overline{)720}$	$70\overline{)630}$	$60\overline{)540}$	$50\overline{)300}$	$40\overline{)360}$
d.	$40\overline{)320}$	$30\overline{)240}$	$20\overline{)160}$	$30\overline{)180}$	$50\overline{)250}$
e.	$50\overline{)350}$	$70\overline{)490}$	$90\overline{)630}$	$80\overline{)560}$	$60\overline{)360}$
f.	$60\overline{)420}$	$40\overline{)360}$	$30\overline{)210}$	$50\overline{)400}$	$70\overline{)280}$

Oral Problems

1. How many farms of 80 acres each can be made from 640 acres of land?

2. How much would be received for 9 cows, if they were sold at $50 each?

3. A man bought a lot for 6 hundred dollars, and built a house costing 18 hundred dollars. How many hundred dollars did both cost?

4. A cord of wood contains 128 cubic feet. How many cubic feet are there (*a*) in $\frac{1}{2}$ cord? (*b*) In $\frac{1}{4}$ cord?

5. From a box containing 30 dozen eggs, 200 eggs were sold. How many remained?

6. If a man works 309 days in a year, how much does he earn, at the rate of $3 per day?

7. How many cubic inches are there in a block of stone 40 inches long, 30 inches wide, 4 inches thick?

8. At 60 firecrackers to the pack, how many packs contain 540 firecrackers?

9. What is the cost of 480 pounds of butter at $\frac{1}{4}$ dollar per pound?

10. If 21 men require 32 days to do a piece of work, (*a*) what part of this time should it take 84 men to do the same work? (*b*) How many days?

11. A dealer received $32 each for 3 suits of clothes. How much less than $100 did he receive for them?

Multiplying and Dividing by 11

Oral Exercises

1. Count by 11's from 11 to 132.

2. How many are (*a*) two 11's? (*b*) Eleven 2's? (*c*) Three 11's? (*d*) Eleven 3's? (*e*) Four 11's? (*f*) Eleven 4's (*g*) Five 11's? (*h*) Eleven 5's? (*i*) Six 11's? (*j*) Eleven 6's? (*k*) Seven 11's? (*l*) Eleven 7's? (*m*) Eight 11's? (*n*) Eleven 8's? (*o*) Nine 11's? (*p*) Eleven 9's?

Written Exercises

1. Multiply by 11:

	A	*B*	*C*	*D*	*E*
a.	111	222	333	444	555
b.	666	777	888	909	876
c.	765	654	543	432	321
d.	454	565	787	898	579

2. Divide by 11:

	A	*B*	*C*	*D*
a.	1,210	1,342	1,595	1,859
b.	2,761	3,949	5,423	7,403
c.	9,119	8,712	7,260	5,808

3. Divide by 11. Find quotients and remainders:

	A	*B*	*C*	*D*
a.	3,681	8,937	9,432	9,004
b.	3,700	9,000	8,400	6,700

Multiplying and Dividing by 12

Learn the following table:

12 times 1 are 12	12 times 7 are 84
12 times 2 are 24	12 times 8 are 96
12 times 3 are 36	12 times 9 are 108
12 times 4 are 48	12 times 10 are 120
12 times 5 are 60	12 times 11 are 132
12 times 6 are 72	12 times 12 are 144

Oral Exercises

1. How many inches are there in 11 feet?

2. At 12 cents per yard, what is paid for 7 yards of muslin?

3. How many cents are 12 nickels?

4. How many eggs are there in 8 dozen?

5. Find the number of square inches in 12 rows, each containing 12 square inches.

6. How many cents are there in a dozen dimes?

7. How many panes of glass are there in 6 windows, each containing 12 panes?

8. How many feet are there in 12 yards?

9. How many years are there in 60 months?

10. How many dimes are there in $1.20?

11. How many inches in 3 feet 6 inches?

12. How many years and months in 40 months?

13. How many square feet are there in a plot of ground 12 feet square?

Sight Exercises

Give products:

	A	*B*	*C*	*D*
a.	9×12	12×8	20×12	12×30
b.	6×12	12×5	12×40	50×12
c.	7×12	12×4	60×12	12×70
d.	3×12	12×2	12×80	90×12

Written Exercises

Multiply by 12:

	A	*B*	*C*	*D*	*E*
a.	111	222	333	444	555
b.	666	777	818	729	645
c.	564	765	654	543	432
d.	321	454	565	787	809

Sight Exercises

Give quotients:

	A	*B*	*C*	*D*
a.	$120 \div 12$	$96 \div 12$	$360 \div 12$	$840 \div 12$
b.	$144 \div 12$	$48 \div 12$	$600 \div 12$	$960 \div 120$
c.	$108 \div 12$	$60 \div 12$	$840 \div 12$	$720 \div 12$
d.	$132 \div 12$	$84 \div 12$	$480 \div 12$	$240 \div 120$

Written Exercises

Divide by 12:

	A	*B*	*C*	*D*
a.	1,332	1,572	1,620	1,884
b.	2,772	3,948	5,424	7,416
c.	8,712	9,180	8,580	6,756
d.	5,088	3,384	4,500	6,336

Two Operations

Oral Problems

1. If 2 bats cost 20 cents, what will be the cost of 1 bat? What will be the cost of 7 bats?

2. If 3 pounds of sugar cost 18 cents, what will 5 pounds cost?

3. A man gives 6 cherries each to 8 children. How many does he give them? If he had 50 cherries at first, how many would be left?

4. Mrs. Smith has a dozen peaches. How many will she have if she gives 2 to each of her 3 children?

5. A girl buys a book for 15 cents and a writing pad for 6 cents. What is the cost of both? If she hands the storekeeper a 25-cent piece, how much change should she receive?

6. A row of corn contains 10 hills, 3 stalks to a hill. How many stalks are there in the row? How many stalks are there in 2 rows?

7. John has 2 pockets, each containing 9 marbles. How many marbles has he? What did they cost at 6 for a cent?

8. At 6 for a cent what will be the cost of 3 bags of marbles each containing 8 marbles?

9. A man has 2 dozen oranges. How many will he have after selling 5 oranges?

10. A boy has 40 cents. How much would he have after spending 25 cents for a ball and 10 cents for a bat?

11. A boy set out 3 rows of cabbage, each containing 8 plants. How many plants did he set out? If he set out 6 plants in another row, how many plants did he set out all together?

12. A farmer planted 5 rows of beans, 10 hills to the row. How many hills did he plant? If he planted 14 hills in another row, how many hills did he plant in the 6 rows?

13. What is the cost of one half of a 20-cent pie? What is the cost of half the pie and 25 cents' worth of sugar?

14. After buying $\frac{1}{2}$ pound of 40-cent tea, a girl gets 30 cents change. How much did she give the grocer?

15. How many pints of milk are there in two cans, one containing 20 quarts and the other containing 10 quarts?

16. A man had 20 quarts of berries. He used 12 quarts and sold the remainder for 5 cents per quart. What did he get for those he sold?

17. A lady gave a half dollar and 3 dimes for 2 yards of goods. What was the price per yard?

18. A girl rides 2 hours in a train going 40 miles per hour, and 3 hours in a stage going 3 miles per hour. How far does she go?

19. A boy is reading a book of 90 pages. He has read 40 pages. How long will it take him to complete the book if he reads 10 pages an hour?

Written Problems

1. If 2 bats cost 30 cents, what will be the cost of 1 bat? What will be the cost of 5 bats?

2. If 3 pounds of cheese cost 48 cents, what will 5 pounds cost?

3. A man gives 16 cherries apiece to 4 children. How many does he give them? If he had 75 cherries at first, how many would be left?

4. Mr. Smith has 90 postage stamps. How many will he have after giving a dozen to each of 6 boys?

5. What is the cost of a 35-cent book and a 16-cent pad? How much change does the storekeeper give out of 75 cents to a boy who buys these two articles?

6. A row of corn contains 16 hills, 3 stalks to a hill. How many stalks are there in the row? How many stalks are there in 2 rows?

7. William has 3 boxes, each containing 25 marbles. How many marbles has he? What would they cost at 5 for a cent?

8. At 6 for a cent what would be the cost of 3 boxes of marbles, 32 marbles to a box?

9. A man has 6 dozen lemons. How many lemons has he? How many will he have after selling 25 lemons?

10. A girl has 80 cents. How much would she have after spending 33 cents for a doll and 26 cents for the doll's clothes?

11. A girl planted 3 rows of geraniums, 14 plants in a row. How many geraniums did she plant? If she planted 18 pansies also, how many flowers of both kinds did she plant?

12. Ida had 3 cards of buttons, each containing 24 buttons, and one card containing 18 buttons. How many buttons were there in the 4 cards?

13. Find the cost of $\frac{1}{2}$ pound of tea costing 70 cents per pound. Find the total cost of the tea and a pound of 25-cent coffee.

14. After buying $\frac{1}{4}$ pound of 60-cent tea a boy gets 35 cents in change. How much did he give the storekeeper?

15. How many quarts of milk are there in two cans, one containing 9 gallons and the other containing 7 gallons?

16. A girl gathered 40 quarts of berries. She preserved 34 quarts and sold the remainder for 16 cents per quart. What did she get for those she sold?

17. A lady gave 3 quarters and 3 nickels for 6 yards of muslin. What did the muslin cost per yard?

18. A boy rode 2 hours on a train going 38 miles per hour and 3 hours in a stage going 4 miles per hour. How far did he ride?

19. A girl is reading a book of 123 pages. She has read 68 pages. How long will it take her to complete the book if she reads eleven pages an hour?

Multipliers containing Ciphers

Sight Exercises

Give products:

	A	*B*	*C*	*D*	*E*	*F*
a.	21 × 400	32 × 300	11 × 500	22 × 400	33 × 300	23 × 300
b.	2,100 × 4	3,200 × 3	1,100 × 5	2,200 × 4	3,200 × 3	2,200 × 3
c.	210 × 40	320 × 30	110 × 50	120 × 40	130 × 30	210 × 30

Written Exercises

1. Multiply 185 by 500.

	PROCESS
185 500 92500 *Ans.*	The product by 0 ones is 0; write 0 in the ones' column. The product by 0 tens is 0; write 0 in the tens' column. Place the right-hand figure of the product by 5 hundred in the hundreds' column.

2. Multiply:

	A	*B*	*C*
a.	486 × 200	329 × 300	239 × 400
b.	184 × 500	157 × 600	139 × 700
c.	118 × 800	109 × 900	478 × 200
d.	327 × 300	248 × 400	177 × 500

2. Multiply 427 by 230.

427 230 12810 854 98210 *Ans.*	PROCESS The product by 0 ones is 0; write 0 in the ones' column. Place the right-hand figure of the product by 3 under 3. Place the right-hand figure of the product by 2 under 2.

	A	*B*	*C*
a.	475×210	309×320	217×430
b.	175×520	146×630	128×740
c.	119×830	105×950	337×250
d.	209×360	208×470	170×580

3. Multiply (*a*) 408 by 205; (*b*) 205 by 408.

(*a*) 408 205 2040 8160 83640 *Ans.*	PROCESS In (*a*) place the right-hand figure of the product by 5 in the ones' column. Since the product by 0 tens	(*b*) 205 408 1640 8200 83640 *Ans.*

is 0, place a cipher in the tens' column. Place the right-hand figure of the product by 2 hundred in the hundreds' column of the same line.

	A	*B*	*C*
a.	102×806	108×907	207×405
b.	203×409	305×306	506×108
c.	389×205	473×205	309×309

4. Multiply (*a*) 279 by 346; (*b*) 346 by 279.

PROCESS

(*a*)
279
346
1674
1116
837
96534 *Ans.*

In (*a*) place the right-hand figure of the product by 6 under 6, the right-hand figure of the product by 4 under 4, and the right-hand figure of the product by 3 under 3.

(*b*)
346
279
3114
2422
692
96534 *Ans.*

Test (*a*) by multiplying 346 by 279, as in (*b*). If the results agree, both products are probably correct.

	A	*B*	*C*
a.	235 × 123	246 × 321	325 × 235
b.	437 × 214	562 × 173	684 × 142
c.	784 × 125	863 × 114	746 × 134
d.	527 × 184	408 × 238	336 × 260
e.	150 × 630	227 × 398	317 × 314
f.	208 × 407	638 × 156	416 × 239
g.	356 × 249	256 × 349	583 × 158
h.	475 × 206	567 × 146	900 × 106
i.	136 × 634	678 × 135	760 × 130
j.	235 × 389	786 × 127	508 × 103
k.	480 × 108	890 × 112	326 × 275
l.	340 × 290	120 × 780	156 × 570
m.	305 × 309	165 × 606	124 × 642
n.	208 × 404	234 × 367	205 × 350

Long Division

1. A pile of copper wire pieces weighs 9,807 ounces. If each piece weighs 21 ounces, how many pieces in the pile?

PROCESS

Ans. 467 (pieces)

21)9807
84
140
126
147
147

Take 98 as the first partial dividend and divide it by 21. Write 4, the first quotient figure, above the 8. Multiply 21 by 4, and place the product 84 under 98. Subtract 84 from 98, and to the remainder 14 annex 0, the next figure of the dividend, which makes 140, the second partial dividend. Divide 140 by 21, and write the quotient 6 above the 0. Multiply 21 by 6 and place the product 126 under 140. Subtract 126 from 140, and to the remainder 14 annex 7, the remaining figure of the dividend, which makes 147 the next partial dividend. Divide 147 by 21 and write the quotient 7 above the 7. Multiply 21 by 7 and place the product 147 under 147. As this is the same as the last partial dividend, there is no remainder. The quotient is, therefore, 467. Write *pieces* in parenthesis.

Ans. 286	*Ans.* 153	*Ans.* 137	*Ans.* 123
34)9724	53)8109	72)9864	81)9963
68	53	72	81
292	280	266	186
272	265	216	162
204	159	504	243
204	159	504	243

Write each figure in the quotient directly over the last figure of the partial dividend that produces it.

Testing Quotients

		Test		
Quotient	286	153	137	123
Divisor	× 34	× 53	× 72	× 81
	1144	459	274	123
	858	765	959	984
Dividend	9724	8109	9864	9963

2. Find quotients:

	A	*B*	*C*	*D*
a.	462 ÷ 21	714 ÷ 51	1,701 ÷ 81	3,936 ÷ 32
b.	483 ÷ 21	867 ÷ 51	2,592 ÷ 81	8,946 ÷ 42
c.	672 ÷ 21	612 ÷ 51	3,483 ÷ 81	9,828 ÷ 42
d.	693 ÷ 21	918 ÷ 51	4,374 ÷ 81	6,604 ÷ 52
e.	882 ÷ 21	816 ÷ 51	5,278 ÷ 91	1,820 ÷ 52
f.	651 ÷ 31	6,832 ÷ 61	1,092 ÷ 91	6,552 ÷ 52
g.	961 ÷ 31	1,403 ÷ 61	2,002 ÷ 91	1,352 ÷ 52
h.	682 ÷ 31	8,174 ÷ 61	1,183 ÷ 91	2,232 ÷ 62
i.	992 ÷ 31	2,745 ÷ 61	3,003 ÷ 91	1,550 ÷ 62
j.	713 ÷ 31	9,516 ÷ 61	4,004 ÷ 91	2,914 ÷ 62
k.	943 ÷ 41	7,881 ÷ 71	7,612 ÷ 22	1,944 ÷ 72
l.	533 ÷ 41	1,562 ÷ 71	3,476 ÷ 22	5,184 ÷ 72
m.	984 ÷ 41	9,514 ÷ 71	5,588 ÷ 22	1,476 ÷ 82
n.	902 ÷ 41	1,775 ÷ 71	4,352 ÷ 32	6,806 ÷ 82
o.	861 ÷ 41	9,656 ÷ 71	7,488 ÷ 32	6,900 ÷ 92
p.	561 ÷ 51	1,704 ÷ 71	7,104 ÷ 32	2,208 ÷ 92
q.	612 ÷ 51	9,372 ÷ 71	4,224 ÷ 32	4,416 ÷ 92

Sight Drills

1. Multiply:

	A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
a.	90	80	70	60	50	40	30	20
	×2	×3	×4	×5	×6	×7	×8	×9
b.	84	93	72	61	41	51	31	21
	×2	×3	×4	×5	×6	×7	×8	×9
c.	94	83	62	71	31	21	41	51
	×2	×3	×4	×5	×6	×7	×8	×9

2. Divide:

d.	180/20	240/30	360/40	350/50	360/60	280/70	320/80
e.	126/21	279/31	246/41	357/51	305/61	497/71	324/81
f.	630/90	819/91	243/81	568/71	183/61	255/51	164/41

3. Give quotients and remainders:

g.	190/21	248/41	186/61	248/81	369/91	357/71	460/51
h.	250/31	250/61	460/91	330/81	360/51	150/21	290/71
i.	100/99	200/99	300/99	400/99	400/98	400/97	400/96

Sight Problems

1. At 32 to a class, how many pupils are there in 4 classes?

2. At the rate of 21 miles per hour, how long would a trolley car require to go 147 miles?

3. Find the cost of 6 acres of land at $61 per acre.

4. How many suits of clothes at $21 each can be bought for $168?

5. What is the total weight of 6 tubs of butter if each weighs 51 pounds?

6. How many barrels will hold 369 gallons of oil if each holds 41 gallons?

7. How many yards around the 4 sides of a square each side of which measures 92 yards?

8. If a conductor receives $4.05 from 81 passengers, what does each pay?

9. At 51 nails to the pound, how many pounds will 459 nails weigh?

10. How many nails in 8 pounds if there are 61 nails to the pound?

11. A piece of rope 126 yards long is divided into 42 pieces. How many yards in each piece?

12. How many quarts of milk are there in 72 gallon-cans?

13. At 32 pounds to the bushel, how many bushels of oats will weigh 128 pounds?

14. How many 21-acre fields are there in a farm of 189 acres?

15. How far does a train travel in 4 hours at the rate of 42 miles per hour?

16. At 41 bushels to the acre, how many acres will produce 328 bushels of corn?

17. If a family uses 3 quarts of milk a day, how many quarts are used in July?

18. How many hours would a train require to go 128 miles at the rate of 32 miles per hour?

19. If 5 men require 41 hours to do a piece of work, how long would it take 1 man to do it?

20. What part of 276 is 92?

21. Find the cost of 72 2-cent postage stamps.

22. At 99 cents each, how many baseballs can be bought for $10, and how much change will there be?

23. If a hogshead contains 63 gallons, how many hogsheads are there in 189 gallons?

24. If 1 fourth of a number is 40, what is 3 fourths of the number?

120			?
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

25. If 3 fourths of a number is 120, what is 1 fourth of the number? What is the number?

26. What part of 120 is 40? What part of 120 is 30? What part of 120 is 90?

Remainders in Division

Sight Exercises

1. If I desire to divide 7 apples between 2 boys, how many whole apples can I give each? How can I divide the remaining apple between them? What is each part called?

2. What is the quotient of $7 \div 2$?

When the dividend does not contain the divisor an exact number of times, write the remainder, then draw a line, and underneath write the divisor.

$2\overline{)9}$	$3\overline{)20}$	$4\overline{)23}$
Ans. $4\frac{1}{2}$	*Ans.* $6\frac{2}{3}$	*Ans.* $5\frac{3}{4}$

	A	*B*	*C*
a.	$\frac{9}{4} = ?$	$\frac{17}{2} = ?$	$\frac{25}{3} = ?$
b.	$15 \div 2 = ?$	$19 \div 3 = ?$	$21 \div 4 = ?$

3. Give answers:

	A	*B*	*C*	*D*	*E*	*F*
a.	$3\overline{)22}$	$8\overline{)41}$	$6\overline{)37}$	$9\overline{)25}$	$5\overline{)51}$	$6\overline{)51}$
b.	$2\overline{)25}$	$3\overline{)38}$	$4\overline{)51}$	$8\overline{)25}$	$7\overline{)51}$	$6\overline{)25}$

	A	*B*	*C*	*D*
a.	$\frac{1}{2}$ of 9	$\frac{1}{3}$ of 10	$\frac{1}{4}$ of 13	$\frac{1}{4}$ of 31
b.	$\frac{1}{5}$ of 11	$\frac{1}{6}$ of 13	$\frac{1}{7}$ of 15	$\frac{1}{7}$ of 52
c.	$\frac{1}{8}$ of 25	$\frac{1}{9}$ of 19	$\frac{1}{6}$ of 37	$\frac{1}{5}$ of 52
d.	$\frac{1}{3}$ of 22	$\frac{1}{2}$ of 25	$\frac{1}{8}$ of 45	$\frac{1}{9}$ of 38

More than One Operation

Sight Problems

1. John has 12 marbles; James has 5 more than John. How many marbles have both?

2. If a girl saves 3 cents per day, how much less than a dollar does she save in October?

3. If a boy saves 2 cents per day, how much more than a half dollar does he save in October?

4. How many days in the first three months of 1916? (Leap year.)

5. How many days in April, May, and June?

6. From a 40-quart can of milk there have been sold 8 gallons. How many quarts remain?

7. What number divided by 21 gives a quotient of 4 and a remainder of 6?

8. A man has 39 cows in three fields. In one field he has 12 cows; in another field he has 14 cows. How many cows in the third field?

9. If a traveler's expenses are $3 per day, how much does he spend in three weeks?

10. Mary has as much more than 25 cents as Jane has less than 25 cents. If Mary has 32 cents, how much has Jane?

11. What must be added to 21 to obtain the difference between 15 and 58?

12. If 8 pounds of sugar cost 48 cents, how many pounds can be bought for 60 cents?

Written Problems

1. William has 25 marbles; Thomas has 16 more than William. How many marbles have both?

2. If a girl saves 3 cents a day, how much more than 50 cents does she save in February, 1916?

3. If a boy saves 4 cents a day in February, 1915, how much less than $ 2 does he save?

4. How many days in the first six months of 1914?

5. How many days in the last six months of 1915?

6. From a 41-gallon barrel of oil there have been sold 48 quarts. How many gallons remain?

7. What number divided by 21 gives a quotient of 3 and a remainder of 17?

8. A man has 60 cows in three fields. In one field he has 17 cows, in another he has 27 cows. How many has he in the third field?

9. If a traveler's expenses are $ 4 per day, how much does he spend in 7 weeks?

10. Sarah has as much more than 75 cents as Laura has less than 75 cents. If Laura has 58 cents, how much has Sarah?

11. What must be added to 39 to obtain the difference between 17 and 91?

12. If 3 pounds of coffee cost 72 cents, how many pounds can be bought for 96 cents?

13. When a 16 pound bag of sugar is worth 96 cents, what is the cost of 13 pounds?

Dividing by a Multiple of 10

Sight Exercises

Give quotients:

	A	*B*	*C*	*D*
a.	10)260	50)550	30)960	20)860
b.	40)880	20)680	70)700	80)880
c.	30)930	40)840	20)880	90)990

Oral Exercises

1. How many times are (*a*) 2 tens contained in 8 tens? (*b*) 3 tens in 12 tens? (*c*) 4 tens in 88 tens? (*d*) 6 tens in 60 tens? (*e*) 2 tens in 88 tens?

2. What is the quotient (*a*) of 8 cents ÷ 2 cents? (*b*) Of 8 dimes ÷ 4 dimes? (*c*) Of 6 tens ÷ 3 tens?

Written Exercises

1. A baseball stand contained 4200 seats. They were arranged in 30 sections. How many seats were in a section?

PROCESS

3|0)420|0 seats
Ans. 140 seats

Cut off by a vertical line the final cipher in both the divisor and the dividend. The numbers remaining will be 3 (the new divisor) and 420 (the new dividend).

	A	*B*	*C*	*D*
a.	50)1,350	20)6,940	40)9,760	30)9,720
b.	60)9,660	20)9,760	90)9,720	80)9,760
c.	50)8,000	40)9,800	30)9,540	60)9,720

Inexact Division

1. Divide 9,810 by 80.

PROCESS

$8|0\overline{)981|0}$

$122\frac{50}{80}$ *Ans.*

When there is a remainder, write the complete remainder, including the cipher cut off, over the original divisor.

NOTE. While performing the division the pupil need only consider the divisor as 8 and the dividend as 981, instead of 8 tens and 981 tens; but, at this stage the 5 tens remaining should be written as 50 over the divisor 8 tens, written as 80.

a. $20\overline{)9{,}910}$ *b.* $40\overline{)9{,}910}$ *c.* $60\overline{)9{,}910}$

d. $30\overline{)9{,}910}$ *e.* $50\overline{)9{,}910}$ *f.* $70\overline{)9{,}910}$

2. Divide 9,911 by 70.

PROCESS

$7|0\overline{)991|1}$

$\frac{1}{70}$

Since the dividend does not end in a cipher, there must be a remainder. In this case write the 1 cut off over the 70. When the division is performed, write before the 1, the 4 tens remaining, making the remainder 41.

$7|0\overline{)991|1}$

$141\frac{41}{70}$ *Ans.*

a. $40\overline{)2{,}316}$ *b.* $70\overline{)5{,}864}$ *c.* $80\overline{)6{,}873}$

d. $50\overline{)3{,}742}$ *e.* $60\overline{)3{,}915}$ *f.* $90\overline{)7{,}777}$

g. $30\overline{)6{,}418}$ *h.* $50\overline{)7{,}218}$ *i.* $70\overline{)8{,}326}$

j. $20\overline{)5{,}437}$ *k.* $40\overline{)6{,}351}$ *l.* $60\overline{)4{,}987}$

Oral Exercises

NOTE. Combine with the entire first number the tens of the second number, then the ones.

Thus $86 + 53 = 86 + 50(136) + 3 = 139$.
Also $86 - 53 = 86 - 50(36) - 3 = 33$.

1. Add:

	A	*B*	*C*	*D*	*E*
a.	30 + 60	70 + 25	42 + 53	73 + 26	54 + 42
b.	40 + 50	85 + 10	71 + 25	81 + 18	65 + 33
c.	70 + 20	60 + 34	82 + 23	63 + 24	76 + 22
d.	80 + 10	37 + 50	63 + 53	35 + 52	82 + 16

2. Subtract:

e.	90 − 30	85 − 35	49 − 23	99 − 19	34 − 13
f.	80 − 40	74 − 40	68 − 34	86 − 21	55 − 22
g.	70 − 20	63 − 23	87 − 45	70 − 23	94 − 33
h.	60 − 30	72 − 30	56 − 22	66 − 23	86 − 25

3. Add:

	A	*B*	*C*	*D*
i.	40¢ + 30¢	50¢ + 35¢	31¢ + 63¢	44¢ + 53¢
j.	50¢ + 40¢	65¢ + 30¢	42¢ + 52¢	55¢ + 41¢
k.	60¢ + 30¢	70¢ + 25¢	53¢ + 46¢	66¢ + 30¢
l.	70¢ + 20¢	85¢ + 10¢	64¢ + 33¢	77¢ + 22¢

4. Subtract:

	A	*B*	*C*
m.	$1.10 − $ .30	$1.05 − $.50	94¢ − 32¢
n.	$1.80 − $1.50	$1.06 − $.86	87¢ − 63¢
o.	$1.20 − $ .70	$1.07 − $.70	75¢ − 21¢
p.	$1.80 − $1.60	$1.08 − $.48	69¢ − 46¢

Oral Problems

1. There are 35 boys and 30 girls in a school. How many pupils are there?

2. In a school of 86 pupils, 42 are girls. How many are boys?

3. When a boy saves 30 cents more, he will have a dollar. How much has he now?

4. A girl has read 35 pages in her reader and she has 60 more to read. How many pages are there in the book?

5. If I pay 5 hundred dollars for one lot and 4 hundred dollars for another, what do I pay for both?

6. Of a farm of 96 acres, 40 acres are in wheat and the rest in corn. How many acres are there in corn?

7. A conductor collected 47 fares going out, and coming back, 40 fares. How many did he collect on the round trip?

8. There are 42 telephone poles on one side of the road and 36 telegraph poles on the other side. How many poles are there on both sides?

9. A farmer has 42 cows. How many must he buy in order to have 65?

10. How many are 23 and 23?

11. A grocer mixed 40 pounds of black tea with 25 pounds of green tea. How many pounds of mixed tea were there?

Long Division

Written Exercises

1. What is the cost per acre when a 64-acre farm costs (*a*) \$ 6720, (*b*) \$ 9600 ?

PROCESS

(*a*)

Ans. \$ 105

64)\$ 6720

64

320

320

Take 67 as the first partial dividend and write one, the first quotient figure over the 7. Since 32, the second partial dividend, does not contain 64, write 0, the second quotient figure over the 2. To 32 annex 0, the next figure of the dividend, making 320 the third partial dividend. Write 5, the last quotient figure, over the 0.

Place the first quotient figure over the right-hand figure of the first partial product and a quotient figure over each of the remaining figures of the dividend, writing a cipher when a partial dividend does not contain the divisor.

In (*b*) the third partial dividend is 0, the last figure of the dividend.

(*b*)

Ans. \$ 150

64)\$ 9600

64

320

320

0

2. Find quotients :

a. $7600 \div 25$	*b*. $9900 \div 66$	*c*. $8750 \div 35$
d. $9360 \div 45$	*e*. $8320 \div 52$	*f*. $9150 \div 61$
g. $8856 \div 82$	*h*. $8589 \div 21$	*i*. $8000 \div 32$
j. $9840 \div 41$	*k*. $9165 \div 13$	*l*. $9696 \div 16$
m. $9386 \div 26$	*n*. $5412 \div 44$	*o*. $8190 \div 90$

Divisors of More than Two Figures

Written Exercises

1. At $105 per acre, how many acres can be bought (*a*) for $6720? (*b*) for $9450?

PROCESS

(*a*)

Ans. 64 (acres)

105)6720

630

420

420

(*b*)

Ans. 90 (acres)

105)9450

945

0

Do not omit the final cipher in the quotient of (*b*).

2. Find quotients:

A	*B*	*C*
a. $981 \div 109$	*b*. $9919 \div 109$	*c*. $9595 \div 505$
d. $832 \div 208$	*e*. $9776 \div 208$	*f*. $9664 \div 604$
g. $921 \div 307$	*h*. $9824 \div 307$	*i*. $9842 \div 703$
j. $812 \div 406$	*k*. $9744 \div 406$	*l*. $9624 \div 802$

3. A dealer paid $8250 for automobiles at $1375 each. How many did he buy?

PROCESS

Ans. 6 (automobiles)

1375)8250

8250

Since there are four figures in the divisor and four in the dividend, there is but one figure in the quotient. Write this over the last figure in the dividend.

Ratio

Oral Problems

1. What part of a dozen (*a*) is 2? (*b*) 3? (*c*) 4? (*d*) 6?

2. If a dozen oranges cost 18 cents, what is the cost (*a*) of a half dozen? (*b*) Of $\frac{1}{3}$ dozen? (*c*) Of $\frac{1}{6}$ dozen?

3. At 3 peaches for 5 cents, (*a*) find the cost of 6 peaches. (*b*) Of 9 peaches. (*c*) Of a dozen peaches.

4. If 3 men can do a piece of work in 20 days, how long would it take 6 men to do the same work?

5. How many men can do in 10 days a piece of work that requires 5 men for 20 days?

6. At the rate of 20 pages in 3 days, how long would it take to finish 100 pages?

7. If 2 fifths of a number is 40, what is 4 fifths of the number?

8. When bricks sell for $7 a thousand, what is the cost of 7,000 bricks?

9. At 3 for 2 cents, find the cost of 60 newspapers.

10. When a 6-acre field produces 100 bushels of wheat, what should a 36-acre field produce at the same rate?

11. At the rate of 40 miles in 3 hours, how long should it take a freight train to go 160 miles?

Cancellation

Preparatory Exercises

1. (*a*) How many pigs at $7 each will pay for 27 cows at $35 each? (*b*) How many pigs at $7 each will pay for 28 cows at $34 each?

A LONG METHOD

In (*a*) the value of the cows is 27 times $35, or $945. The quotient of $945 by $7 gives 135 as the number of pigs.

(*a*)
$$\begin{array}{r} \$35 \\ \times 27 \\ \hline 245 \\ 70 \\ \hline \$7)\$945 \end{array}$$

Ans. 135 (pigs)

Find the answer to (*b*) by this method.

Examples involving only multiplication and division can sometimes be shortened by cancellation.

A SHORTER METHOD

In (*a*) indicate the product of 35 by 27, by placing the multiplication sign (×) between them. Indicate that this product is to be divided by 7 by writing the latter under a line drawn below the former. Divide 35 by 7, canceling both, and writing the quotient 5 above the former. The product of 5 and 27 is the number of pigs, 135.

$$\frac{35 \times 27}{7}$$

$$\frac{\overset{5}{\cancel{35}} \times 27}{\cancel{7}} = 135 \text{ (pigs)} \quad \textit{Ans.}$$

Find the answer to (*b*) by this method.

Written Problems

1. How many yards at 18 cents per yard will pay for 21 pounds of butter at 24 cents per pound?

PROCESS

Indicate the product of 24 (¢) by 21 and the quotient of this result by 18. Divide 18 and 24 by 6, canceling both, and writing the respective quotients 3 and 4. Cancel 3 and 21, writing the quotient 7. Write the product of 4 and 7 as the number of yards.

$$\frac{\overset{7}{\cancel{21}} \times \overset{4}{\cancel{24}}}{\underset{3}{\cancel{18}}} = 28 \text{ (yd.)}$$

2. How many pounds of sugar at 6 cents a pound will pay for 15 pounds of butter at 24 cents a pound?

3. How many pounds of butter at 25 cents a pound will pay for 75 pounds of sugar at 6 cents a pound?

4. How many pounds of pork at 15 cents a pound can be exchanged for 27 bushels of potatoes at 50 cents per bushel?

5. How many dozen of eggs at 33 cents per dozen will pay for 22 pounds of ham at 20 cents per pound?

6. When a 6-acre field yields 95 bushels of wheat, what should be the yield of an 18-acre field?

7. When 18 acres yield 276 bushels of wheat, what should be the yield of 6 acres?

8. At the rate of 370 miles in 20 hours, how many miles would a freight train go in 15 hours?

Denominate Numbers

Oral Exercises

1. How many hours (*a*) in a day and a half? (*b*) In 1 day 12 hours?

2. How many pints in a gallon?

3. How many quarts (*a*) in 3 gallons? (*b*) In 3 gallons 2 quarts?

4. How many quarts (*a*) in 2 pecks? (*b*) In 3 pecks? (*c*) In 4 pecks? (*d*) In a bushel?

5. How many eggs (*a*) in 3 dozen? (*b*) In 4 dozen?

6. How many days (*a*) in 7 weeks 1 day? (*b*) In 11 weeks?

7. How many weeks (*a*) in February, 1915? (*b*) How many weeks in January, and how many days over?

8. Change 4 feet 2 inches to inches.

9. Change 1 pound 6 ounces to ounces.

10. How many inches (*a*) in 2 feet? (*b*) In 3 feet? (*c*) In a yard?

11. How many minutes (*a*) in $\frac{1}{5}$ hour? (*b*) In $\frac{2}{5}$ hour?

12. What part of a day is (*a*) 6 hours? (*b*) 12 hours? (*c*) 18 hours?

13. Change 160 ounces to pounds.

14. Change 169 ounces to pounds and ounces.

15. Change 32 feet to yards and feet.

Written Exercises

1. How many hours (*a*) in $2\frac{1}{2}$ days? (*b*) In 2 days 12 hours?

2. (*a*) How many quarts in 13 gallons? (*b*) How many pints?

3. How many quarts (*a*) in 16 gallons? (*b*) In 16 gallons 2 quarts?

4. How many quarts (*a*) in 12 pecks? (*b*) In 3 bushels?

5. How many eggs (*a*) in 8 dozen? (*b*) In 7 dozen and a half?

6. How many days (*a*) in 14 weeks? (*b*) In 14 weeks 2 days?

7. (*a*) How many weeks in a year of 365 days, and how many days over? (*b*) How many days over in leap year, 366 days?

8. Change 8 feet 3 inches to inches.

9. Change 3 pounds 2 ounces to ounces.

10. How many inches (*a*) in 2 yards? (*b*) In $\frac{1}{2}$ yard? (*c*) In $2\frac{1}{2}$ yards?

11. How many minutes (*a*) in $\frac{1}{5}$ hour? (*b*) In $\frac{2}{5}$ hour? (*c*) In $\frac{3}{5}$ hour? (*d*) In $\frac{4}{5}$ hour?

12. What part of an hour is (*a*) 12 minutes? (*b*) 24 minutes? (*c*) 36 minutes? (*d*) 48 minutes?

13. How many bushels in 64 pecks?

14. (*a*) How many gallons in 64 quarts? (*b*) How many pints?

Fractional Parts of Numbers

Oral Exercises

1. How many ounces (*a*) in $\frac{1}{8}$ pound? (*b*) In $\frac{3}{8}$ pound? (*c*) In $\frac{5}{8}$ pound? (*d*) In $\frac{7}{8}$ pound?

2. Find (*a*) $\frac{1}{8}$ of 24. (*b*) $\frac{3}{8}$ of 24. (*c*) $\frac{5}{8}$ of 24. (*d*) $\frac{7}{8}$ of 24.

3. How many minutes (*a*) in $\frac{1}{5}$ hour? (*b*) In $\frac{2}{5}$ hour? (*c*) In $\frac{3}{5}$ hour? (*d*) In $\frac{4}{5}$ hour? (*e*) In $\frac{1}{6}$ hour? (*f*) In $\frac{5}{6}$ hour? (*g*) In $\frac{1}{2}$ hour? (*h*) In $\frac{1}{3}$ hour? (*i*) In $\frac{2}{3}$ hour? (*j*) In $\frac{1}{4}$ hour? (*k*) In $\frac{3}{4}$ hour?

4. How many hours (*a*) in $\frac{1}{2}$ day? (*b*) In $\frac{1}{4}$ day? (*c*) In $\frac{1}{3}$ day? (*d*) In $\frac{3}{4}$ day? (*e*) In $\frac{2}{3}$ day? (*f*) In $\frac{1}{8}$ day? (*g*) In $\frac{3}{8}$ day? (*h*) In $\frac{5}{8}$ day? (*i*) In $\frac{7}{8}$ day? (*j*) In $\frac{1}{6}$ day? (*k*) In $\frac{5}{6}$ day?

Sight Exercises

Give answers:

	A	*B*	*C*	*D*
a.	$\frac{1}{2}$ of 168	$\frac{1}{2}$ of 184	$\frac{1}{2}$ of 250	$\frac{1}{2}$ of 248
b.	$\frac{1}{3}$ of 366	$\frac{1}{3}$ of 396	$\frac{1}{3}$ of 369	$\frac{1}{3}$ of 648
c.	$\frac{1}{4}$ of 440	$\frac{1}{4}$ of 484	$\frac{1}{4}$ of 888	$\frac{1}{4}$ of 848
d.	$\frac{1}{5}$ of 255	$\frac{1}{5}$ of 300	$\frac{1}{5}$ of 555	$\frac{1}{5}$ of 525
e.	$\frac{1}{6}$ of 606	$\frac{1}{6}$ of 486	$\frac{1}{6}$ of 366	$\frac{1}{6}$ of 420
f.	$\frac{1}{8}$ of 168	$\frac{1}{8}$ of 248	$\frac{1}{8}$ of 328	$\frac{1}{8}$ of 480
g.	$\frac{2}{3}$ of 120	$\frac{3}{4}$ of 120	$\frac{1}{5}$ of 150	$\frac{2}{5}$ of 150
h.	$\frac{3}{5}$ of 150	$\frac{4}{5}$ of 150	$\frac{5}{6}$ of 180	$\frac{3}{8}$ of 160

Written Exercises

		A	*B*	*C*	*D*	*E*	*F*
1.	Find $\frac{1}{2}$ of	276,	480,	178,	360,	696,	720.
2.	Find $\frac{1}{3}$ of	360,	297,	165,	576,	480,	720.
3.	Find $\frac{1}{4}$ of	484,	360,	576,	720,	244,	676.
4.	Find $\frac{1}{5}$ of	510,	650,	360,	720,	480,	975.
5.	Find $\frac{1}{6}$ of	270,	444,	720,	516,	888,	978.

Find $\frac{2}{3}$ of 408.

METHOD

$\frac{2}{3}$ of $\overset{136}{\cancel{408}} = 272$, *Ans.* Find 1 third of 408, which is 136, by dividing 408 by 3, and cancel these two numbers. Multiply 136 by 2.

6.	Find $\frac{2}{3}$ of	342,	444,	396,	165,	576,	720.
7.	Find $\frac{3}{4}$ of	480,	360,	576,	720,	244,	676.
8.	Find $\frac{2}{5}$ of	510,	650,	360,	720,	480,	975.
9.	Find $\frac{3}{5}$ of	510,	650,	360,	720,	480,	975.
10.	Find $\frac{4}{5}$ of	510,	650,	360,	720,	480,	975.
11.	Find $\frac{5}{6}$ of	360,	480,	720,	516,	888,	978.

12. (*a*) Find $\frac{2}{6}$ of 216. (*b*) Find $\frac{1}{3}$ of 216. (*c*) Compare the two results.

13. (*a*) Find $\frac{3}{6}$ of 216. (*b*) Find $\frac{1}{2}$ of 216. (*c*) Compare the results. (*d*) Find $\frac{5}{6}$ of 216.

14. (*a*) Find $\frac{4}{6}$ of 216. (*b*) Find $\frac{2}{3}$ of 216. (*c*) Compare the results.

15. Find the sum of $\frac{1}{6}$ of 216 and $\frac{1}{3}$ of 216.

Written Problems

1. A man sold $\frac{7}{8}$ of his farm of 168 acres. How many acres did he sell?

PROCESS

Find 1 eighth of 168 by dividing 168 by 8, canceling these numbers, and writing the quotient 21, over the former. Multiply 21 by 7 to find 7 eighths.

$\frac{7}{\cancel{8}}$ of $\cancel{168}^{21}$ A. = 147 A. *Ans.*

The abbreviation for acres is A.; for pounds, lb.; for yards, yd.; for miles, mi.

2. How many pounds are there in $\frac{3}{8}$ of a ton of 2,000 pounds?

3. How many yards are there in $\frac{3}{4}$ mile, a mile containing 1,760 yards?

4. A planter sold $\frac{2}{3}$ of his crop of cotton consisting of 258 bales. How many bales did he sell?

5. Of a grove of 360 trees, three fifths are pine trees. How many are pine trees?

6. How far has a train gone when it has gone $\frac{5}{8}$ of the distance from New York to Washington, 224 miles?

7. A man sold for $\frac{7}{8}$ of its cost a farm that cost him $2,800. What did he receive for it?

8. An acre contains 160 square rods. How many square rods are there in a plot containing $\frac{4}{5}$ acre?

9. A piece of cloth contains 56 yards. How many yards are left after $\frac{3}{4}$ of the piece is used?

Cents as Divisors

Written Exercises

1. At 5 cents per yard, how many yards can be bought for $1.95?

PROCESS

Write the divisor and the dividend as *cents*.
195 cents contains 5 cents 39 times.
Write yd. in a parenthesis.

cents cents
5)195
Ans. 39 (yd.)

2. At 13 cents per pound, how many pounds of pork can be bought for $1.69?

(169 cents divided by 13 cents gives the *number* of pounds.)

3. Divide the following:

a. $3.64 ÷ $.07
b. $4.84 ÷ $.11
c. $4.84 ÷ $.44
d. $4.41 ÷ $.21
e. $10.50 ÷ 25¢
f. $10.50 ÷ 42¢
g. $40.50 ÷ 50¢
h. $17.22 ÷ 14¢

4. At 25 cents each, how many penknives can be bought for $12.75?

5. At 13 cents per quart, how many quarts of berries will $4.03 pay for?

6. At 30 cents per quart, how many quarts of ice cream can be bought for $10.80?

7. At 5 cents for each fare, how many fares amount to $3.45?

8. At 25 cents each, how many dolls can be bought for $6.25?

Long Division

1. A machine turns out 8,649 feet of wire in 83 minutes. What is the output per minute? What is the production per minute when 9,499 feet are delivered in 73 minutes?

PROCESS

Ans. $104\frac{17}{83}$ ft.

$$\begin{array}{r} 83\overline{)8649} \text{ ft.} \\ 83 \\ \hline 349 \\ 332 \\ \hline 17 \end{array}$$

Place the first quotient figure over the right-hand figure of the first partial product, and a quotient figure over each of the remaining figures of the dividend, writing a cipher when a partial dividend does not contain the divisor.

Ans. $130\frac{9}{73}$ ft.

$$\begin{array}{r} 73\overline{)9499} \text{ ft.} \\ 73 \\ \hline 219 \\ 219 \\ \hline 9 \end{array}$$

TEST

$$\begin{array}{rl} 104 & \textit{Quotient} \\ \times\, 83 & \textit{Divisor} \\ \hline 312 & \\ 832 & \\ \hline 8632 & \\ +\, 17 & \textit{Remainder} \\ \hline 8649 & \textit{Dividend} \end{array}$$

Test the result by adding the remainder to the product of the quotient by the divisor. The sum will equal the dividend if the work is correct.

$$\begin{array}{rl} 130 & \textit{Quotient} \\ \times\, 73 & \textit{Divisor} \\ \hline 390 & \\ 910 & \\ \hline 9490 & \\ +\, 9 & \textit{Remainder} \\ \hline 9499 & \textit{Dividend} \end{array}$$

2. Divide:

a. $7{,}656 \div 25$ *c.* $7{,}000 \div 66$ *e.* $2{,}000 \div 19$

b. $7{,}358 \div 35$ *d.* $9{,}400 \div 77$ *f.* $7{,}009 \div 28$

Oral Problems

1. Find the cost of 4 pounds of tea at 40 cents a pound.

2. I paid $1.20 for 6 pineapples. What was the price of each?

3. Andrew has 90 cents; Bernard has 60 cents more than Andrew. How much has Bernard?

4. A $2 bill is given in payment for goods amounting to $1.20. How much change is received?

5. What is the cost of $\frac{1}{2}$ yard of silk at the rate of $1.60 a yard?

6. If a man receives $2.40 a day of 8 hours, how much is he paid an hour?

7. When goods cost $1.60 a yard, what part of a yard can be bought for 40 cents?

8. After spending 80 cents I have 80 cents left, how much had I at first?

9. Find the total cost of 25 cents' worth of cake and 3 pounds of candy at 20 cents per pound.

10. A girl pays 30 cents for 3 half-pound boxes of candy. What does the candy cost a pound?

11. If 2 feet of wire rope cost 20 cents, what would be the cost of a yard?

12. Find the cost of a yard of ribbon at the rate of 20 cents for two thirds of a yard.

13. A farmer has 80 sheep. How many has he after he sells three quarters of them?

Written Problems

1. Find the cost of 6 pounds of tea at 45 cents per pound.

2. I paid $1.05 for 7 quarts of berries. What was the price of a quart?

3. Harry has 84 cents; Fred has 26 cents more than Harry. How much money has Fred?

4. I buy goods amounting to $3.85 and I give the grocer a $5 bill. How much change do I get?

5. What is the cost of $\frac{1}{2}$ yard of velvet at $3.50 per yard?

6. If a man receives $2.80 per day of 8 hours, how much is he paid by the hour?

7. When goods cost $2.80 per yard, what part of a yard can be bought for 35 cents?

8. After giving his sister 55 cents, a boy still has $1.35. How much money had he at first?

9. What is the cost of 3 pounds of candy at 35 cents per pound and 45 cents' worth of ice cream?

10. A boy pays $1.05 for 3 half-pound packages of tea. What does the tea cost a pound?

11. If 2 feet of wire cable cost 38 cents, what is the cost of a yard?

12. Find the cost of a yard of silk at the rate of 72 cents for two thirds of a yard.

13. A farmer has 144 sheep. How many would he have if he sold three fourths of them?

Roman Numbers

20 is written XX.
30 is written XXX.
40 is written XL.
50 is written L.
60 is written LX.
70 is written LXX.
80 is written LXXX.
90 is written XC
100 is written C.

A number between 20 and 29, 30 and 39, 40 and 49, etc., is expressed by placing the letter or letters representing the ones after the letter or letters representing the tens.

28 is written XXVIII.
34 is written XXXIV.
49 is written XLIX.
63 is written LXIII.
57 is written LVII.
72 is written LXXII.
96 is written XCVI.
85 is written LXXXV.

Express in Roman numbers:

A	*B*	*C*	*D*	*E*
22	66	82	49	18
33	77	75	31	27
44	88	64	26	32
55	99	59	81	46

Read:

A	*B*	*C*	*D*
XXIII	XLVIII	LXVI	XLV
XXIV	LXVII	XXV	LXIX
LVII	XXXVI	XLII	XXXV
XLIX	XCIX	XXIX	XLVII

NOTE. Owing to their limited application, but little attention should be given to Roman numbers.

Denominate Numbers

Long Measure

12 inches (in.)	1 foot (ft.)
3 feet	1 yard (yd.)
$5\frac{1}{2}$ yards	1 rod (rd.)
320 rods	1 mile (mi.)

Oral Problems

1. How many houses, each 20 feet wide, can be built from First Street to Second Street if the building space is 200 feet?

2. What is the distance from the middle of First Street to the middle of Second Street if each street is 50 feet wide, the sidewalk on each street is 7 feet wide, and the building space is 200 feet?

3. How many houses, each 20 feet wide, can be built from Avenue A to Avenue B if the building space is 800 feet?

4. What is the distance from the middle of Avenue A to the middle of Avenue B if each avenue is 60 feet wide, the sidewalk on each avenue is 10 feet wide, and the building space is 800 feet?

5. What part of a mile is the length of a square field, if each side measures 80 rods?

6. How many feet are there in a rod?

7. If there are 20 streets to a mile, how far do you walk in going from 60th Street to 85th Street?

Written Problems

1. Fill the blanks in the following:

$$1 \text{ mi.} = 320 \text{ rd.} = — \text{ yd.} = — \text{ ft.}$$
$$1 \text{ rd.} = 5\tfrac{1}{2} \text{ yd.} = — \text{ ft.}$$

2. When a man's pace measures 3 feet, how many paces are there in $\frac{1}{4}$ mile?

3. If a boy's pace is $2\frac{1}{2}$ feet, how many yards are equal to 120 paces?

4. When railroad ties are 3 feet apart, how many ties are there to a mile?

5. How many dollars will pay for 1,320 railroad ties at $\$\frac{1}{4}$ each?

6. How many rails each 60 feet long will make a mile?

7. At 18 pounds to the yard, find the weight of one 60-foot rail.

8. Measure the length of a page of your book. Measure the length of the cover. Find the difference between the two lengths.

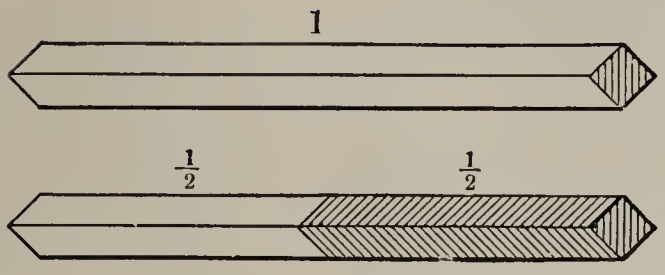
9. When streets are 264 feet apart how many streets are there to a mile?

10. When avenues are 880 feet apart, how many avenues are there to a mile?

11. How many miles does a person walk in going from Avenue A to Avenue I and from 18th Street to 33d Street?

Mixed Numbers Containing Halves

Preparatory Exercises



1. I buy one half dollar's worth of tea and one half dollar's worth of sugar. What do I pay for both?

2. How many half dollars (*a*) in \$1? (*b*) In \$2? (*c*) In \$$1\frac{1}{2}$? (*d*) In \$$2\frac{1}{2}$?

> $1\frac{1}{2}$, $2\frac{1}{2}$, etc., are called *mixed numbers.*

3. Change to a whole number or to a mixed number: (*a*) $\frac{2}{2}$. (*b*) $\frac{3}{2}$. (*c*) $\frac{4}{2}$. (*d*) $\frac{5}{2}$.

4. A man sold a pie and a half to a boy, and a half pie to a girl. How many did he sell to both?

5. A girl baked 3 pies. How many of them are left after $\frac{1}{2}$ pie is eaten?

6. A man earned \$3 per day. He spent \$$2\frac{1}{2}$ per day. How much did he save each day?

7. Give sums at sight:

a.	*b.*	*c.*	*d.*	*e.*
$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$
$+3\frac{1}{2}$	$+2\frac{1}{2}$	$+1\frac{1}{2}$	$+3$	$+\frac{1}{2}$

8. Give remainders at sight:

a.	*b.*	*c.*	*d.*	*e.*
$6\frac{1}{2}$	6	$6\frac{1}{2}$	6	6
$-3\frac{1}{2}$	$-\frac{1}{2}$	-4	$-1\frac{1}{2}$	$-4\frac{1}{2}$

Written Exercises

1. Three lots of cloth contained $13\frac{1}{2}$, $6\frac{1}{2}$, and $29\frac{1}{2}$ yards. How many yards in all?

PROCESS

First add the fractions. Their sum is $\frac{3}{2}$, which is equal to $1\frac{1}{2}$. Write the fraction $\frac{1}{2}$, and carry 1 to the column of ones, etc.

$13\frac{1}{2}$ yd.
$6\frac{1}{2}$
$29\frac{1}{2}$
Ans. $49\frac{1}{2}$ yd.

2. Add the following:

	A	*B*	*C*	*D*	*E*
a.	$20\frac{1}{2}$	$20\frac{1}{2}$	$37\frac{1}{2}$	25	$25\frac{1}{2}$
	37	$37\frac{1}{2}$	$6\frac{1}{2}$	$30\frac{1}{2}$	$30\frac{1}{2}$
b.	$48\frac{1}{2}$	$18\frac{1}{2}$	$37\frac{1}{2}$	$23\frac{1}{2}$	17
	$37\frac{1}{2}$	$14\frac{1}{2}$	$56\frac{1}{2}$	$15\frac{1}{2}$	$18\frac{1}{2}$
c.	$63\frac{1}{2}$	$55\frac{1}{2}$	27	1	23
	$8\frac{1}{2}$	20	$6\frac{1}{2}$	$17\frac{1}{2}$	$9\frac{1}{2}$
	$9\frac{1}{2}$	$17\frac{1}{2}$	48	$8\frac{1}{2}$	64
d.	20	$37\frac{1}{2}$	$3\frac{1}{2}$	$25\frac{1}{2}$	17
	$36\frac{1}{2}$	$20\frac{1}{2}$	18	$26\frac{1}{2}$	$6\frac{1}{2}$
	$6\frac{1}{2}$	30	50	27	18
	9	$1\frac{1}{2}$	$4\frac{1}{2}$	10	$25\frac{1}{2}$
e.	$21\frac{1}{2}$	$15\frac{1}{2}$	$18\frac{1}{2}$	$30\frac{1}{2}$	$20\frac{1}{2}$
	$21\frac{1}{2}$	$15\frac{1}{2}$	$18\frac{1}{2}$	$20\frac{1}{2}$	$20\frac{1}{2}$
	$21\frac{1}{2}$	$15\frac{1}{2}$	$18\frac{1}{2}$	$10\frac{1}{2}$	$20\frac{1}{2}$
	$21\frac{1}{2}$	$15\frac{1}{2}$	$18\frac{1}{2}$	$5\frac{1}{2}$	$20\frac{1}{2}$

Subtraction

3. Find answers:

	A	*B*	*C*	*D*	*E*
a.	$4\frac{1}{2}$	41	$41\frac{1}{2}$	$31\frac{1}{2}$	$20\frac{1}{2}$
	$+\ ?$	$+\ ?$	$+\ ?$	$+\ ?$	$+\ ?$
	$50\frac{1}{2}$	$50\frac{1}{2}$	50	50	50
b.	?	?	?	?	?
	$+36$	$+36\frac{1}{2}$	$+36\frac{1}{2}$	$+30\frac{1}{2}$	$+19\frac{1}{2}$
	$50\frac{1}{2}$	$50\frac{1}{2}$	50	50	50

4. Subtract $19\frac{1}{2}$ from 100.

PROCESS

Say $\frac{1}{2}$ and $\frac{1}{2}$ (writing $\frac{1}{2}$) are 1. Carrying 1 to 9, say 10 and **0** (writing 0) are 10. Carrying 1 to 1, say 2 and **8** (writing 8) are 10. Test by adding $80\frac{1}{2}$ and $19\frac{1}{2}$.

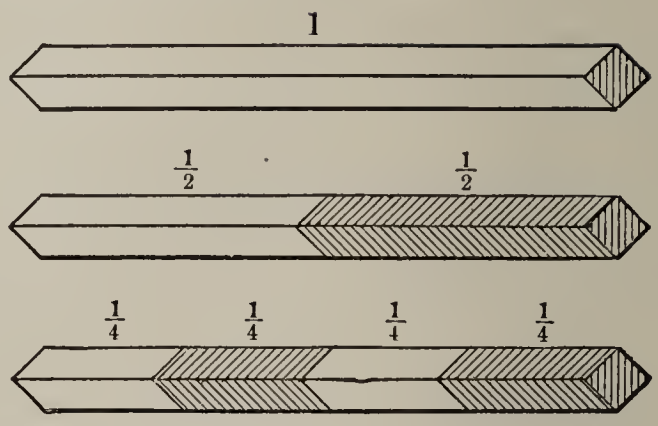
$$\begin{array}{r} 100 \\ -\ 19\frac{1}{2} \\ \hline 80\frac{1}{2} \end{array}$$ *Ans.*

5. Subtract:

	A	*B*	*C*	*D*	*E*
a.	80	$75\frac{1}{2}$	$93\frac{1}{2}$	62	$48\frac{1}{2}$
	$-19\frac{1}{2}$	$-48\frac{1}{2}$	-57	$-13\frac{1}{2}$	-29
b.	$50\frac{1}{2}$	$47\frac{1}{2}$	$31\frac{1}{2}$	$44\frac{1}{2}$	63
	$-28\frac{1}{2}$	-19	$-17\frac{1}{2}$	$-16\frac{1}{2}$	$-14\frac{1}{2}$
c.	$51\frac{1}{2}$	62	$73\frac{1}{2}$	$84\frac{1}{2}$	$72\frac{1}{2}$
	-22	$-19\frac{1}{2}$	$-25\frac{1}{2}$	-46	$-26\frac{1}{2}$
d.	95	$86\frac{1}{2}$	$77\frac{1}{2}$	68	$50\frac{1}{2}$
	$-59\frac{1}{2}$	$-38\frac{1}{2}$	-49	$-19\frac{1}{2}$	-23

Halves and Fourths

Preparatory Exercises



1. How many quarters in 1 quarter and 1 quarter?

2. What single piece of money has the same value as 2 quarter dollars?

3. What fraction has the same value as $\frac{2}{4}$?

NOTE. When $\frac{2}{4}$ is changed to $\frac{1}{2}$, it is expressed in *lowest terms.*

4. How many fourths are 3 fourths and 1 fourth?

5. Give the sum of $\frac{3}{4}+\frac{1}{4}$ as a whole number.

Improper Fractions. Mixed Numbers

$\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{2}{5}$, are called *proper fractions*, since each is less than 1.

$\frac{2}{2}$, $\frac{4}{3}$, $\frac{6}{4}$, $\frac{10}{5}$, are called *improper fractions*, since each is 1 or more.

$2\frac{1}{2}$, $3\frac{1}{4}$, $7\frac{2}{3}$, are called *mixed numbers*, since each consists of a whole number and a fraction.

6. Change each of the following improper fractions to a whole number or to a mixed number:

a. $\frac{2}{2}$.	*b*. $\frac{3}{2}$.	*c*. $\frac{4}{4}$.	*d*. $\frac{5}{4}$.
e. $\frac{4}{2}$.	*f*. $\frac{9}{4}$.	*g*. $\frac{8}{4}$.	*h*. $\frac{5}{2}$.

7. How many dollars are (*a*) 4 quarter-dollars? (*b*) 4 half-dollars? (*c*) 6 half-dollars?

Addition

8. Find the sum (*a*) of $38\frac{1}{4}$ and $27\frac{1}{4}$. (*b*) Of $38\frac{1}{4}$ and $27\frac{1}{2}$. (*c*) Of $38\frac{3}{4}$ and $27\frac{1}{2}$. (*d*) Of $38\frac{3}{4}$ and $27\frac{3}{4}$.

a.	*b.*	*c.*	*d.*
$38\frac{1}{4}$	$38\frac{1}{4}$	$38\frac{3}{4}$	$38\frac{3}{4}$
$+\ 27\frac{1}{4}$	$+\ 27\frac{1}{2}$	$+\ 27\frac{1}{2}$	$+\ 27\frac{3}{4}$
Ans. $65\frac{1}{2}$	*Ans.* $65\frac{3}{4}$	*Ans.* $66\frac{1}{4}$	*Ans.* $66\frac{1}{2}$

In (*a*) the sum of the fractions is $\frac{2}{4}$. Change $\frac{2}{4}$ to $\frac{1}{2}$ and write $\frac{1}{2}$ under the fractions. Add the whole numbers.

In (*b*) change $\frac{1}{2}$ to $\frac{2}{4}$ and add to $\frac{1}{4}$. Write the sum, $\frac{3}{4}$, under the fractions; etc.

In (*c*) change $\frac{1}{2}$ to $\frac{2}{4}$ and add to $\frac{3}{4}$, making $\frac{5}{4}$, which is equal to $1\frac{1}{4}$. Write $\frac{1}{4}$ under the fractions and carry 1 to the whole numbers.

In (*d*) change the sum of the fractions $\frac{6}{4}$ to $1\frac{2}{4}$, which is equal to $1\frac{1}{2}$. Write $\frac{1}{2}$ under the fractions and carry 1 to the whole numbers.

Sight Exercises

NOTE. Change $\frac{2}{4}$ in a result to $\frac{1}{2}$.

Give sums:

	A	*B*	*C*	*D*	*E*
a.	$3\frac{1}{4}$	$3\frac{1}{4}$	$4\frac{3}{4}$	$1\frac{3}{4}$	$3\frac{1}{4}$
	$+3\frac{1}{4}$	$+3\frac{3}{4}$	$+5\frac{1}{4}$	$+1\frac{3}{4}$	$+6\frac{3}{4}$
b.	$1\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{1}{4}$	$3\frac{1}{4}$
	$1\frac{1}{4}$	$3\frac{3}{4}$	$2\frac{1}{4}$	2	$3\frac{1}{4}$
	$1\frac{1}{4}$	4	$2\frac{1}{4}$	$1\frac{3}{4}$	$3\frac{1}{2}$

Written Exercises

Add the following:

	A	*B*	*C*	*D*	*E*
a.	$13\frac{1}{4}$	$6\frac{1}{4}$	$20\frac{3}{4}$	$7\frac{1}{4}$	$17\frac{1}{4}$
	$3\frac{3}{4}$	$16\frac{1}{4}$	$8\frac{1}{4}$	29	$9\frac{1}{4}$
	25	$26\frac{1}{4}$	$9\frac{1}{4}$	$50\frac{1}{4}$	$23\frac{1}{4}$
b.	$53\frac{3}{4}$	$53\frac{3}{4}$	$25\frac{1}{2}$	$48\frac{3}{4}$	$48\frac{3}{4}$
	$27\frac{1}{4}$	$27\frac{1}{2}$	$65\frac{1}{4}$	$29\frac{1}{4}$	$29\frac{1}{2}$

Sight Exercises

Give answers:

	A	*B*	*C*	*D*	*E*
a.	$16\frac{1}{2}$	$24\frac{3}{4}$	$33\frac{3}{4}$	$47\frac{1}{4}$	$50\frac{1}{2}$
	$-1\frac{1}{4}$	$-2\frac{1}{2}$	$-3\frac{1}{4}$	$-4\frac{1}{4}$	$-5\frac{1}{4}$
b.	$29\frac{1}{2}$	$38\frac{3}{4}$	$42\frac{3}{4}$	35	46
	$-1\frac{1}{4}$	$-2\frac{1}{2}$	$-1\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{2}$
c.	28	36	47	$55\frac{1}{2}$	$63\frac{1}{2}$
	$-1\frac{1}{4}$	$-2\frac{1}{2}$	$-1\frac{3}{4}$	$-6\frac{1}{4}$	$-7\frac{1}{4}$

Written Exercises

Subtract:

	A	*B*	*C*	*D*	*E*
a.	$38\frac{3}{4}$	$62\frac{3}{4}$	$95\frac{3}{4}$	$65\frac{3}{4}$	46
	$-19\frac{1}{4}$	$-33\frac{1}{4}$	$-27\frac{3}{4}$	$-16\frac{1}{4}$	$-17\frac{1}{4}$
b.	73	84	50	$57\frac{3}{4}$	$81\frac{1}{2}$
	$-25\frac{1}{2}$	$-36\frac{1}{4}$	$-29\frac{3}{4}$	$-28\frac{1}{4}$	$-16\frac{1}{4}$

Oral Problems

1. If I buy goods amounting to $\$1\frac{1}{2}$, how much change should I get out of a $\$10$ bill?

2. A grocer sold $1\frac{1}{2}$ pounds of black tea and $\frac{3}{4}$ pound of green tea. How many pounds did he sell of both?

3. At $\$1\frac{1}{4}$ each, what is the cost of 3 baseball gloves?

4. If I have 6 yards of calico and I use three fourths of a yard, how much have I left?

5. A baker has $3\frac{1}{2}$ apple pies and $4\frac{1}{4}$ peach pies. How many has he of both kinds?

6. One cow gave $15\frac{1}{2}$ quarts of milk and another gave $16\frac{1}{2}$ quarts. How many quarts did both cows give?

Written Problems

1. If I buy goods amounting to $\$19\frac{1}{4}$, how much change should I receive out of a $\$50$ bill?

2. A grocer sold in a day $24\frac{1}{2}$ pounds of black tea and $18\frac{3}{4}$ pounds of green tea. How many pounds did he sell of both?

3. At $\$17\frac{1}{4}$ each, what is the cost of 4 tables?

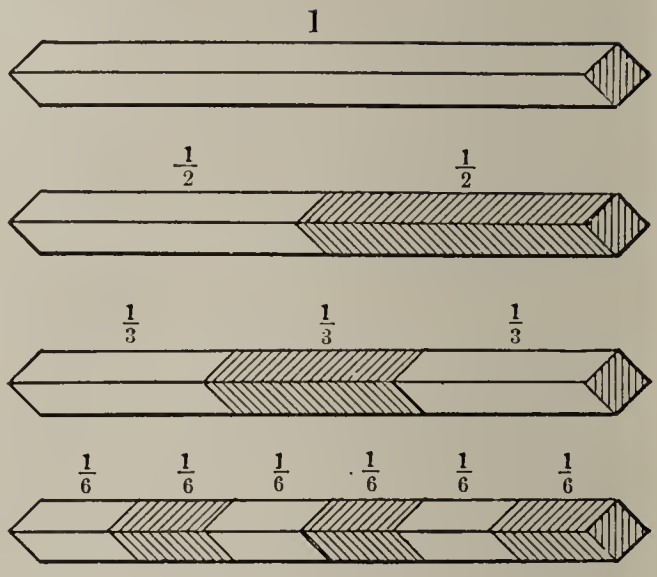
4. If I have 60 yards of muslin, how many yards shall I have after using $13\frac{3}{4}$ yards?

5. A dealer has $23\frac{1}{2}$ apple pies, $14\frac{1}{4}$ peach pies, and $3\frac{1}{4}$ plum pies. How many pies has he?

Thirds and Sixths

Preparatory Exercises

1. How many halves in 1? How many thirds in 1? How many sixths in 1?



2. How many sixths in one half? How many sixths in one third? How many sixths in two thirds?

3. How many sixths in 1 sixth + 1 sixth? How many thirds?

4. How many sixths in 1 sixth + 1 third? Give the sum of $\frac{1}{6}+\frac{1}{3}$ in lowest terms.

5. How many sixths in 1 sixth + 1 half? Give the sum of $\frac{1}{6}+\frac{1}{2}$ in lowest terms.

Sight Exercises

Give sums. Change $\frac{2}{6}$ in a result to $\frac{1}{3}$, $\frac{3}{6}$ to $\frac{1}{2}$, $\frac{4}{6}$ to $\frac{2}{3}$.

	A	*B*	*C*	*D*	*E*	*F*
a.	$1\frac{1}{3}$	$2\frac{1}{6}$	$3\frac{1}{6}$	$4\frac{2}{6}$	$5\frac{1}{3}$	$6\frac{3}{6}$
	$\underline{1\frac{1}{3}}$	$\underline{2\frac{1}{6}}$	$\underline{3\frac{5}{6}}$	$\underline{4\frac{1}{6}}$	$\underline{5\frac{1}{6}}$	$\underline{6\frac{1}{6}}$
b.	$7\frac{1}{2}$	$8\frac{4}{6}$	$9\frac{2}{3}$	$8\frac{2}{3}$	$7\frac{2}{3}$	$6\frac{2}{3}$
	$\underline{7\frac{1}{6}}$	$\underline{8\frac{1}{6}}$	$\underline{9\frac{1}{6}}$	$\underline{8\frac{2}{3}}$	$\underline{7\frac{1}{3}}$	$\underline{6\frac{5}{6}}$

Written Exercises

Add:

	A	*B*	*C*	*D*
a.	$28\frac{1}{3}$	$28\frac{2}{3}$	$28\frac{1}{6}$	$28\frac{1}{6}$
	$8\frac{1}{3}$	$8\frac{2}{3}$	$8\frac{1}{6}$	8
	$19\frac{1}{3}$	$19\frac{2}{3}$	$19\frac{1}{6}$	$19\frac{1}{6}$
b.	$27\frac{1}{3}$	$38\frac{1}{3}$	4	$39\frac{5}{6}$
	32	$7\frac{1}{6}$	$66\frac{1}{2}$	50
	$5\frac{1}{3}$	43	$25\frac{1}{6}$	$4\frac{1}{6}$
c.	$16\frac{1}{3}$	$33\frac{1}{6}$	$11\frac{1}{6}$	$62\frac{2}{3}$
	$22\frac{2}{3}$	$8\frac{5}{6}$	38	$35\frac{1}{6}$
	39	$14\frac{1}{6}$	$46\frac{2}{3}$	$1\frac{1}{6}$
d.	$45\frac{1}{2}$	$24\frac{1}{6}$	$57\frac{1}{3}$	$14\frac{5}{6}$
	$18\frac{1}{3}$	$58\frac{1}{6}$	$15\frac{1}{3}$	95
	$24\frac{1}{6}$	$7\frac{1}{6}$	$18\frac{1}{3}$	49
e.	$47\frac{5}{6}$	26	$36\frac{5}{6}$	$46\frac{2}{3}$
	37	$7\frac{2}{3}$	$5\frac{5}{6}$	$15\frac{2}{3}$
	$8\frac{1}{3}$	$59\frac{5}{6}$	$28\frac{5}{6}$	$8\frac{2}{3}$
f.	$29\frac{1}{6}$	$8\frac{1}{6}$	$65\frac{1}{6}$	43
	$35\frac{1}{6}$	$68\frac{1}{3}$	17	$38\frac{1}{3}$
	$14\frac{1}{6}$	$9\frac{1}{2}$	$3\frac{2}{3}$	$5\frac{1}{6}$
g.	$34\frac{5}{6}$	28	$64\frac{1}{2}$	$28\frac{1}{6}$
	$24\frac{5}{6}$	$41\frac{2}{3}$	$5\frac{1}{3}$	$8\frac{1}{6}$
	34	$19\frac{2}{3}$	$25\frac{1}{6}$	48

Sight Exercises

Subtract:

	A	*B*	*C*	*D*	*E*	*F*
a.	2	2	$3\frac{1}{3}$	$3\frac{1}{3}$	$4\frac{1}{2}$	6
	$1\frac{1}{3}$	$1\frac{1}{6}$	$1\frac{1}{6}$	$3\frac{1}{6}$	$4\frac{1}{6}$	$5\frac{2}{3}$
b.	$7\frac{5}{6}$	$8\frac{5}{6}$	$9\frac{5}{6}$	$8\frac{5}{6}$	8	$6\frac{1}{2}$
	$1\frac{1}{6}$	$1\frac{1}{3}$	$1\frac{1}{2}$	$1\frac{2}{3}$	$6\frac{5}{6}$	$5\frac{1}{3}$

Written Exercises

Subtract:

	A	*B*	*C*	*D*
a.	75	94	87	93
	$13\frac{1}{3}$	$26\frac{2}{3}$	$48\frac{1}{6}$	$57\frac{5}{6}$
b.	$46\frac{2}{3}$	$32\frac{2}{3}$	$67\frac{5}{6}$	$54\frac{5}{6}$
	$19\frac{1}{3}$	$18\frac{1}{6}$	$29\frac{1}{3}$	$16\frac{2}{3}$
c.	$70\frac{1}{2}$	$41\frac{2}{3}$	$82\frac{5}{6}$	$90\frac{1}{2}$
	$43\frac{1}{3}$	$27\frac{1}{2}$	$16\frac{1}{2}$	$37\frac{1}{6}$
d.	$33\frac{5}{6}$	$52\frac{1}{2}$	$68\frac{1}{3}$	$41\frac{2}{3}$
	$16\frac{1}{6}$	$38\frac{1}{6}$	$29\frac{1}{6}$	$17\frac{1}{6}$
e.	53	65	70	82
	$26\frac{1}{6}$	$37\frac{5}{6}$	$18\frac{2}{3}$	$58\frac{1}{3}$
f.	$94\frac{1}{2}$	$80\frac{1}{3}$	$72\frac{2}{3}$	$61\frac{5}{6}$
	$18\frac{1}{6}$	$25\frac{1}{6}$	$49\frac{1}{6}$	$33\frac{1}{6}$

Fifths

Sight Exercises

1. Give answers:

	A	*B*	*C*	*D*	*E*
a.	$4\frac{1}{5}$	$3\frac{2}{5}$	$5\frac{1}{5}$	$8\frac{3}{5}$	$9\frac{4}{5}$
	$+5\frac{4}{5}$	$+2\frac{3}{5}$	$+6\frac{2}{5}$	$+2\frac{3}{5}$	$+3\frac{4}{5}$
b.	$9\frac{4}{5}$	$8\frac{3}{5}$	$6\frac{2}{5}$	$6\frac{1}{5}$	5
	$-6\frac{2}{5}$	$-3\frac{3}{5}$	$-4\frac{1}{5}$	-2	$-3\frac{1}{5}$
c.	6	7	8	9	8
	$-1\frac{2}{5}$	$-1\frac{3}{5}$	$-1\frac{4}{5}$	$-8\frac{3}{5}$	$-7\frac{2}{5}$

Written Exercises

2. Add:

	A	*B*	*C*	*D*
a.	$19\frac{2}{5}$	51	$35\frac{3}{5}$	$9\frac{4}{5}$
	$20\frac{3}{5}$	$8\frac{2}{5}$	18	$16\frac{4}{5}$
b.	$59\frac{2}{5}$	$36\frac{3}{5}$	$45\frac{4}{5}$	$9\frac{1}{5}$
	$28\frac{2}{5}$	$7\frac{3}{5}$	$37\frac{4}{5}$	$59\frac{2}{5}$
	$6\frac{2}{5}$	$48\frac{3}{5}$	$16\frac{4}{5}$	$29\frac{4}{5}$

3. Subtract:

	A	*B*	*C*	*D*
a.	40	51	62	73
	$-16\frac{1}{5}$	$-25\frac{2}{5}$	$-37\frac{3}{5}$	$-58\frac{4}{5}$
b.	$84\frac{4}{5}$	$95\frac{3}{5}$	$86\frac{2}{5}$	$77\frac{1}{5}$
	$-37\frac{2}{5}$	$-69\frac{1}{5}$	$-57\frac{1}{5}$	-59

Oral Review Problems

1. Grace weighs 64 pounds, and her brother weighs 36 pounds more than Grace. How many pounds do both weigh together?

2. How much less than a dollar has a boy who has a half dollar, a quarter, a dime, a nickel, and a cent?

3. How many pounds are there in 3 loads of hay weighing 21 hundred pounds each?

4. How many seats are there in 8 classrooms containing 40 seats each?

5. How many pounds are there in 320 ounces?

6. Change 2 feet 9 inches to inches.

7. In a school of 480 pupils, one sixth were absent on a stormy day. How many were present?

8. How many feet of wire netting will inclose a plot 31 feet wide, 100 feet long?

9. At 10 cents each, how much fare is received from 64 passengers? How much fare at 5 cents each?

10. Mark has read 50 pages in a book and there are still 32 to read. How many pages are there in the book?

11. An airship sailed 2 hours 45 minutes. How many minutes less than 3 hours was it in the air?

12. How many weeks are there in 350 days? How many weeks and days are there in 355 days?

13. How many half-pint cups are there in 2 quarts?

14. How many days are there in the last two months of the year?

15. At $1\frac{1}{2}$ bushels per acre, how many bushels of wheat are required to sow 40 acres?

16. When wool loses $\frac{1}{4}$ of its weight in washing, what will a quantity of wool weigh after washing if it weighs 80 pounds before it is washed?

17. When oats weigh 32 pounds per bushel, what is the weight of a peck of oats?

18. At the rate of 40 cents for $\frac{1}{2}$ yard, how many yards of silk can be bought for $\$2.40$?

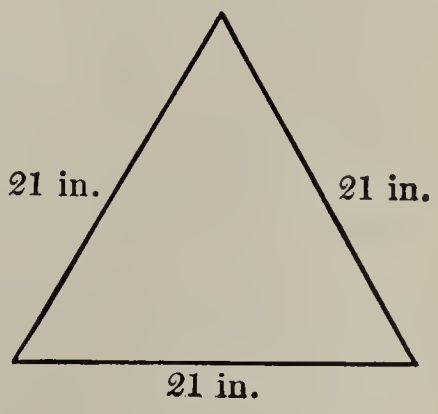
19. (*a*) How many feet of ribbon are required for 30 bows, when each bow takes 24 inches? (*b*) How many yards?

20. At $\frac{1}{2}$ cent a pound, how many pounds of cotton must a man pick to earn (*a*) $\$1$? (*b*) $\$2\frac{1}{2}$?

21. At 12 miles per hour, (*a*) how many hours does an automobile take to go 480 miles? (*b*) How many days of 10 hours each?

22. (*a*) What part of 63 is 21? (*b*) What part of 63 is 42?

23. A boy had a trip of 120 miles to make. How many miles remained after he had gone $\frac{2}{3}$ of the distance?



24. What is the perimeter of a triangle when each of the three equal sides measures 21 inches?

25. What is the fare for 124 miles at 2 cents per mile?

26. At 20 quarts of gasoline a day, how many gallons will a motor boat use in 10 days?

27. A boy set out 360 plants, of which $\frac{1}{2}$ died. How many remained?

28. How many eggs are there in a box of 30 dozen?

29. A man weighs 150 pounds and his son weighs 50 pounds less. How many pounds do both together weigh?

30. How much more than \$15 is the cost of eight barrels of apples at $\$2\frac{1}{2}$ per barrel?

31. What day of the year is (*a*) Feb. 1? (*b*) March 1, 1915? (*c*) March 1, 1916?

32. How many passengers at 5 cents each will pay \$1.50 in fares?

33. On one trip a conductor collected 5 cents each from 8 passengers and 3 cents each from 10 passengers; how much did he collect on that trip?

34. A conductor collected on one trip \$1.30 in fares, 20 of them being 5-cent fares and the remainder 3-cent fares. How many were 3-cent fares?

35. How many eggs are there in $3\frac{1}{2}$ dozen?

36. What is the cost of 4 horses at \$200 each?

37. How much less than \$500 will be the cost of 8 cows at \$50 each?

38. How much more than \$500 will be the cost of 11 cows at \$50 each?

Written Review Problems

1. A boy weighs 96 pounds, and his father weighs 75 pounds more than the son. What is the total weight of the two?

2. How much less than 10 dollars has a man who has a $5 bill, $2 bill, $1 bill, a silver dollar, a half dollar, a quarter, a dime, a nickel, and a cent?

3. Find the weight of 2 loads of hay weighing 1,975 pounds each.

4. How many seats are there in 16 class rooms each containing 40 seats?

5. How many pounds are there in 496 ounces?

6. Change 15 feet 9 inches to inches.

7. In a school of 475 pupils, two fifths of them were unable to reach school on a very stormy day. How many were present?

8. How many feet of wire netting will inclose a plot 40 feet wide, 140 feet long?

9. At 5 cents each how much fare is received from 97 passengers?

10. Flora has read 147 pages in a book and has still 154 pages to read. How many pages are there in the book?

11. An airship sailed 1 hour 37 minutes. How many minutes longer should it have sailed to remain in the air (*a*) 2 hours? (*b*) 3 hours?

12. How many weeks and days in 400 days?

13. How many quarter pint cups are there in 8 gallons?

14. How many days are there in the last six months of the year?

15. At $1\frac{1}{2}$ bushels per acre how many bushels of wheat are required to sow 48 acres?

16. When raw silk loses $\frac{1}{4}$ of its weight in boiling, what will be the weight after boiling of a quantity that weighs 96 pounds before it is boiled?

17. What is the weight of a half peck of corn at the rate of 56 pounds to the bushel?

18. If corn is bought at the rate of 15 cents a peck, how many bushels can be bought for $\$21.60$?

19. How many yards of ribbon are required for 36 bows, if each bow takes 21 inches?

20. At $\frac{1}{2}$ cent per pound, how many pounds of cotton must a man pick to earn $\$13.86$?

21. At 12 miles per hour, how many days of 8 hours each will it take an automobile to go 480 miles?

22. (*a*) What part of 120 is 24? (*b*) What part of 120 is 72? (*c*) What part of 120 is 96?

23. A boy had a journey of 120 miles to make. How many miles remained after he had finished $\frac{2}{5}$ of the distance?

24. Find the perimeter of a square if each of the 4 equal sides measures $13\frac{1}{2}$ inches.

25. What is the fare for 124 miles at $2\frac{1}{2}¢$ per mile?

26. At 25 quarts of gasoline per day how many gallons will a motor boat use in 32 days?

27. A man set out 396 cabbage plants, $\frac{1}{11}$ of which died. How many remained?

28. How many eggs are there in 6 boxes of 30 dozen each?

29. A man weighs 153 pounds, and his son weighs 58 pounds less. What is the total weight of both?

30. How much more than \$15 is the cost of 8 barrels of apples at \$2.75 per barrel?

31. What day of the year is (*a*) Feb. 22? (*b*) March 4, 1915? (*c*) May 30, 1916? (*d*) July 4, 1917?

32. How many passengers at 5 cents each will pay \$2.45 in fares?

33. On one trip a conductor received 5 cents each from 21 passengers and 3 cents each from 13 passengers; what was the total amount received on that trip?

34. A conductor collected altogether \$1.50 in fares, 24 of them being 5-cent fares and the remainder 3-cent fares. How many 3-cent fares were there?

35. How many eggs are there in $9\frac{1}{2}$ dozen?

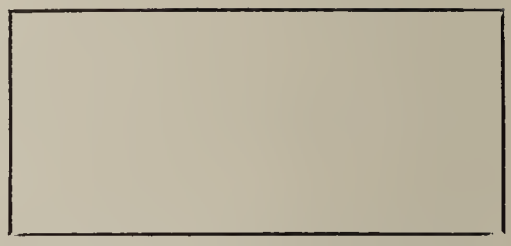
36. What is the cost of 5 horses at \$175 each?

37. How much less than \$500 will be the cost of 7 cows at \$55 each?

38. How much more than \$500 will be the cost of 11 cows at \$55 each?

Rectangles

A *rectangle* is a figure of four sides having square corners.



The floor of the classroom is a rectangle; so is the ceiling, each wall, the door, the window.

The opposite sides of a rectangle are equal in length. When a rectangle has four equal sides, it is called a *square*.

To find the *area* of a rectangle means to find the number of square inches, square feet, square yards, etc., it contains.

Preparatory Exercises

1. A square having each side 1 foot long contains a *square foot*. How many 1-foot squares can be cut from a piece of paper 3 feet long, 2 feet wide?

2. A square having each side 1 yard long contains a *square yard*. How many 1-yard squares can be cut from a piece of sheeting 3 yards long, 2 yards wide?

To find the *number* of square inches, square feet, square yards, etc., in the area of a rectangle multiply the *number* of inches, feet, yards, etc., in its length by the *number* of the same denomination in its width.

Areas of Rectangles

Oral Exercises

1. How many postage stamps in a sheet 7 stamps long, 4 stamps wide?

2. How many square yards are there in a floor 10 yards long, 8 yards wide?

3. How many square feet in the surface of a board 16 feet long, $\frac{1}{2}$ foot wide?

4. How many boards $\frac{1}{2}$ foot wide will cover a floor 12 feet wide?

5. Find the area of a fence 20 feet long, 6 feet high.

6. How many square feet of cloth will be required to cover the top of a table 4 feet long, $2\frac{1}{2}$ feet wide?

7. The top of a paving brick is 8 inches long, 4 inches wide. How many square inches will it cover?

8. The side of a paving brick is 8 inches long, $2\frac{1}{2}$ inches high. How many square inches does it contain?

9. How many square inches are there in the end of a brick whose dimensions are 4 inches by $2\frac{1}{2}$ inches?

10. How many square yards are there in a playground 24 yards long, 20 yards wide?

11. How many square yards of matting will cover a hall 10 yards long, $2\frac{1}{2}$ yards wide?

Sight Exercises

1. Give the area of each of the following rectangles:

a. 10 in. by 11 in.
b. 14 ft. by 10 ft.
c. 20 yd. by 13 yd.
d. 16 in. by 10 in.
e. 9 ft. by 8 ft.
f. 10 yd. by 8 yd.
g. 20 in. by 12 in.
h. 21 ft. by 10 ft.
i. 12 yd. by 10 yd.
j. 11 in. by 9 in.

The *perimeter* of a figure is the distance around it.

2. The number of yards in the perimeter of a field 20 yards wide, 24 yards long is 20 yd. + 24 yd. + 20 yd. + 24 yd., or 88 yd.

3. Give the perimeter of each of the following rectangles:

a. 12 in. by 10 in.
b. 21 ft. by 21 ft.
c. 20 yd. by 14 yd.
d. 12 in. by 21 in.
e. 20 ft. by 30 ft.
f. 13 yd. by 30 yd.
g. 20 in. by 12 in.
h. 22 ft. by 22 ft.
i. 21 yd. by 13 yd.
j. 30 in. by 40 in.

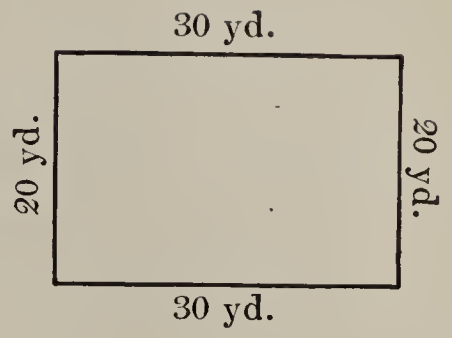
4. What is the length of a room 12 feet wide that contains 240 square feet?

5. Give the perimeter of a square whose area is 100 square inches.

6. How many square yards of carpet are needed to cover a floor 4 yards wide, 5 yards long?

Oral Problems

1. Find the perimeter of a field 30 yards long, 20 yards wide.



2. A rug contains 140 square feet. If its length is 14 feet, what is its width?

3. A field 30 yards long, 20 yards wide is inclosed by a wire fence. How many yards of wire are needed for each wire in the fence?

4. How many square inches of gilt paper are required to cover each of the six square faces of a cube 8 inches long?

5. A room is 20 feet long, 15 feet wide, 10 feet high.

a. How many square feet are there in each of the two side walls?

b. How many square feet are there in each of the two end walls?

c. How many square feet are there in the ceiling?

d. How many square feet of plastering are required?

e. How many square feet of carpet are needed to cover the floor?

6. How many square feet are there in a fence 6 feet high, 30 feet long?

Notation and Numeration

1. Write in figures:

One hundred thousand. Two hundred thousand. Three hundred thousand. Four hundred thousand. Five hundred thousand. Six hundred thousand. Seven hundred thousand. Eight hundred thousand. Nine hundred thousand.

2. Read the following numbers:

100,000	405,600	756,400
200,350	550,000	864,370
304,000	675,000	999,999

3. Write in figures:

Eight thousand, three hundred twenty-five.

Eighty-eight thousand, three hundred twenty-five.

Eight hundred eighty-eight thousand, three hundred twenty-five.

Six hundred seven thousand, four hundred eleven.

Eight hundred sixty thousand, eighty-six.

Seven hundred nine.

Four hundred twenty thousand, nineteen.

Thirty-five thousand, six hundred one.

Two hundred thousand, five.

Five hundred eleven thousand, eighty.

4. Read the following numbers:

40,252	67,226	52,321
468,800	120,645	242,598
514,868	50,250	105,709
156,017	721,809	500,746

Written Exercises

1. Add across: Add down:

1 +	2 +	3 +	4 +	5 = ?
20 +	30 +	40 +	50 +	60 = ?
300 +	400 +	500 +	600 +	700 = ?
4,000 +	5,000 +	6,000 +	7,000 +	8,000 = ?
50,000 +	60,000 +	70,000 +	80,000 +	90,000 = ?
100,000 +	100,000 +	200,000 +	100,000 +	100,000 = ?
? +	? +	? +	? +	? = ?

2. Add down: Subtract across:

9 −	6 = ?	8 −	3 = ?
80 −	50 = ?	70 −	20 = ?
700 −	400 = ?	600 −	400 = ?
6,000 −	3,000 = ?	9,000 −	5,000 = ?
50,000 −	20,000 = ?	50,000 −	10,000 = ?
400,000 −	100,000 = ?	600,000 −	300,000 = ?
? −	? = ?	? −	? = ?

3. Multiply across: Add multiplicands and products:

7 × 5 = ?	2 × 8 = ?	2 × 10 = ?	1 × 12 = ?
5 × 5 = ?	10 × 8 = ?	10 × 10 = ?	10 × 12 = ?
? × 5 = ?	? × 8 = ?	? × 10 = ?	? × 12 = ?

1 × 5 = ?	3 × 6 = ?	3 × 12 = ?	5 × 20 = ?
10 × 5 = ?	20 × 6 = ?	10 × 12 = ?	20 × 20 = ?
100 × 5 = ?	100 × 6 = ?	100 × 12 = ?	300 × 20 = ?
? × 5 = ?	? × 6 = ?	? × 12 = ?	? × 20 = ?

Roman Numbers

200 is written CC 300 is written CCC
400 is written CD 500 is written D
600 is written DC 700 is written DCC
800 is written DCCC 900 is written CM
1000 is written M

A number between 100 and 199, 200 and 299, etc., is expressed by writing the letter or letters expressing the tens and ones after the letter or letters expressing the hundreds.

128 is written CXXVIII 585 is written DLXXXV
234 is written CCXXXIV 696 is written DCXCVI
349 is written CCCXLIX 752 is written DCCLII
463 is written CDLXIII 971 is written CMLXXI

Express in Roman numbers:

A	*B*	*C*	*D*	*E*
122	566	982	449	218
233	677	775	331	327
344	788	664	226	432
455	899	559	181	546

Read:

A	*B*	*C*
CXXIII	DXLVIII	CMLXVI
CCXXIV	DCLXVII	DCCCXXV
CCCLVII	DCCXXXVI	DCCXLII
CDXLIX	DCCCXLIX	DCXXIX
DXLV	CCCXXV	CXXVIII
CDLXIX	CCXLVII	CCLVII

Addition and Subtraction

Sight Drills

For daily drills a chart similar to the following may be prepared:

	A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
a.	2	13	25	39	48	57	64	76
b.	3	15	29	38	47	54	66	72
c.	5	19	28	37	44	56	62	73
d.	9	18	27	34	46	52	63	75
e.	8	17	24	36	42	53	65	79
f.	7	14	26	32	43	55	69	78
g.	4	16	22	33	45	59	68	77
h.	6	12	23	35	49	58	67	74

1. Add to each of the numbers in the table:

A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
50	41	32	23	14	25	36	47
60	51	42	33	24	35	46	57

To the order, "Add 50 by lines," successive pupils answer rapidly: 52, 63, 75, etc.; 53, 65, 79, etc. To the order, "Add 47 by columns," the replies are: 49, 50, 52, etc.; 60, 62, 66, etc.

2. Subtract each of the numbers in the table from

99	91	95	89	96	87	98	85
92	97	90	94	88	93	86	84

The order here is: "Take from 99 by lines" or "Take from 91 by columns."

Addition and Subtraction

Written Exercises

1. Find sums. Test:

	A	*B*	*C*	*D*
a.	260,371	312,345	43,876	73,887
	44,252	89,764	264,668	325,307
	123,456	7,652	28,748	95,400
	80,991	98,030	402,606	67,859
	46,887	204,786	90,090	242,784
	14,868	88,359	5,163	68,135
b.	406,756	142,735	69,644	142,371
	72,348	94,681	377,180	45,852
	8,889	27,658	92,143	247,481
	77,777	248,569	269,515	25,635
	12,834	60,370	25,790	147,162
	6,957	85,396	8,405	36,505
c.	315,546	214,653	333,726	439,876
	167,453	94,728	188,706	60,400
	39,062	315,840	48,057	294,501
	67,456	53,174	64,382	4,975
	20,989	58,034	8,590	28,463
	8,274	65,348	138,249	58,674

2. Find differences without rearranging:

502,346	− 83,604	− 90,089	605,902
− 29,879	600,000	234,567	− 408,904

3. Add:

	A	*B*	*C*
a.	$123,456.78	$ 94,309.82	$167,088.00
	90,312.20	172,074.55	126,435.79
	6,734.87	99,873.00	205,719.65
	539,314.60	67,021.45	80,482.36
	19,512.14	216,835.50	198,060.00
b.	$254,923.74	$270,050.66	$220,932.32
	45,024.58	382,104.20	88,150.08
	7,056.00	92,307.55	26,934.45
	304,729.68	81,256.43	342,345.00
	51,120.09	7,759.00	6,437.46
c.	$ 82,559.24	$395,694.63	$450,880.77
	76,385.64	96,438.00	57,028.24
	371,626.00	42,740.08	96,462.50
	27,842.96	138,128.72	192,664.82
	181,730.53	69,569.06	48,125.82
	78,473.75	70,591.76	38,484.57

4. Insert missing addend:

	A	*B*	*C*
a.	$157,943.87	?	$345,678.90
	+ ?	+ $883,654.63	+ ?
	$200,000.00	$900,000.00	$634,567.89
b.	$ 82,559.24	$495,694.63	?
	76,385.64	?	$350,880.77
	?	96,438.00	292,664.23
	$200,000.00	$900,000.00	$934,567.89

Multiplication and Division

Drill Exercises

1. Give products:

Say twice two ten are four twenty, four times six ten are twenty-four forty. Omit the words *hundred* and *thousand*.

	A	*B*	*C*	*D*
a.	2×210	3×210	4×210	5×210
b.	2×310	3×310	4×310	5×310
c.	2×410	3×410	4×410	5×410
d.	2×510	3×510	4×510	5×510
e.	2×610	3×610	4×610	5×610

	E	*F*	*G*	*H*
a.	6×210	7×210	8×210	9×210
b.	6×310	7×310	8×310	9×310
c.	6×410	7×410	8×410	9×410
d.	6×510	7×510	8×510	9×510
e.	6×610	7×610	8×610	9×610

2. Give quotients and remainder, if any:

Think two ten into fourteen seventy, etc.

	A	*B*	*C*	*D*
a.	210)1,470	210)1,890	210)1,260	210)1,680
b.	310)1,550	310)2,480	310)1,860	310)2,180
c.	410)3,700	410)1,640	410)2,500	410)2,050
d.	510)2,040	510)3,670	510)1,540	510)4,600
e.	610)5,500	610)1,830	610)3,070	610)4,880
f.	710)5,000	710)1,430	710)6,400	710)5,680

Oral Problems

1. A man went from New York to Baltimore, 184 miles, and then from Baltimore to Washington, 40 miles. How far did he travel from New York to Washington?

2. At 32 miles per hour how long would it take a train to go 960 miles?

3. What is the weight of 40 bushels of oats at 32 pounds to the bushel?

4. Twelve hundred eighty pounds are how many pounds less than twenty hundred pounds?

5. At 320 rods to the mile, how many rods are there in 4 miles?

6. How many working days are there in a year of 365 days, excluding 52 Sundays and 4 holidays?

7. How many $\frac{1}{4}$-acre plots are there in a piece of ground containing 16 acres?

8. If a man walks $2\frac{1}{2}$ miles to his work and $2\frac{1}{2}$ miles back, how many miles does he walk in a year of 309 working days in going to work and returning?

9. How many square yards of wire will be required for a fence 4 wires high around a square plot, each side measuring 200 feet?

10. Find how much less than \$100 will be the cost of 80 hammocks at \$1.10 each.

11. How much change is given when a \$20 bill is given for a purchase of \$18.40?

Multiplication

Written Exercises

Multiply. Test:

	A	*B*	*C*
a.	415 × 306	504 × 307	1,205 × 308
b.	421 × 509	498 × 406	1,307 × 345
c.	123 × 876	234 × 301	1,406 × 403
d.	234 × 543	407 × 048	1,508 × 512
e.	316 × 435	305 × 352	2,042 × 332
f.	423 × 316	234 × 234	2,105 × 423
g.	538 × 243	357 × 468	3,016 × 312
h.	641 × 165	536 × 243	4,204 × 205
i.	812 × 143	135 × 354	1,234 × 716
j.	924 × 122	216 × 234	1,345 × 621
k.	844 × 137	123 × 331	2,123 × 477
l.	763 × 204	214 × 332	3,214 × 266
m.	627 × 212	125 × 665	4,125 × 155
n.	586 × 423	263 × 164	1,326 × 687
o.	437 × 514	143 × 468	2,314 × 376
p.	359 × 625	425 × 357	3,245 × 265
q.	286 × 713	162 × 579	4,216 × 154
r.	175 × 826	531 × 467	1,135 × 843
s.	298 × 735	244 × 253	4,424 × 232
t.	367 × 642	157 × 275	2,571 × 321
u.	406 × 457	356 × 345	2,809 × 246
v.	584 × 318	824 × 609	1,763 × 357

Oral Exercises

1. At 20¢ each, how many articles can be bought for

	A	*B*	*C*	*D*	*E*
a.	20¢?	60¢?	100¢?	140¢?	180¢?
b.	40¢?	80¢?	120¢?	160¢?	200¢?

2. At 19¢ each, how many articles can be bought for

a.	20¢?	60¢?	120¢?	160¢?	180¢?
b.	40¢?	80¢?	140¢?	180¢?	200¢?

and how many cents remain in each case?

3. Give the number of articles at 18¢ each that can be bought for each of the following sums, and state the amount remaining in each:

a.	40¢	20¢	100¢	160¢	180¢
b.	80¢	60¢	140¢	120¢	200¢

4. Give quotients:

	A	*B*	*C*	*D*
a.	30)60	30)120	30)180	30)240
b.	30)90	30)150	30)210	30)270

5. Give quotients and remainders:

a.	29)30	29)90	29)150	29)210
b.	29)60	29)120	29)180	29)240
c.	28)30	28)90	28)150	28)210

Long Division

Drill Exercises

Give quotients:

NOTE. Omit remainders, if any.

	A	*B*	*C*	*D*
a.	200)1,800	201)1,800	199)1,800	250)1,800
b.	300)2,400	302)2,400	299)2,400	360)2,400
c.	400)2,800	403)2,800	399)2,800	470)2,800
d.	500)2,500	504)2,500	499)2,500	580)2,500
e.	600)4,200	605)4,200	599)4,200	690)4,200
f.	700)6,300	704)6,300	699)6,300	790)6,300
g.	800)5,600	803)5,600	799)5,600	880)5,600
h.	900)7,200	902)7,200	899)7,200	999)7,200
i.	240)1,920	241)1,920	239)1,920	249)1,920
j.	320)2,240	321)2,240	319)2,240	320)2,239
k.	410)3,690	411)3,690	409)3,690	410)3,689
l.	520)2,080	521)2,080	519)2,080	520)2,076
m.	630)3,780	631)3,780	629)3,780	630)3,774
n.	710)4,970	711)4,970	709)4,970	710)4,953
o.	820)4,100	821)4,100	819)4,100	820)4,096
p.	910)8,190	911)8,190	909)8,190	910)8,183

Oral Problems

1. What is the total cost of a lot at 3 hundred dollars and a house at 21 hundred dollars?

2. A man had 31 hundred dollars in bank. How much remained after he drew out 8 hundred dollars?

3. Give the cost of 21 horses at $300 each.

4. A driver sold 30 cows at $41 each. How much did he receive for them?

5. At 4¢ per pound what is the cost of a barrel of sugar containing 300 pounds?

6. How many 20-acre fields are there in a farm of 640 acres?

7. At 20 bushels to the acre what would be the yield of 34 acres of wheat?

8. How long would a train require to go 820 miles at the rate of 41 miles an hour?

9. If a man has saved $991, how much more must be saved to have $1,000?

10. How many square yards are there in a plot of ground 32 yards long, 30 yards wide?

11. Mr. Payne has two farms, one of 260 acres and the other of 120 acres. How many acres are there in both?

12. If 3 men can do a piece of work in 21 days, how long would it require 1 man to do it? 7 men?

13. How much shall I have left of $1,000 after paying for 3 horses at $300 each?

Written Problems

1. What is the total cost of a lot at $375 and a house at $2,475?

2. A man had $950 in bank. How much remained after he took out $875.75?

3. Find the cost of 21 horses at $375 each.

4. A drover sold 30 cows at $45 each. How much did he receive for them?

5. At 4¢ per pound what is the cost of a barrel of sugar containing 375 pounds?

6. How many 25-acre plots can be made out of 600 acres of land?

7. At 19 bushels to the acre what would be the yield of 34 acres of wheat?

8. How long would a train require to go 975 miles at the rate of 30 miles per hour?

9. A man requires $1,000; he has already saved $837.50. How much does he still need?

10. What is the area of a plot of ground 32 yards long, 29 yards wide?

11. Mr. Black has two farms, one of $269\frac{1}{2}$ acres and the other of $110\frac{1}{2}$ acres. How much land is there in both?

12. If 3 men can do a piece of work in 35 days, how long would it require 1 man to do it? 7 men?

13. How much change should I receive out of a $1,000 bill given in payment for 3 horses at $317 each?

Written Exercises

In dividing 969 by 19, find the first quotient figure by dividing 9 by 2, 19 being nearly 20. In dividing 975 by 39, get the first quotient figure by dividing 9 by 4.

1. Divide:

	A	*B*	*C*
a.	969 ÷ 19	8,213 ÷ 191	61,280 ÷ 1,915
b.	928 ÷ 29	9,376 ÷ 293	82,124 ÷ 2,933
c.	975 ÷ 39	9,480 ÷ 395	86,922 ÷ 3,951
d.	784 ÷ 49	7,455 ÷ 497	89,496 ÷ 4,972
e.	885 ÷ 59	8,386 ÷ 599	83,916 ÷ 5,994
f.	897 ÷ 69	8,376 ÷ 698	90,584 ÷ 6,968
g.	869 ÷ 79	6,368 ÷ 796	87,648 ÷ 7,968
h.	979 ÷ 89	9,834 ÷ 894	71,592 ÷ 8,949
i.	891 ÷ 99	7,936 ÷ 992	69,489 ÷ 9,927
j.	704 ÷ 88	9,691 ÷ 881	52,890 ÷ 8,815
k.	936 ÷ 78	9,396 ÷ 783	70,497 ÷ 7,833
l.	952 ÷ 68	9,590 ÷ 685	82,212 ÷ 6,851
m.	928 ÷ 58	9,424 ÷ 589	94,272 ÷ 5,892
n.	864 ÷ 48	9,723 ÷ 463	82,348 ÷ 4,844
o.	988 ÷ 38	9,650 ÷ 386	88,918 ÷ 3,866
p.	952 ÷ 28	9,690 ÷ 285	99,960 ÷ 2,856
q.	936 ÷ 18	9,752 ÷ 184	95,836 ÷ 1,843
r.	945 ÷ 27	9,936 ÷ 276	99,432 ÷ 2,762
s.	999 ÷ 37	9,672 ÷ 372	93,025 ÷ 3,721

Oral Problems

1. How many ounces are there in 3 pounds?

2. Change 50 ounces to pounds and ounces.

3. How many postage stamps are there in a sheet 15 stamps long, 3 stamps wide?

4. What is the cost of 23 two-cent stamps?

5. At 14 cents a gallon, how many gallons of oil can be bought for 42 cents?

6. If 45 men require 30 days to do a piece of work, how long would it take 15 men to do it?

7. At 16 bushels to the acre, how many acres will produce 48 bushels?

8. Seven times 8 are how many more than 50?

9. At the rate of 15 examples an hour, how long does it require a girl to work 45 examples?

10. How many times is 99 contained in 100? what is the remainder? How many times in 200? what is the remainder? In 300? what is the remainder? In 500? what is the remainder?

11. How many times is 98 contained in 100? what is the remainder? In 300? what is the remainder? In 700? what is the remainder?

12. At 99¢ a yard, how many yards of silk can be bought for $6, and how many cents change are there?

13. A girl bought 7 yards of goods at 99¢ per yard and received 7¢ change. How much did she give the storekeeper?

Multiples and Factors

Since 14 is divisible by 2 and by 7, it is a *multiple* of these numbers; 12 is a multiple of 2, of 3, of 4, and of 6.

Since 14 is divisible by 2 and by 7, these two numbers are *factors* of 14; 2, 3, 4, and 6 are factors of 12.

1 is not considered a factor of a number, neither is the number itself.

Oral Exercises

1. What number will exactly divide 25? 49? 81? 121?

2. What two numbers will exactly divide 21? 26? 33? 34? 35? 39? 46? 51? 55? 57?

Prime Numbers

Since they have no factors, 1, 2, 3, 5, etc., are called *prime numbers.*

Sight Exercises

1. Name a prime number between 6 and 9.

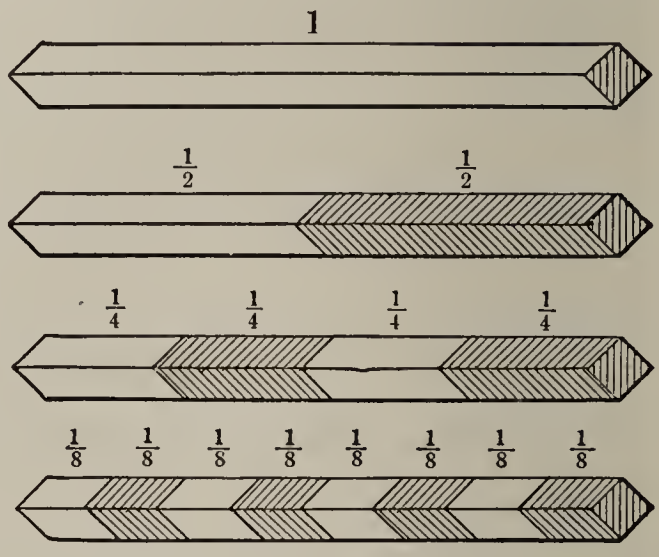
2. Name two prime numbers between 10 and 15. Two between 16 and 20. One between 21 and 25. One between 25 and 30.

3. Name two prime numbers between 30 and 40. Three between 40 and 50. Two between 50 and 60. Two between 60 and 70. Three between 70 and 80. Two between 80 and 90. One between 90 and 100.

Reduction

Oral Exercises

When a thing is divided into 8 equal parts, each part is called an eighth, written $\frac{1}{8}$.



1. How many eighths are there in a half? In a quarter? In three fourths?

2. Change to 8ths:

a. $\frac{1}{2}$. *b.* $\frac{1}{4}$. *c.* $\frac{3}{4}$.

In the fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, the numbers 2, 4, 8, are called the *denominators*.

In the fractions $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{7}{8}$, the numbers 1, 3, 5, 7, are called the *numerators*.

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

When $\frac{2}{8}$ is changed to $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{4}{8}$ to $\frac{1}{2}$, $\frac{6}{8}$ to $\frac{3}{4}$, etc., each fraction is changed to *lowest terms*.

3. Change to lowest terms:

	A	*B*	*C*	*D*	*E*
a.	$\frac{2}{4}$	$\frac{2}{8}$	$\frac{3}{6}$	$\frac{4}{8}$	$\frac{6}{8}$
b.	$\frac{6}{12}$	$\frac{4}{6}$	$\frac{2}{6}$	$\frac{8}{12}$	$\frac{9}{12}$

4. Change to a whole or to a mixed number:

	A	*B*	*C*	*D*	*E*
a.	$\frac{3}{2}$	$\frac{5}{4}$	$\frac{9}{3}$	$\frac{11}{6}$	$\frac{13}{8}$
b.	$\frac{17}{12}$	$\frac{9}{4}$	$\frac{7}{3}$	$\frac{11}{8}$	$\frac{13}{6}$

Adding and Subtracting Fractions

Preparatory Exercises

To add or to subtract fractions having different denominators, the denominators must be made the same; that is, the fractions must have a *common denominator*.

1. Add $\frac{1}{2}$ and $\frac{1}{4}$. What is the common denominator?

2. Add $\frac{1}{2}$ and $\frac{1}{6}$. What is the common denominator?

3. (*a*) What is the common denominator of $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{6}$? (*b*) Of $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$? (*c*) Of $\frac{1}{2}$ and $\frac{1}{3}$? (*d*) Of $\frac{1}{4}$ and $\frac{1}{3}$? (*e*) Of $\frac{1}{4}$ and $\frac{1}{6}$? (*f*) Of $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{6}$?

Sight Exercises

Give answers:

	A	*B*	*C*	*D*	*E*	*F*	*G*
a.	$\frac{1}{2}+\frac{1}{4}$	$\frac{1}{2}+\frac{1}{8}$	$\frac{1}{4}+\frac{1}{8}$	$\frac{1}{2}+\frac{3}{8}$	$\frac{1}{4}+\frac{3}{8}$	$\frac{3}{4}+\frac{1}{8}$	$\frac{3}{4}+\frac{3}{8}$
b.	$1\frac{1}{2}+\frac{1}{4}$	$1\frac{1}{2}+\frac{1}{8}$	$1\frac{1}{4}+\frac{1}{8}$	$1\frac{1}{2}+\frac{3}{8}$	$1\frac{1}{4}+\frac{3}{8}$	$1\frac{3}{4}+\frac{1}{8}$	$1\frac{3}{4}+\frac{3}{8}$
c.	$1\frac{1}{2}+\frac{3}{4}$	$1\frac{3}{4}+\frac{1}{8}$	$1\frac{1}{2}+\frac{5}{8}$	$1\frac{1}{4}+\frac{5}{8}$	$1\frac{3}{4}+\frac{5}{8}$	$1\frac{3}{4}+\frac{7}{8}$	$1\frac{3}{8}+\frac{3}{8}$
d.	$2\frac{1}{8}+\frac{1}{2}$	$2\frac{3}{8}+\frac{1}{4}$	$2\frac{5}{8}+\frac{3}{4}$	$2\frac{7}{8}+\frac{1}{2}$	$2\frac{1}{2}+\frac{7}{8}$	$2\frac{5}{8}+\frac{5}{8}$	$2\frac{7}{8}+\frac{7}{8}$
e.	$1-\frac{1}{8}$	$1-\frac{3}{8}$	$1-\frac{5}{8}$	$1-\frac{7}{8}$	$1\frac{1}{2}-\frac{1}{8}$	$1\frac{1}{4}-\frac{1}{8}$	$1\frac{3}{8}-\frac{1}{4}$

Adding Mixed Numbers

Sight Problems

1. How much cloth is needed for a suit of clothes if 4 yards are needed for the coat, $1\frac{1}{2}$ yards for the vest, and $2\frac{1}{2}$ yards for the trousers?

2. How many inches (*a*) in $\frac{1}{3}$ foot? (*b*) In $\frac{1}{6}$ foot? (*c*) In $\frac{1}{3}$ ft. + $\frac{1}{6}$ ft.? (*d*) What part of a foot is 6 inches? (*e*) What part of a foot is $\frac{1}{2}$ ft. + $\frac{1}{6}$ ft.?

3. (*a*) What is the smallest number that is divisible by 3, by 4, and by 6? (*b*) What is the least common denominator of $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{6}$? (*c*) How many 12ths in the sum of $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{6}$? (*d*) $\frac{1}{3}+\frac{1}{4}+\frac{1}{6}=$ how many fourths?

4. After a man had sold $\frac{1}{3}+\frac{1}{4}+\frac{1}{6}$ of his farm, (*a*) what part of his farm was sold? (*b*) What part did he still own? (*c*) If he still owned 40 acres, how many acres did he own at first?

Written Exercises

Add:

	A	*B*	*C*	*D*	*E*
a.	$20\frac{1}{8}$	$16\frac{3}{8}$	32	$46\frac{3}{8}$	$72\frac{5}{8}$
	13	$7\frac{5}{8}$	$8\frac{1}{8}$	4	$20\frac{5}{8}$
	$3\frac{3}{8}$	14	$19\frac{7}{8}$	$5\frac{7}{8}$	6
b.	$17\frac{1}{2}$	30	$14\frac{1}{4}$	$21\frac{3}{4}$	8
	13	$18\frac{1}{2}$	$5\frac{1}{8}$	16	$22\frac{1}{2}$
	$7\frac{3}{8}$	$6\frac{1}{8}$	19	$9\frac{7}{8}$	$15\frac{5}{8}$

Subtracting Mixed Numbers

Oral Problems

1. An airship remained in the air $58\frac{1}{2}$ minutes. How many minutes is that less than an hour?

2. After spending $\frac{1}{2}$ and $\frac{1}{3}$ of his money, (*a*) what part of his money did a boy still have? (*b*) If he then had 10 cents, how much had he at first?

3. A man had to walk 10 miles. He walks $3\frac{1}{2}$ miles the first hour and $3\frac{1}{4}$ the second hour. How many miles has he still to go?

4. Out of 100 yards of cloth $92\frac{1}{2}$ yards have been used. How many yards remain?

5. How much more than \$ 50 will be the cost of a dress at \$ $40\frac{3}{4}$ and a trunk at \$ $9\frac{1}{2}$?

Written Exercises

Subtract:

	A	*B*	*C*	*D*	*E*
a.	30	43	74	65	72
	$-18\frac{1}{2}$	$-19\frac{1}{4}$	$-27\frac{3}{4}$	$-38\frac{1}{3}$	$-47\frac{2}{3}$
b.	50	83	92	36	45
	$-24\frac{1}{6}$	$-46\frac{5}{6}$	$-25\frac{7}{8}$	$-16\frac{5}{8}$	$-26\frac{7}{8}$
c.	$30\frac{3}{4}$	$42\frac{5}{6}$	$51\frac{7}{8}$	$62\frac{5}{8}$	$71\frac{3}{8}$
	$-18\frac{1}{2}$	$-26\frac{1}{2}$	$-39\frac{1}{2}$	$-13\frac{1}{2}$	$-22\frac{1}{4}$

Addition

Written Exercises

1. Find the sum of $30\frac{3}{4}+25\frac{5}{6}+8\frac{2}{3}$.

PROCESS

To the right of the addends draw a vertical line and from its top draw a horizontal line. Above the latter write 12 (the least common denonimator). Change the fractions to $\frac{9}{12}$, $\frac{10}{12}$, and $\frac{8}{12}$, respectively, and write 9, 10, and 8 (the new numerators) under 12 (the new denominator). Add these numerators, and write 27 (their sum), over 12 (the common denominator), making the sum of the fractions $\frac{27}{12}$. Change this first to $2\frac{3}{12}$, and then to $2\frac{1}{4}$. Write $\frac{1}{4}$ under the original fractions, and carry 2 to the whole numbers.

		12
	$30\frac{3}{4}$	9
	$25\frac{5}{6}$	10
	$8\frac{2}{3}$	8
Ans.	$65\frac{1}{4}$	$\frac{27}{12}=2\frac{3}{12}=2\frac{1}{4}$

2. Find sums:

A	*B*	*C*	*D*	*E*
$30\frac{1}{4}$	$16\frac{3}{4}$	$5\frac{1}{2}$	$60\frac{1}{2}$	$25\frac{2}{3}$
$25\frac{1}{6}$	$8\frac{1}{6}$	$20\frac{1}{4}$	$9\frac{3}{4}$	$18\frac{3}{4}$
$8\frac{1}{3}$	$39\frac{1}{3}$	$8\frac{5}{6}$	$18\frac{7}{8}$	6

3. Add:

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

Addition and Subtraction

Written Exercises

1. A field contained $35\frac{9}{10}$ acres of land. $15\frac{3}{4}$ acres were sold. How much remained?

PROCESS

Write 20 (the least common denominator), as in addition, and 18 and 15 (the new numerators). Place 3 (their difference) over 20 (the common denominator), making the difference between the fractions $\frac{3}{20}$. Write the latter under the original fractions, then subtract the whole numbers.

		20
	$35\frac{9}{10}$	18
	$15\frac{3}{4}$	15
Ans.	$20\frac{3}{20}$	$\frac{3}{20}$

2. Subtract:

	A	*B*	*C*	*D*	*E*
a.	$15\frac{2}{3}$	$30\frac{4}{5}$	$27\frac{5}{6}$	$54\frac{5}{6}$	$40\frac{3}{4}$
	$-8\frac{3}{8}$	$-14\frac{3}{8}$	$-9\frac{3}{4}$	$-26\frac{7}{9}$	$-6\frac{7}{10}$
b.	$64\frac{2}{3}$	$92\frac{5}{6}$	$87\frac{3}{4}$	$73\frac{5}{6}$	$50\frac{7}{8}$
	$-16\frac{2}{5}$	$-24\frac{3}{8}$	$-59\frac{2}{5}$	$-8\frac{3}{10}$	$-23\frac{7}{10}$

3. Find answers:

a.	$35\frac{3}{4}$	$35\frac{3}{4}$	$42\frac{2}{3}$	$42\frac{2}{3}$	$26\frac{5}{6}$
	$+16\frac{2}{3}$	$-16\frac{2}{3}$	$+8\frac{3}{10}$	$-8\frac{3}{10}$	$+9\frac{4}{5}$
b.	$26\frac{5}{6}$	$67\frac{7}{8}$	$67\frac{7}{8}$	$84\frac{7}{12}$	$84\frac{7}{12}$
	$-9\frac{4}{5}$	$+29\frac{5}{12}$	$-29\frac{5}{12}$	$+18\frac{5}{9}$	$-18\frac{5}{9}$
c.	$72\frac{7}{8}$	$72\frac{7}{8}$	$90\frac{5}{6}$	$90\frac{5}{6}$	$52\frac{9}{10}$
	$+6\frac{2}{3}$	$-6\frac{2}{3}$	$+8\frac{3}{8}$	$-8\frac{3}{8}$	$+27\frac{3}{4}$

Multiplying by a Mixed Number

Preparatory Exercises

1. If a horse travels at the rate of 6 miles an hour, (*a*) how far does he go in $\frac{1}{2}$ hour? (*b*) In an hour and a half?

2. How many miles are $1\frac{1}{2}$ times 6 miles?

3. At 12 cents a yard, what is the cost (*a*) of 2 yards of muslin? (*b*) Of $\frac{1}{4}$ yard? (*c*) Of $2\frac{1}{4}$ yards?

4. How many cents are $2\frac{1}{4}$ times 24 cents?

5. At \$ 40 per acre what is the cost (*a*) of $\frac{1}{8}$ acre of land? (*b*) Of $3\frac{1}{8}$ acres?

6. How many dollars are $3\frac{1}{8}$ times \$ 40?

7. How many bushels of oats can be raised (*a*) on $\frac{3}{4}$ acre at the rate of 40 bushels to the acre? (*b*) On $1\frac{3}{4}$ acres?

8. How many bushels are $1\frac{3}{4}$ times 40 bushels?

Sight Exercises

Give products:

	A	*B*	*C*	*D*	*E*	*F*
a.	$24 \times 1\frac{1}{2}$	$24 \times 1\frac{1}{3}$	$24 \times 1\frac{1}{4}$	$24 \times 1\frac{1}{6}$	$24 \times 1\frac{1}{8}$	$30 \times 1\frac{1}{6}$
b.	$60 \times 1\frac{1}{2}$	$60 \times 1\frac{1}{3}$	$40 \times 1\frac{1}{4}$	$60 \times 1\frac{1}{6}$	$80 \times 1\frac{1}{8}$	$80 \times 1\frac{1}{2}$
c.	$30 \times 1\frac{1}{3}$	$30 \times 2\frac{1}{3}$	$40 \times 2\frac{1}{4}$	$30 \times 2\frac{1}{6}$	$40 \times 2\frac{1}{8}$	$20 \times 3\frac{1}{2}$

Written Exercises

1. A man makes 87 hats in a week. How many will he make in $2\frac{1}{3}$ weeks?

PROCESS

Get 1 third of 87 by dividing 87 by 3. Place the right-hand figure of the product of 87 by 2 in the ones' column.

	87 hats
	$2\frac{1}{3}$
($\frac{1}{3}$ times 87)	29
(2 times 87)	174
($2\frac{1}{3}$ times 87)	203 hats

2. Find products. Consider the mixed number the multiplier.

	A	*B*	*C*	*D*
a.	$86 \times 2\frac{1}{2}$	$84 \times 3\frac{1}{4}$	$96 \times 2\frac{1}{3}$	$34 \times 4\frac{1}{2}$
b.	$88 \times 4\frac{1}{8}$	$75 \times 5\frac{1}{5}$	$72 \times 3\frac{1}{6}$	$25 \times 3\frac{1}{5}$
c.	$72 \times 3\frac{1}{3}$	$92 \times 4\frac{1}{4}$	$84 \times 5\frac{1}{6}$	$48 \times 2\frac{1}{8}$

3. Multiply 84 by $24\frac{1}{6}$.

PROCESS

After finding $\frac{1}{6}$ of 84, multiply 84 by 4, placing the right-hand figure of the product in the ones' column, then multiply 84 by 2 tens, placing the right-hand figure of the product in the tens' column, etc.

	84
	$24\frac{1}{6}$
($\frac{1}{6}$ of 84)	14
(4 times 84)	336
(2 tens times 84)	168
($24\frac{1}{6}$ times 84)	2030 *Ans.*

4. Find products:

a. $36 \times 21\frac{1}{2}$ *b.* $42 \times 33\frac{1}{3}$ *c.* $48 \times 23\frac{1}{4}$

Oral Problems

1. What is the cost of a yard of dress goods when one half yard costs 32 cents?

2. At 6 pairs of stockings for a dollar, how many pairs can be bought for $4.50?

3. When collars sell at 2 for 25 cents, what is received for a dozen collars?

4. How many tons of hay are there in two stacks, one containing $10\frac{1}{2}$ tons and the other containing $15\frac{1}{2}$ tons?

5. A man has two farms each containing 64 acres. How many acres are there in both?

6. A rod is $16\frac{1}{2}$ feet. How many feet wide is a road that is 2 rods wide?

7. At 60 cents a dozen, how much is paid for 36 roses?

8. How many are $5\frac{1}{2}+5\frac{1}{2}+5\frac{1}{2}$?

9. When each house is 20 feet wide, how many houses can be built on a plot 200 feet wide?

10. How many half-pint glasses of lemonade are there in 2 gallons?

11. One third of a flock of sheep are in the barn. How many are there in the flock if there are 32 sheep in the barn?

12. How many nails can be made from a yard of wire (*a*) when $\frac{1}{2}$ inch is needed for each nail? (*b*) When 2 inches are needed?

13. If a pail of water weighs 16 pounds and the pail alone weighs $2\frac{1}{2}$ pounds, how many pounds does the water weigh?

14. If $\frac{1}{2}$ peck of wheat weighs $7\frac{1}{2}$ pounds, what is the weight (*a*) of a peck? (*b*) Of 2 pecks? (*c*) Of 4 pecks?

15. A freight car can carry 100 thousand pounds. How many tons of 2 thousand pounds each can it carry?

16. A steel freight car weighs 22 tons of 2 thousand pounds each. How many pounds does it weigh?

17. Taking 1 pound as the weight of a pint of water, what is the weight of a 3-gallon pail of water, when the pail weighs 6 pounds?

18. At 25 cents a pound, how many pounds of coffee can be purchased (*a*) for \$1? (*b*) For \$2? (*c*) For \$4?

19. If a gallon of paint will cover 300 square feet, how many gallons are needed to paint 1,800 square feet?

20. At the rate of 3 pounds of flour to 4 pounds of bread, how many pounds of bread will 30 pounds of flour make?

21. If the dough weighs $\frac{3}{5}$ more than the flour, how many pounds of dough will 20 pounds of flour make?

22. The sum of 2 numbers is 60; one of the numbers is 26. What is the other?

Written Problems

1. What is the cost of a yard of cloth when one eighth of a yard costs 22 cents?

2. At 3 pairs of stockings for 50 cents, how many pairs can be bought for $3.50?

3. When cuffs sell at 2 pairs for 45 cents, what is received for a dozen pairs?

4. How many tons of hay are there in 3 stacks, containing, respectively, $10\frac{1}{4}$ tons, $12\frac{1}{2}$ tons, and $14\frac{1}{4}$ tons?

5. A farm consists of 3 fields each containing $36\frac{1}{2}$ acres. How many acres are there in the farm?

6. How many feet wide is a road 4 rods wide, a rod being 3 yards of $5\frac{1}{2}$ feet each?

7. At $1 per dozen, how much is paid for 66 roses?

8. How many are $16\frac{1}{2}+16\frac{1}{2}+16\frac{1}{2}+16\frac{1}{2}+16\frac{1}{2}$?

9. When each house is 25 feet wide, how many houses can be built on a plot 600 feet wide?

10. How many half-pint glasses of lemonade are there in 5 gallons?

11. One sixth of a flock of sheep are in the barn. How many sheep are there in the flock if there are 35 in the barn.

12. How many nails can be made from 5 yards of wire if $\frac{1}{2}$ inch is used in making each nail?

13. If a barrel with the flour weighs $220\frac{1}{2}$ pounds and the barrel weighs $24\frac{1}{2}$ pounds, how many pounds of flour does it contain?

14. When $\frac{1}{4}$ peck of potatoes weighs $3\frac{3}{4}$ pounds, find the weight of the potatoes in a barrel containing $2\frac{1}{2}$ bushels.

15. How many tons of 2,240 pounds each make 98,560 pounds?

16. How many pounds less than 44,000 does a car weigh that weighs 19 tons of 2,240 pounds each?

17. Assuming that a pint of water weighs a pound, what is the weight of a 40-quart can filled with water when the can weighs 25 pounds?

18. My bill for coffee at 25 cents per pound was \$ 11.25. How many pounds did I buy?

19. If a gallon of paint will cover 315 square feet, how many gallons will be needed to paint a fence containing 1,890 square feet?

20. At the rate of 3 pounds of flour to 4 pounds of bread, how many pounds of bread will 195 pounds of flour make?

21. If the dough weighs $1\frac{3}{5}$ times as much as the flour, how many pounds of dough will 195 pounds of flour make?

22. The sum of two numbers is 117. One of the numbers is 79. Find the other number.

23. What number multiplied by 32 gives a product of 480?

Areas

Oral Exercises

1. (*a*) How many square inches are there in a square 2 inches long? (*b*) In a rectangle 2 inches long, $\frac{1}{2}$ inch wide? (*c*) In a rectangle $2\frac{1}{2}$ inches long, 2 inches wide?

2. How many square feet in a blackboard $8\frac{1}{2}$ feet long, 4 feet wide?

3. How many square feet in a door 6 feet high, $2\frac{1}{2}$ feet wide?

4. How many square feet in two windows each 5 feet high, $2\frac{1}{2}$ feet wide?

5. How many square yards in a floor 6 yards long, $4\frac{1}{2}$ yards wide?

6. How many square yards in a piece of carpet 36 yards long, $\frac{3}{4}$ yard wide?

7. How many square inches in a square 12 inches long, 12 inches wide? In a square 1 foot long, 1 foot wide?

8. How many square feet in a city lot (*a*) 20 feet by 100 feet? (*b*) 25 feet by 100 feet? (*c*) 30 feet by 150 feet?

9. How many square feet are there (*a*) in 4 city lots, each measuring 20 feet by 100 feet? (*b*) In 40?

10. There are 160 square rods in an acre. (*a*) How many square rods in 10 acres? (*b*) How many acres in a square field 40 rods long?

Written Exercises

Square Measure

144 square inches (sq. in.)	1 square foot (sq. ft.)
9 square feet	1 square yard (sq. yd.)

NOTE. To find the area in *square inches*, express each dimension in inches; to find the area in *square feet*, express each dimension in feet; to find the area in *square yards* express each dimension in yards.

1. Find the area of a rug 54 inches wide, 72 inches long.

The *number* of square inches $= 54 \times 72$.
The *number* of square feet $= 4\frac{1}{2} \times 6$.
The *number* of square yards $= 1\frac{1}{2} \times 2$.

2. Find the number of *square inches* in each of the following rectangles:

a. Length, 48 inches; width, 42 inches.
b. Length, 4 feet; width, 42 inches.
c. Length, 4 feet; width, $3\frac{1}{2}$ feet.

3. Find the number of *square feet* in each of the following rectangles:

a. Length, 4 feet; width, $3\frac{1}{2}$ feet.
b. Length, 54 feet; width, 60 inches.
c. Length, 120 feet; width, 25 feet.

4. Find the number of *square yards* in each of the following rectangles:

a. Length, 36 yards; width, $\frac{3}{4}$ yard.
b. Length, 108 feet; width, 27 inches.
c. Length, 48 yards; width, $37\frac{1}{2}$ yards.

Measurements

Written Problems

1. A room is 18 feet long, 12 feet wide, 9 feet high.

a. Find the number of square feet in the floor.

b. How many square yards of carpet will cover the floor?

c. Find the number of square feet in the ceiling.

d. How many running feet of baseboard are there in four sides of the room, deducting 3 feet for the space taken by a door?

e. How many square feet of baseboard are there in the room, when the baseboard is one foot high?

2. A paper cracker box is 8 inches long, 3 inches wide, 3 inches high.

a. How many square inches of paper are required for each of the square ends?

b. How many square inches of paper are required for each of the four long faces?

c. How many square inches of paper are required for all six faces, making no allowance for overlapping?

d. How many crackers 3 inches square will it hold, if each cracker is $\frac{1}{4}$ inch thick?

3. How many square feet of wall paper are there in a roll of paper 18 yards long, 18 inches wide?

4. At $1.50 per square yard, what will be the cost of the linoleum covering a kitchen 15 feet square?

5. A fence on the front of a lot is 25 feet long and 6 feet high. How many square feet does it contain?

SECTION IV

REVIEW AND SUPPLEMENTARY WORK

Notation and Numeration

For convenience in reading large numbers divide them by commas into periods of three figures each, beginning at the right.

TABLE

Millions' Period			Thousands' Period			Ones' Period		
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones
1	2	3,	4	5	6,	7	8	9

In reading numbers omit the name of the ones' period. Read 789, seven hundred eighty-nine.

Read 6,789, 6 thousand 789.

Read 3,456,789, 3 million 456 thousand 789.

The periods above the third are named *billions'* period, *trillions'* period, etc.

Omit the name of a period consisting exclusively of ciphers. Thus, read 14,000,000 as 14 million; 6,000,375 as 6 million 375.

Do not use a comma in writing a number of four figures denoting a year.

Numbers of four figures are frequently read as hundreds; as, 19 hundred 10. The word *hundred* is also omitted; as, nineteen ten.

Oral Exercises

Read the following:

	A	*B*	*C*	*D*
a.	250,000	1,205,060	23,004,005	103,206,580
b.	173,086	789,516	3,000,486	215,387,614
c.	45,297	2,314,800	28,000,000	319,600,000
d.	6,050	6,519,260	36,050,000	48,600,000
e.	23,915	800,000	5,060,000	562,009,007
f.	456,808	3,465,292	45,103,950	643,870,530

Written Exercises

Express in figures:

1. Three hundred seventy-two thousand.

2. One million, forty-two thousand, six hundred.

3. Ten million, fifty thousand, seventy.

4. One hundred seventy-five million, two hundred three thousand, six hundred.

5. Eighty-four million, seven hundred twenty-two thousand, three hundred ninety-five.

6. Two million, five thousand, three.

7. One hundred six million, three hundred ten thousand, eight.

8. Nine hundred eighty-seven million, six hundred fifty-four thousand, three hundred twenty-one.

9. Five hundred million, two thousand, one.

10. Seven hundred eighty-five million, two hundred forty-four thousand, nine hundred fifty-six.

Oral Problems

1. A gross is 12 dozen. How many pencils (*a*) in $\frac{1}{2}$ gross? (*b*) In $\frac{1}{3}$ gross? (*c*) In $\frac{3}{4}$ gross? (*d*) In $\frac{1}{4}$ gross?

2. How many quarts of oil are there in a barrel containing 51 gallons?

3. From a farm of 300 acres, 261 acres were sold. How many acres were not sold?

4. How many quarter-dollars are there in $22?

5. Mr. Alphin sets out 88 hundred cabbage plants in 44 rows. How many plants are there in each row?

6. If a wagon weighs 12 hundred pounds and the straw on it weighs 22 hundred pounds, what is the weight of both?

7. From a barrel of oil containing 50 gallons $10\frac{1}{2}$ gallons were sold. How many gallons remain?

8. How many days (*a*) in 50 weeks? (*b*) In 2 weeks? (*c*) In 52 weeks?

9. How many dollars are there in 888 quarter dollars?

10. How many days will 48 pounds of butter last if 16 pounds are used in a week?

11. If a man earns $125 per month and his expenses are $94 per month, how many dollars can be saved (*a*) in a month? (*b*) In a year?

12. What is the weight of 1,000 common bricks at $1\frac{1}{2}$ lb. each?

13. At 160 bricks per day, how many days are required to lay 960 bricks?

14. What is the cost of a cement walk 3 feet wide, 100 feet long, at 8 cents per square foot?

15. A man takes an automobile trip 40 miles and back at the rate of 8 miles per hour going, and 10 miles per hour returning. How long does he require for the trip?

16. I bought 20 yards of velvet for $70 and sold it at a profit of $\$\frac{1}{2}$ per yard. How much per yard did I receive for it?

17. Two boys start from the same point and travel in opposite directions at the rate of $2\frac{1}{2}$ miles per hour. How far apart are they in 5 hours?

18. What is the cost of a horse and a wagon if the horse cost $250 and the wagon cost $125?

19. A field is 300 yards square. How many yards of wire will be required to inclose it with a fence 4 wires high?

20. A man bought a lot for $650, giving 12 cows, for which he was allowed $50 each, and the balance in cash. How much cash did he give?

21. After selling one half of his crop of cotton Judge Wilson has 324 bales left. Of how many bales did the crop consist?

22. A boy used 224 of a bunch of 250 shingles in mending a roof. How many shingles were left?

Written Problems

1. A great gross consists of 12 gross of 12 dozen each. How many pens are there in one half of a great gross?

2. How many quarts of oil are there in 49 gallons?

3. From a farm of 300 acres $137\frac{3}{4}$ acres were sold. How many acres remain?

4. How many quarter dollars are there in $\$27\frac{1}{2}$?

5. If 9,180 cabbage plants are required for 45 rows, how many plants are there to a row?

6. A wagon weighs 1,245 lb. and the straw on it weighs 2,156 lb. What is the weight of both?

7. From a barrel of oil containing 50 gallons, three lots were sold of $10\frac{1}{2}$ gallons each. How many gallons remain?

8. How many days are there in 26 weeks?

9. How many dollars are there in 972 quarter dollars?

10. How many days will 255 pounds of butter last if 17 pounds are used each week?

11. If a man earns \$112.50 per month and his expenses are \$83.75 per month, how many dollars can he save in (*a*) 1 month? (*b*) 1 year? (*c*) 2 years?

12. A girl makes a steamboat trip of 100 miles and back at the rate of 16 miles per hour going and 12 miles per hour returning. How many hours are required for the round trip?

13. What is the weight of 960 common bricks at $1\frac{1}{2}$ pounds each?

14. At 160 bricks per day, how many days are required to lay 4,000 bricks?

15. At 10 cents per square foot, what is the cost of a cement walk 5 feet wide, 164 feet long?

16. A dealer bought 32 yards of cloth for $80 and sold it at a profit of $\$\frac{3}{4}$ per yard. How much did he receive for it per yard?

17. Two boys start from the same point and travel in opposite directions, each going at the rate of $2\frac{3}{4}$ miles per hour. How far apart are they in 8 hours?

18. What is the cost of a horse, a wagon, and a set of harness, if the horse cost $375, the wagon $150, and the harness $35?

19. A field is 256 yards square. How many yards of wire will inclose it with a fence 4 wires high?

20. A man bought a lot for $800, giving 12 cows at the rate of $55 each and the remainder in cash. How much cash did he give?

21. After selling three fourths of his crop of hay Mr. Whitlock has 123 tons left. How many tons were there in the crop?

22. A boy uses 787 shingles out of 4 bunches of 250 shingles each. How many shingles are left?

23. How many tons of 2,240 pounds each do 1,600 paving bricks weigh if a brick weighs 7 pounds?

Aliquot Parts of Dollar

Oral Exercises

1. How many dollars are equal to 44 half dollars?

2. What is the cost of 2 dozen baseballs at $\$\frac{1}{2}$ each?

3. How much must be paid for 48 yards of dress goods at 50 cents per yard?

4. A girl has saved 12 dollars and 12 half dollars. How much has she saved?

5. Find the cost of 2 dozen straw hats at $\$1\frac{1}{2}$ each.

6. A man cut down 64 trees, each yielding $1\frac{1}{2}$ cords of wood. How many cords of wood did he cut?

7. What will be received for cutting 64 cords of wood at $\$1\frac{1}{2}$ per cord?

8. At 25 cents per dozen, what is received for 48 dozen eggs?

9. What is the yearly cost of a newspaper at 25 cents per month?

10. At 25 cents each, what is the cost of 88 readers?

11. When meat is 25 cents per pound, how much does the butcher receive for 168 pounds?

12. If 4 pairs of cuffs cost a dollar, how many pairs can be bought for $\$42$?

13. At 4 for a dollar, how many baseballs can be bought for $\$12$?

14. How many 50-cent baseballs will cost $\$24$?

Sight Exercises

1. Give the cost of each of the following items:

a. 120 yards of silk @ $1.50 per yard.

$120 + $\frac{1}{2}$ of $120.

b. 248 gallons of sirup @ 50 cents per gallon.

248 half dollars.

c. 484 pounds of coffee @ 25 cents per pound.

484 quarter dollars.

d. 620 bushels of apples @ $1.50 per bushel.

e. 840 handkerchiefs @ 25 cents each.

f. 360 pairs of socks @ 25 cents per pair.

g. 168 baseballs @ 50 cents each.

h. 440 penknives @ $1.50 each.

i. 120 gallons of oil @ 16 cents per gallon.

16 times 120.

j. 210 pounds of sugar @ 6 cents per pound.

k. 320 yards of velvet @ $3 per yard.

l. 24 carpet rugs @ $20 each.

m. 180 dozen collars @ $1.50 per dozen.

n. 44 bushels of wheat @ $1.02 per bushel.

44 times $1.02.

o. 110 barrels of flour @ $6 per barrel.

p. 15 horses @ $300 each.

q. 2 automobiles @ $2,400 each.

r. 200 acres of land @ $40 per acre.

s. 488 pounds of butter @ 25 cents per pound.

t. 620 geranium plants @ 4 cents each.

Relation of Numbers

Preparatory Exercises

1. Find $\frac{1}{2}$ of each of the following numbers:
   a. 24. *b.* 48. *c.* 62. *d.* 86. *e.* 50. *f.* 70.

2. Find $\frac{1}{4}$ of each of the following numbers:
   a. 24. *b.* 36. *c.* 48. *d.* 84. *e.* 64. *f.* 96.

3. Find $\frac{1}{3}$ of each of the following numbers:
   a. 18. *b.* 24. *c.* 36. *d.* 48. *e.* 69. *f.* 96.

4. Find $\frac{3}{4}$ of each of the following numbers:
   a. 16. *b.* 20. *c.* 32. *d.* 40. *e.* 48. *f.* 80.

5. Find $\frac{2}{3}$ of each of the following numbers:
   a. 15. *b.* 21. *c.* 33. *d.* 63. *e.* 90. *f.* 96.

6. What fraction of 60 is each of the following:
   a. 30? *b.* 20? *c.* 15? *d.* 12? *e.* 24? *f.* 40?

7. What fraction of 48 is each of the following:
   a. 8? *b.* 16? *c.* 24? *d.* 12? *e.* 36? *f.* 32?

8. What fraction of a foot is each of the following:
   a. 2 in.? *b.* 3 in.? *c.* 4 in.? *d.* 5 in.?
   e. 6 in.? *f.* 7 in.? *g.* 8 in.? *h.* 9 in.?
   i. 1 in.? *j.* 12 in.? *k.* 10 in.? *l.* 11 in.?

9. What fraction of a pound is each of the following:
   a. 1 oz.? *b.* 2 oz.? *c.* 3 oz.? *d.* 4 oz.?
   e. 5 oz.? *f.* 6 oz.? *g.* 7 oz.? *h.* 8 oz.?
   i. 9 oz.? *j.* 10 oz.? *k.* 11 oz.? *l.* 12 oz.?
   m. 13 oz.? *n.* 14 oz.? *o.* 15 oz.? *p.* 16 oz.?

10. What fraction of 24 is:

a. 1? *b.* 5? *c.* 7? *d.* 11?
e. 13? *f.* 17? *g.* 19? *h.* 23?

11. What fraction of 24, in lowest terms, is:

a. 20? *b.* 9? *c.* 15? *d.* 21?
e. 10? *f.* 14? *g.* 22? *h.* 18?

12. Find the number whose one-half is:

a. 10. *b.* 15. *c.* 20. *d.* 25. *e.* 30. *f.* 40.

13. Find the number whose one-fourth is:

a. 10. *b.* 12. *c.* 21. *d.* 25. *e.* 31. *f.* 42.

14. Find the number whose one-third is:

a. 12. *b.* 13. *c.* 15. *d.* 16. *e.* 21. *f.* 32.

15. Find 2 thirds of a number when 1 third is:

a. 10. *b.* 11. *c.* 14. *d.* 24. *e.* 33. *f.* 44.

16. Find 1 third of a number when 2 thirds are:

a. 22. *b.* 30. *c.* 36. *d.* 44. *e.* 60. *f.* 80.

17. Find 3 thirds of a number when 2 thirds are:

a. 22. *b.* 30. *c.* 36. *d.* 44. *e.* 60. *f.* 80.

18. Find 4 fourths of a number when 3 fourths are:

a. 12. *b.* 18. *c.* 24. *d.* 30. *e.* 60. *f.* 90.

19. Find the number when 4 thirds are:

a. 12. *b.* 16. *c.* 32. *d.* 40. *e.* 48. *f.* 84.

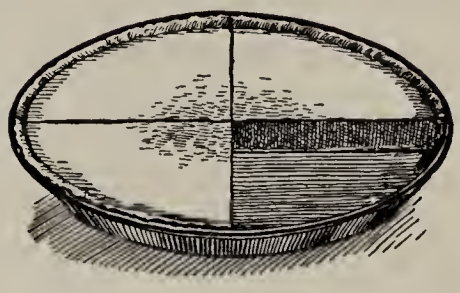
20. Find the number when 4 fifths are:

a. 12. *b.* 16. *c.* 32. *d.* 40. *e.* 48. *f.* 84.

Oral Problems

1. If $\frac{1}{2}$ pound of butter costs 12 cents, what is the price of a quarter of a pound?

2. If one half of a pie costs 10 cents, what is the price of a quarter of a pie?



3. If a girl paid 15 cents for 3 quarters of a pie, what was the price of each quarter?

4. How is the price of a quarter of a yard found when you know the price of a half yard to be 20 cents?

5. How is the price of 1 fourth of a pie found, when you know the price of 3 fourths to be 15 cents?

6. When 2 equal parts of a number are 60, what is each of the equal parts?

7. When 3 of the equal fields of a farm contain 60 acres, how many acres are there in each?

8. If 3 fourths of a number is 12, (*a*) what is 1 fourth of the number? (*b*) What is the number?

9. If 2 thirds of a yard of goods cost 22 cents, what will 3 thirds of a yard cost?

10. If 9 in. of wire cost 18¢, what will 12 in. cost?

11. If 3 fourths of a foot of wire cost 12 cents, what will 4 fourths of a foot cost?

12. Find the cost of a gallon of oil when 3 quarts cost 12 cents.

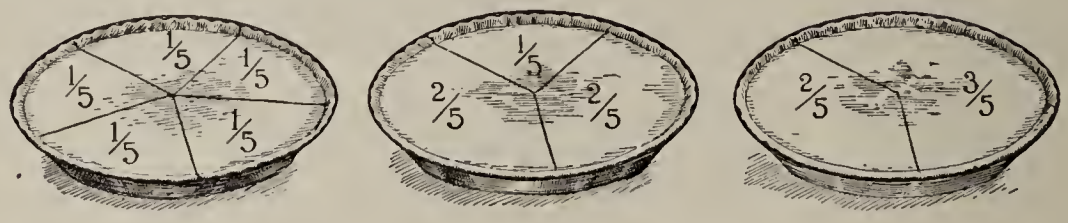
Fractions

A fraction is one or more of the equal parts into which a thing is divided.

A fraction consists of two numbers, called the *terms* of the fraction, one written above the other with a line between them.

When an apple, a pie, a number, etc., is divided into *two* equal parts, each part is called a *half;* when it is divided into *three* equal parts, each part is called a *third;* etc.

One half, one third, one fourth, etc., are written: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, etc.



If a pie, for instance, is divided into five equal parts, one of these parts is called one fifth; a portion equal in size to two of these parts is called two fifths; a portion equal in size to three of these parts is called three fifths; etc.

The number written below the line is called the *denominator* of the fraction; it shows into how many parts a thing is supposed to be divided. The number written above the line is called the *numerator;* it shows the number of these parts that are taken.

A fraction indicates division: the numerator being the dividend and the denominator the divisor.

Proper and Improper Fractions

A *proper* fraction is a fraction in which the number expressing the numerator is smaller than the number expressing the denominator; an *improper* fraction is one in which the number expressing the numerator is at least as large as the number expressing the denominator.

$\frac{1}{2}$, $\frac{2}{3}$, $\frac{4}{5}$, $\frac{7}{8}$, etc., are proper fractions.

$\frac{3}{3}$, $\frac{4}{3}$, $\frac{11}{5}$, $\frac{16}{8}$, etc., are improper fractions.

A *mixed number* is a whole number and a proper fraction written together.

$1\frac{1}{2}$, $3\frac{2}{3}$, $19\frac{7}{8}$, etc., are mixed numbers.

An improper fraction may be reduced to a whole or to a mixed number by dividing the numerator of the fraction by the denominator.

$$\frac{16}{2} = 8 \qquad \frac{17}{4} = 4\frac{1}{4} \qquad \frac{27}{8} = 3\frac{3}{8}$$

Sight Exercises

1. Change to whole or to mixed numbers:

	A	*B*	*C*	*D*	*E*
a.	$\frac{17}{2}$	$\frac{23}{5}$	$\frac{49}{8}$	$\frac{66}{11}$	$\frac{48}{16}$
b.	$\frac{16}{3}$	$\frac{25}{6}$	$\frac{72}{9}$	$\frac{25}{12}$	$\frac{71}{20}$

2. Change to improper fractions:

	A	*B*	*C*	*D*	*E*
a.	$8\frac{1}{2}$	$4\frac{1}{10}$	$3\frac{2}{5}$	$2\frac{3}{25}$	$3\frac{1}{6}$
b.	$5\frac{1}{3}$	$6\frac{1}{4}$	$3\frac{1}{2}$	$1\frac{8}{15}$	$4\frac{3}{25}$

Lowest Terms

A change in the form of a fraction that does not alter its value is called a *reduction.*

A fraction is reduced to *lowest terms* by dividing the numerator and the denominator by the largest number that will exactly divide both terms.

Sight Exercises

Reduce to lowest terms:

	A	*B*	*C*	*D*	*E*
a.	$\frac{2}{8}$	$\frac{2}{6}$	$\frac{2}{10}$	$\frac{2}{20}$	$\frac{2}{16}$
b.	$\frac{4}{8}$	$\frac{4}{6}$	$\frac{4}{10}$	$\frac{4}{20}$	$\frac{4}{16}$
c.	$\frac{6}{9}$	$\frac{6}{16}$	$\frac{6}{20}$	$\frac{6}{24}$	$\frac{6}{18}$
d.	$\frac{12}{16}$	$\frac{16}{24}$	$\frac{20}{25}$	$\frac{18}{30}$	$\frac{15}{18}$

Higher Terms

A fraction is changed to *higher terms* by multiplying both terms by the same number.

Sight Exercises

1. Change $\frac{1}{2}$ to 4ths. To 8ths. To 24ths.
2. Change $\frac{1}{3}$ to 6ths. To 9ths. To 15ths.
3. Change $\frac{2}{3}$ to 6ths. To 9ths. To 18ths.
4. Change $\frac{3}{4}$ to 8ths. To 16ths. To 24ths.
5. Change $\frac{5}{6}$ to 12ths. To 24ths. To 30ths.
6. Change $\frac{3}{8}$ to 16ths. To 24ths. To 40ths.
7. Change $\frac{5}{8}$ to 16ths. To 24ths. To 40ths.
8. Change $\frac{2}{5}$ to 10ths. To 20ths. To 30ths.

Common Denominators

To add or to subtract fractions, they must have the same denominator. When two or more fractions are changed to equivalent fractions each having the same denominator, they are said to be reduced to a *common denominator*.

Sight Exercises

1. Reduce each set to fractions having a common denominator:

	A	*B*
a.	$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$	$\frac{1}{2}, \frac{3}{4}, \frac{7}{10}$
b.	$\frac{1}{3}, \frac{1}{4}, \frac{1}{6}$	$\frac{1}{2}, \frac{2}{3}, \frac{3}{10}$
c.	$\frac{1}{2}, \frac{1}{4}, \frac{1}{5}$	$\frac{1}{2}, \frac{5}{6}, \frac{1}{10}$
d.	$\frac{1}{2}, \frac{1}{3}, \frac{1}{8}$	$\frac{2}{3}, \frac{3}{5}, \frac{1}{6}$

2. Find sums:

Reduce improper fractions in results to mixed numbers.

	A	*B*	*C*
a.	$\frac{1}{2}+\frac{1}{3}$	$\frac{1}{2}+\frac{1}{5}$	$\frac{1}{3}+\frac{2}{5}$
b.	$\frac{1}{3}+\frac{1}{4}$	$\frac{1}{3}+\frac{1}{5}$	$\frac{2}{3}+\frac{1}{5}$
c.	$\frac{1}{2}+\frac{2}{3}$	$\frac{1}{2}+\frac{2}{5}$	$\frac{1}{3}+\frac{3}{5}$
d.	$\frac{1}{3}+\frac{3}{4}$	$\frac{1}{2}+\frac{3}{5}$	$\frac{2}{3}+\frac{3}{5}$

3. Subtract:

	A	*B*	*C*
a.	$\frac{1}{2}-\frac{1}{3}$	$\frac{1}{2}-\frac{1}{5}$	$\frac{2}{5}-\frac{1}{3}$
b.	$\frac{1}{3}-\frac{1}{4}$	$\frac{1}{3}-\frac{1}{5}$	$\frac{2}{3}-\frac{1}{5}$
c.	$\frac{2}{3}-\frac{1}{2}$	$\frac{1}{2}-\frac{2}{5}$	$\frac{3}{5}-\frac{1}{3}$

Addition of Fractions

Written Exercises

1. A boy divided a strip of copper into four pieces measuring, respectively, $\frac{2}{3}$ ft., $\frac{3}{4}$ ft., $\frac{5}{6}$ ft., and $\frac{7}{8}$ ft. What was the length of the strip?

PROCESS

Find the least common denominator of $\frac{5}{6}$ and $\frac{7}{8}$, rejecting the other denominators 3 and 4, each of which is a factor of 6 or of 8. Test successive multiples of 8, until one is found, 24, that is a multiple of 6; 24 is the required common denominator.

Change each fraction to 24ths, writing only the new numerators in a line under the common denominator. Write the sum of the numerators, 75, over the denominator, 24. Change $\frac{75}{24}$ to $3\frac{3}{24}$, and then to $3\frac{1}{8}$.

	24
$\frac{2}{3}$	16
$\frac{3}{4}$	18
$\frac{5}{6}$	20
$\frac{7}{8}$	21
Ans. $3\frac{1}{8}$	$\frac{75}{24} = 3\frac{3}{24} = 3\frac{1}{8}$

2. Add the following:

	A	*B*	*C*
a.	$\frac{1}{2}+\frac{1}{3}+\frac{1}{4}$	$\frac{1}{2}+\frac{2}{3}+\frac{5}{8}$	$\frac{1}{2}+\frac{2}{3}+\frac{2}{5}$
b.	$\frac{1}{3}+\frac{1}{4}+\frac{1}{6}$	$\frac{1}{2}+\frac{2}{3}+\frac{3}{8}$	$\frac{1}{2}+\frac{2}{3}+\frac{5}{9}$
c.	$\frac{1}{2}+\frac{1}{4}+\frac{1}{5}$	$\frac{1}{3}+\frac{5}{6}+\frac{4}{15}$	$\frac{1}{2}+\frac{5}{6}+\frac{1}{10}$
d.	$\frac{1}{2}+\frac{1}{3}+\frac{1}{8}$	$\frac{1}{6}+\frac{4}{9}+\frac{5}{12}$	$\frac{2}{3}+\frac{3}{5}+\frac{1}{6}$
e.	$\frac{1}{4}+\frac{1}{5}+\frac{1}{10}$	$\frac{1}{6}+\frac{1}{10}+\frac{1}{15}$	$\frac{1}{2}+\frac{3}{4}+\frac{7}{10}$
f.	$\frac{1}{2}+\frac{2}{3}+\frac{3}{4}$	$\frac{1}{5}+\frac{3}{8}+\frac{7}{10}$	$\frac{1}{2}+\frac{5}{12}+\frac{1}{8}$
g.	$\frac{1}{3}+\frac{3}{4}+\frac{5}{6}$	$\frac{2}{3}+\frac{3}{4}+\frac{4}{9}$	$\frac{5}{6}+\frac{7}{8}+\frac{3}{4}$
h.	$\frac{1}{2}+\frac{3}{4}+\frac{2}{5}$	$\frac{1}{2}+\frac{5}{6}+\frac{7}{15}$	$\frac{2}{3}+\frac{5}{8}+\frac{1}{12}$

Addition of Mixed Numbers

1. A boy divided a rope into four pieces measuring $17\frac{1}{2}$ yd., $8\frac{2}{3}$ yd., $\frac{5}{9}$ yd., $20\frac{3}{4}$ yd., and $9\frac{5}{12}$ yd., respectively. What was the length of the rope?

PROCESS

Reject the denominators 2, 3, and 4, each of which is a factor of 9 or of 12. Test successive multiples of 12, until one is found, 36, that is a multiple of 9; write 36 as the common denominator.

		36
	$17\frac{1}{2}$	18
	$8\frac{2}{3}$	24
	$\frac{5}{9}$	20
	$20\frac{3}{4}$	27
	$9\frac{5}{12}$	15
Ans.	$56\frac{8}{9}$	$\frac{104}{36} = 2\frac{32}{36} = 2\frac{8}{9}$

Change the fractions to 36ths, find their sum, and reduce the result to $2\frac{8}{9}$. Write $\frac{8}{9}$ under the original fractions and carry 2 to the ones' column of the whole numbers.

2. Add the following:

	A	*B*	*C*	*D*	*E*
a.	$6\frac{1}{2}$	$10\frac{2}{3}$	$33\frac{1}{4}$	53	$17\frac{4}{5}$
	$20\frac{1}{3}$	$5\frac{3}{4}$	16	$20\frac{5}{8}$	$12\frac{1}{6}$
	15	$27\frac{1}{8}$	$2\frac{2}{5}$	$7\frac{1}{6}$	13
	$3\frac{1}{15}$	19	$1\frac{3}{8}$	$9\frac{5}{12}$	$11\frac{3}{10}$
b.	$24\frac{1}{6}$	$30\frac{3}{4}$	27	$3\frac{3}{4}$	$16\frac{5}{9}$
	$7\frac{3}{10}$	36	$18\frac{5}{6}$	$17\frac{1}{5}$	$27\frac{3}{4}$
	$16\frac{11}{15}$	$7\frac{1}{5}$	$12\frac{5}{9}$	28	$8\frac{2}{3}$
	20	$8\frac{3}{8}$	$7\frac{5}{12}$	$9\frac{9}{10}$	42

Subtraction of Mixed Numbers

Preparatory Exercises

1. What fraction added to $\frac{7}{8}$ gives 1 as the sum?

2. What fraction added to $\frac{7}{8}$ gives a sum $\frac{1}{8}$ greater than 1?

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

3. What fraction added to $\frac{7}{8}$ gives $1\frac{1}{4}$ as the sum?

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

Sight Exercises

Subtract:

	A	*B*	*C*	*D*	*E*	*F*
a.	$1 - \frac{7}{8}$	$1\frac{1}{8} - \frac{7}{8}$	$1\frac{1}{4} - \frac{7}{8}$	$1\frac{3}{8} - \frac{7}{8}$	$1\frac{1}{2} - \frac{7}{8}$	$1\frac{5}{8} - \frac{7}{8}$
b.	$1 - \frac{5}{6}$	$1\frac{1}{6} - \frac{5}{6}$	$1\frac{1}{3} - \frac{5}{6}$	$1\frac{1}{2} - \frac{5}{6}$	$1\frac{2}{3} - \frac{5}{6}$	$1\frac{3}{4} - \frac{7}{8}$
c.	$1\frac{1}{5} - \frac{2}{5}$	$1\frac{1}{5} - \frac{3}{5}$	$1\frac{1}{5} - \frac{4}{5}$	$1\frac{2}{5} - \frac{3}{5}$	$1\frac{2}{5} - \frac{4}{5}$	$1\frac{3}{5} - \frac{4}{5}$
d.	$1\frac{1}{4} - \frac{1}{2}$	$1\frac{1}{3} - \frac{2}{3}$	$1\frac{1}{6} - \frac{1}{3}$	$1\frac{1}{4} - \frac{1}{3}$	$1\frac{1}{3} - \frac{3}{4}$	$1\frac{1}{2} - \frac{3}{4}$
e.	$1\frac{1}{8} - \frac{1}{4}$	$1\frac{1}{8} - \frac{1}{2}$	$1\frac{1}{8} - \frac{3}{4}$	$1\frac{3}{8} - \frac{1}{2}$	$1\frac{3}{8} - \frac{3}{4}$	$1\frac{1}{2} - \frac{5}{8}$
f.	$2\frac{1}{8} - \frac{1}{4}$	$3\frac{1}{8} - \frac{1}{2}$	$4\frac{1}{8} - \frac{3}{4}$	$5\frac{3}{8} - \frac{1}{2}$	$6\frac{3}{8} - \frac{3}{4}$	$7\frac{1}{8} - \frac{5}{8}$
g.	$4\frac{1}{6} - 3\frac{1}{3}$	$5\frac{1}{6} - 4\frac{1}{2}$	$6\frac{1}{3} - 5\frac{1}{2}$	$7\frac{1}{6} - 6\frac{2}{3}$	$8\frac{3}{8} - 7\frac{1}{2}$	$9\frac{1}{4} - 8\frac{1}{3}$

Written Exercises

1. From $60\frac{17}{36}$ yards of iron cable a man cut $32\frac{8}{9}$ yards. How many yards were left?

PROCESS

Since 36 is a multiple of 9, 36 is the least common denominator. Write 36, and underneath it the numerator 17, and the new numerator 32. Since $\frac{32}{36}$ is greater than $\frac{17}{36}$, increase the latter by 1, making it $1\frac{17}{36}$, and change it to the improper fraction $\frac{53}{36}$, writing the numerator of the latter alongside for convenience in performing the subtraction. Take 32 from 53, writing the difference, 21, over the common denominator. Reduce $\frac{21}{36}$ to $\frac{7}{12}$. Write $\frac{7}{12}$ under the original fractions and carry 1 to the ones' figure of the subtrahend. Say 3 and **7** (writing 7) are 10; carrying 1 to 3, say 4 and **2** (writing 2) are 6.

Test by adding the remainder and the subtrahend.

	36	
$60\frac{17}{36}$	17	53
$-32\frac{8}{9}$	32	
Ans. $27\frac{7}{12}$	$\frac{21}{36}=\frac{7}{12}$	

2. Subtract. Test:

	A	*B*	*C*
a.	$51\frac{1}{3}-27\frac{5}{9}$	$48\frac{1}{2}-27\frac{5}{6}$	$86\frac{1}{8}-37\frac{3}{4}$
b.	$80\frac{2}{3}-16\frac{7}{8}$	$35\frac{3}{4}-12\frac{8}{9}$	$63\frac{2}{3}-36\frac{3}{4}$
c.	$93\frac{1}{6}-18\frac{3}{4}$	$80\frac{2}{9}-27\frac{5}{12}$	$53\frac{1}{2}-36\frac{7}{9}$
d.	$75\frac{2}{3}-55\frac{3}{4}$	$67\frac{1}{2}-49\frac{11}{15}$	$42\frac{3}{4}-36\frac{4}{5}$
e.	$30\frac{1}{2}-15\frac{7}{10}$	$40\frac{2}{3}-14\frac{7}{10}$	$50\frac{1}{3}-20\frac{3}{4}$
f.	$60\frac{1}{4}-20\frac{3}{10}$	$70\frac{3}{4}-23\frac{9}{10}$	$80\frac{5}{6}-70\frac{7}{8}$

Sight Problems

1. From a tub containing $50\frac{1}{2}$ pounds of butter there were sold $20\frac{3}{4}$ pounds. How many pounds remain?

2. What is the cost of 8 yards of muslin at $10\frac{3}{4}$ cents a yard?

3. How much is received for $10\frac{1}{2}$ yards of velvet sold at \$ 4 per yard?

4. A coat takes $3\frac{1}{2}$ yards of cloth and a vest $\frac{7}{8}$ yard. How many yards are required for both?

5. After walking $2\frac{7}{8}$ miles, how far must a girl still walk to complete $4\frac{1}{2}$ miles?

6. If the distance around a running track is a quarter of a mile, how many times around it must a boy run to go $2\frac{1}{2}$ miles?

7. At $40\frac{1}{2}$ miles per hour, how far will a train go in 10 hours?

8. If it requires 3 bushels of seed wheat for 2 acres, how many acres can be sown with 30 bushels?

9. (*a*) At \$ $\frac{1}{4}$ each, how many books can be bought for \$ $8\frac{1}{4}$? (*b*) How many books at \$ $\frac{3}{4}$ each can be bought for \$ $8\frac{1}{4}$?

10. At $1\frac{3}{4}$ bushels to the acre, how many bushels of oats will be required to sow 40 acres?

11. At the rate of $31\frac{1}{2}$ gallons to a barrel, how many gallons are there in a hogshead of 2 barrels?

12. Take three times $1\frac{1}{2}$ from 100.

Written Problems

1. From a tub containing $52\frac{1}{4}$ pounds of butter $27\frac{1}{2}$ pounds have been sold. How many pounds are left?

2. Find the cost of 8 yards of dress goods at $56\frac{3}{4}$ cents per yard.

3. A man buys $23\frac{1}{2}$ yards of velvet at \$ 3.60 per yard. How much does he pay for it?

4. How much cloth is required to make a suit if the coat takes $3\frac{1}{2}$ yards, the vest $\frac{7}{8}$ yard, and the trousers $1\frac{3}{4}$ yards?

5. After riding $12\frac{3}{5}$ miles, how many miles remain of a journey of $20\frac{3}{10}$ miles?

6. If the distance around a track is an eighth of a mile, how many laps must a bicycle rider make to complete $13\frac{3}{4}$ miles?

7. At $37\frac{3}{8}$ miles per hour, how far will a train go in 10 hours?

8. If it requires 3 bushels of seed wheat to sow 2 acres, how many acres can be sown with 72 bushels?

9. (*a*) At \$ $\frac{1}{4}$ each, how many books can be bought for \$ $18\frac{3}{4}$? (*b*) If the books are 3 quarter dollars each, how many can be bought for \$ $18\frac{3}{4}$?

10. At $1\frac{3}{4}$ bushels to the acre, how many bushels of seed will be required for 56 acres?

11. There are $5\frac{1}{2}$ yards in a rod. How many inches are there in a rod?

Product of a Mixed Number and a Whole Number

Preparatory Exercises

1. Add $\frac{1}{2}$ and $\frac{1}{2}$. Add $12\frac{1}{2}$ and $12\frac{1}{2}$. Multiply $12\frac{1}{2}$ by 2.

2. How many quarters are 8 times 1 quarter? How many ones are 8 times $\frac{1}{4}$? Multiply $\$\frac{1}{4}$ by 8. Multiply $\$1\frac{1}{4}$ by 4.

3. What will 8 baseballs cost at $\$1\frac{1}{4}$ each?

4. How many fourths are 8 times 3 fourths? How many ones are 24 fourths? $\frac{3}{4}$ of 8 = ? 8 times $\frac{3}{4}$ = ?

5. Multiply $7\frac{2}{3}$ by 12.

PROCESS

$7\frac{2}{3} \times 12 = 92$ *Ans.*

Think 12 times 2 thirds are 24 thirds, or 8. Carry 8 to 12 times 7 (84), making 92. Write 92.

Test by dividing 92 by 12.

Sight Exercises

Give products:

	A	*B*	*C*	*D*	*E*	*F*
a.	$6\frac{1}{2}$	$4\frac{1}{4}$	$4\frac{1}{6}$	$3\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{3}{4}$
	$\times 2$	$\times 4$	$\times 6$	$\times 8$	$\times 8$	$\times 4$
b.	$3\frac{1}{3}$	$4\frac{1}{3}$	$5\frac{2}{3}$	$6\frac{1}{3}$	$7\frac{2}{3}$	$8\frac{2}{3}$
	$\times 3$	$\times 6$	$\times 3$	$\times 9$	$\times 6$	$\times 9$
c.	$9\frac{1}{5}$	$8\frac{2}{5}$	$7\frac{3}{5}$	$6\frac{4}{5}$	$5\frac{1}{6}$	$4\frac{5}{6}$
	$\times 5$	$\times 5$	$\times 5$	$\times 5$	$\times 6$	$\times 6$

Written Exercises

1. A barrel of potatoes weighed $246\frac{3}{4}$ lb. What would be the probable weight of 12 barrels?

PROCESS

Think 12 times $\frac{3}{4}$ are $\frac{36}{4}$, or 9. Carry 9 to 12 times 6 (72), making 81, etc.

Test by dividing 2961 by 12.

$246\frac{3}{4}$ lb.
12
Ans. 2961 lb.

2. Find products:

	A	*B*	*C*
a.	$25\frac{1}{2} \times 8$	$17\frac{1}{4} \times 8$	$33\frac{1}{3} \times 6$
b.	$46\frac{3}{4} \times 4$	$28\frac{3}{5} \times 5$	$66\frac{2}{3} \times 9$
c.	$75\frac{3}{8} \times 8$	$87\frac{2}{3} \times 6$	$93\frac{3}{4} \times 8$
d.	$18\frac{3}{4} \times 12$	$26\frac{4}{5} \times 10$	$42\frac{2}{3} \times 12$

3. Multiply $437\frac{1}{4}$ by 126.

PROCESS

Reduce $\frac{126}{4}$, the product of $\frac{1}{4}$ by 126, to $31\frac{2}{4}$ by dividing 126 by 4 (without rewriting these numbers), and change $\frac{2}{4}$ to $\frac{1}{2}$. Write $31\frac{1}{2}$.

Multiply 437 by 6, placing the right-hand figure of the product in the ones' column. Place the right-hand figure of the product by 2 tens and by 1 hundred in the tens' and hundreds' columns, respectively. Combine the partial products.

$437\frac{1}{4}$
126
$31\frac{1}{2}$
2622
874
437
$55093\frac{1}{2}$ *Ans.*

4. Find products:

	A	*B*	*C*
a.	$36\frac{1}{3} \times 25$	$29\frac{1}{4} \times 17$	$63\frac{1}{6} \times 15$
b.	$42\frac{1}{5} \times 18$	$54\frac{1}{2} \times 31$	$70\frac{1}{8} \times 27$
c.	$91\frac{1}{9} \times 19$	$83\frac{1}{10} \times 16$	$65\frac{1}{12} \times 26$
d.	$72\frac{1}{7} \times 23$	$52\frac{1}{11} \times 24$	$44\frac{1}{3} \times 22$

5. Multiply $275\frac{5}{6}$ by 16.

PROCESS

Find the product of $\frac{5}{6}$ by 16 by multiplying 16 by 5, and dividing the result by 6, reducing the fraction $\frac{2}{6}$ to $\frac{1}{3}$. Under this write the product of 6 times 275, etc.

$$
\begin{array}{r}
275\frac{5}{6} \\
16 \\
\hline
6\overline{)80} \\
\quad 13(\frac{2}{6})\frac{1}{3} \\
1650 \\
275 \\
\hline
4413\frac{1}{3} \quad \textit{Ans.}
\end{array}
$$

	A	*B*	*C*
a.	$48\frac{2}{3} \times 25$	$37\frac{3}{4} \times 17$	$64\frac{5}{6} \times 15$
b.	$73\frac{4}{5} \times 16$	$82\frac{3}{8} \times 14$	$90\frac{2}{9} \times 24$
c.	$56\frac{3}{10} \times 13$	$62\frac{5}{12} \times 18$	$86\frac{7}{8} \times 21$
d.	$70\frac{5}{9} \times 19$	$58\frac{2}{5} \times 23$	$49\frac{7}{12} \times 22$
e.	$22\frac{5}{6} \times 16$	$41\frac{2}{3} \times 22$	$75\frac{3}{5} \times 31$
f.	$31\frac{5}{8} \times 22$	$32\frac{3}{4} \times 31$	$54\frac{5}{8} \times 33$
g.	$63\frac{2}{5} \times 31$	$23\frac{4}{5} \times 18$	$43\frac{7}{9} \times 21$
h.	$45\frac{2}{9} \times 15$	$55\frac{3}{8} \times 17$	$32\frac{2}{3} \times 22$
i.	$54\frac{2}{3} \times 20$	$34\frac{4}{9} \times 13$	$21\frac{7}{8} \times 14$

6. Multiply 285 by $16\frac{1}{6}$.

PROCESS

Find the product of 285 by $\frac{1}{6}$ by dividing 285 by 6. Find the other two partial products and combine the three.

$$\begin{array}{r} 285 \\ 16\frac{1}{6} \\ \hline 47\,(\frac{3}{6})\,\frac{1}{2} \\ 1710 \\ 285 \\ \hline 4607\frac{1}{2} \end{array}$$ *Ans.*

	A	*B*	*C*
a.	$25 \times 13\frac{1}{2}$	$37 \times 14\frac{1}{3}$	$49 \times 15\frac{1}{4}$
b.	$52 \times 16\frac{1}{5}$	$63 \times 17\frac{1}{6}$	$74 \times 18\frac{1}{7}$
c.	$82 \times 19\frac{1}{8}$	$98 \times 21\frac{1}{9}$	$87 \times 45\frac{1}{10}$

7. Multiply 285 by $23\frac{5}{6}$.

PROCESS

Find the product of 285 by $\frac{5}{6}$ by multiplying 285 by 5 and dividing the result by 6, reducing the fraction.

$$\begin{array}{r} 285 \\ 23\frac{5}{6} \\ \hline 6)\overline{1425} \\ 237\,(\frac{3}{6})\,\frac{1}{2} \\ 855 \\ 570 \\ \hline 6792\frac{1}{2} \end{array}$$ *Ans.*

	A	*B*	*C*
a.	$98 \times 23\frac{3}{4}$	$98 \times 24\frac{2}{3}$	$78 \times 25\frac{3}{5}$
b.	$67 \times 26\frac{5}{6}$	$58 \times 27\frac{3}{7}$	$49 \times 32\frac{5}{8}$
c.	$39 \times 33\frac{3}{10}$	$27 \times 34\frac{5}{12}$	$36 \times 41\frac{4}{5}$
d.	$47 \times 42\frac{3}{8}$	$54 \times 43\frac{2}{7}$	$63 \times 44\frac{7}{12}$
e.	$72 \times 51\frac{2}{5}$	$66 \times 62\frac{7}{8}$	$55 \times 73\frac{9}{10}$

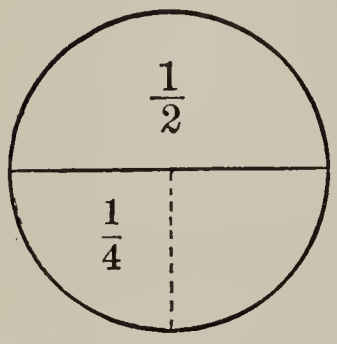
Multiplication of Fractions

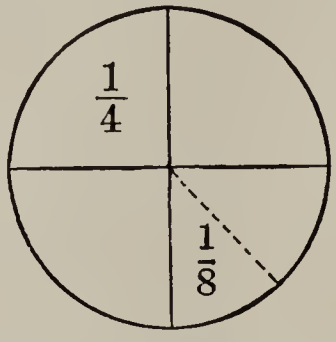
Preliminary Exercises

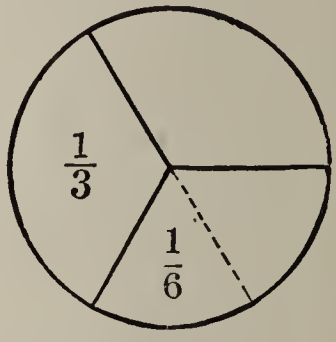
1. A boy earned $\$\frac{1}{2}$. He gave $\frac{1}{2}$ of it to his sister. What part of a dollar did he give her?

2. Draw 3 circles. Divide one of them into 2 halves, one into 4 fourths, and one into 3 thirds.

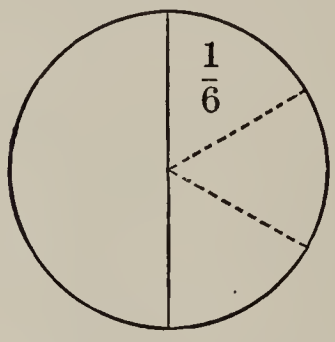
3. What is (*a*) $\frac{1}{2}$ of $\frac{1}{2}$? (*b*) $\frac{1}{2}$ of $\frac{1}{4}$? (*c*) $\frac{1}{2}$ of $\frac{1}{3}$?

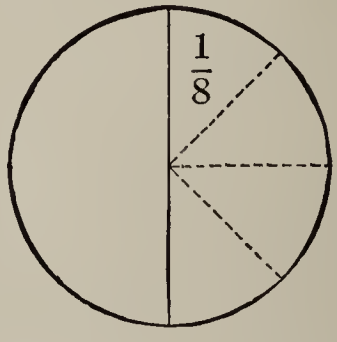






4. Draw two circles. Divide each into halves.





5. What is (*a*) $\frac{1}{3}$ of $\frac{1}{2}$? (*b*) $\frac{1}{4}$ of $\frac{1}{2}$? (*c*) $\frac{1}{5}$ of $\frac{1}{2}$? (*d*) $\frac{1}{6}$ of $\frac{1}{2}$? (*e*) $\frac{1}{3}$ of $\frac{1}{4}$? (*f*) $\frac{1}{4}$ of $\frac{1}{3}$?

6. What is (*a*) $\frac{1}{2}$ of 2 thirds? (*b*) $\frac{1}{3}$ of 3 fourths? (*c*) $\frac{1}{2}$ of 4 fifths? (*d*) $\frac{1}{4}$ of 4 fifths?

7. At $\$\frac{1}{2}$ per yard, find the cost of (*a*) 4 yards; (*b*) 3 yards; (*c*) 2 yards; (*d*) $\frac{1}{2}$ yard; (*e*) $1\frac{1}{2}$ yards.

8. (*a*) 4 times $\$\frac{1}{2} = ?$ (*b*) $3 \times \$\frac{1}{2} = ?$ (*c*) $2 \times \$\frac{1}{2} = ?$ (*d*) $\frac{1}{2} \times \$\frac{1}{2} = ?$ (*e*) $1\frac{1}{2} \times \$\frac{1}{2} = ?$

Written Exercises

1. Multiply $7\frac{1}{2}$ by (*a*) $\frac{1}{2}$; (*b*) $\frac{1}{3}$; (*c*) $1\frac{1}{2}$; (*d*) $1\frac{1}{3}$; (*e*) $2\frac{1}{4}$.

PROCESS

(*a*) $7\frac{1}{2} \times \frac{1}{2} = \frac{15}{2} \times \frac{1}{2} = \frac{15}{4} = 3\frac{3}{4}$ *Ans.*

Change $7\frac{1}{2}$ to an improper fraction and rewrite the fractions. Place 15, the product of the numerators, over 4, the product of the denominators, making $\frac{15}{4}$. Reduce this to a mixed number.

(*b*) $7\frac{1}{2} \times \frac{1}{3} = \frac{\overset{5}{\cancel{15}}}{2} \times \frac{1}{\cancel{3}} = \frac{5}{2} = 2\frac{1}{2}$ *Ans.*

Cancel 3 in a denominator and 15 in a numerator. Place the product of the numerators, as changed, over that of the denominators, etc.

(*c*) $7\frac{1}{2} \times 1\frac{1}{2} = \frac{15}{2} \times \frac{3}{2} = \frac{45}{4} = 11\frac{1}{4}$ *Ans.*

Change both mixed numbers to improper fractions, etc.

(*d*) $7\frac{1}{2} \times 1\frac{1}{3} = \frac{\overset{5}{\cancel{15}}}{\cancel{2}} \times \frac{\overset{2}{\cancel{4}}}{\cancel{3}} = 10$ *Ans.*

Cancel 3 and 15 by 3, 2 and 4 by 2. Omit 1, the product of the changed denominators, and write only 10, the product of the changed numerators.

(*e*) $7\frac{1}{2} \times 2\frac{1}{4} = \frac{15}{2} \times \frac{9}{4} = \frac{135}{8} = 16\frac{7}{8}$ *Ans.*

2. Multiply:

	A	*B*	*C*
a.	$16\frac{2}{3} \times 2\frac{1}{2}$	$12\frac{3}{4} \times 3\frac{1}{3}$	$18\frac{4}{5} \times 4\frac{1}{4}$
b.	$20\frac{1}{2} \times 3\frac{1}{2}$	$18\frac{1}{2} \times 4\frac{1}{3}$	$15\frac{1}{2} \times 5\frac{1}{4}$

Division of Fractions

Preliminary Exercises

1. A man divided $\$\frac{1}{2}$ equally between his 2 children. What part of \$1 did each receive?

2. If I have \$6, how many times can I spend (*a*) $\$\frac{1}{2}$? (*b*) $\$\frac{1}{4}$?

3. If I have \$6 in quarters, how many times can I spend 3 quarters?

4. To save \$6, how many times must I save (*a*) $\$\frac{1}{2}$? (*b*) $\$\frac{1}{4}$? (*c*) $\$\frac{3}{4}$?

5. (*a*) $6 \div \frac{1}{2} = ?$ (*b*) $6 \div \frac{1}{4} = ?$ (*c*) $6 \div \frac{3}{4} = ?$

6. Give quotients:

(*a*) $2\overline{)12}$ (*b*) $\frac{1}{2}\overline{)12}$ (*c*) $\frac{1}{4}\overline{)12}$ (*d*) $\frac{3}{4}\overline{)12}$

7. Give dividends:

(*a*) $\begin{array}{r} 2)\ ? \\ \hline 12 \end{array}$ (*b*) $\begin{array}{r} \frac{1}{2})\ ? \\ \hline 12 \end{array}$ (*c*) $\begin{array}{r} \frac{1}{4})\ ? \\ \hline 12 \end{array}$ (*d*) $\begin{array}{r} \frac{3}{4})\ ? \\ \hline 12 \end{array}$

8. Give divisors:

(*a*) $\begin{array}{r} ?)48 \\ \hline 24 \end{array}$ (*b*) $\begin{array}{r} ?)18 \\ \hline 24 \end{array}$ (*c*) $\begin{array}{r} ?)24 \\ \hline 48 \end{array}$ (*d*) $\begin{array}{r} ?)10 \\ \hline 40 \end{array}$

9. (*a*) $6 \div \frac{1}{2} = 6 \times ?$ (*b*) $6 \div \frac{1}{4} = 6 \times ?$ (*c*) $6 \div \frac{3}{4} = 6 \times ?$ (*d*) $6 \div \frac{3}{2} = 6 \times ?$ (*e*) $6 \div \frac{2}{3} = 6 \times ?$

10. Give quotients:

(*a*) $\frac{3}{2}\overline{)12}$ (*b*) $\frac{4}{3}\overline{)12}$ (*c*) $\frac{5}{4}\overline{)10}$ (*d*) $\frac{6}{5}\overline{)12}$

(*e*) $12 \div 1\frac{1}{2}$ (*f*) $12 \div 1\frac{1}{3}$ (*g*) $10 \div 1\frac{1}{4}$ (*h*) $12 \div 1\frac{1}{5}$

Written Exercises

1. At $\$ 1\frac{1}{2}$ per yard, how many yards of cloth can be bought for $\$ 9\frac{3}{4}$?

PROCESS

The number of yards is the quotient of $9\frac{3}{4}$ by $1\frac{1}{2}$.

$$\begin{array}{ccccc} (a) & & (b) & & (c) \\ 9\frac{3}{4} \div 1\frac{1}{2} & = & \frac{39}{4} \div \frac{3}{2} & = & \frac{\overset{13}{\cancel{39}}}{\underset{2}{\cancel{4}}} \times \frac{\cancel{2}}{\cancel{3}} = \frac{13}{2} = 6\frac{1}{2} \text{ (yd.)} \end{array}$$

In (a) indicate the division of the mixed numbers. In (b) rewrite the mixed numbers as improper fractions. In (c) indicate the multiplication of the dividend by the divisor inverted. Perform the indicated multiplication.

TEST

Multiply the quotient $6\frac{1}{2}$ by the divisor $1\frac{1}{2}$.

$$6\tfrac{1}{2} \times 1\tfrac{1}{2} = \tfrac{13}{2} \times \tfrac{3}{2} = \tfrac{39}{4} = 9\tfrac{3}{4}.$$

2. Find quotients:

	A	B	C
$a.$	$9\frac{3}{4} \div 6\frac{1}{2}$	$19\frac{1}{2} \div 29\frac{1}{4}$	$83\frac{1}{3} \div 12\frac{1}{2}$
$b.$	$83\frac{1}{3} \div 6\frac{2}{3}$	$12\frac{1}{2} \div 83\frac{1}{3}$	$71\frac{3}{4} \div 10\frac{1}{4}$
$c.$	$71\frac{3}{4} \div 3\frac{1}{2}$	$10\frac{1}{4} \div 71\frac{3}{4}$	$87\frac{1}{2} \div 100$
$d.$	$87\frac{1}{2} \div 6\frac{1}{4}$	$12\frac{1}{2} \div 87\frac{1}{2}$	$87\frac{1}{2} \div 16\frac{2}{3}$
$e.$	$37\frac{1}{2} \div 3\frac{1}{8}$	$12\frac{1}{2} \div 33\frac{1}{3}$	$81\frac{1}{4} \div 33\frac{1}{3}$

Oral Problems — One Operation

State the operation required to solve each of the following examples when the given numbers are employed.

1. When dress goods are 48 cents a yard, what is the cost of $\frac{3}{4}$ yard?

2. When $\frac{3}{4}$ pound of coffee costs 18 cents, what is the price of a pound?

3. When tea is 60 cents a pound, how much can be bought for 90 cents?

4. What part of a book of 60 pages have I read when I have completed 40 pages?

5. What is $\frac{7}{12}$ of 84?

6. What fraction of 84 is 49?

7. 40 is $\frac{2}{3}$ of what number?

8. 24 is what fraction of 32?

9. 55 contains 15 how many times and what fraction of a time?

10. 10 is what fraction of 15?

11. How many quarter pints of ice cream are there in 3 pints? If a boy eats $\frac{3}{4}$ pint, how many boys will eat 3 pints?

12. How many times can I take a quarter out of a box containing 6 dollars in quarters? How many times can I take 3 quarters out of the same box? How many times can I take out 2 quarters?

Written Problems

NOTE. First indicate the solution by placing the proper sign between the given numbers.

1. When cloth is 96 cents a yard, what is the cost of $\frac{3}{4}$ yard?

2. When $\frac{3}{4}$ pound of tea costs 45 cents, what is the price of a pound?

3. When dress goods are 64 cents a yard how many yards can be bought for 88 cents?

4. What part of a book of 64 pages have I read when I have finished 24 pages?

5. (*a*) What is $\frac{11}{16}$ of 96? (*b*) $\frac{23}{24}$ of 144?

6. What fraction of 96 is (*a*) 44? (*b*) 72? (*c*) 36?

7. 72 is (*a*) $\frac{18}{25}$ of what number? (*b*) $\frac{9}{17}$ of what?

8. 64 is what fraction (*a*) of 96? (*b*) Of 144?

9. How many times and what fraction of a time does 448 contain 160?

10. (*a*) 128 is what fraction of 160? (*b*) 156 is what fraction of 160? (*c*) 20 is what fraction of 64?

11. (*a*) How many quarter pints are there in 27 pints of ice cream? (*b*) Among how many boys can 27 pints be divided if each receives 3 quarter pints?

12. How many $\frac{3}{4}$ inches are there (*a*) in 12 inches? How many are there (*b*) in 18 inches? (*c*) In 1 yard?

Decimals

Preparatory Exercises

1. In writing \$ 83.17, how many dollars does the 8 represent? The 3? What part of a dollar is represented by the 1? By the 7?

2. What part of a dollar is 17 cents? How many cents are there in $\frac{83}{100}$ of a dollar?

3. Express as dollars and cents:

\$ $3\frac{37}{100}$. \$ $15\frac{75}{100}$. \$ $32\frac{5}{100}$. \$ $74\frac{1}{100}$.

4. Express as dimes and cents:

\$ 0.77. \$ 0.49. \$ 0.82. \$ 0.03.

5. Express as *tenths* of a dollar. As *hundredths* of a dollar:

\$ 0.40. \$ 0.10. \$ 0.30. \$ 0.50.

6. What part of a dollar is 30 cents, 70 cents, 10 cents, 90 cents?

7. Express as *hundredths* of a dollar:

\$ 0.37. \$ 0.13. \$ 0.75. \$ 0.84.

8. In the expression \$ 333.33, how many dollars are represented by the left-hand 3? By the next 3? By the next 3? What part of a dollar is represented by the next 3? By the right-hand 3?

9. Read \$ 333.33 as dollars and the fraction of a dollar. Read \$ 33.30 as dollars and the fraction of a dollar, expressing the fraction in lowest terms.

Notation and Numeration

Fractions such as $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{12}$, etc., are called *common fractions;* fractions whose denominators are 10, 100, 1,000, and the like, are sometimes called *decimal fractions*, such as $\frac{3}{10}$, $\frac{17}{100}$, $\frac{9}{100}$, etc.

These fractions are called *decimals* when they are written without denominators, the prefixed *decimal point* showing that they are fractions.

Hundreds.	Tens.	Ones.	Decimal Point.	Tenths.	Hundredths.
1	1	1	.	1	1

The number 111.11 is read one hundred eleven, *and* eleven hundredths, the word "and" being used between the whole number and the decimal.

The number 23.4 is read twenty-three, and four tenths.

The number 256.03 is read two hundred fifty-six, and three hundredths.

The number .7 is read seven tenths; the number .56 is read fifty-six hundredths; the number .09 is read nine hundredths.

In the expression \$123.45, how many times is the value expressed (*a*) by 5 contained in the value expressed by 4? (*b*) The value expressed by 4 in that expressed by 3?

Reading and Writing Decimals

1. Read the following:

a. 103.27	*f.* 983.41
b. .5	*g.* .22
c. 20.03	*h.* 6.15
d. .87	*i.* 32.08
e. 864.09	*j.* .7

2. Write as decimals or as whole numbers and decimals:

a. One hundred nine, and nine hundredths.
b. Twenty-seven, and seventy-three hundredths.
c. Five tenths.
d. Sixteen hundredths.
e. Eight hundred sixty-five, and seven tenths.

Reductions

Sight Exercises

Express the following decimals as common fractions in lowest terms:

	A	*B*	*C*	*D*
a.	.02	.25	.75	.22
b.	.5	.4	.04	.05
c.	.08	.84	.45	.38
d.	.95	.8	.12	.18
e.	.6	.85	.2	.06

Written Exercises

Write the following common fractions as decimals:

	A	*B*	*C*	*D*
a.	$\frac{1}{2}$	$\frac{1}{5}$	$\frac{9}{10}$	$\frac{12}{25}$
b.	$\frac{1}{10}$	$\frac{3}{10}$	$\frac{11}{25}$	$\frac{13}{20}$
c.	$\frac{1}{25}$	$\frac{3}{20}$	$\frac{4}{5}$	$\frac{13}{25}$
d.	$\frac{3}{4}$	$\frac{7}{25}$	$\frac{11}{20}$	$\frac{7}{10}$
e.	$\frac{1}{50}$	$\frac{1}{4}$	$\frac{3}{50}$	$\frac{13}{50}$

Sight Exercises

1. Give sums:

2.5	2.05	2.2	Omit a final decimal cipher in giving the answers.
+3.5	+3.05	+3.25	
6 *Ans.*	5.1 *Ans.*	5.45 *Ans.*	

A	*B*	*C*	*D*	*E*	*F*	*G*
1.5	1.25	2.5	3.	3.15	3.6	2.4
+1.5	+1.75	+1.25	+2.5	+3.4	+3.45	+2.7

2. Give remainders:

5.	3.5	4.75	Vacant decimal places in the subtrahend are considered to contain ciphers.
−2.5	−1.5	−1.25	
2.5 *Ans.*	2. *Ans.*	3.5 *Ans.*	

9.	8.5	7.35	6.5	5.55	4.7	3.
−4.5	−1.25	−4.25	−2.5	−3.5	−1.35	−1.8

Multiplying a Decimal by a Whole Number

3. Give products:

1.23	2.5	3.05	Place the decimal point in the product when it is reached in multiplying. Omit unnecessary ciphers.
×3	×4	×2	
3.69 *Ans.*	10. *Ans.*	6.1 *Ans.*	

2.5	2.03	3.5	4.05	4.05	4.5	.25
×3	×4	×2	×5	×4	×4	×8

Dividing a Decimal by a Whole Number

4. Give quotients:

4)9.	2)8.1	3).12	5)1.
2.25 *Ans.*	4.05 *Ans.*	.04 *Ans.*	.2 *Ans.*

Place the decimal point in the quotient when it is reached in dividing. Be careful not to omit a necessary cipher in the tenths' place of a quotient.

4)8.4	4)8.2	5)9.1	6)9	2)7.1	5)6.

Miscellaneous Exercises

5. Give answers:

	A	*B*	*C*
a.	2.6 + 3.4	1.25 + 1.5	2.05 + 1.7
b.	3.4 − 1.6	4.25 − 1.5	3.25 − 1.07
c.	3.4 × 5	1.02 × 5	1.24 × 3
d.	5.4 ÷ 5	1.05 ÷ 5	.1 ÷ 5

Written Exercises

Perform operations with decimals in the same way as operations with dollars and cents.

Addition and Subtraction of Decimals

> To add or to subtract decimals, write the decimal points in a vertical line, and the decimal point in the sum or the difference in this same line.

In writing results, reject unnecessary ciphers.
Thus, write 37 instead of 37.00, 28.5 instead of 28.50.

1. Find sums:

A	*B*	*C*	*D*	*E*
24.03	48.94	32.	16.66	37.7
5.6	.67	5.85	.49	25.08
18.	13.25	.4	.8	3.4
2.95	1.4	27.75	58.95	11.29

2. Find remainders:

a.	56.38	72.4	63.	86.42	90.
	−25.49	−5.96	−8.88	−19.72	−25.08
b.	45.32	50.2	14.06	21.3	37.24
	−22.66	−7.49	−.99	−1.85	−20.06
c.	95.	84.3	73.13	62.5	51.25
	−5.06	−2.42	−8.9	−56.03	−6.66

Multiplying a Decimal by a Whole Number

3. Find products:

> In multiplying or dividing a decimal by a whole number write the decimal point in the result when it is reached in performing the operations.

	A	*B*	*C*	*D*	*E*
a.	48.05 × 4	27.2 × 5	12.5 × 6	1.15 × 8	.24 × 5
b.	37.09 × 7	56.4 × 2	23.5 × 4	3.25 × 8	.48 × 5

Dividing a Decimal by a Whole Number

4. Find quotients:

	A	*B*	*C*	*D*	*E*
a.	4)90.	6)33.	4)11.	5)23.4	8)2.
b.	25)3.	48)60.	32)88.	64)3.2	64)16.
c.	4)4.2	6)5.7	8)10.	5)1.35	8)6.
d.	25)1.5	36)81.	16)12.	88)4.4	48)12.

Miscellaneous Written Examples

1. Find the sum of thirty-five and four hundredths, six and seven tenths, twenty-nine, three and ninety-six hundredths.

2. Find the difference between fifty-nine and eighty-three hundredths and seventeen and nine tenths.

3. Multiply by five the sum of six and ninety-four hundredths plus twelve and eighty-six hundredths.

4. Divide by forty-four the difference between eighty-four and ninety-five hundredths and eighty-seven and fifteen hundredths.

5. After walking 7.2 miles and riding 27.3 miles, how far has a man still to go to make a journey of 50 miles?

6. At 38.2 miles per hour, how far does a train go in 5 hours?

7. A French franc is equal to 19.3 cents. What is the value in our money of a 20-franc piece?

8. How many cents are equal to a German mark if 25 marks are worth $ 5.95?

9. If 100 pounds sterling are worth $ 486.65, what is the value of 500 pounds sterling?

10. A meter is 39.37 inches long. How many inches are there in 500 meters?

11. A man owns 100 acres. How many acres has he after he buys 24.2 acres and sells 48.45 acres?

Business Forms

Bills for Goods bought at One Time

1. Copy the following bill, inserting the missing extensions and the footings:

LOGANSPORT, IND., *Dec. 20, 1914*

Mrs. Wm. Priedigkeit
Cypress Hills

Bought of WALLACE GODETT
Dealer in Toys

	4 Dolls	*$ 1.50*	*6*	*—*	
	6 pr. Dolls' Shoes	*.15*			
	2 sets Dishes	*1.05*			
	1 Doll Carriage		*1*	*50*	
	2 boxes Tools	*.85*			
	8 strings Beads	*.10*			
	Received payment				*$*
	Dec. 20, 1914				
	Wallace Godett				
	Per S. M. Y.				

2. Make out a bill for the following goods. Use your own name as the buyer, and the name of a local dealer as the seller. Receipt the bill, adding the initials of a classmate as clerk. Do not use @ in the bill.

$3\frac{1}{2}$ lb. Nuts	@ 20 ¢
$1\frac{3}{4}$ gal. Ice Cream	@ 80 ¢
$4\frac{1}{2}$ doz. Lemons	@ 24 ¢
6 boxes Strawberries	@ $12\frac{1}{2}$ ¢
1 Pineapple	@ 30 ¢
3 Watermelons	@ 25 ¢

Goods bought at Different Times

3. Copy the following bill, inserting omitted items:

NEW YORK, *April 1, 1914*

Mrs. L. C. Alphin
131 Livingston St.

Bought of F. LOESER & Co.
Dry Goods
Fulton and Bond Sts.

1914						
Mch.	*2*	*2 pr. Gloves*	*$ 1.15*	*2*	*30*	
		14 1/2 yd. Muslin	*.12*			
	7	*3 1/3 doz. Buttons*	*.15*			
	15	*4 Tablecloths*	*2.75*			
		8 pc. Trimming	*.37 1/2*			
		1 Hat		*8*	—	
	27	*1/2 doz. Handkerchiefs*	*2.50*			
		4 pr. Stockings	*.45*			
						$
	31	*By Cash*				*10* —
		Balance Due				

The payment of $10 on Mar. 31 is called a payment *on account.* The bill is *settled* by the payment of the balance due, and is then receipted.

4. Supply dates, names, etc., for the following:

$\frac{1}{2}$ doz. Collars	@	$ 1.50
3 pr. Cuffs	@	25 ¢
1 Hat	@	$ 2.75
2 Ties	@	$37\frac{1}{2}$ ¢
2 pr. Gloves	@	75 ¢

Bill for Labor and Materials

5. Copy the following bill. Insert missing extensions and the footing. Receipt it of the date Oct. 3.

CHAMPAIGN CO., ILL., *Sept. 30, 1914*

Mr. Daniel Carroll

TO FRED. CHAMBERS, DR.

Steam Threshing

Sept.	*16*	*To 800 bu. Oats*	*.02*	*16*	—	
		630 " Wheat	*.04*			
		¾ ton Coal	*6.—*			
		2 Teams	*3.—*			
		4 Men	*1.75*			
						$

The foregoing bill is *rendered* by Mr. Chambers, who threshes Mr. Carroll's grain. Besides the charge for the threshing, the bill includes the cost of the coal used in the engine and also the labor of extra teams and men supplied by Mr. Chambers.

The abbreviation *Dr.*, debtor, means that Mr. Carroll is indebted to Mr. Chambers for the items specified.

6. Make out a carpenter's bill for making repairs. Use the following items: 1 man, 6 days, at $3.75; 1 helper, 2 days, at $2; 1 bunch shingles, at $1.25; 2 M boards at $30.

7. Make out a bill for 6 rolls of wall paper at 20 cents per roll; 20 yards of border at 3 cents per yard; hanging the paper at 25 cents per roll and 3 cents per yard for the border; 4 gallons of paint, at $1.80 per gallon; 2 days for painter, at $3 per day.

Miscellaneous

8. Make out bills for goods purchased as follows:

Date each the first of the month succeeding the one in which the goods are bought. Use your own name as buyer, and the name of a local dealer or firm as seller. Receipt each bill, adding the initials of a classmate as clerk. Make all extensions without using another sheet. Abbreviate quantities, and omit such unnecessary words as "of," "at," etc.

a. Jan. 5, 1915, bought 20 pounds of sugar at $5\frac{1}{2}$ cents per pound; 3 quarts of milk at 8 cents per quart; Jan. 11, 4 bars of soap at 15 cents per bar, 1 barrel of flour for $5.60; Jan. 18, 5 pounds of butter at 32 cents per pound, 6 gallons of oil at $16\frac{1}{2}$ cents per gallon.

b. Nov. 2, 1915, bought 24 pounds of nails at 6 cents and 1 hatchet for 75 cents; Nov. 8, 3 pails at 75 cents each; Nov. 11, 9 dozen screws at 18 cents per dozen; Nov. 15, gave 4 dozen eggs at 45 cents a dozen in part payment.

9. Make out the bill of the owner of a dry-goods store for six items bought at one time. Give credit on the bill for butter and eggs supplied the same day by the purchaser of the dry goods. Find the balance which is paid in cash, and receipt the bill.

NOTE. A bill showing credits is somtimes called a *statement.*

10. Make out a farmer's statement of hay and oats supplied a storekeeper at different dates. Credit the latter with goods delivered to the former. Receipt the statement.

11. Copy the following letter:

MADISON, WIS., Mch. 17, 1914

Martin Haupt & Sons
138–156 La Salle St.
Chicago, Ill.

Gentlemen

Kindly ship me the following by fast freight:

3 bbl. Portland Cement
10 M Shingles, Cedar
14 bbl. Wire Nails, 10's

Your early attention to this order is respectfully requested.

Truly yours
COTTIER JONES
R.F.D. No. 4

12. Copy the following reply:

138–156 LA SALLE ST.
CHICAGO, ILL., Mch. 19, 1914

Cottier Jones, Esq.
R.F.D. No. 4
Madison, Wis.

Dear Sir

We have shipped to-day by fast freight the goods ordered in your favor of the 17th inst.

Inclosed please find bill.

Yours sincerely
MARTIN HAUPT & SONS

13. Draw on the back of the first letter a rectangle $6\frac{1}{2}$ inches by $3\frac{1}{2}$ inches to represent an envelope. Write on it the address given on the next page.

MARTIN HAUPT & SONS
138–156 LA SALLE ST.
CHICAGO
ILLINOIS

14. On the back of the second letter draw an envelope and write the proper address.

15. Frank O'Malley has money in the National City Bank of Omaha. He owes Smith, Brown, & Co., of St. Louis, $154.36 for goods purchased from them. He *draws* his check as follows:

A Bank Check

No. 354 *Omaha, Neb., April 2, 1915*

NATIONAL CITY BANK

Pay to the order of Smith, Brown, & Co.
One Hundred Fifty-four $\frac{36}{100}$ Dollars

$154\frac{36}{100}$ *Frank O'Malley*

Copy the foregoing check.

16. If Mr. O'Malley wishes to defer payment for a time, he may make a promissory note, as follows:

A Promissory Note

Omaha, Neb., April 2, 1915

Thirty days after date, I promise to pay to the order of Smith, Brown, & Co., One Hundred Fifty-four $\frac{36}{100}$ Dollars, value received, at the National City Bank.

$154 $\frac{36}{100}$ *Frank O'Malley*

On May 2, Smith, Brown, & Co. will collect $154.36 from the National City Bank, which sum will be deducted from the money Mr. O'Malley has in the bank.

Copy the foregoing note.

17. Make out the bill of Martin Haupt & Sons for the articles ordered by Cottier Jones (p. 240), using the prevailing prices.

18. Write Mr. Jones's note for the amount of the bill, promising to pay the same in sixty days after date, at a Madison bank.

When Mr. O'Malley's check reaches Smith, Brown, & Co., they send the former the following

Receipt in Full

St. Louis, Mo., April 4, 1915

Received of ------- Frank O'Malley ------- check for ~~~~~~~~~~ One Hundred Fifty-four ~~~~~~~~~~ $\frac{36}{100}$ Dollars in full of account to date.

$154 $\frac{36}{100}$ *Smith, Brown, & Co.*

If Mr. O'Malley should send a check for only $100, Smith, Brown, & Co. send him the following

Receipt on Account

St. Louis, Mo., April 4, 1915

Received of ---------- *Frank O'Malley* ---------- *check for* ~~~~~~~~~~~~~~~~ *One Hundred* ~~~~~~~~~~~~~~~~ $\frac{00}{100}$ *Dollars on account*

$100 $\frac{00}{100}$ *Smith, Brown, & Co.*

This indicates that there is a balance still due the firm by Mr. O'Malley.

19. Make out the receipt in full sent by Martin Haupt & Sons on the arrival of Cottier Jones's check.

The following is a form of

Rent Receipt

Chicago, Ill., Mch. 30, 1915

Received of ---------- *Martin Haupt & Sons* ---------- ~~~~~~~~~~~~ *Three Hundred Fifty* ~~~~~~~~~~~~ $\frac{00}{100}$ *Dollars in full of rent to date of premises 138-156 La Salle St.*

$350 $\frac{00}{100}$ *Prentis Fleming*

20. Make out a mechanic's receipt, substituting for "of rent" the following, "for services rendered and materials furnished."

21. Write a doctor's receipt "in full for professional services to date."

Accounts

The following is a form of account kept by a boy who receives 25 cents per day for tasks performed before and after school hours:

CASH ACCOUNT

			Dr.		Cr.	
Feb.	*1*	*On hand*	*1*	*42*		
	3	*Repairs to bicycle*				*75*
	5	*Bananas*				*05*
	7	*Wages for week*	*1*	*75*		
	10	*Penknife*				*85*
		Skates			*1*	*25*
	14	*Wages for week*	*1*	*75*		
	21	*Wages for week*	*1*	*75*		
	23	*Materials for sled*				*60*
	27	*Book*				*25*
	28	*Wages for week*	*1*	*75*		
		Balance			**4**	**67**
			8	*42*	*8*	*42*
Mch.	*1*	*On hand*	*$ 4*	*67*		

The *debit* double column, headed "Dr.," shows all moneys received, and the *credit* double column, headed "Cr.," all payments.

At the end of the month the word "Balance" is written and a line is drawn below it. The footing of the Dr. column is written, and the same amount, $8.42, is written in the Cr. column. The difference between the sum of the credits and $8.42 ($4.67) is entered on the line with the word "Balance." The account is correct if the cash on hand is $4.67. A double line is drawn to close the February account, and the account for March is opened with $4.67 in the debit column.

Personal Accounts

Peter Denyse, a farmer, buys goods of Chambers & Johnson, giving them produce in part payment. The account in the books of the latter takes the following form:

PETER DENYSE — DR. — CR.

				Dr.		Cr.	
1915							
Oct.	*1*	*Brought forward*		*12*	*87*		
	2	*To 50 lb. sugar*	*.06 1/2*	*3*	*25*		
	3	*By 1 ton Hay*				*14*	*—*
		" 20 bu. Oats	*.48*			*9*	*60*
	7	*To 10 lb. Coffee*	*.24 1/2*				
	15	*" 20 yd. Muslin*	*.05 1/4*				
	20	*By 40 bu. Corn*	*.62*			*24*	*80*
	27	*To Cash*		*20*	*—*		
	30	*" 3 bbl. Flour*	*6.25*				
	31	**By balance**				**9**	**97**
				58	*37*	*58*	*37*
Nov.	*1*	*Brought forward*		*$9*	*97*		

The Dr. column shows sums due Chambers & Johnson for goods sold Mr. Denyse and a payment in cash. The Cr. column shows value of goods received from the latter. On Oct. 31 the balance Mr. Denyse owes is entered in red ink. On Nov. 1 this amount is entered as a debit.

22. Copy and complete the following account, which shows how the foregoing transactions appear on the books of Peter Denyse. Debits in the foregoing account will appear as credits in this one, and *vice versa*. Begin each credit item a short distance to the right of the date lines.

CHAMBERS & JOHNSON

1915				Dr.		Cr.	
Oct.	1	*Brought forward*				12	87
	2	*By 50 lb. sugar*	.06½			3	25
	3	*To 1 ton Hay*		14	—		
		" *20 bu. Oats*	.48	9	60		
		etc.		*et*	*c.*	*et*	*c.*
	31	**To balance**		**9**	**97**		
				58	37	58	37
Nov.	1	*Brought forward*				$9	97

Statements

It is customary for the person to whom a balance is due to render a *statement.* This is frequently done at the close of a month in the following form:

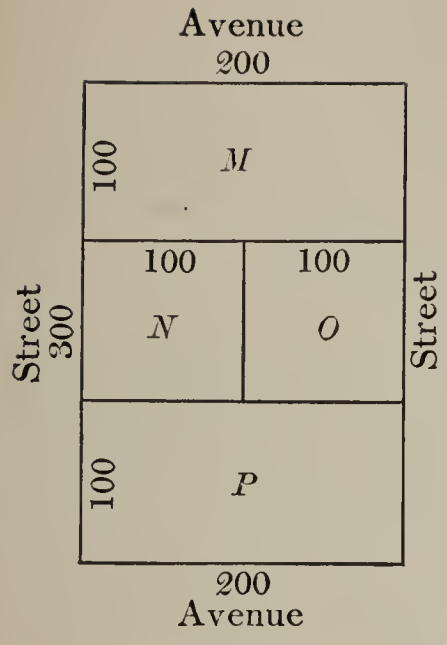
INDIANAPOLIS, IND., *Nov. 1, 1915*

Mr. Peter Denyse

In account with CHAMBERS & JOHNSON

1915		*Dr.*				
Oct.	1	*Statement rendered*	12	87		
		To Mdse. (as per bill)	3	25		
	2	" " " " "	2	45		
	7	" " " " "	1	05		
	27	" *Cash on a/c*	20	—		
	30	" *Mdse.*	18	75	58	37
		Cr.				
Oct.	3	*By Mdse.*	23	60		
	30	" "	24	80	48	40
	31	*Balance due*			$9	97

Measurements



1. The diagram represents a plot of ground 300 feet long, 200 feet wide. If the diagram is $1\frac{1}{2}$ inches by 1 inch, how many feet are represented by each inch of the diagram?

2. (*a*) How many square feet are there in the whole plot? How many square feet (*b*) in *M*? (*c*) In *P*? (*d*) In *N*? (*e*) In *O*?

3. (*a*) *M* represents what fraction of the whole? (*b*) What fraction does *P* represent? (*c*) *N*? (*d*) *O*?

4. (*a*) *M* is how many times *N*? (*b*) *N* is what part of *M*? (*c*) $\frac{1}{6}$ is what part of $\frac{1}{3}$? (*d*) $\frac{1}{3}$ is how many times $\frac{1}{6}$?

5. (*a*) Into how many building lots 25 feet front, 100 feet deep, facing the avenue, can *M* be divided? (*b*) Into how many can *P* be divided? (*c*) Into how many lots facing the street can *N* be divided? (*d*) *O*?

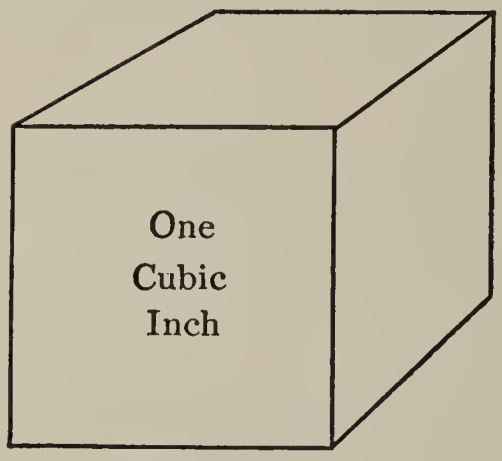
6. (*a*) *M* and *P* together form what part of the whole plot? (*b*) *N* and *P*? (*c*) *N* and *O*?

7. Divide a rectangle 4 inches by 2 inches into 8 one-inch squares. (*a*) What part of the whole rectangle is each square? (*b*) How many square inches in one half of the rectangle? (*c*) In one fourth? (*d*) In one eighth? (*e*) How many times $\frac{1}{4}$ is $\frac{1}{2}$? (*f*) How many times $\frac{1}{8}$ is $\frac{1}{2}$?

Rectangular Solids

Oral Exercises

A cube each of whose edges measures 1 inch contains 1 cubic inch.



1. How many faces has a cube? How many edges? What is the length of each edge of a one-inch cube? How long is each face? How wide?

2. How many one-inch cubes will it take to make a cube 3 inches long, 3 inches wide, and 3 inches high? How many one-inch cubes in the bottom layer? In the top layer?

3. How many one-inch cubes will it take to cover the bottom of a box 4 inches long, 3 inches wide? If the box is 2 inches high, how many one-inch cubes will it take to fill the box?

4. How many cubes of loaf sugar will fill a box that will hold 6 layers, each layer containing 10 rows of 8 cubes each?

5. A pile of bricks is 10 bricks long. It contains 6 rows to a layer, and is 4 layers high. How many bricks are there in the pile?

Volumes

To find the *volume* of a solid means to find the number of cubic inches, cubic feet, cubic yards, etc., it contains.

A solid having six rectangular faces is called a *rectangular prism*. The opposite faces of a rectangular prism are equal in area. When each of the six faces is a square, the solid is called a cube.

A caramel is a rectangular prism, so is a brick, a box, a room, etc.

A rectangular prism has three *dimensions;* length, width, and thickness.

To find the *number* of cubic inches, cubic feet, cubic yards, etc., in a rectangular prism, multiply the number of inches, feet, yards, etc., in its length, by the number of the same denomination in its width, and this product by the number of the same denomination in its thickness.

Table

Cubic Measure

1728 cubic inches (cu. in.)	1 cubic foot (cu. ft.).
27 cubic feet	1 cubic yard (cu. yd.).

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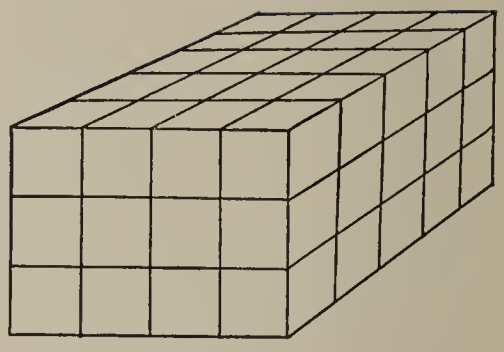
1 cubic foot = $7\frac{1}{2}$ gallons (nearly).

1 cubic foot = $\frac{4}{5}$ bushel (nearly).

Cubical Contents

Preparatory Exercises



1. (*a*) How many one-inch cubes can be placed on the bottom of a box 5 inches long, 4 inches wide? (*b*) If the box holds 3 layers of one-inch cubes, how many one-inch cubes will the box hold?

2. A box 6 inches long, $5\frac{1}{2}$ inches wide, and 7 inches high will hold exactly a gallon. How many cubic inches are there in a gallon?

3. How many one-inch cubes can be put into a cracker box 3 inches by 3 inches by 8 inches?

4. Carefully balance an empty pint measure by placing sand on the opposite pan of the scales, then fill the measure with water and ascertain the weight of the water.

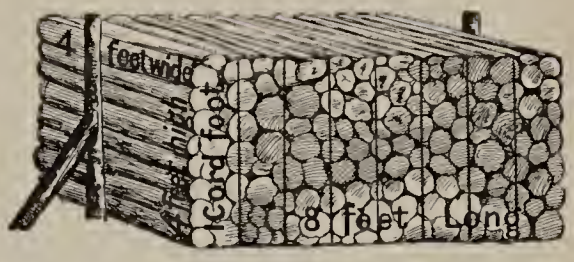
5. (*a*) Find the number of cubic inches in a cube 12 inches long, 12 inches wide, 12 inches high. (*b*) How many cubic feet does it contain? (*c*) How many cubic inches are there in a cubic foot?

6. (*a*) How many cubic feet are there in a cube 3 feet long, 3 feet wide, 3 feet high? (*b*) How many cubic feet are there in a cubic yard?

7. Give the capacity of a bin measuring, on the inside, 2 yards long, 2 yards wide, 2 yards high.

Written Exercises

1. How many cubic feet are there in a pile of wood 8 feet long, 4 feet wide, 4 feet high?



NOTE. A pile of wood 8 ft. by 4 ft. by 4 ft. contains a *cord*.

2. How many cubic feet of grain can be placed in a bin 5 feet long, 5 feet wide, 5 feet high?

3. At $\frac{4}{5}$ bushel to the cubic foot, how many bushels are there in 125 cubic feet?

4. A cubic foot of water weighs 1,000 ounces. How many pounds does it weigh?

5. At $62\frac{1}{2}$ pounds to the cubic foot, what is the weight of 128 cubic feet of water?

6. At $31\frac{1}{4}$ pounds to the cubic foot, what is the weight of a cord of wood (128 cu. ft.)?

7. If a cart body is 4 feet long and 3 feet wide, how high must it be to hold 27 cubic feet?

8. When dry sand weighs 86 pounds to the cubic foot, what is the weight of a cart load containing 22 cubic feet?

9. How many cubic feet are there in a wagon body 6 feet long, $4\frac{1}{2}$ feet wide, $1\frac{1}{3}$ feet high?

10. What is the weight of a cubic yard of sand weighing 86 pounds to the cubic foot?

11. How many cubic yards are there in a box 2 yards long, $1\frac{1}{2}$ yards wide, $\frac{1}{2}$ yard high?

12. How many cubic feet are there in $1\frac{1}{3}$ cubic yards?

13. At $7\frac{1}{2}$ gallons to a cubic foot, how many gallons of water will fill a tank 8 feet long, 4 feet wide, 4 feet high?

14. How many cubic feet of earth are removed in digging a cellar 50 feet long, 20 feet wide, and 9 feet deep?

15. How many cubic yards of air are there in a room 18 feet long, 12 feet wide, and 9 feet high?

16. (*a*) How many cubic feet are there in a timber 16 feet long, 6 inches wide, 3 inches thick? (*b*) what is its weight at 40 pounds to the cubic foot?