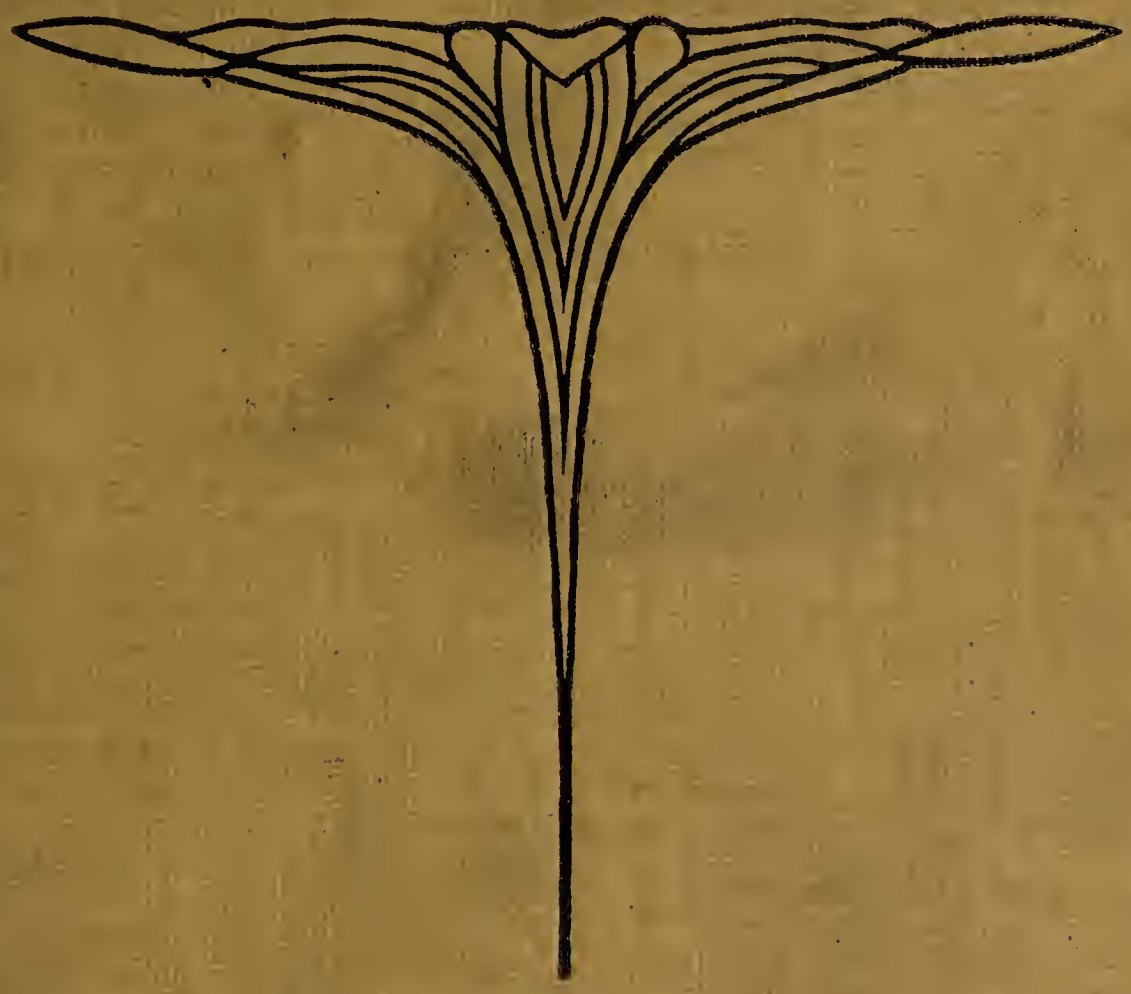
THE WALSH-SUZZALLO ARITHMETICS

FIFTH YEAR BOOK



WALSH-SUZZALLO ARITHMETICS

BY

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By Grades

FIFTH YEAR

D. C. HEATH & CO., PUBLISHERS
BOSTON NEW YORK CHICAGO

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

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PREFACE

THESE books will develop all the mathematical power needed by the average person in the accurate control of his affairs. The purpose has been to teach first the most important topics of arithmetic and last those least frequently used. In consequence, the teacher may feel that the child who is leaving school at the end of any particular grade has been taught whatever would be most useful to him, considering that his schooling had to stop just then. Nothing in the next grade beyond is more important than what he has just studied.

These books are so constructed as to complete the fundamental processes of arithmetic by the end of the sixth year of school life. No pupil studying from this course through the first six years will be left without an essential mathematical power. With this foundation, he can proceed by himself, as need confronts him, to learn shorter or more convenient methods of calculation and to make new applications of the processes learned.

Furthermore, it may be said that in attaining a higher social utility in the arrangement of these books, nothing of teaching efficiency has been sacrificed. In completing the fundamentals in six school years, nothing radical or experimental has been done! Every topic in arithmetic

which these books require to be taught at a particular time in the fourth, fifth, or sixth year is now already successfully taught at that period in some progressive school or school system. The authors have merely combined the successful practices of many efficient schools into a unified scheme of procedure, now urgently demanded by all who understand the needs of those who cannot remain in school eight years.

In addition to giving the child all the fundamental skills of calculation, room has been found for the introduction of those simple institutional applications which are likely to be among the immediate needs of those who leave school early. Every child who completes the sixth grade will know something of being accurate and business-like about his own earning, spending, and saving. He will comprehend the simplest methods of accounting which are to aid him in his own modest affairs, whether these relate to the industrial payroll, the farm income, the household expenditure, or the savings in the bank. Thus every real economy in the teaching of arithmetic has enhanced efficiency.

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SECTION ONE — INTRODUCTORY REVIEW

SECTION TWO — MIXED NUMBERS, BILLS, MEASUREMENTS, SHORT METHODS, REVIEWS

SECTION THREE — DECIMALS, DENOMINATE NUMBERS, MEASUREMENTS, REVIEWS, SHORT METHODS, BILLS AND RECEIPTS

ARITHMETIC

FIFTH YEAR

SECTION I

INTRODUCTORY REVIEW

Oral Counting Drills

1. Counting by 7's.
   - *a.* Beginning with 7, count by 7's to 98.
   - *b.* Beginning with 6, count by 7's to 97.
   - *c.* Beginning with 8, count by 7's to 99.
   - *d.* Beginning with 9, count by 7's to 93.

2. Counting by 8's.
   - *a.* Beginning with 8, count by 8's to 96.
   - *b.* Beginning with 7, count by 8's to 95.
   - *c.* Beginning with 9, count by 8's to 97.
   - *d.* Beginning with 6, count by 8's to 94.

3. Counting by 9's.
   - *a.* Beginning with 9, count by 9's to 99.
   - *b.* Beginning with 8, count by 9's to 98.
   - *c.* Beginning with 7, count by 9's to 97.
   - *d.* Beginning with 6, count by 9's to 96.

NOTE. — A minute or two should be given daily to these drills. The teacher says, "Count by 7's; beginning with 7." Successive pupils say, "14, 21, 28," etc., until 98 is reached. Then the teacher says, "Begin with 6," and successive pupils say, "13, 20, 27," etc., until 97 is reached.

Addition Drills

1. Add 8 to each of the following: *a.* 16. *b.* 24. *c.* 38. *d.* 49. *e.* 55. *f.* 67. *g.* 78. *h.* 83.

2. Add 9 to each of the following: *a.* 81. *b.* 75. *c.* 64. *d.* 58. *e.* 42. *f.* 37. *g.* 26. *h.* 13.

3. Add 7 to each of the following: *a.* 15. *b.* 28. *c.* 34. *d.* 47. *e.* 59. *f.* 66. *g.* 73. *h.* 88.

4. Add 6 to each of the following: *a.* 84. *b.* 79. *c.* 67. *d.* 56. *e.* 48. *f.* 37. *g.* 28. *h.* 15.

5. Add 5 to each of the following: *a.* 16. *b.* 28. *c.* 39. *d.* 46. *e.* 58. *f.* 67. *g.* 79. *h.* 87.

Graded Sight Drills

Addition and Subtraction

1. Give sums:

a. 14+9	*b.* 9+67	*c.* 86+9	*d.* 9+34	*e.* 88+9
f. 23+8	*g.* 8+54	*h.* 75+5	*i.* 8+48	*j.* 77+4
k. 35+7	*l.* 7+49	*m.* 69+6	*n.* 7+57	*o.* 69+8

2. Give remainders:

a. 23−5	*b.* 24−15	*c.* 91−9	*d.* 92−87	*e.* 30−9
f. 31−6	*g.* 32−26	*h.* 83−8	*i.* 84−76	*j.* 40−7
k. 42−7	*l.* 43−37	*m.* 76−7	*n.* 73−69	*o.* 50−5

3. Add:

NOTE. — To add 33 and 45, think 73 (33 + 40), 78 (adding 5).
To add 26 and 68, think 86 (26 + 60), 94 (adding 8).

a. 30+40	*b.* 32+40	*c.* 33+41	*d.* 33+48
e. 20+50	*f.* 20+55	*g.* 22+55	*h.* 22+59
i. 60+30	*j.* 63+30	*k.* 63+36	*l.* 37+36
m. 40+40	*n.* 40+44	*o.* 41+44	*p.* 48+44

Sight Problems

1. A boy purchases 60 cents' worth of groceries. How much change should he receive out of 75 cents?

2. There are 25 boys and 30 girls in a class. How many pupils are there in the class?

3. How many minutes are there from 20 minutes before nine to 15 minutes after nine?

4. How many days are there from December 11 to December 25?

5. After selling 48 tons of hay, a farmer still has 15 tons. How many tons had he at first?

6. How many acres are there in two fields, one containing 35 acres, and the other containing 40 acres?

7. After traveling 75 miles, how far must I go to complete a trip of 95 miles?

8. Mary worked 20 examples on Monday and 19 on Tuesday. How many did she work in the two days?

9. How many blocks does a boy walk in going to school and returning if he walks 15 blocks each way?

10. How many pupils are present of a class of 40, when 12 are absent on account of a storm?

11. What is the cost of two cows at $45 each?

12. A girl is saving her money to buy a 50-cent doll. When she has 38 cents, how much does she still need?

13. There are 29 grown people in a car and 12 children. How many passengers are there in the car?

14. A 40-quart can contains 27 quarts of milk. How many more quarts will it hold?

15. A boy has 60 examples to work in a week. How many has he still to do when he has done 45?

Adding Whole Numbers

Written Exercises

1. A freight train carried 387 pounds of clover seed, 4095 pounds of timothy, 57,367 pounds of wheat, 825,456 pounds of corn, 6789 pounds of flaxseed, 32,506 pounds of oats, and 9987 pounds of barley. What was the total weight of the seeds?

387 lb.	PROCESS
4,095	Write *lb.* (the abbreviation for pounds) after the
57,367	first addend. Add upwards, beginning with the
825,456	ones' column: 13, 22, 28, 35, 40, 47; write 7. Carry
6,789	4 to the second column, and think 12 (skip 0), 20,
32,506	25, 31, 40, 48; write 8. Carry 4 to the third column,
9,987	and think 13, 18, 25, 29, 32 (skip 0), 35; write 5.
936,587 lb.	Carry 3 to the fourth column, and think 12, 14, 20,
	25, 32, 36; write 6. Carry 3 to the fifth column,
	and think 6, 8, 13; write 3. Carry one to the sixth
	column, and think 9; write 9. Place *lb.* after the sum.

TEST

Cover the answer with a piece of paper. Upon this write the new results. Add downward.

2. Find sums:

a. 46 lb. + 135 lb. + 72 lb. + 39 lb. + 427 lb. + 64 lb. + 139 lb.

b.	*c.*	*d.*	*e.*
52,363	29,438	48,375	64,235
9,888	4,567	57,842	96,487
65,435	887	9,384	8,986
82,389	37,469	77,485	678
654	18,253	4,969	56,787
9,839	3,579	53,774	959

Adding Dollars and Cents

3. During March Mr. X bought goods costing $18.75, $4.48, $32, $6.93, and $.86.

$18.75	PROCESS
4.48	Write the successive addends under each other, keeping the decimal points in the same vertical line. Use the dollar sign with only the first addend and the sum.
32.—	
6.93	
.86	
$63.02 *Ans.*	

4. Add the following:

a. $596.80, $64.35, $806, $284.35, $9718.87, $.68, and $4772.13.

b. $76.71, $328.57, $.08, $4156.12, $13,389.28, $4.34, and $667.94.

c. $781.74, $97.66, $489, $82.98, $.33, $121.65, and $148.

d. $857.23, $17.67, $312.77, $886, $78.81, $.09, $.36, and $95.34.

e. $596.80, $80.62, $718.87, $4772.13, $947.82, $684, $135.79, $.25, and $83.06.

f.	*g.*	*h.*	*i.*
52,363	29,438	48,375	64,235
9,888	4,567	57,482	96,487
65,435	887	9,384	8,986
82,389	37,469	77,485	678
654	18,253	4,969	56,787
9,839	3,579	53,774	959
27,506	24,608	879	3,465

Subtracting Whole Numbers

Written Exercises

1. A man's earnings in a year were $6400. He saved $1497.59. How much did he pay out during the year?

PROCESS

Minuend	$6400.
Subtrahend	1497.59
Remainder	$4902.41 *Ans.*

Omit the dollar mark from the subtrahend. Think 9 and **1** (writing 1) are 10. Carrying 1 to 5, think 6 and **4** (writing 4) are 10. Carrying 1 to 7, think 8 and **2** (writing 2) are 10. Carrying 1 to 9, think 10 and **0** (writing 0) are 10. Carrying 1 to 4, think 5 and **9** (writing 9) are 14. Carrying 1, think 2 and **4** (writing 4) are 6.

TEST

Cover the minuend with a piece of paper. On it write the sum of the remainder and the subtrahend, adding upwards. Remove the paper and compare the sum with the minuend.

NOTE. — In working an example, do not write the words "minuend," "subtrahend," etc.

2. Find remainders:

a. 16346 — 8974
b. $4000 — $138.06
c. 18075 — 9889
d. $240.35 — $6.97
e. 79000 — 58960
f. $217.40 — $108.16
g. 30000 — 16432
h. $123.45 — $98.76

Sight Exercises

1. Subtract:

a. 140 — 60
b. 260 — 70
c. 1200 — 500
d. 243 — 60
e. 363 — 70
f. 1220 — 600
g. 345 — 65
h. 466 — 76
i. 1280 — 780
j. 445 — 62
k. 566 — 75
l. 1290 — 820
m. 440 — 62
n. 560 — 75
o. 1200 — 820

Addition and Subtraction Combined

Written Exercises

1. A farmer raised 1800 bushels of wheat. How many bushels had he left after selling 347 bushels, 86 bushels, 443 bushels, and 79 bushels?

PROCESS

1800 bu.	Add the ones' column of the four subtrahends; 12, 18, 25 and think **5** (writing 5) are 30. Carry 3 to the tens' column; 10, 14, 22, 26, and think **4** (writing 4) are 30. Carry 3 to the next column; 7, 10, and think **8** (writing 8) are 18.
347	
86	
443	
79	
Ans. 845 bu.	

TEST

Cover 1800 (the minuend) with a piece of paper. On this write the total of 845 (the remainder) and the four subtrahends, adding upwards.

1st column. Think 14(5 + 9), 17, 23, 30. Write 0.
2d column. Carrying 3; think 7, 14, 18, 26, 30. Write 0.
3d column. Carrying 3; think 11, 15, 18. Write 18.

2. Find remainders:

a. 1234 − (164 + 587)
b. 1863 − (659 + 86 + 203)
c. 2000 − (317 + 865)
d. 2456 − (735 + 97 + 888)
e. 2468 − (676 + 943)
f. 3248 − (874 + 95 + 875)

Written Problems

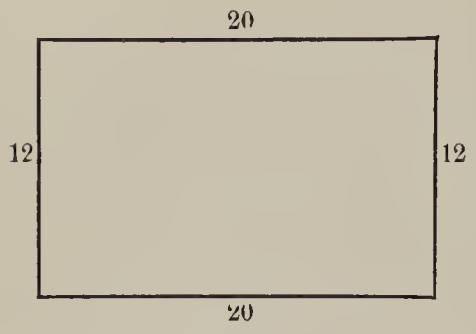
1. How much change should a boy receive from $1 when he buys articles costing 9 cents, 17 cents, 29 cents, and 38 cents, respectively?

2. A man had 600 bushels of wheat. How many bushels are left after he has sold 184 bushels, 97 bushels, and 48 bushels?

Sight Problems

1. A's farm contains 20 acres more than B's. B's contains 110 acres. How many acres are there (*a*) in A's farm? (*b*) In both farms?

2. A field is 20 rods long, 12 rods wide. How many rods of fence are needed to enclose it?



3. John found 24 eggs one afternoon, which was 4 more than he found in the morning. How many did he find that day?

4. A boy lives 14 blocks from school. His uncle lives 2 blocks beyond. How many blocks does he walk in going from his home to his uncle's and returning?

5. A has 40 sheep; B has 20 more than A; C has 12 fewer than B. How many sheep has C?

6. After taking 5 gallons and 6 gallons of oil from a barrel, there are 34 gallons left. How many gallons were there in the barrel at first?

7. How many gallons per minute are discharged by two pipes when one discharges 25 gallons per minute and the other 7 gallons less?

8. How many times does a clock strike (*a*) in the first three hours: 1 o'clock, 2 o'clock, and 3 o'clock? (*b*) In the next three: 4 o'clock, 5 o'clock, and 6 o'clock? (*c*) In the next three: 7 o'clock, 8 o'clock, and 9 o'clock? (*d*) In the next three: 10 o'clock, 11 o'clock, and 12 o'clock?

9. A girl needs 10 cents more to buy a 50-cent doll. How much would she have left if she bought one for 25 cents?

Written Problems

1. A's farm contains 27 acres more than B's. B's contains 109 acres. How many acres are there (*a*) in A's farm? (*b*) In both farms?

2. A field is 67 rods long and 48 rods wide. How many rods of fence are required to enclose it?

3. In the orchard there are 35 pear trees, which is 12 more than the number of plum trees. How many are there of the two kinds?

4. Philadelphia is 90 miles from New York. Baltimore is 94 miles beyond Philadelphia. How many miles are traveled in a trip from New York to Baltimore and return?

5. A has 47 sheep; B has 27 more than A; C has 18 fewer than B. How many sheep has C?

6. After selling 26 gallons and 18 gallons of gasoline, a dealer still has 56 gallons. How many gallons had he at first?

7. How many gallons per minute are discharged by two pipes when one discharges 137 gallons per minute and the other discharges 49 gallons less?

8. If a clock strikes the hours, how many times does it strike (*a*) in 12 hours? (*b*) In a day?

9. To buy a horse for $350 would require $57 more than Mr. Brown has. How much would he have after buying one for $275?

10. At the beginning of the year a school has 376 pupils. During the year 84 new pupils are admitted and 92 leave. How many pupils are there at the end of the year?

11. A man was 47 years old in 1898; how old was he in 1913?

Multiplying Whole Numbers

Preparatory Exercises

1. Count:

a. By 2's to 18. *b.* By 3's to 27.
c. By 4's to 36. *d.* By 5's to 45.
e. By 6's to 54. *f.* By 7's to 63.
g. By 8's to 72. *h.* By 9's to 81.

2. Give tables of:

a. 2 times 2 to 2 times 9. *b.* 3 times 2 to 3 times 9.
c. 4 times 2 to 4 times 9. *d.* 5 times 2 to 5 times 9.
e. 6 times 2 to 6 times 9. *f.* 7 times 2 to 7 times 9.
g. 8 times 2 to 8 times 9. *h.* 9 times 2 to 9 times 9.

3. At 2 pints to the quart, give the number of pints:

a. In 3 qt. *b.* In 2 qt. *c.* In 9 qt. *d.* In 6 qt.
e. In 5 qt. *f.* In 8 qt. *g.* In 4 qt. *h.* In 7 qt.

4. At 3 feet to the yard, give the number of feet:

a. In 2 yd. *b.* In 8 yd. *c.* In 7 yd. *d.* In 3 yd.
e. In 4 yd. *f.* In 5 yd. *g.* In 6 yd. *h.* In 9 yd.

5. At 4 pecks to the bushel, give the number of pecks:

a. In 5 bu. *b.* In 4 bu. *c.* In 6 bu. *d.* In 9 bu.
e. In 3 bu. *f.* In 7 bu. *g.* In 2 bu. *h.* In 8 bu.

6. At 5 cents to the nickel, give the number of cents:

a. In 9 ni. *b.* In 5 ni. *c.* In 4 ni. *d.* In 7 ni.
e. In 8 ni. *f.* In 2 ni. *g.* In 3 ni. *h.* In 6 ni.

7. At 6 ¢ per yard, give the cost:

a. Of 6 yd. *b.* Of 9 yd. *c.* Of 5 yd. *d.* Of 4 yd.
e. Of 7 yd. *f.* Of 3 yd. *g.* Of 8 yd. *h.* Of 2 yd.

Multipliers of One Figure

Drill Exercises

Give products at sight:

a.	51	*b.*	83	*c.*	61	*d.*	72	*e.*	91	*f.*	84	*g.*	51
	×7		×3		×6		×4		×9		×2		×8
h.	92	*i.*	51	*j.*	92	*k.*	61	*l.*	71	*m.*	91	*n.*	74
	×4		×9		×3		×8		×5		×7		×2
o.	71	*p.*	94	*q.*	81	*r.*	93	*s.*	81	*t.*	71	*u.*	82
	×9		×2		×6		×3		×8		×6		×3

Written Exercises

1. How many pounds of hay are raised on 6 acres at the rate of 9804 pounds to the acre?

PROCESS

Multiplicand	9084 lb.
Multiplier	6
Product	54504 lb.

Think 6 times 4 are 24; write 4 and carry 2. Think 6 times 8 are 48, carrying 2 makes 50; write 0 and carry 5. Think 6 times 0 are 0; carrying 5 makes 5; write 5. Think 6 times 9 are 54; write 54.

TEST

Cover the answer with a piece of paper. On the latter write the product of 9084 by 2, and then multiply this product by 3. Remove the paper and compare the final product with the one obtained by multiplying 9084 by 6.

9084 lb.
2
18168 lb.
3
54504 lb.

2. Multiply 8475 (*a*) by 6. (*b*) By 4. (*c*) By 8. (*d*) By 9. Test.

3. Multiply 7608 (*a*) by 4. (*b*) By 6. (*c*) By 8. (*d*) By 9. Test.

Divisors of One Figure

Drill Exercises

Give quotients at sight:

a. 2)188	*b.* 3)219	*c.* 4)328	*d.* 5)455	*e.* 6)366
f. 7)357	*g.* 8)568	*h.* 9)459	*i.* 8)408	*j.* 7)497
k. 6)546	*l.* 5)355	*m.* 4)288	*n.* 3)276	*o.* 2)148
p. 3)216	*q.* 4)328	*r.* 5)405	*s.* 6)486	*t.* 7)637

Written Exercises

1. When 7 acres yield 63581 pounds of hay, what is the average yield of 1 acre?

PROCESS

Divisor 7)63581 lb. Dividend
Ans. 9083 lb. Quotient

Think 7 into 63 (goes) 9 times; write 9 under 3. Think 7 into 5 (goes) 0 times with 5 remainder; write 0 under 5. Combine 5 (remainder) with 8 making 58; think 7 into 58 (goes) 8 times with 2 remainder; write 8 under 8. Combine 2 with 1 making 21; think 7 into 21 (goes) 3 times; write 3 under 1.

TEST

Cover the dividend with a piece of paper. On the latter write the product of 9083 (the quotient) by 7 (the divisor) without rewriting these numbers.

Quotient	9083 lb.
Divisor	×7
Dividend	63581 lb.

2. Find quotients. Test.

a. 2)98760	*b.* 3)87654	*c.* 4)75436	*d.* 5)16835
e. 6)19332	*f.* 7)90594	*g.* 8)94528	*h.* 9)48366
i. 8)10848	*j.* 7)25830	*k.* 6)20136	*l.* 5)76030

Multiplication

Written Exercises

1. Multiply 46078 by 7.

	TEST
46078 7 7)322546 46078	As 7 is a prime number, test the product by dividing it by 7. Write the quotient on the paper used to cover the multiplicand.

NOTE. — A *prime number* has no factors; 1, 2, 3, 5, 7, 11, etc., are prime numbers.

2. Find products. Test by division.

Multiply by 7: *a.* 40632 *b.* 24079 *c.* 56387 *d.* 35790

Remainders in Division

Written Exercises

1. When 8 acres yield 975 bushels of potatoes, how many bushels are yielded on an average by 1 acre?

	PROCESS
8)1095 bu. *Ans.* $136\frac{7}{8}$ bu.	Write 7 (the final remainder) over 8 (the divisor) as the fraction $\frac{7}{8}$.

TEST

Cover the dividend with a piece of paper. Think 8 sixes are 48, carry 7 (the remainder) making 55; write 5 and carry 5. Think 8 threes are 24, carry 5 making 29; write 9 and carry 2, etc.

2. Find quotients. Test.

Divide by 7: *a.* 406321 *b.* 240792 *c.* 563873 *d.* 35794
Divide by 8: *e.* 356785 *f.* 350676 *g.* 135797 *h.* 268508
Divide by 9: *i.* 747870 *j.* 516782 *k.* 657913 *l.* 678985

Multiplying Dollars and Cents

1. Find the cost of 9 suits of clothes at $18.75 each.

	PROCESS	TEST
$18.75 × 9 $168.75	In multiplying dollars and cents, write a decimal point in the product under the decimal point in the multiplicand.	$18.75 × 3 56.25 × 3 $168.75

2. Find products:

a. $20.43 × 6 *b.* $7.84 × 7 *c.* $260.75 × 8 *d.* $0.55 × 9

3. What is the cost of 285 pounds of sugar at 6 cents a pound?

	PROCESS
$.06 × 285 $17.10	At six cents per pound, 285 pounds will cost 285 times 6 cents. In practice, however, use 6 as the multiplier. Point off two decimals in the result.

4. Multiply:

a. $.03 × 248 *b.* $.04 × 123 *c.* $.05 × 345 *d.* $.06 × 218 *e.* $.08 × 154

Dividing Dollars and Cents — Divisor an Abstract Number

Preparatory Exercises

1. How much does each boy receive when $1 is divided (*a*) Between 2 boys? (*b*) Among 4 boys?

2. *a.* $1 ÷ 2 = ? *b.* $1 ÷ 4 = ? *c.* $1 ÷ 5 = ?

3. Give quotients:

a. 2)50¢ *b.* 3)$3.60 *c.* 4)$1.60 *d.* 4)$4.40

Written Exercises

1. A farmer's profits on 5 acres of land were $467.65. What was his average profit per acre?

	PROCESS	TEST
5)$467.65 $93.53 *Ans.*	Place a decimal point in the quotient under the decimal point in the dividend.	$93.53 × 5 $467.65

2. Divide $85.80 (*a*) by 3. (*b*) By 4. (*c*) By 5.

3. Divide $95.76 (*a*) by 6. (*b*) By 7. (*c*) By 8.

Cents as Divisors

Preparatory Exercises

1. At 5 cents each how many pies can be bought (*a*) for 25 cents? (*b*) For 50 cents? (*c*) For $1? (*d*) For $2?

2. How many times is (*a*) 5¢ contained in 40¢? (*b*) 10¢ in $1? (*c*) 5¢ in $5?

Written Exercises

1. At 5¢ each, how many baseballs can be bought (*a*) for $2.85? (*b*) For $3?

PROCESS

(*a*) 5¢)285¢ (*b*) 5¢)300¢

Ans. 57 (baseballs) *Ans.* 60 (baseballs)

Write both the divisor and the dividend as cents. The quotient represents the *number* of baseballs. Write *baseballs* in a parenthesis.

2. Find quotients:

a. $.05)$3.70 *b.* $.04)$9.00 *c.* $.08)$54

Sight Problems

1. When 8 gallons of milk weigh 69 pounds, what is the weight of a gallon?

2. What is the weekly cost of a cow's feed at the rate of $21\frac{3}{7}$ cents per day?

3. The weekly cost for labor per cow is 50 cents. Find the cost per day.

4. Find the average weight of an egg when a dozen eggs weigh 23 ounces.

5. What is the average yield per acre when 6 acres yield 13 tons of hay?

Sight Exercises

1. Give quotients:

a.	$\frac{43}{5}$	*b.*	$\frac{27}{7}$	*c.*	$\frac{31}{6}$	*d.*	$\frac{43}{9}$	*e.*	$\frac{33}{4}$	*f.*	$\frac{53}{8}$	*g.*	$\frac{31}{3}$
h.	$\frac{15}{2}$	*i.*	$\frac{38}{3}$	*j.*	$\frac{41}{4}$	*k.*	$\frac{33}{5}$	*l.*	$\frac{37}{8}$	*m.*	$\frac{55}{6}$	*n.*	$\frac{33}{7}$
o.	$\frac{37}{3}$	*p.*	$\frac{58}{5}$	*q.*	$\frac{44}{7}$	*r.*	$\frac{59}{6}$	*s.*	$\frac{65}{9}$	*t.*	$\frac{43}{4}$	*u.*	$\frac{65}{8}$

2. Give dividends:

a.	$\frac{?}{5} = 8\frac{3}{5}$	*b.*	$\frac{?}{7} = 7\frac{1}{7}$	*c.*	$\frac{?}{6} = 5\frac{5}{6}$	*d.*	$\frac{?}{9} = 6\frac{2}{9}$
e.	$\frac{?}{4} = 9\frac{3}{4}$	*f.*	$\frac{?}{8} = 4\frac{3}{8}$	*g.*	$\frac{?}{3} = 9\frac{2}{3}$	*h.*	$\frac{?}{5} = 7\frac{4}{5}$
i.	$\frac{?}{7} = 7\frac{2}{7}$	*j.*	$\frac{?}{6} = 8\frac{1}{6}$	*k.*	$\frac{?}{9} = 7\frac{5}{9}$	*l.*	$\frac{?}{4} = 6\frac{3}{4}$
m.	$\frac{?}{8} = 9\frac{3}{8}$	*n.*	$\frac{?}{3} = 5\frac{1}{3}$	*o.*	$\frac{?}{5} = 8\frac{4}{5}$	*p.*	$\frac{?}{7} = 5\frac{6}{7}$

3. Give quotients:

a.	$5¢)\underline{60¢}$	*b.*	$\$.05)\underline{\$1}$	*c.*	$\$.05)\underline{\$1.50}$	*d.*	$\$.05)\underline{\$5}$
e.	$4¢)\underline{84¢}$	*f.*	$\$.04)\underline{\$1}$	*g.*	$\$.04)\underline{\$3.60}$	*h.*	$\$.04)\underline{\$8}$
i.	$3¢)\underline{96¢}$	*j.*	$\$.03)\underline{\$3}$	*k.*	$\$.03)\underline{\$9.90}$	*l.*	$\$.03)\underline{\$9}$
m.	$6¢)\underline{66¢}$	*n.*	$\$.06)\underline{\$3}$	*o.*	$\$.06)\underline{\$5.40}$	*p.*	$\$.06)\underline{\$6}$

Multiplying by a Multiple of 10

Sight Exercises

NOTE. — Announce the product of 38 by 10 as three, eighty; the product of 49 by 100 as 49 hundred.

Give products:

a.	24	*b.*	22	*c.*	30	*d.*	144
	× 10		× 100		× 30		× 20
e.	24	*f.*	23	*g.*	40	*h.*	231
	× 20		× 200		× 40		× 30

Written Exercises

1. *a.* Find the cost of 469 horses at $300 each. *b.* At 2000 pounds to a ton how many pounds are there in 384 tons?

PROCESS

a 469
× $300
$140700 *Ans.*

In (*a*) use 300 as the multiplier. Write 0, the product by 0 (ones), in the ones' place. Write 0, the product by 0 (tens), in the tens' place. Write 7, the right-hand figure of the product by 3 (hundreds), in the hundreds' place, etc.

In (*b*) use 2000 as the multiplier. Write 8, the right-hand figure of the product by 2 (thousands), in the thousands' place.

b 384
× 2000 lb.
Ans. 768000 lb.

2. Find products:

a.	195	*b.*	240	*c.*	425	*d.*	7150	*e.*	345
	× 200		× 900		× 8000		× 2000		× 300
f.	350	*g.*	350	*h.*	1480	*i.*	659	*j.*	420
	× 600		× 500		× 5000		× 400		× 700

Dividing by a Multiple of 10

Written Exercises

1. At \$30 each, how many cows cost \$2670?

PROCESS

$3|0\overline{)267|0}$
Ans. 89 (cows)

Omit the dollar mark in the divisor and in the dividend. Divide the divisor (30) and the dividend (2670) by 10 by cutting off the terminal cipher in each. Divide 267 by 3 to obtain the number of cows. Write "cows" in a parenthesis.

NOTE. — When the divisor and the dividend have the same denomination, \$, lb., ft., etc., the denomination may be omitted from both.

Dividing the divisor and the dividend by the same number makes no change in the quotient.

2. Find quotients. (Test by multiplication.)

a. $80\overline{)1920}$ *c.* $700\overline{)37100}$ *e.* $4000\overline{)136000}$

b. $90\overline{)4950}$ *d.* $600\overline{)73800}$ *f.* $3000\overline{)192000}$

3. At \$50 per acre, how many acres cost \$2687?

PROCESS

$5|0\overline{)268|7}$
$53\frac{37}{50}$

Cut off 0 in the divisor and 7 in the dividend. In the quotient write 7 as the partial remainder over the divisor 50. Divide 268 by 5, which gives a quotient of 53 and a remainder of 3. Prefix 3 to 7 (the partial remainder), making the complete remainder 37. Ans. $53\frac{37}{50}$ acres.

4. Find quotients. Test.

a. $90\overline{)2827}$ *c.* $700\overline{)67241}$ *e.* $4000\overline{)62357}$

b. $80\overline{)7853}$ *d.* $600\overline{)98767}$ *f.* $3000\overline{)78961}$

Multipliers of Two or More Figures

Sight Exercises

Give two factors of each of the following:

a. 15 *b.* 21 *c.* 22 *d.* 26 *e.* 33 *f.* 34 *g.* 35 *h.* 38 *i.* 39

Written Exercises

1. Find the weight of 6048 bushels of timothy seed at 45 pounds to the bushel.

PROCESS

	6048
	× 45 lb.
	30240
	24192
Ans.	272160 lb.

Use 45 as the multiplier, and place the right-hand figure of the product by 5 (ones) under the 5. Place the right-hand figure of the product of 4 (tens) under the 4. Combine the partial products.

2. Find products. Test by using factors.

a. 21×5463 *b.* 27×6804 *c.* 28×5729 *d.* 32×6918
e. 36×8618 *f.* 42×7855 *g.* 45×4205 *h.* 48×4869

3. Multiply 348 by 607.

PROCESS

	348
	607
	2436
	2088
Ans.	211236

Place the product by 7 (ones) under 7, and the product by 6 (hundreds) under 6. Write only two partial products.

TEST

Test the foregoing product by multiplying 607 by 348.

4. Find products. Test.

a. 204×253 *b.* 942×367 *c.* 907×805
d. 346×645 *e.* 986×623 *f.* 834×304

Long Division

1. In digging out a cellar, 8260 cubic feet of earth were removed. At 27 cubic feet to the cubic yard, how many cubic yards were removed?

PROCESS

Ans. $305\frac{25}{27}$ (cu. yd.)

$$
\begin{array}{r}
27\overline{)8260} \\
81 \\
\hline
160 \\
135 \\
\hline
25
\end{array}
$$

Take 82 as the first partial dividend, divide it by 27, and write 3 (the first figure of the quotient) above 2 (the last figure of the first partial dividend). Multiply 27 by 3, and write 81 (the product) under 82. To 1 (the remainder) annex 6 (the third figure of the dividend), making 16 the second partial dividend. Since this does not contain 27, write 0 above 6, as the second figure of the quotient, and annex 0 (the last figure of the dividend) to 16, making 160 the third partial dividend. Since 160 contains the divisor 5 times, write 5 above 0, as the third figure of the quotient. Multiply the divisor by 5, place 135 (the product) under 160, and subtract. Write 25 (the final remainder) over 27 (the divisor) in the form of the fraction $\frac{25}{27}$.

TEST

Multiply 305 (the whole number in the quotient) by 27 (the divisor). To 8235 (the product) add 25 (the remainder). Since the sum, 8260, is the same as the dividend, the original answer is probably correct.

Quotient	305
Divisor	27
	2135
	610
	8235
Remainder	25
Dividend	8260

2. How many cubic yards of earth were removed from an excavation containing 9473 cubic feet?

3. At 22 cubic feet to the load, how many loads will 9482 cubic feet make?

Written Exercises

1. Divide. Test :

a. $675 \div 27$	*b.* $6755 \div 27$	*c.* $6775 \div 271$
d. $865 \div 34$	*e.* $6971 \div 34$	*f.* $8530 \div 341$
g. $245 \div 17$	*h.* $2451 \div 17$	*i.* $2451 \div 172$
j. $307 \div 27$	*k.* $3072 \div 27$	*l.* $3072 \div 273$
m. $573 \div 38$	*n.* $5733 \div 38$	*o.* $5733 \div 384$
p. $645 \div 48$	*q.* $6454 \div 48$	*r.* $6454 \div 485$

2. Find quotients. Test :

a. $24516 \div 172$	*b.* $245161 \div 1721$
c. $30725 \div 273$	*d.* $307252 \div 2732$
e. $57334 \div 384$	*f.* $573343 \div 3843$
g. $64543 \div 485$	*h.* $645434 \div 4854$
i. $87652 \div 596$	*j.* $876525 \div 5965$

3. Divide 35417 by 1800.

PROCESS

Ans. $19\frac{1217}{1800}$

$$
\begin{array}{r|l}
18\,|\,00 & 354\,|\,17 \\
 & \underline{18} \\
 & 174 \\
 & \underline{162} \\
 & 12
\end{array}
$$

Cut off the two terminal ciphers in the divisor, and the last two figures of the quotient. Divide 354 by 18. To the partial remainder 12 annex 17, the quotient figures cut off, making 1217 the complete remainder. Underneath this remainder write 1800 (the divisor) in the form of a fraction.

TEST

To the product of 19 (the partial quotient) by 1800 (the divisor) add 1217 (the remainder). The result should equal the dividend.

4. Find quotients. Test :

a. $64813 \div 1800$	*b.* $64813 \div 1890$	*c.* $73245 \div 2700$
d. $73245 \div 2780$	*e.* $46157 \div 3600$	*f.* $46157 \div 3670$

Divisors Containing Cents

5. At 95 cents per bushel how many bushels of wheat can be bought for $76?

Ans. 80 (bushels)

$$95\overline{)7600}$$
$$\underline{760}$$
$$0$$

PROCESS

Write the divisor and the dividend as cents, but omit the words "cents." The quotient will be the *number* of bushels.

6. Divide:

a. $24 ÷ 25¢ *b.* $37.50 ÷ 75¢ *c.* $31.25 ÷ $1.25
d. $123 ÷ 75¢ *e.* $24 ÷ 48¢ *f.* $48.96 ÷ 51¢
g. $48.96 ÷ $3.06 *h.* $123 ÷ 15¢

Shortening the Work

Written Exercises

1. At 15 cents per dozen, find the cost of 64 lemons.

$$\frac{\overset{5}{\cancel{15}¢} \times \overset{16}{\cancel{64}}}{\underset{4}{\cancel{12}}} = 80¢ \text{ } \textit{Ans.}$$

PROCESS

Write 15¢ above the line and 12 below it to indicate the cost of 1 lemon. Then above the line write 64 preceded by a multiplication sign, to indicate the cost of 64 lemons. Divide 12 and 15 by 3, drawing a cancellation line through both, and write 4 below 12 and 5 above 15. Cancel 4 and 64, and write 16 above the latter. Write 80¢ (16 times 5¢) as the required answer. Test by finding the cost of 1 lemon and multiplying the result by 64.

2. When 27 acres yield 555 bushels of wheat, what should be the yield of 36 acres?

Cancellation

Cancellation consists in rejecting the same factor from a divisor and a dividend.

3. Find answers:

a. $\frac{27 \times 16}{12}$	*b.* $\frac{25 \times 84}{75}$	*c.* $\frac{21 \times 40}{14}$	*d.* $\frac{56 \times 18}{24}$
e. $\frac{37 \times 32}{74}$	*f.* $\frac{36 \times 96}{48}$	*g.* $\frac{65 \times 42}{26}$	*h.* $\frac{43 \times 24}{86}$
i. $\frac{25 \times 76}{95}$	*j.* $\frac{32 \times 27}{54}$	*k.* $\frac{70 \times 20}{140}$	*l.* $\frac{38 \times 36}{72}$

4. If a barrel of gasoline will drive an engine 9 hours a day for 14 days, how many barrels will be required to run it 8 hours a day for 84 days?

PROCESS

$$\frac{\overset{2}{\cancel{84}} \times 8}{\underset{3}{\cancel{14} \times \cancel{9}}} = \frac{16}{3} = 5\tfrac{1}{3} \text{ (bbl.) } \textit{Ans.}$$

Indicate the number of hours it is required to run, by writing 84×8. Indicate the number of hours 1 barrel will last by writing 14×9, placing this indicated product below the line (as a divisor). Cancel 14 and 84, writing 6 above the latter. Cancel 6 and 9 by dividing each by 3, writing 2 above the former and 3 below the latter. Write 16 (2×8) as the numerator of an improper fraction and 3 as its denominator. Change $\frac{16}{3}$ to a mixed number. Write bbl. in a parenthesis.

5. Find answers:

a. $\frac{14 \times 9}{8 \times 84}$	*b.* $\frac{10 \times 88}{11 \times 12}$	*c.* $\frac{11 \times 12}{10 \times 88}$	*d.* $\frac{70 \times 20}{14 \times 75}$
e. $\frac{14 \times 75}{70 \times 20}$	*f.* $\frac{14 \times 25}{70 \times 20}$	*g.* $\frac{50 \times 14}{70 \times 20}$	*h.* $\frac{70 \times 20}{20 \times 14}$

Sight Problems

1. A's farm is twice as large as B's. B's contains 80 acres. How many acres are there (*a*) in A's farm? (*b*) In both farms?

2. How many square rods are there in a rectangular field 20 rods long and 12 rods wide?

3. John has saved 7 cents. His sister has saved three times as much. How many cents have both saved?

4. After filling 3 five-gallon cans with oil from a barrel there are 30 gallons left in the latter. How many gallons were in it at first?

5. One pipe discharges 40 gallons in 2 minutes, the other discharges 36 gallons in 3 minutes. How many gallons per minute do both together discharge?

6. How many times does a clock tick in 5 minutes if it ticks 60 times a minute?

7. At the rate of 31 miles per hour, how far will a train go from 1 P.M. to 10 P.M.?

8. A man bought a wagon for $100 and spent $20 on repairs. What was his profit, if he sold it for $150?

9. A train that was due at 9.15 A.M. did not arrive until 10 A.M. How many minutes late was it?

10. How much change should a girl receive if she buys 63 cents' worth of groceries and gives the storekeeper a $1 bill?

11. I bought 2 pounds of coffee and gave the storekeeper 75 cents. If he gave me 15 cents in change, what was the price of the coffee per pound?

12. A 160-acre farm is divided into 4 fields of the same size. One field yielded 120 tons of hay. What was the yield per acre?

Written Problems

1. X's farm is three times as large as Y's. Y's contains 97 acres. How many acres are there (*a*) in X's farm? (*b*) In both farms?

2. How many square rods are there in a rectangular field 27 rods long and 24 rods wide?

3. A farmer paid $13 for a calf and four times as much for a cow. What did he pay for both?

4. After filling 3 forty-five gallon barrels of oil from a tank the latter still contains 95 gallons. How many gallons did it contain at first?

5. One pipe discharges 169 gallons in 13 minutes. Another discharges 196 gallons in 14 minutes. How many gallons per minute do both together discharge?

6. How many times does a clock strike in a week if it strikes 156 times a day?

7. At the rate of 28 miles per hour, how far will a train go from 2 P.M. to 3 A.M.?

8. A man bought a carriage for $275. After spending $47 for repairs he sold it for $350. What was his profit?

9. How many minutes late was a train that was due at 9.15 A.M. and did not arrive until 10.26 A.M.?

10. How much change should a man receive if he buys 4 yards of cloth at $1.35 per yard, and gives 3 two-dollar bills in payment?

11. I bought 14 pounds of coffee and received $6.50 change out of a 10-dollar bill. What did the coffee cost per pound?

Fractions

Preparatory Exercises

1. Into how many parts is A divided? B? C? D? E?

2. If A were placed upon B, how many parts of B would be covered (*a*) by the shaded part of A? (*b*) By the white part of A?

3. If A were placed upon C, how many parts of C would be covered (*a*) by the white part of A? (*b*) By the shaded part of A?

4. If A were placed upon E, how many parts of E would be covered (*a*) by the white part of A? (*b*) By the shaded part of A?

5. If B were placed upon C, how many parts of C would be covered (*a*) by the shaded part of B? (*b*) By the white part of B?

6. If D were placed upon E, how many parts of E would be covered (*a*) by the shaded part of D? (*b*) By the white part of D?

7. What fraction is shaded (*a*) in A? (*b*) In B? (*c*) In C? (*d*) In D? (*e*) In E?

8. What fraction is white (*a*) in A? (*b*) in B? (*c*) In C? (*d*) In D? (*e*) In E?

When $\frac{8}{12}$ is changed to $\frac{4}{6}$, it is reduced to *lower terms;* when it is changed to $\frac{2}{3}$, it is reduced to *lowest terms;* when it is changed to $\frac{16}{24}$ or to $\frac{24}{36}$, it is expressed in *higher terms.*

Reductions

Sight Exercises

1. Change $\frac{1}{2}$ (*a*) to fourths, (*b*) to eighths, (*c*) to sixths.

2. Change $\frac{1}{3}$ (*a*) to sixths, (*b*) to ninths, (*c*) to twelfths.

3. Give answers:

a. $\frac{1}{2} = \frac{?}{4}$ *b.* $\frac{1}{2} = \frac{?}{8}$ *c.* $\frac{1}{2} = \frac{?}{6}$ *d.* $\frac{1}{2} = \frac{?}{10}$
e. $\frac{1}{4} = \frac{?}{8}$ *f.* $\frac{1}{4} = \frac{?}{12}$ *g.* $\frac{3}{4} = \frac{?}{8}$ *h.* $\frac{3}{4} = \frac{?}{12}$
i. $\frac{1}{3} = \frac{?}{6}$ *j.* $\frac{2}{3} = \frac{?}{6}$ *k.* $\frac{1}{3} = \frac{?}{12}$ *l.* $\frac{2}{3} = \frac{?}{12}$

4. Change to inches:

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

5. Change to ounces:

a. $\frac{1}{2}$ lb. *b.* $\frac{1}{4}$ lb. *c.* $\frac{3}{4}$ lb. *d.* $\frac{1}{8}$ lb. *e.* $\frac{3}{8}$ lb.

6. Change to minutes:

a. $\frac{1}{2}$ hr. *b.* $\frac{1}{3}$ hr. *c.* $\frac{1}{4}$ hr. *d.* $\frac{2}{3}$ hr. *e.* $\frac{1}{5}$ hr.

7. Express as whole or as mixed numbers:

a. $\frac{16}{2}$ *b.* $\frac{12}{4}$ *c.* $\frac{27}{3}$ *d.* $\frac{17}{2}$ *e.* $\frac{15}{4}$ *f.* $\frac{29}{3}$ *g.* $\frac{21}{2}$

8. Change to fourths:

a. $8\frac{1}{4}$ *b.* $9\frac{1}{4}$ *c.* $5\frac{1}{4}$ *d.* $7\frac{1}{4}$ *e.* $4\frac{3}{4}$ *f.* $3\frac{3}{4}$ *g.* $6\frac{3}{4}$

9. Change to improper fractions:

a. $8\frac{1}{3}$ *b.* $9\frac{1}{2}$ *c.* $5\frac{2}{3}$ *d.* $7\frac{1}{8}$ *e.* $4\frac{1}{4}$ *f.* $3\frac{3}{8}$ *g.* $6\frac{5}{8}$

10. Reduce to lowest terms:

a. $\frac{2}{4}$ *b.* $\frac{5}{10}$ *c.* $\frac{4}{8}$ *d.* $\frac{6}{12}$ *e.* $\frac{2}{8}$ *f.* $\frac{6}{8}$ *g.* $\frac{3}{6}$
h. $\frac{2}{6}$ *i.* $\frac{4}{6}$ *j.* $\frac{3}{9}$ *k.* $\frac{6}{9}$ *l.* $\frac{2}{10}$ *m.* $\frac{4}{10}$ *n.* $\frac{6}{10}$

11. Change to inches:

a. 3 ft. *b.* 1 ft. 6 in. *c.* 2 ft. 3 in. *d.* 3 ft. 5 in.

12. Change to ounces:

a. 2 lb. *b.* 1 lb. 6 oz. *c.* 2 lb. 3 oz. *d.* 3 lb. 2 oz.

13. Reduce to pints:

a. 2 gal. *b.* 1 qt. 1 pt. *c.* 2 qt. 1 pt. *d.* 3 qt. 1 pt. *e.* 10 qt. 1 pt.

14. Reduce to quarts:

a. 1 bu. *b.* 1 pk. 1 qt. *c.* 2 pk. 1 qt. *d.* 3 pk. 3 qt. *e.* 10 pk. 1 qt.

15. Change to the fraction of a foot:

a. 6 in. *b.* 4 in. *c.* 3 in. *d.* 2 in. *e.* 1 in. *f.* 9 in. *g.* 8 in. *h.* 5 in. *i.* 10 in.

16. Change to the fraction of a dollar:

a. 50 ¢ *b.* 25 ¢ *c.* 75 ¢ *d.* 20 ¢ *e.* 40 ¢ *f.* 60 ¢

17. Change to the fraction of a pound:

a. 8 oz. *b.* 10 oz. *c.* 2 oz. *d.* 9 oz. *e.* 6 oz. *f.* 4 oz. *g.* 12 oz.

18. Change to cents:

a. $\$\frac{1}{4}$ *b.* $\$\frac{3}{4}$ *c.* $\$\frac{1}{5}$ *d.* $\$\frac{2}{5}$ *e.* $\$\frac{4}{5}$ *f.* $\$\frac{3}{5}$

19. Change to the fraction of a year:

a. 1 mo. *b.* 2 mo. *c.* 3 mo. *d.* 4 mo. *e.* 5 mo. *f.* 6 mo. *g.* 9 mo. *h.* 8 mo. *i.* 10 mo.

20. Change to the fraction of a month of 30 days:

a. 10 da. *b.* 15 da. *c.* 20 da. *d.* 6 da. *e.* 12 da. *f.* 18 da. *g.* 25 da. *h.* 24 da. *i.* 9 da. *j.* 21 da.

21. Change to months:

a. 3 yr. 6 mo. *b.* 4 yr. 4 mo. *c.* 1 yr. 8 mo. *d.* 2 yr. 6 mo. *e.* 5 yr. 3 mo. *f.* 6 yr. 1 mo.

Adding and Subtracting Fractions

Sight Exercises

1. Give sums:

a. 2 ninths + 2 ninths

b. $\frac{1}{9} + \frac{1}{9}$ *c.* $\frac{4}{9} + \frac{1}{9}$ *d.* $\frac{4}{9} + \frac{4}{9}$ *e.* $\frac{2}{9} + \frac{5}{9}$

f. 2 sevenths + 3 sevenths

g. $\frac{2}{7} + \frac{2}{7}$ *h.* $\frac{3}{7} + \frac{3}{7}$ *i.* $\frac{2}{7} + \frac{3}{7}$ *j.* $\frac{3}{7} + \frac{1}{7}$

k. 2 fifths + 2 fifths

l. $\frac{1}{5} + \frac{2}{5}$ *m.* $\frac{3}{5} + \frac{1}{5}$ *n.* $\frac{1}{5} + \frac{1}{5}$ *o.* $\frac{1}{5} + \frac{3}{5}$

2. Give remainders:

a. 4 ninths − 2 ninths

b. $\frac{8}{9} - \frac{1}{9}$ *c.* $\frac{7}{9} - \frac{2}{9}$ *d.* $\frac{8}{9} - \frac{4}{9}$ *e.* $\frac{5}{9} - \frac{1}{9}$

f. 3 fifths − 2 fifths

g. $\frac{4}{5} - \frac{1}{5}$ *h.* $\frac{4}{5} - \frac{3}{5}$ *i.* $\frac{3}{5} - \frac{1}{5}$ *j.* $\frac{2}{5} - \frac{1}{5}$

k. 5 sevenths − 3 sevenths

l. $\frac{4}{7} - \frac{2}{7}$ *m.* $\frac{6}{7} - \frac{3}{7}$ *n.* $\frac{5}{7} - \frac{2}{7}$ *o.* $\frac{4}{7} - \frac{1}{7}$

3. Give results in lowest terms:

a. $\frac{1}{4} + \frac{1}{4}$ *b.* $\frac{1}{6} + \frac{1}{6}$ *c.* $\frac{1}{8} + \frac{1}{8}$ *d.* $\frac{1}{8} + \frac{3}{8}$ *e.* $\frac{1}{9} + \frac{2}{9}$

f. $\frac{1}{12} + \frac{5}{12}$ *g.* $\frac{1}{9} + \frac{5}{9}$ *h.* $\frac{3}{8} + \frac{3}{8}$ *i.* $\frac{1}{10} + \frac{3}{10}$ *j.* $\frac{7}{10} + \frac{1}{10}$

k. $\frac{1}{15} + \frac{4}{15}$ *l.* $\frac{5}{12} + \frac{5}{12}$ *m.* $\frac{1}{8} + \frac{5}{8}$ *n.* $\frac{1}{12} + \frac{1}{12}$ *o.* $\frac{1}{12} + \frac{7}{12}$

4. Give remainders in lowest terms:

a. $\frac{1}{2} - \frac{1}{4}$ *b.* $\frac{3}{4} - \frac{1}{4}$ *c.* $\frac{3}{4} - \frac{1}{2}$ *d.* $\frac{1}{3} - \frac{1}{6}$ *e.* $\frac{5}{6} - \frac{1}{2}$

f. $\frac{1}{2} - \frac{1}{6}$ *g.* $\frac{1}{2} - \frac{1}{8}$ *h.* $\frac{1}{2} - \frac{3}{8}$ *i.* $\frac{3}{8} - \frac{1}{4}$ *j.* $\frac{5}{8} - \frac{1}{2}$

k. $\frac{7}{8} - \frac{1}{8}$ *l.* $\frac{7}{8} - \frac{3}{8}$ *m.* $\frac{7}{8} - \frac{5}{8}$ *n.* $\frac{7}{8} - \frac{1}{4}$ *o.* $\frac{7}{8} - \frac{1}{2}$

5. Give answers in whole or in mixed numbers. Express fractions in answers in lowest terms.

a. $\frac{1}{2} + \frac{1}{2}$ *b.* $\frac{1}{3} + \frac{2}{3}$ *c.* $\frac{2}{3} + \frac{2}{3}$ *d.* $\frac{3}{4} + \frac{3}{4}$ *e.* $\frac{5}{8} + \frac{5}{8}$

f. $\frac{1}{2} + \frac{2}{3}$ *g.* $\frac{1}{2} + \frac{3}{4}$ *h.* $\frac{1}{2} + \frac{5}{6}$ *i.* $\frac{1}{3} + \frac{5}{6}$ *j.* $\frac{2}{3} + \frac{5}{6}$

6. Give remainders:

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

f. $1 - \frac{5}{6}$ *g.* $1\frac{1}{3} - \frac{2}{3}$ *h.* $1\frac{1}{4} - \frac{3}{4}$ *i.* $1\frac{1}{4} - \frac{1}{2}$ *j.* $1\frac{1}{8} - \frac{3}{8}$

k. $1\frac{1}{8} - \frac{7}{8}$ *l.* $1\frac{1}{8} - \frac{1}{2}$ *m.* $2 - \frac{1}{2}$ *n.* $2 - 1\frac{1}{2}$ *o.* $2 - \frac{1}{4}$

7. Add:

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

Adding Mixed Numbers

Sight Exercises

1. A man bought a suit of clothes for $\$27\frac{3}{4}$ and a pair of shoes for $\$3\frac{3}{4}$. How much did he pay for both?

	PROCESS
$\$27\frac{3}{4}$ $2\frac{3}{4}$ $\$30\frac{1}{2}$ *Ans.*	Find the sum of the fractions ($\frac{6}{4}$), change $\frac{6}{4}$ to $1\frac{2}{4}$, and then to $1\frac{1}{2}$. Write $\frac{1}{2}$ under the fractions, carry 1 to the whole numbers, etc.

2. Give sums:

a. $19\frac{1}{2}$ $+ 9\frac{1}{2}$	*b.* $19\frac{1}{4}$ $+ 8\frac{1}{4}$	*c.* $18\frac{3}{4}$ $+ 6\frac{1}{4}$	*d.* $16\frac{3}{4}$ $+ 5\frac{1}{2}$	*e.* $15\frac{3}{4}$ $+ 4\frac{3}{4}$
f. $20\frac{1}{3}$ $+ 5\frac{1}{3}$	*g.* $22\frac{1}{3}$ $+ 6\frac{2}{3}$	*h.* $34\frac{2}{3}$ $+ 3\frac{2}{3}$	*i.* $42\frac{1}{6}$ $+ 4\frac{1}{6}$	*j.* $12\frac{5}{6}$ $+ 8\frac{1}{6}$
k. $30\frac{1}{8}$ $+ 5\frac{1}{8}$	*l.* $52\frac{1}{8}$ $+ 6\frac{3}{8}$	*m.* $18\frac{1}{8}$ $+ 2\frac{5}{8}$	*n.* $27\frac{1}{8}$ $+ 37\frac{7}{8}$	*o.* $30\frac{3}{8}$ $+ \frac{3}{8}$

Written Exercises

Find sums:

a. $24\frac{1}{2}$ $6\frac{1}{2}$ 30	*b.* $14\frac{1}{2}$ $7\frac{1}{2}$ $39\frac{1}{2}$	*c.* $32\frac{1}{4}$ $25\frac{1}{4}$ 6	*d.* $18\frac{1}{4}$ $42\frac{1}{4}$ $9\frac{1}{4}$	*e.* $23\frac{1}{4}$ $9\frac{3}{4}$ $6\frac{1}{4}$
f. $62\frac{3}{4}$ $5\frac{3}{4}$ 29	*g.* $22\frac{3}{4}$ $16\frac{1}{4}$ $52\frac{3}{4}$	*h.* $19\frac{1}{2}$ $4\frac{1}{4}$ $40\frac{1}{4}$	*i.* $34\frac{1}{2}$ $16\frac{1}{4}$ $15\frac{1}{2}$	*j.* $47\frac{1}{2}$ $2\frac{3}{4}$ 24
k. $55\frac{1}{2}$ $10\frac{3}{4}$ $4\frac{1}{2}$	*l.* $44\frac{3}{4}$ $20\frac{3}{4}$ $5\frac{1}{2}$	*m.* $33\frac{3}{4}$ $8\frac{3}{4}$ $16\frac{3}{4}$	*n.* $22\frac{1}{3}$ $20\frac{1}{3}$ $9\frac{1}{3}$	*o.* $11\frac{2}{3}$ $12\frac{1}{3}$ 13

Subtracting Mixed Numbers

Sight Exercises

1. Give remainders :

a. $16 - \frac{1}{2}$	*b.* $20 - \frac{1}{4}$	*c.* $30 - \frac{3}{4}$	*d.* $25 - \frac{1}{3}$	*e.* $44 - \frac{2}{3}$
f. $16 - 5\frac{1}{2}$	*g.* $20 - 4\frac{1}{4}$	*h.* $30 - 9\frac{3}{4}$	*i.* $25 - 4\frac{1}{3}$	*j.* $44 - 3\frac{2}{3}$

2. Subtract :

a. $10\frac{1}{2} - 3\frac{1}{2}$	*b.* $11\frac{2}{3} - 6\frac{1}{2}$	*c.* $12\frac{1}{3} - 7\frac{1}{6}$	*d.* $13\frac{5}{6} - 8\frac{1}{6}$	*e.* $14\frac{5}{6} - 9\frac{1}{3}$
f. $29\frac{5}{6} - 8\frac{1}{2}$	*g.* $38\frac{5}{6} - 4\frac{2}{3}$	*h.* $47\frac{7}{8} - \frac{1}{8}$	*i.* $36\frac{7}{8} - \frac{3}{8}$	*j.* $25\frac{7}{8} - \frac{5}{8}$

Written Exercises

1. From a farm of 160 acres $87\frac{3}{4}$ acres were sold. How many acres were left?

$$\begin{array}{r} 160 \text{ A.} \\ -\ 87\frac{3}{4} \\ \hline \text{Ans.} \quad 72\frac{1}{4} \text{ A.} \end{array}$$

PROCESS

Think $\frac{3}{4}$ and $\frac{1}{4}$ (writing $\frac{1}{4}$) are 1. Carry 1 to 7, making 8, and think 8 and **2** (writing 2) are 10. Carry 1 to 8, making 9, and think 9 and **7** (writing 7) are 16.

Cover 160 A. (the minuend) with a piece of paper. On the latter write the sum of $72\frac{1}{4}$ and $87\frac{3}{4}$, adding upward.

TEST

Think $\frac{1}{4}$ and $\frac{3}{4}$ are 1; carrying 1 to 2, think 3 and 7 are 10; write 0. Carrying 1 to 7, think 8 and 8 are 16; write 16.

2. Subtract. Test :

a. $150 - 85\frac{1}{2}$	*b.* $240\frac{3}{4} - 67\frac{1}{4}$	*c.* $315\frac{3}{4} - 98\frac{1}{2}$	*d.* $420 - 54\frac{3}{4}$

Sight Problems

1. A's farm contains $4\frac{1}{2}$ acres more than B's. B's contains $95\frac{1}{2}$ acres. How many acres are there (*a*) in A's farm? (*b*) In both farms?

2. A field is $20\frac{1}{2}$ rods long and $10\frac{1}{2}$ rods wide. How many rods of fence are required to enclose it?

3. A boy lives 10 blocks from the school. His uncle lives $2\frac{1}{2}$ blocks beyond. How many blocks does he walk in going from his home to his uncle's and returning?

4. A raised 40 tons of hay; B raised $10\frac{1}{2}$ tons more than A; C raised $9\frac{1}{4}$ tons less than B. How many tons did C raise?

5. After taking $5\frac{1}{2}$ and $6\frac{1}{4}$ gallons of oil from a barrel, there are $33\frac{1}{4}$ gallons left in the latter. How many gallons did it contain originally?

6. How many gallons per minute are discharged by two pipes, if one discharges $25\frac{1}{2}$ gallons per minute and the other $5\frac{1}{2}$ gallons less?

7. Find the sum of $1\frac{1}{2}$, $2\frac{1}{2}$, $3\frac{1}{2}$, and $4\frac{1}{2}$.

8. A can cut $\frac{1}{2}$ of the grass on a field in a day; B can cut $\frac{1}{3}$ of it in a day; and C can cut $\frac{1}{6}$ of it in a day. What part of the field can the three together cut in a day?

9. A man had $36\frac{1}{2}$ acres of land. How many acres would he have after buying $10\frac{1}{2}$ acres and selling $6\frac{1}{2}$ acres?

10. How long does it require a train to go from A to B if it leaves A at half past 6 in the morning and reaches B at noon?

11. In making a trip of 96 miles, a train goes 34 miles the first hour and four miles less the second hour. How many miles must it go the next hour to finish the trip in 3 hours?

Written Problems

1. A's farm contains $14\frac{3}{4}$ acres more than B's. B's contains $197\frac{3}{8}$ acres. (*a*) How many acres are there in A's farm? (*b*) In both farms?

2. A field is $37\frac{7}{8}$ rods long and $23\frac{1}{2}$ rods wide. How many rods of fence will be required to enclose it?

3. Mr. Brown traveled $43\frac{3}{4}$ miles on Monday. On Tuesday he traveled $8\frac{2}{3}$ miles less than on Monday. How far did he travel in the two days?

4. A raised $40\frac{1}{2}$ tons of hay; B raised $10\frac{3}{8}$ tons more than A; C raised $9\frac{3}{4}$ less than B. How many tons did C raise?

5. After drawing off $15\frac{1}{2}$ and $16\frac{3}{4}$ gallons of oil from a tank it still contains $63\frac{5}{8}$ gallons. How many gallons did it contain originally?

6. How many gallons per minute are discharged by two pipes if one discharges $25\frac{3}{4}$ gallons per minute and the other $6\frac{3}{8}$ gallons less?

7. Find the sum (*a*) of $9\frac{1}{2}$, $10\frac{1}{3}$, and $6\frac{1}{6}$. (*b*) Of 9 ft. 6 in., 10 ft. 4 in., and 6 ft. 2 in.

8. M can do $\frac{5}{24}$ of a piece of work in a day; N can do $\frac{7}{24}$ of it in a day. (*a*) What part of it can both together do in a day? (*b*) How many days would both together require to do the work?

9. A man had $36\frac{7}{8}$ acres of land. How many acres would he have after buying $10\frac{3}{4}$ acres and selling $9\frac{1}{2}$?

10. How long does it require a train to go from M to N if it leaves M at a quarter to 9 Monday night, and reaches N at half past 7 Tuesday morning?

Multiplication — One Fractional Factor

Sight Exercises

1. What is the value of $\frac{3}{4}$ acre of land at the rate of \$240 an acre?

$\frac{1}{4}$ of \$240 is \$60; $\frac{3}{4}$ of \$240 is 3 times \$60, which is \$180. *Ans.*

2. A man bought 240 ducks at $\$\frac{3}{4}$ each. How much did he pay for them?

At $\$\frac{1}{4}$ each the ducks would cost \$60; the cost at $\$\frac{3}{4}$ each is 3 times \$60, which is \$180.

3. Give answers:

a. $\frac{1}{4}$ of 416 *b.* $440 \times \frac{1}{4}$ *c.* $\frac{1}{2}$ of 240 *d.* $280 \times \frac{1}{2}$

Written Exercises

1. What is the cost of $\frac{3}{4}$ acre of land at the rate of \$264 per acre?

$$\frac{3}{\cancel{4}} \times \frac{\overset{66}{\cancel{\$264}}}{1} = \$198 \text{ } \textit{Ans.}$$

PROCESS

Find $\frac{3}{4}$ of \$264 by substituting the multiplication sign for "of" and writing 1 under 264 as a denominator. Cancel 4 and 264, etc.

2. A man bought 116 chickens at $\$\frac{3}{4}$ each. How much did he pay for them?

$$\frac{\overset{29}{\cancel{116}}}{1} \times \frac{\$3}{\cancel{4}} = \$87 \text{ } \textit{Ans.}$$

PROCESS

Write 116 times $\$\frac{3}{4}$, placing 1 under 116. Cancel.

3. Find products:

a. $\frac{1}{4}$ of 192 *b.* $144 \times \frac{1}{4}$ *c.* $\frac{1}{2}$ of 112 *d.* $132 \times \frac{1}{2}$

e. $\frac{1}{3}$ of 144 *f.* $144 \times \frac{2}{3}$ *g.* $\frac{3}{4}$ of 192 *h.* $144 \times \frac{1}{8}$

One Factor a Mixed Number

Sight Exercises

1. At the rate of 60 bushels of corn to the acre, how many bushels would $1\frac{1}{2}$ acres yield?

$1\frac{1}{2}$ acres would yield 60 bushels + 30 bushels ($\frac{1}{2}$ of 60 bushels).
Ans. 90 bushels.

2. Find the cost of 80 yards of cloth at $\$1\frac{1}{2}$ per yard.

80 yards would cost \$80 + \$40 ($\frac{1}{2}$ of \$80), or \$120. *Ans.*

3. Give answers:

a. $120 + \frac{1}{2}$ of 120	*b.* $1\frac{1}{2} \times 60$	*c.* $40 \times 1\frac{1}{2}$	*d.* $50 \times 1\frac{1}{5}$
e. $120 + \frac{1}{3}$ of 120	*f.* $1\frac{1}{3} \times 60$	*g.* $30 \times 1\frac{1}{3}$	*h.* $40 \times 1\frac{1}{5}$
i. $120 + \frac{1}{4}$ of 120	*j.* $1\frac{1}{4} \times 40$	*k.* $80 \times 1\frac{1}{4}$	*l.* $30 \times 1\frac{1}{5}$
m. $120 + \frac{1}{6}$ of 120	*n.* $1\frac{1}{6} \times 60$	*o.* $30 \times 1\frac{1}{6}$	*p.* $20 \times 1\frac{1}{5}$

4. Give products:

a. $20 \times 1\frac{1}{2}$	*b.* $2\frac{1}{2} \times 20$	*c.* $20 \times 3\frac{1}{2}$	*d.* $4\frac{1}{2} \times 20$
e. $12 \times 1\frac{1}{4}$	*f.* $2\frac{1}{4} \times 12$	*g.* $12 \times 3\frac{1}{4}$	*h.* $4\frac{1}{4} \times 12$
i. $30 \times 1\frac{1}{3}$	*j.* $2\frac{1}{3} \times 30$	*k.* $30 \times 3\frac{1}{3}$	*l.* $4\frac{1}{3} \times 30$
m. $10 \times 1\frac{1}{5}$	*n.* $2\frac{1}{5} \times 10$	*o.* $10 \times 3\frac{1}{5}$	*p.* $4\frac{1}{5} \times 10$

Written Exercises

1. At the rate of 68 bushels per acre, how many bushels of corn would $23\frac{1}{4}$ acres yield?

PROCESS

68 bu.
$23\frac{1}{4}$
17
204
136
1581 bu. *Ans.*

Multiply 68 by $\frac{1}{4}$. Do this by dividing 68 by 4, writing each quotient figure in its proper place. Multiply 68 by 3 (ones), placing the right-hand figure in the ones' column. Place the right-hand figure of the product by 2 (tens) in the tens' column. Combine the three partial products. Test the result by dividing 1581 by 68. The quotient should be 23 and the remainder 17.

2. Find products:

a. $68 \times 14\frac{1}{4}$	*b.* $64 \times 23\frac{1}{4}$	*c.* $128 \times 34\frac{1}{4}$	*d.* $256 \times 42\frac{1}{4}$	*e.* $92 \times 53\frac{1}{4}$
f. $64 \times 23\frac{1}{2}$	*g.* $126 \times 34\frac{1}{3}$	*h.* $168 \times 25\frac{1}{3}$	*i.* $240 \times 32\frac{1}{5}$	*j.* $210 \times 44\frac{1}{6}$

3. Find the cost of 32 acres of land at $\$124\frac{1}{2}$ per acre.

$\$124\frac{1}{2}$
32
16
248
372
$\$3984$ *Ans.*

PROCESS

Find 32 times $\frac{1}{2}$. Do this by dividing 32 by 2, writing each quotient figure in its proper place. Multiply 124 by 2 (ones). Then by 3 (tens). Combine the partial product.

TEST

Test the result by multiplying $124\frac{1}{2}$ by 8, and the resulting product by 4.

$124\frac{1}{2}$
$\times$ 8
996
4
3984

4. Multiply:

a. $168\frac{1}{2} \times 24$	*b.* $206\frac{1}{4} \times 52$	*c.* $153\frac{1}{3} \times 39$	*d.* $221\frac{1}{5} \times 65$
e. $118\frac{1}{2} \times 72$	*f.* $243\frac{1}{8} \times 96$	*g.* $164\frac{1}{5} \times 85$	*h.* $342\frac{1}{6} \times 96$
i. $123\frac{1}{3} \times 84$	*j.* $225\frac{1}{4} \times 68$	*k.* $215\frac{1}{2} \times 32$	*l.* $323\frac{1}{3} \times 24$

Division — Fraction in Quotient

Sight Exercises

1. A farmer paid $42 for 4 calves. What did they cost apiece?

PROCESS

$4)\overline{\$42}$

$\$10\frac{2}{4} = \$10\frac{1}{2}$ *Ans.*

Reduce $\frac{2}{4}$ in the quotient to $\frac{1}{2}$.

2. What is the cost of a chicken at the rate of $27 for 36 chickens?

PROCESS

$36)\overline{\$27}$

$\$\frac{27}{36} = \$\frac{3}{4}$ *Ans.*

Reduce the quotient $\frac{27}{36}$ to $\frac{3}{4}$.

3. Divide. Express fractions in quotients in lowest terms:

a. $2)\overline{9}$	*b.* $4)\overline{2}$	*c.* $2)\overline{15}$	*d.* $10)\overline{2}$	*e.* $4)\overline{30}$	*f.* $2)\overline{1}$
g. $4)\overline{9}$	*h.* $4)\overline{3}$	*i.* $4)\overline{15}$	*j.* $10)\overline{4}$	*k.* $6)\overline{20}$	*l.* $8)\overline{2}$
m. $6)\overline{9}$	*n.* $6)\overline{2}$	*o.* $6)\overline{15}$	*p.* $10)\overline{5}$	*q.* $3)\overline{20}$	*r.* $6)\overline{4}$
s. $8)\overline{9}$	*t.* $6)\overline{3}$	*u.* $8)\overline{15}$	*v.* $10)\overline{6}$	*w.* $8)\overline{20}$	*x.* $8)\overline{6}$

4. Give quotients:

a. $\frac{10}{4}$	*b.* $\frac{10}{15}$	*c.* $\frac{10}{3}$	*d.* $\frac{10}{16}$	*e.* $\frac{10}{6}$	*f.* $\frac{10}{25}$	*g.* $\frac{10}{24}$
h. $\frac{14}{4}$	*i.* $\frac{12}{15}$	*j.* $\frac{20}{3}$	*k.* $\frac{12}{16}$	*l.* $\frac{40}{3}$	*m.* $\frac{25}{40}$	*n.* $\frac{60}{40}$

5. Divide:

a. $18 \div 4$	*b.* $4 \div 18$	*c.* $18 \div 10$	*d.* $10 \div 18$	*e.* $14 \div 6$
f. $30 \div 8$	*g.* $8 \div 20$	*h.* $25 \div 10$	*i.* $10 \div 25$	*j.* $10 \div 4$

Written Exercises

1. A farmer paid $600 for 32 calves. How much did they cost apiece?

PROCESS

$\$\ 18\frac{24}{32} = \$18\frac{3}{4}$ *Ans.*

32)$600

32

280

256

24

Divide $600 by 32. Reduce $\frac{24}{32}$, the fraction in the quotient, to $\frac{3}{4}$.

Test by multiplying $18\frac{3}{4}$ (the quotient) by 32 (the divisor).

2. Divide:

Ans. ?	*Ans.* ?	*Ans.* ?	*Ans.* ?
a. $24\overline{)280}$	*b.* $16\overline{)200}$	*c.* $32\overline{)900}$	*d.* $36\overline{)570}$

3. At $32 each, how many cows can be bought for $500 and how many dollars will remain?

Fraction in Dividend

Sight Exercises

1. A man divided 3 quarters of a dollar among 3 boys. What part of a dollar did each receive?

2. Divide:

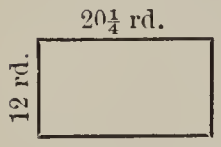
a. 3)3 quarters	*b.* $\frac{3}{4} \div 3$	*c.* 2)2 thirds	*d.* $\frac{2}{3} \div 2$

3. Give quotients:

a. $2)20\frac{2}{3}$	*b.* $3)30\frac{3}{4}$	*c.* $4)40\frac{4}{5}$	*d.* $5)50\frac{5}{6}$
e. $6)60\frac{6}{7}$	*f.* $2)20\frac{4}{5}$	*g.* $3)30\frac{9}{10}$	*h.* $4)40\frac{8}{9}$

Sight Problems

1. A's farm is $2\frac{1}{2}$ times as large as B's. B's contains 80 acres. How many acres are there (*a*) in A's farm? (*b*) In both farms?



2. How many square rods are there in a rectangular field $20\frac{1}{4}$ rods long, 12 rods wide?

3. X has $\frac{1}{2}$ as many sheep as Y; Y has $\frac{1}{3}$ as many as Z; X has 30 sheep. (*a*) How many has Y? (*b*) How many has Z?

4. After filling four $2\frac{1}{2}$ gallon cans with oil from a barrel, there are 35 gallons left in the latter. How many gallons were there in it at first?

5. One pipe discharges 10 gallons in $\frac{1}{2}$ minute, the other 10 gallons in $\frac{1}{3}$ minute. How many gallons per minute do both discharge together?

6. How many times does a clock tick in $2\frac{1}{2}$ minutes when it ticks 60 times a minute?

7. At the rate of 40 miles per hour, how far will a train go from a quarter to 1 to a quarter past 3?

8. A man bought a plow for $\$8\frac{1}{2}$ and paid $\$1\frac{1}{4}$ for repairs. If he sold it for \$12, what was his profit?

9. A train due at 9.20 A.M. arrived at 10 A.M. What part of an hour was it behind time?

10. What change should a person receive who gives a dollar bill to pay for $1\frac{1}{2}$ pounds of 40-cent tea?

11. I bought a half yard of cloth and gave the storekeeper \$1. If I received 40 cents in change, what did the cloth cost per yard?

12. A 12-acre field was divided into 32 plots of the same size. What part of an acre did each plot contain?

Written Problems

1. M's farm is $1\frac{3}{4}$ times as large as N's. N's contains 160 acres. How many acres are there (*a*) in M's farm? (*b*) In both farms?

2. How many square rods are there in a rectangular field $20\frac{3}{4}$ rods long, 16 rods wide?

3. One field contains 36 acres. Another field is $\frac{3}{4}$ as large. Find the number of acres in the two fields.

4. A has 36 sheep. He has $\frac{1}{2}$ as many as Y. (*a*) How many has Y? Y has $\frac{1}{3}$ as many as Z. (*b*) How many has Z?

5. After filling five $2\frac{1}{2}$-gallon cans with oil from a barrel there are $32\frac{1}{2}$ gallons left in the barrel. How many gallons were there in it at first?

6. One pipe discharges $13\frac{1}{4}$ gallons in $\frac{1}{2}$ minute, another discharges $10\frac{1}{3}$ gallons in $\frac{1}{3}$ minute. How many gallons per minute do both together discharge?

7. At the rate of 26 miles per hour, how far will a train go from a quarter to 1 to 3 o'clock?

8. A man bought a machine for $\$25\frac{3}{4}$, and spent $\$5\frac{1}{2}$ for repairs. If he sold it for $\$34\frac{1}{2}$, what was his profit?

9. A train due at 9.36 A.M. arrived at 10 A.M. What part of an hour was it late?

10. What change should a person receive who gives a dollar to pay for $1\frac{3}{4}$ pounds of 28-cent coffee?

11. I bought 3 yards of cloth and received $\$\frac{3}{4}$ change out of $\$3$. What part of a dollar did the cloth cost per yard?

12. How many acres does each plot contain when a farm of 160 acres is divided into (*a*) 128 equal plots? (*b*) 256 plots?

SECTION II

MIXED NUMBERS, BILLS, MEASUREMENTS, SHORT METHODS, REVIEWS

Adding Mixed Numbers

Written Exercises

1. A boy walked a mile in $13\frac{3}{4}$ minutes and a second mile in $14\frac{7}{12}$ minutes. How long did it take him to walk two miles?

$$\begin{array}{r|l} & 12 \\ 13\frac{3}{4} & 9 \\ 14\frac{7}{12} & 7 \\ \hline 28\frac{1}{3} & \dfrac{16}{12} = 1\frac{4}{12} = 1\frac{1}{3} \end{array}$$

Ans. $28\frac{1}{3}$ min.

PROCESS

Since 12 is a multiple of 4, write 12 as the least common denominator of $\frac{3}{4}$ and $\frac{7}{12}$. Change $\frac{3}{4}$ to $\frac{9}{12}$, and write 9 (the numerator) under the common denominator. Under 9 write 7 (the numerator of the other fraction). Add the numerators and write 16 (the result) over the common denominator, making the sum of the fractions $\frac{16}{12}$. Change this improper fraction to the mixed number $1\frac{4}{12}$, and rewrite it, reducing the fraction, the result being $1\frac{1}{3}$. Write $\frac{1}{3}$ under the original fractions, and carry 1 to the whole numbers.

2. Add:

a.	*b.*	*c.*	*d.*	*e.*
$83\frac{3}{5}$	$74\frac{2}{3}$	$67\frac{5}{6}$	$58\frac{2}{3}$	$49\frac{3}{4}$
$+8\frac{7}{10}$	$+15\frac{11}{12}$	$+9\frac{7}{12}$	$+20\frac{5}{9}$	$+57\frac{7}{8}$

Sight Exercises

Give sums. Express fractions in results in lowest terms:

a. $\frac{1}{2}$	*b.* $\frac{1}{2}$	*c.* $\frac{1}{3}$	*d.* $\frac{1}{3}$	*e.* $\frac{1}{4}$	*f.* $\frac{1}{5}$
$+\frac{1}{10}$	$+\frac{1}{12}$	$+\frac{1}{9}$	$+\frac{1}{12}$	$+\frac{1}{12}$	$+\frac{1}{10}$
g. $\frac{1}{6}$	*h.* $\frac{1}{8}$	*i.* $\frac{1}{3}$	*j.* $\frac{1}{5}$	*k.* $\frac{1}{4}$	*l.* $\frac{1}{6}$
$+\frac{1}{12}$	$+\frac{1}{16}$	$+\frac{1}{15}$	$+\frac{1}{15}$	$+\frac{1}{16}$	$+\frac{1}{18}$

Written Exercises

1. On a piece of work one man spent $12\frac{4}{5}$ hours and another man spent $43\frac{3}{4}$ hours. How many hours were spent by both?

$$\begin{array}{r|l} & 20 \\ 12\frac{4}{5} & 16 \\ 43\frac{3}{4} & 15 \\ \hline 56\frac{1}{2}\frac{1}{0} & 31 \\ & 20 \end{array} = 1\frac{1}{2}\frac{1}{0}$$

PROCESS

Since 5 and 4 have no common factor, write their product, 20, as the least common denominator, etc.

Ans. $56\frac{1}{2}\frac{1}{0}$ hr.

NOTE. — Two numbers that have no common factor are said to be *prime to each other.*

2. Add:

a. $25\frac{4}{5}$	*b.* $18\frac{2}{3}$	*c.* $39\frac{5}{8}$	*d.* $48\frac{5}{6}$	*e.* $57\frac{3}{4}$
$+37\frac{1}{2}$	$+40\frac{3}{5}$	$+27\frac{2}{3}$	$+16\frac{4}{5}$	$+8\frac{4}{9}$

Sight Exercises

Give sums:

a. $\frac{1}{2}$	*b.* $\frac{1}{2}$	*c.* $\frac{1}{2}$	*d.* $\frac{1}{3}$	*e.* $\frac{1}{3}$	*f.* $\frac{1}{4}$
$+\frac{1}{3}$	$+\frac{1}{5}$	$+\frac{1}{9}$	$+\frac{1}{4}$	$+\frac{1}{5}$	$+\frac{1}{5}$
g. $\frac{1}{5}$	*h.* $\frac{1}{4}$	*i.* $\frac{1}{3}$	*j.* $\frac{1}{3}$	*k.* $\frac{1}{5}$	*l.* $\frac{1}{5}$
$+\frac{1}{6}$	$+\frac{1}{9}$	$+\frac{1}{8}$	$+\frac{1}{10}$	$+\frac{1}{9}$	$+\frac{1}{8}$

Written Exercises

1. A dealer sold two pieces of cloth, one containing $28\frac{5}{9}$ yards, and the other $8\frac{7}{12}$ yards. How many yards were there in both?

PROCESS

$$\begin{array}{r|l} & 36 \\ 28\frac{5}{9} & 20 \\ 8\frac{7}{12} & 21 \\ \hline 37\frac{5}{36} & 41 \\ & 36 \end{array} = 1\frac{5}{36}$$

Since the denominators 9 and 12 have a common factor, test successive multiples of 12 (24, 36); since 36 is also a multiple of 9, write 36 as the common denominator.

Ans. $37\frac{5}{36}$ yd.

2. Add:

a. $24\frac{5}{6} + 9\frac{3}{8}$ *b.* $36\frac{3}{4} + 19\frac{5}{6}$ *c.* $47\frac{3}{4} + 8\frac{7}{10}$ *d.* $56\frac{5}{6} + 18\frac{4}{9}$ *e.* $63\frac{5}{8} + 7\frac{9}{10}$

Sight Exercises

1. Give sums:

a. $\frac{1}{4} + \frac{1}{6}$ *b.* $\frac{1}{4} + \frac{1}{10}$ *c.* $\frac{1}{6} + \frac{1}{8}$ *d.* $\frac{1}{6} + \frac{1}{9}$ *e.* $\frac{1}{6} + \frac{1}{10}$ *f.* $\frac{1}{8} + \frac{1}{12}$

g. $\frac{1}{9} + \frac{1}{12}$ *h.* $\frac{1}{10} + \frac{1}{12}$ *i.* $\frac{1}{8} + \frac{1}{10}$ *j.* $\frac{1}{6} + \frac{1}{15}$ *k.* $\frac{1}{10} + \frac{1}{15}$ *l.* $\frac{1}{15} + \frac{1}{20}$

2. Give remainders in lowest terms:

a. $\frac{1}{2} - \frac{1}{10}$ *b.* $\frac{1}{2} - \frac{1}{12}$ *c.* $\frac{1}{3} - \frac{1}{9}$ *d.* $\frac{1}{3} - \frac{1}{12}$ *e.* $\frac{1}{4} - \frac{1}{12}$ *f.* $\frac{1}{5} - \frac{1}{10}$

g. $\frac{1}{6} - \frac{1}{12}$ *h.* $\frac{1}{8} - \frac{1}{16}$ *i.* $\frac{1}{2} - \frac{1}{3}$ *j.* $\frac{1}{2} - \frac{1}{5}$ *k.* $\frac{1}{2} - \frac{1}{9}$ *l.* $\frac{1}{3} - \frac{1}{4}$

m. $\frac{1}{3} - \frac{1}{5}$ *n.* $\frac{1}{4} - \frac{1}{5}$ *o.* $\frac{1}{5} - \frac{1}{6}$ *p.* $\frac{1}{4} - \frac{1}{9}$ *q.* $\frac{1}{4} - \frac{1}{6}$ *r.* $\frac{1}{4} - \frac{1}{10}$

Subtracting Mixed Numbers

Written Exercises

1. In making a trip of $30\frac{5}{6}$ miles, how far has a man to go after he has traveled (*a*) $12\frac{7}{12}$ miles? (*b*) $9\frac{3}{5}$ miles? (*c*) $16\frac{4}{9}$ miles?

PROCESS

a.
$$\begin{array}{r|l} & 12 \\ \hline 30\frac{5}{6} & 10 \\ -12\frac{7}{12} & 7 \\ \hline 18\frac{1}{4} & \frac{3}{12} = \frac{1}{4} \end{array}$$
Ans. $18\frac{1}{4}$ mi.

b.
$$\begin{array}{r|l} & 30 \\ \hline 30\frac{5}{6} & 25 \\ -9\frac{3}{5} & 18 \\ \hline 21\frac{7}{30} & \frac{7}{30} \end{array}$$
Ans. $21\frac{7}{30}$ mi.

c.
$$\begin{array}{r|l} & 18 \\ \hline 30\frac{5}{6} & 15 \\ -16\frac{4}{9} & 8 \\ \hline 14\frac{7}{18} & \frac{7}{18} \end{array}$$
Ans. $14\frac{7}{18}$ mi.

Find the common denominator. Write the new numerators. Subtract the numerators and place the remainder over the common denominator. Reduce this fraction to its lowest terms. Write it under the original fractions. Subtract the whole numbers.

2. Subtract:

a. $23\frac{3}{4} - 14\frac{7}{12}$ *b.* $31\frac{4}{5} - 8\frac{3}{10}$ *c.* $40\frac{2}{3} - 15\frac{5}{12}$ *d.* $52\frac{2}{3} - 9\frac{1}{9}$ *e.* $63\frac{5}{6} - 18\frac{7}{12}$

3. Add the following: (*a*) $1\frac{1}{2}$ hours, $2\frac{2}{3}$ hours, $3\frac{3}{5}$ hours; (*b*) $1\frac{1}{4}$ minutes, $2\frac{5}{6}$ minutes, $3\frac{3}{10}$ minutes.

PROCESS

a.
$$\begin{array}{r|l} & 30 \\ \hline 1\frac{1}{2} & 15 \\ 2\frac{2}{3} & 20 \\ 3\frac{3}{5} & 18 \\ \hline 7\frac{23}{30} & 53 \\ & \overline{30} = 1\frac{23}{30} \end{array}$$
Ans. $7\frac{23}{30}$ hr.

a. Since 2, 3, and 5 are prime to each other, take their continued product, 30 ($2 \times 3 \times 5$), as the L. C. D.

b. Find the L. C. M. of 4 and 6 (which is 12). Find the L. C. M. of 12 and 10, testing 24, 36, 48, 60 (multiples of 12); 60 is the L. C. D.

b.
$$\begin{array}{r|l} & 60 \\ \hline 1\frac{1}{4} & 15 \\ 2\frac{5}{6} & 50 \\ 3\frac{3}{10} & 18 \\ \hline 7\frac{23}{60} & 83 \\ & \overline{60} = 1\frac{23}{60} \end{array}$$
Ans. $7\frac{23}{60}$ min.

Written Exercises

2. Find sums :

a. $6\frac{1}{2}$	*b.* $10\frac{1}{3}$	*c.* $18\frac{3}{4}$	*d.* $23\frac{2}{3}$	*e.* $18\frac{3}{4}$
$20\frac{2}{3}$	$20\frac{3}{4}$	$26\frac{2}{5}$	$14\frac{5}{6}$	$24\frac{1}{6}$
$12\frac{1}{4}$	$6\frac{2}{5}$	$5\frac{1}{6}$	$8\frac{1}{9}$	$16\frac{5}{9}$
f. $36\frac{2}{5}$	*g.* $6\frac{1}{2}$	*h.* $6\frac{1}{3}$	*i.* $17\frac{7}{8}$	*j.* $38\frac{1}{4}$
$7\frac{3}{10}$	$21\frac{5}{6}$	$21\frac{5}{6}$	$6\frac{1}{2}$	$6\frac{4}{5}$
$33\frac{1}{2}$	$13\frac{2}{9}$	$3\frac{2}{9}$	$32\frac{7}{10}$	$\frac{7}{10}$

3. Add the following : (*a*) $1\frac{1}{2}$ years, $2\frac{2}{3}$ years, $3\frac{1}{4}$ years, $4\frac{5}{12}$ years ; (*b*) $1\frac{2}{3}$ days, $2\frac{3}{4}$ days, $3\frac{1}{6}$ days, $4\frac{3}{8}$ days.

PROCESS

a.

	12
$1\frac{1}{2}$	6
$2\frac{2}{3}$	8
$3\frac{1}{4}$	3
$4\frac{5}{12}$	5
$11\frac{5}{6}$	22
	12

$= 1\frac{10}{12} = 1\frac{5}{6}$

Ans. $11\frac{5}{6}$ yr.

b.

	24
$1\frac{2}{3}$	16
$2\frac{3}{4}$	18
$3\frac{1}{6}$	4
$4\frac{3}{8}$	9
$11\frac{23}{24}$	47
	24

$= 1\frac{23}{24}$

Ans. $11\frac{23}{24}$ da.

a. Reject 2, 3, 4. *b.* Reject 3 and 4. Find L. C. M. of 6 and 8.

4. Find sums :

a. $6\frac{1}{2}$	*b.* $10\frac{1}{3}$	*c.* $5\frac{1}{6}$	*d.* $18\frac{1}{2}$	*e.* $36\frac{3}{10}$
$20\frac{2}{3}$	$6\frac{1}{2}$	$23\frac{2}{3}$	$24\frac{1}{4}$	$7\frac{1}{6}$
$12\frac{3}{4}$	$18\frac{1}{4}$	$14\frac{5}{12}$	$9\frac{3}{5}$	$33\frac{1}{2}$
$8\frac{1}{6}$	$26\frac{5}{8}$	$8\frac{1}{4}$	$16\frac{3}{8}$	$6\frac{4}{5}$
f. $21\frac{1}{3}$	*g.* $32\frac{8}{9}$	*h.* $38\frac{3}{10}$	*i.* $7\frac{1}{2}$	*j.* $12\frac{7}{10}$
$13\frac{9}{10}$	$27\frac{2}{3}$	$6\frac{2}{5}$	$10\frac{3}{4}$	$6\frac{3}{8}$
$17\frac{1}{2}$	$11\frac{1}{6}$	$\frac{5}{6}$	$18\frac{5}{6}$	$17\frac{3}{4}$
$6\frac{2}{5}$	$1\frac{1}{2}$	$14\frac{1}{3}$	$23\frac{7}{8}$	$7\frac{1}{2}$

Subtraction

Preparatory Exercises

1. Give missing addend:

a. $\frac{2}{5} + ? = 1$	*b.* $\frac{2}{5} + ? = 1\frac{1}{5}$	*c.* $\frac{3}{5} + ? = 1\frac{1}{5}$	*d.* $\frac{4}{5} + ? = 1\frac{1}{5}$	*e.* $\frac{3}{5} + ? = 1\frac{2}{5}$	*f.* $\frac{4}{5} + ? = 1\frac{2}{5}$
g. $\frac{4}{5} + ? = 1\frac{3}{5}$	*h.* $\frac{2}{3} + ? = 1\frac{1}{3}$	*i.* $\frac{5}{9} + ? = 1\frac{1}{9}$	*j.* $\frac{4}{9} + ? = 1\frac{2}{9}$	*k.* $\frac{7}{9} + ? = 1\frac{5}{9}$	*l.* $\frac{7}{9} + ? = 1\frac{1}{9}$

2. Subtract:

a. $1 - \frac{2}{5}$	*b.* $1\frac{1}{5} - \frac{2}{5}$	*c.* $1\frac{1}{5} - \frac{3}{5}$	*d.* $1\frac{1}{5} - \frac{4}{5}$	*e.* $1\frac{2}{5} - \frac{3}{5}$	*f.* $1\frac{2}{5} - \frac{4}{5}$
g. $1\frac{3}{5} - \frac{4}{5}$	*h.* $1\frac{1}{3} - \frac{2}{3}$	*i.* $1\frac{1}{9} - \frac{5}{9}$	*j.* $1\frac{2}{9} - \frac{5}{9}$	*k.* $1\frac{5}{9} - \frac{7}{9}$	*l.* $1\frac{1}{9} - \frac{7}{9}$

Written Exercises

1. From $60\frac{7}{24}$ days, take (*a*) $30\frac{1}{24}$ days; (*b*) $28\frac{13}{24}$ days; (*c*) $7\frac{23}{24}$ days.

PROCESS

a. $60\frac{7}{24}$ | (31)
$30\frac{1}{24}$ |
$29\frac{5}{6}$ | $\frac{20}{24} = \frac{5}{6}$

Ans. $29\frac{5}{6}$ da.

b. $60\frac{7}{24}$ | (31)
$28\frac{13}{24}$ |
$31\frac{3}{4}$ | $\frac{18}{24} = \frac{3}{4}$

Ans. $31\frac{3}{4}$ da.

c. $60\frac{7}{24}$ | (31)
$7\frac{23}{24}$ |
$52\frac{1}{3}$ | $\frac{8}{24} = \frac{1}{3}$

Ans. $52\frac{1}{3}$ da.

The fraction in the subtrahend being greater in each case than the fraction in the minuend, increase the latter fraction by 1, making it $1\frac{7}{24}$, which equals $\frac{31}{24}$. Write 31 in a parenthesis.

In (*a*) think $\frac{1}{24}$ and $\frac{20}{24}$ (writing $\frac{20}{24}$) are $\frac{31}{24}$. Reduce $\frac{20}{24}$ to $\frac{5}{6}$ and write the latter under the original fractions. Carry 1 to the whole number in the subtrahend.

2. Subtract:

a. $90\frac{1}{4}$	*b.* $81\frac{3}{8}$	*c.* $72\frac{5}{12}$	*d.* $63\frac{3}{16}$	*e.* $54\frac{2}{9}$
$-\ 8\frac{3}{4}$	$-\ 17\frac{7}{8}$	$-\ 25\frac{11}{12}$	$-\ 34\frac{9}{16}$	$-\ 9\frac{7}{9}$
f. $45\frac{2}{5}$	*g.* $36\frac{1}{3}$	*h.* $27\frac{11}{20}$	*i.* $30\frac{3}{10}$	*j.* $44\frac{1}{6}$
$-\ 16\frac{4}{5}$	$-\ 27\frac{2}{3}$	$-\ 8\frac{19}{20}$	$-\ 10\frac{9}{10}$	$-\ 25\frac{5}{6}$

3. From $60\frac{1}{6}$ miles, take (*a*) $12\frac{5}{12}$ miles, (*b*) $9\frac{3}{5}$ miles, (*c*) $26\frac{8}{9}$ miles.

PROCESS

	12			30			18	
a. $60\frac{1}{6}$	2	(14)	*b.* $60\frac{1}{6}$	5	(35)	*c.* $60\frac{1}{6}$	3	(21)
$-\ 12\frac{5}{12}$	5		$-\ 9\frac{3}{5}$	18		$-\ 26\frac{8}{9}$	16	
$47\frac{3}{4}$	$\frac{9}{12} = \frac{3}{4}$		$50\frac{17}{30}$	$\frac{17}{30}$		$33\frac{5}{18}$	$\frac{5}{18}$	

Ans. $47\frac{3}{4}$ mi. *Ans.* $50\frac{17}{30}$ mi. *Ans.* $33\frac{5}{18}$ mi.

a. Write 12 (the L. C. D.). Write the new numerators. Since 5 twelfths is greater than 2 twelfths, increase the latter by 1, making $1\frac{2}{12}$, which is equal to $\frac{14}{12}$. Write 14 in a parenthesis. Think $\frac{5}{12}$ and $\frac{9}{12}$ (writing $\frac{9}{12}$) are $\frac{14}{12}$. Change $\frac{9}{12}$ to $\frac{3}{4}$, and write $\frac{3}{4}$ under the original fractions. Carry 1 to 2, and think 3 and **7** (writing 7) are 10; etc.

b. Increase 5 thirtieths by 1, making $\frac{35}{30}$. Write 35 in a parenthesis, etc.

c. Increase 3 eighteenths by 1; etc.

4. Find remainders:

a. $23\frac{7}{12}$	*b.* $31\frac{3}{10}$	*c.* $40\frac{5}{12}$	*d.* $52\frac{1}{9}$	*e.* $63\frac{5}{6}$
$-\ 5\frac{3}{4}$	$-\ 16\frac{4}{5}$	$-\ 5\frac{2}{3}$	$-\ 16\frac{2}{3}$	$-\ 8\frac{7}{12}$
f. $56\frac{3}{8}$	*g.* $46\frac{1}{6}$	*h.* $36\frac{3}{10}$	*i.* $24\frac{4}{9}$	*j.* $49\frac{5}{8}$
$-\ 28\frac{5}{6}$	$-\ 8\frac{3}{4}$	$-\ 19\frac{3}{4}$	$-\ 5\frac{5}{6}$	$-\ 29\frac{9}{10}$

Sight Problems

1. A church roof is 40 feet from the ground. The steeple extends $25\frac{1}{2}$ feet above the roof. How high above the ground is the top of the steeple?

2. M has $\$3\frac{1}{2}$; N has $\$1\frac{1}{4}$ more than M. *a.* How much money has N? *b.* How much money have both?

3. After selling $3\frac{1}{2}$ tons of hay a farmer still has $20\frac{5}{8}$ tons. How many tons had he originally?

4. How many acres are there in two fields, one of which contains $20\frac{1}{2}$ acres, and the other $3\frac{1}{4}$ acres less?

5. What is the perimeter of a rectangle $10\frac{1}{2}$ feet long, $6\frac{1}{4}$ feet wide?

6. How much change should I receive if I buy goods amounting to $\$10\frac{1}{2}$ and I give the grocer a \$20-bill?

Written Problems

1. The deck of a vessel is $34\frac{5}{6}$ feet above the surface of the water, and the top of a mast is $67\frac{3}{4}$ feet above the deck. How high above the water is the top of the mast?

2. A has $\$32\frac{1}{2}$; B has $\$7\frac{3}{4}$ more than A. How much have both together?

3. After selling $13\frac{3}{25}$ tons of hay a farmer has $28\frac{7}{10}$ tons remaining. How many tons had he at first?

4. How much land is there in two fields, one of which contains $28\frac{7}{8}$ acres, and the other $9\frac{5}{6}$ acres less?

5. How many feet are there in the four sides of a rectangle $39\frac{3}{4}$ feet wide and $87\frac{2}{3}$ feet long? How many feet and inches?

6. With a \$50-bill I pay for three articles costing, respectively, $\$12\frac{3}{4}$, $\$\frac{3}{10}$, $\$8\frac{17}{25}$. How much change should I receive?

Multiplication — One Factor a Whole Number

Preparatory Exercises

1. Multiply :

a. 2 sevenths	*b.* 2 ninths	*c.* 1 tenth	*d.* 1 third
$\times 3$	$\times 4$	$\times 7$	$\times 2$

e. $4 \times \frac{2}{9}$ *f.* $7 \times \frac{1}{12}$ *g.* $3 \times \frac{1}{4}$ *h.* $2 \times \frac{2}{5}$

2. Give products in lowest terms :

a. $3 \times \frac{1}{6}$ *b.* $4 \times \frac{1}{8}$ *c.* $2 \times \frac{1}{10}$ *d.* $3 \times \frac{1}{9}$
e. $4 \times \frac{1}{12}$ *f.* $2 \times \frac{1}{16}$ *g.* $3 \times \frac{1}{12}$ *h.* $4 \times \frac{1}{16}$

NOTE. — The expressions $10 \times \frac{1}{5}$, $\frac{1}{5} \times 10$, and $\frac{1}{5}$ of 10 indicate the same operation, the result in each case being 2.

3. Multiply :

a. $5 \times \frac{1}{6}$ *b.* $6 \times \frac{5}{6}$ *c.* $5 \times \frac{1}{3}$ *d.* $12 \times \frac{1}{6}$
e. $5 \times \frac{1}{5}$ *f.* $4 \times \frac{3}{4}$ *g.* $6 \times \frac{2}{3}$ *h.* $12 \times \frac{5}{6}$
i. $7 \times \frac{1}{8}$ *j.* $8 \times \frac{5}{8}$ *k.* $8 \times \frac{1}{4}$ *l.* $15 \times \frac{2}{3}$
m. $7 \times \frac{1}{7}$ *n.* $9 \times \frac{7}{9}$ *o.* $8 \times \frac{3}{4}$ *p.* $10 \times \frac{4}{5}$
q. $8 \times \frac{1}{9}$ *r.* $7 \times \frac{5}{7}$ *s.* $9 \times \frac{1}{3}$ *t.* $10 \times \frac{1}{5}$
u. $8 \times \frac{1}{8}$ *v.* $5 \times \frac{3}{5}$ *w.* $9 \times \frac{2}{3}$ *x.* $10 \times \frac{3}{5}$

Sight Exercises

1. Multiply by 10: *a.* $\frac{1}{2}$. *b.* $\frac{1}{3}$. *c.* $\frac{3}{4}$. *d.* $\frac{3}{5}$. *e.* $\frac{4}{5}$. *f.* $\frac{1}{6}$. *g.* $\frac{5}{6}$. *h.* $\frac{1}{8}$.

2. Multiply by 12: *a.* $\frac{1}{2}$. *b.* $\frac{2}{3}$. *c.* $\frac{1}{4}$. *d.* $\frac{5}{6}$. *e.* $\frac{3}{5}$. *f.* $\frac{3}{8}$. *g.* $\frac{1}{9}$. *h.* $\frac{2}{9}$.

3. Multiply by 24: *a.* $1\frac{1}{2}$. *b.* $1\frac{1}{3}$. *c.* $1\frac{1}{4}$. *d.* $1\frac{2}{3}$. *e.* $1\frac{3}{4}$. *f.* $1\frac{1}{6}$. *g.* $1\frac{5}{6}$.

4. Multiply by $2\frac{1}{4}$: *a.* 4. *b.* 8. *c.* 12. *d.* 16. *e.* 20. *f.* 24. *g.* 28. *h.* 32.

Written Exercises

1. How many inches of wire will be required to make 408 tacks if $\frac{7}{16}$ of an inch is required for each tack?

PROCESS

$$\frac{\overset{51}{\cancel{408}}}{1} \times \frac{7 \text{ in.}}{\cancel{16}\ 2} = \frac{357 \text{ in.}}{2} = 178\tfrac{1}{2} \text{ in. } \textit{Ans.}$$

Write 408 as an improper fraction with 1 for the denominator. Cancel.

2. Find products:

a. $864 \times \frac{8}{9}$	*b.* $\frac{5}{6} \times 981$	*c.* $396 \times \frac{11}{24}$	*d.* $\frac{2}{15} \times 215$
e. $472 \times \frac{7}{8}$	*f.* $\frac{6}{7} \times 525$	*g.* $576 \times \frac{5}{18}$	*h.* $\frac{5}{12} \times 630$
i. $576 \times \frac{3}{4}$	*j.* $\frac{3}{5} \times 875$	*k.* $225 \times \frac{3}{10}$	*l.* $\frac{7}{20} \times 350$

3. How many square rods are there in a field (*a*) 127 rods long, $38\frac{1}{4}$ rods wide? (*b*) $127\frac{1}{4}$ rods long, 38 rods wide?

PROCESS

a.
$$\begin{array}{r} 127 \\ 38\frac{1}{4} \\ \hline 31\frac{3}{4} \\ 1016 \\ 381 \\ \hline \textit{Ans.}\ 4857\frac{3}{4} \text{ (sq. rd.)} \end{array}$$

In (*a*) first write $31\frac{3}{4}$ (the product of 127 by $\frac{1}{4}$). Next write 1016 (the product of 127 by 8). Then write 381 tens (the product of 127 by 3 tens). Combine the three partial products.

In (*b*) first write $9\frac{1}{2}$ (the product of $\frac{1}{4}$ by 38). Then write the other two partial products. Combine.

b.
$$\begin{array}{r} 127\frac{1}{4} \\ 38 \\ \hline 9\frac{1}{2} \\ 1016 \\ 381 \\ \hline \textit{Ans.}\ 4835\frac{1}{2} \text{ (sq. rd.)} \end{array}$$

4. Find products:

a. $49 \times 16\frac{1}{3}$	*b*. $75 \times 45\frac{1}{6}$	*c*. $149\frac{1}{5} \times 63$
d. $58 \times 24\frac{1}{4}$	*e*. $86 \times 54\frac{1}{8}$	*f*. $204\frac{1}{4} \times 74$
g. $67 \times 32\frac{1}{5}$	*h*. $98 \times 36\frac{1}{3}$	*i*. $327\frac{1}{3} \times 85$

5. Find the cost of (*a*) 404 acres of land at $\$24\frac{3}{8}$ per acre; (*b*) $404\frac{7}{9}$ acres at \$24 per acre.

PROCESS

a. 404
$\$\ 24\frac{3}{8}$
8) 1212
151 $(\frac{4}{8})\ \frac{1}{2}$
1616
808
$\$9847\frac{1}{2}$ *Ans.*

In (*a*) find the product of 404 by $\frac{3}{8}$ by multiplying 404 by 3 and dividing the product by 8, expressing the fraction in lowest terms.

In (*b*) find the product of $\frac{7}{9}$ by 24 by multiplying 24 by 7 and dividing the product by 9, expressing the fraction in lowest terms.

b. $404\frac{7}{9}$
\$ 24
9) 168
18 $(\frac{6}{9})\ \frac{2}{3}$
1616
808
Ans. $\$9714\frac{2}{3}$

6. Multiply:

a. $147 \times 96\frac{2}{3}$	*b*. $635\frac{8}{9} \times 75$	*c*. $234 \times 87\frac{3}{4}$
d. $328 \times 76\frac{2}{5}$	*e*. $727\frac{11}{12} \times 63$	*f*. $465 \times 63\frac{5}{6}$
g. $524 \times 58\frac{3}{8}$	*h*. $826\frac{5}{6} \times 36$	*i*. $816 \times 55\frac{7}{10}$

Drill Exercises

1. Count by 12ths from $\frac{1}{12}$ to 1, expressing each successive fraction in its lowest terms.

2. Count by 16ths from $\frac{1}{16}$ to 1.

3. Count by 8ths from $\frac{1}{8}$ to 2.

4. Count by 20ths. 5. By 24ths. 6. By 30ths.

Two Fractional Factors

Preparatory Exercises

1. What is *a.* $\frac{1}{2}$ of 8? *b.* $\frac{1}{2}$ of 4? *c.* $\frac{1}{2}$ of 2? *d.* $\frac{1}{2}$ of 1? *e.* $\frac{1}{2}$ of $\frac{1}{2}$? *f.* $\frac{1}{2}$ of $\frac{1}{3}$? *g.* $\frac{1}{3}$ of $\frac{1}{3}$?

2. What is *a.* $\frac{1}{2}$ of $\frac{2}{3}$? *b.* $\frac{1}{3}$ of $\frac{3}{4}$? *c.* $\frac{1}{2}$ of $\frac{4}{5}$? *d.* $\frac{1}{3}$ of $\frac{3}{5}$? *e.* $\frac{1}{3}$ of $\frac{3}{8}$? *f.* $\frac{1}{4}$ of $\frac{4}{5}$? *g.* $\frac{1}{5}$ of $\frac{5}{6}$?

3. What is *a.* $\frac{1}{2}$ of $\frac{3}{5}$? *b.* $\frac{3}{5}$ of $\frac{1}{2}$? *c.* $\frac{1}{3}$ of $\frac{2}{5}$? *d.* $\frac{2}{5}$ of $\frac{1}{3}$? *e.* $\frac{2}{3}$ of $\frac{2}{5}$? *f.* $\frac{2}{3}$ of $\frac{3}{5}$?

> *To multiply fractions, cancel, then write the product of their new numerators over the product of their new denominators.*

Sight Exercises

1. Give products:

a. $\frac{1}{2} \times \frac{2}{3}$	*b.* $\frac{1}{3} \times \frac{3}{4}$	*c.* $\frac{3}{4} \times \frac{2}{3}$	*d.* $\frac{3}{4} \times \frac{5}{9}$
e. $\frac{1}{2} \times \frac{3}{4}$	*f.* $\frac{1}{3} \times \frac{2}{3}$	*g.* $\frac{4}{5} \times \frac{1}{2}$	*h.* $\frac{5}{6} \times \frac{1}{2}$
i. $\frac{1}{2} \times \frac{3}{5}$	*j.* $\frac{1}{3} \times \frac{4}{5}$	*k.* $\frac{5}{6} \times \frac{2}{5}$	*l.* $\frac{2}{3} \times \frac{7}{10}$

2. Multiply by $\frac{1}{2}$: *a.* $\frac{1}{8}$. *b.* $\frac{2}{3}$. *c.* $\frac{3}{4}$. *d.* $\frac{4}{5}$. *e.* $\frac{1}{6}$. *f.* $\frac{5}{6}$. *g.* $\frac{4}{9}$.

3. Multiply by $\frac{1}{3}$: *a.* $\frac{1}{2}$. *b.* $\frac{1}{3}$. *c.* $\frac{1}{4}$. *d.* $\frac{3}{4}$. *e.* $\frac{5}{6}$. *f.* $\frac{1}{12}$. *g.* $\frac{2}{9}$.

4. Multiply by $\frac{2}{3}$: *a.* $\frac{1}{2}$. *b.* $\frac{5}{6}$. *c.* $\frac{3}{4}$. *d.* $\frac{7}{8}$. *e.* $\frac{1}{10}$. *f.* $\frac{5}{12}$. *g.* $\frac{3}{8}$.

5. Multiply by $\frac{3}{4}$: *a.* $\frac{1}{2}$. *b.* $\frac{2}{3}$. *c.* $\frac{4}{5}$. *d.* $\frac{2}{5}$. *e.* $\frac{5}{6}$. *f.* $\frac{7}{8}$. *g.* $\frac{5}{9}$.

6. Multiply by $\frac{3}{10}$: *a.* $\frac{1}{2}$. *b.* $\frac{3}{4}$. *c.* $\frac{1}{5}$. *d.* $\frac{4}{5}$. *e.* $\frac{1}{10}$. *f.* $\frac{5}{8}$. *g.* $\frac{1}{5}$.

Written Exercises

1. How many square feet are there in 12 sheets of tin, $1\frac{2}{3}$ feet long, $\frac{3}{4}$ foot wide?

PROCESS

$$12 \times 1\tfrac{2}{3} \times \tfrac{3}{4} = \frac{\overset{3}{\cancel{12}}}{1} \times \frac{5}{\cancel{3}} \times \frac{\cancel{3}}{\cancel{4}} = 15 \text{ (sq. ft.)} \quad \textit{Ans.}$$

Change the whole and the mixed number to improper fractions. Cancel.

2. Multiply:

a. $\frac{2}{3} \times \frac{15}{16} \times 8$	*b.* $3\frac{3}{4} \times 4\frac{2}{3}$	*c.* $16\frac{2}{3} \times 6\frac{3}{5}$
d. $\frac{3}{4} \times \frac{9}{10} \times \frac{20}{27}$	*e.* $5\frac{1}{5} \times 7\frac{1}{12}$	*f.* $24\frac{1}{2} \times 5\frac{1}{4}$
g. $\frac{4}{5} \times \frac{1}{6} \times \frac{15}{28}$	*h.* $8\frac{1}{3} \times 3\frac{3}{10}$	*i.* $10\frac{1}{2} \times 1\frac{3}{7}$
j. $\frac{7}{8} \times \frac{3}{10} \times \frac{20}{21}$	*k.* $5\frac{1}{4} \times 1\frac{3}{7}$	*l.* $15\frac{2}{3} \times 6\frac{1}{10}$
m. $\frac{2}{3} \times \frac{7}{9} \times \frac{18}{35}$	*n.* $1\frac{3}{5} \times 3\frac{3}{4}$	*o.* $14\frac{1}{6} \times 2\frac{2}{15}$

Sight Exercises

1. Multiply:

a. $\frac{1}{2} \times \frac{10}{3}$	*b.* $\frac{1}{2} \times \frac{16}{3}$	*c.* $\frac{1}{2} \times \frac{29}{4}$	*d.* $\frac{1}{2} \times \frac{31}{3}$
e. $\frac{1}{2} \times 5\frac{1}{3}$	*f.* $\frac{1}{2} \times 7\frac{1}{4}$	*g.* $\frac{1}{3} \times 4\frac{1}{2}$	*h.* $\frac{1}{4} \times 7\frac{1}{5}$
i. $\frac{1}{3} \times 4\frac{1}{3}$	*j.* $\frac{1}{5} \times 6\frac{1}{4}$	*k.* $\frac{1}{4} \times 5\frac{1}{3}$	*l.* $\frac{1}{2} \times 8\frac{1}{2}$
m. $\frac{1}{4} \times 8\frac{4}{5}$	*n.* $\frac{1}{3} \times 9\frac{3}{4}$	*o.* $\frac{1}{2} \times 7\frac{1}{3}$	*p.* $\frac{1}{3} \times 6\frac{3}{4}$

First take the two factors whose product is a whole number, then multiply this product by the remaining factor.

q. $4 \times 2\frac{1}{2} \times 3\frac{1}{5}$	*r.* $12\frac{1}{2} \times 8 \times 1\frac{1}{25}$
s. $3\frac{1}{3} \times 1\frac{3}{10} \times 3$	*t.* $33\frac{1}{3} \times 1\frac{1}{4} \times 3$
u. $1\frac{1}{4} \times 4\frac{2}{5} \times 8$	*v.* $16\frac{2}{3} \times 6 \times 2\frac{1}{5}$
w. $2\frac{2}{3} \times 3 \times 1\frac{7}{8}$	*x.* $12\frac{1}{2} \times 1\frac{3}{10} \times 4$
y. $3\frac{1}{2} \times 1\frac{3}{7} \times 4$	*z.* $10\frac{1}{2} \times 2 \times 1\frac{1}{7}$

Sight Problems

1. How much will be left of \$1 after paying for 8 pounds of sugar at $6\frac{1}{2}$ cents per pound?

2. A boy picked $5\frac{1}{2}$ bushels of tomatoes in one week and $6\frac{1}{2}$ the next week, which he sold for $\$\frac{3}{4}$ per bushel. How much did he receive for them?

3. How many cubic feet will a box contain, when its inside measurements are $3\frac{1}{3}$ feet in length, $2\frac{1}{2}$ feet in width, and 3 feet in height?

4. A square rod is $5\frac{1}{2}$ yards long and $5\frac{1}{2}$ yards wide. How many square yards are there in a square rod?

5. How many inches of wire are required to make 4 dozen nails if each nail requires $\frac{7}{8}$ inch?

6. A dealer sells three fourths of a 24-yard piece of cloth at $\$1\frac{1}{2}$ per yard. What does he receive for the part sold?

7. How many bushels of apples will 16 barrels hold if each holds $2\frac{1}{2}$ bushels?

8. A man buys 2 pigs at $\$10\frac{1}{2}$ each. He pays $\$8\frac{3}{4}$ in cash and the remainder in hay. What is the value of the hay?

9. A girl has $2\frac{1}{4}$ yards of ribbon. How much has she after using two thirds of it?

10. If a train goes $10\frac{1}{4}$ miles in $\frac{1}{4}$ hour, how far does it go in $\frac{1}{2}$ hour at the same rate?

11. At 5 miles per hour, how long will it take to drive $3\frac{1}{3}$ miles beyond Goshen, which is $7\frac{1}{2}$ miles away?

12. John earns $\frac{3}{4}$ of a dollar and gave his brother $\frac{2}{5}$ of it. What part of a dollar did John keep?

13. If it requires $1\frac{1}{2}$ bushels of wheat to sow an acre, how many bushels will be required to sow 42 acres?

Written Problems

1. At $5\frac{7}{8}¢$ per pound, how much less than $20 will be the cost of a barrel of sugar containing 312 pounds?

2. A man sold two loads of potatoes containing $47\frac{1}{2}$ and $34\frac{3}{4}$ bushels, respectively. How much did he receive for them at $\$\frac{3}{5}$ per bushel?

3. How many cubic yards are removed in making an excavation $21\frac{1}{3}$ yards long, $10\frac{1}{2}$ yards wide, $2\frac{7}{8}$ yards deep?

4. A plot $16\frac{1}{2}$ feet long and $16\frac{1}{2}$ feet wide contains a square rod. How many square feet are there in a square rod?

5. How many feet of wire are required to make 8 dozen nails if each nail requires $1\frac{7}{8}$ inches of wire?

6. From a piece of cloth containing 40 yards a dealer sells $\frac{2}{5}$ of it at $\$1\frac{1}{4}$ per yard, and $\frac{2}{3}$ of the remainder at $\$1\frac{1}{2}$ per yard. How much is received for the two pieces sold?

7. At $16\frac{1}{2}$ feet to the rod, how many feet are there in $9\frac{1}{3}$ rods?

8. A man buys 3 pigs at $\$10\frac{1}{2}$ apiece. He pays in cash $\$23\frac{4}{5}$ and the rest in potatoes. What is the value of the potatoes?

9. A farmer has $272\frac{1}{4}$ acres of land, $\frac{8}{9}$ of which is cultivated. How many acres are cultivated?

10. If a train goes $10\frac{1}{4}$ miles in $\frac{1}{4}$ hour, how far does it go in $3\frac{1}{2}$ hours, at the same rate?

11. Mary earned $\$10\frac{1}{2}$ and gave $\frac{2}{3}$ of it to her mother. How much did she keep?

12. If $1\frac{1}{4}$ bushels of wheat will sow an acre, how many bushels will it take to sow $43\frac{1}{5}$ acres?

Bills

Thomas J. Farrell has bought goods from Ryan and Taylor, from whom he receives the following bill :

MARION, IND., Nov. 4, 1916

MR. THOMAS J. FARRELL
376 Main Street

Bought of RYAN AND TAYLOR
WHOLESALE GROCERS
4 Market Square

48 lb. Coffee	*.25*	*12*		
6 bbl. Flour	*6.50*			
80 lb. Sugar	*.05½*			
4½ lb. Butter	*.30*			
1 case Tomatoes		*1*	*25*	
12 gal. Sirup	*.43*			
Received payment				$
Nov. 30, 1916				
Ryan and Taylor				
per F. O'M.				

Written Exercise

Copy this bill, dating it to-day, using your own name as purchaser, and inserting your address.

Write in the first double column the amount of the separate items (*extensions*) and place the total (the *footing*) in the second double column, on the line below the last item.

Assume that the bill is paid a few days later ; receipt it as shown above. After the word *per* (which means "by"), write the initials of a classmate.

Sight Exercises

Give the cost of each item:

1.	*a.*	13 lb. Coffee	at	30 ¢
	b.	120 lb. Sugar	at	6 ¢
	c.	48 gal. Oil	at	$12\frac{1}{2}$ ¢
	d.	1 bbl. Flour	at	$5.75
	e.	$4\frac{1}{2}$ lb. Tea	at	60 ¢
2.	*a.*	10 doz. Plates	at	72 ¢
	b.	3 Bowls	at	56 ¢
	c.	$2\frac{1}{2}$ doz. Dishes	at	80 ¢
	d.	1 Tea Set	at	$4.50
3.	*a.*	$4\frac{1}{2}$ yd. Ribbon	at	30 ¢
	b.	1 Suit	at	$2.40
	c.	2 pc. Braid	at	34 ¢
	d.	$10\frac{1}{2}$ yd. Silk	at	$1.20
	e.	1 pr. Gloves	at	$1.50
4.	*a.*	4 doz. Bolts	at	$1.25
	b.	$\frac{1}{2}$ doz. Chisels	at	$6.00
	c.	50 lb. Nails	at	$6\frac{1}{2}$ ¢
	d.	4 Planes	at	$2.50
	e.	$1\frac{1}{2}$ doz. Shovels	at	$10.00

Written Exercises

1. Make out and receipt bills for the foregoing articles, naming a local merchant as the seller and yourself as the purchaser.

Write the extensions and the footings at once in their proper column, without using a separate sheet for the calculations. When only one article of a kind is bought, place its price only in the column of extensions. Do not employ "at" or other unnecessary words or signs.

2. Make out bills for the foregoing purchases at the prices prevailing in your local stores.

Denominate Numbers

Measures of Length

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

Sight Exercises

1. How many inches are there in 1 yard?

2. How many feet are there in 1 rod?

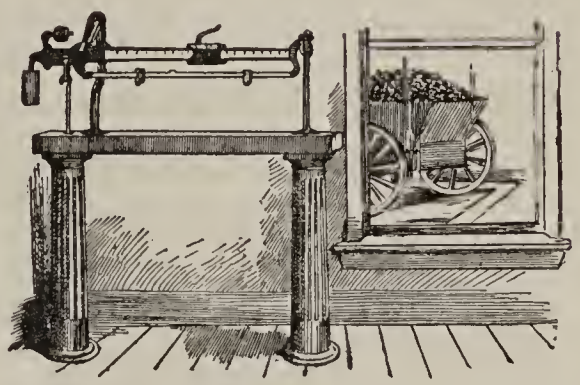
3. How many yards are there (*a*) in 3 rods? (*b*) In 300 rods? (*c*) In 20 rods?

4. How many inches in 2 ft. 9 in.?

Measures of Weight

16 ounces (oz.) 1 pound (lb.)
2000 pounds 1 ton (T.)

NOTE. — Coal is sold at the mines by the *long ton* of 2240 pounds.



Sight Exercises

1. How many more pounds are there in a long ton than in a short one?

2. At the rate of 5 cents an ounce, what is the cost of a pound?

3. How many ounces are there in 10 lb. 5 oz.?

Measures of Time

60 seconds (sec.)	1 minute (min.)
60 minutes	1 hour (hr.)
24 hours	1 day (da.)
7 days	1 week (wk.)

Years and Months

Three years out of every four contain 365 days; the fourth which is called a *leap year*, contains 366 days. 1916 is a leap year; 1915, 1917, 1918 are ordinary years.

A year (yr.) consists of 12 months (mo.). Four of the latter contain 30 days each. They are given in the old rhyme:

"Thirty days have September,
April, June, and November."

1916 FEBRUARY 1916						
Sun.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29				

February has 29 days in leap year, and 28 days in other years. The other months have 31 days each.

Sight Exercises

1. Name the leap years from 1916 to 1940.

2. How many days in January and February, 1915?

3. How many days in February and March, 1916?

4. When Jan. 1 falls on Sunday, give the dates of the other Sundays in January?

5. How many minutes are there in $2\frac{1}{2}$ hours?

6. Change to the fraction of a minute: (*a*) 20 sec. (*b*) 30 sec. (*c*) 40 sec. (*d*) 45 sec. (*e*) 48 sec.

7. Change to the decimal of an hour: (*a*) 12 min. (*b*) 15 min. (*c*) 24 min. (*d*) 48 min. (*e*) 54 min.

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

Adding Compound Numbers

Preparatory Exercises

1. How many ounces are 12 ounces and 10 ounces?

2. How many pounds and ounces are 22 ounces?

3. How many pounds and ounces are 10 ounces and 12 ounces?

Sight Exercises

1. Give sums in pounds and ounces:

a.	*b.*	*c.*	*d.*	*e.*
13 oz.	12 oz.	10 oz.	11 oz.	14 oz.
+ 9 oz.	+ 8 oz.	+ 10 oz.	+ 7 oz.	+ 9 oz.

2. Give sums in feet and inches:

a.	*b.*	*c.*	*d.*	*e.*
11 in.	9 in.	7 in.	8 in.	6 in.
+ 6 in.	+ 10 in.	+ 11 in.	+ 10 in.	+ 9 in.

Written Exercises

1. Find the total weight of three hams, weighing respectively 13 lb. 8 oz., 16 lb. 9 oz., and 15 lb. 10 oz.

13 lb. 8 oz. 16 lb. 9 oz. 15 lb. 10 oz. *Ans.* 45 lb. 11 oz.	PROCESS Write pounds under pounds and ounces under ounces. Find the sum of the ounces, 27 oz., change it to 1 lb. 11 oz., and write 11 oz. under ounces. Carry 1 lb. to the pounds.

2. Add the following:

a.	*b.*	*c.*
17 lb. 9 oz.	6 ft. 10 in.	15 da. 20 hr.
+ 13 lb. 12 oz.	+ 22 ft. 8 in.	+ 6 da. 10 hr.

d.	*e.*	*f.*
13 lb. 12 oz.	22 ft. 8 in.	6 da. 10 hr.
+ 6 lb. 8 oz.	+ 39 ft. 5 in.	+ 23 da. 15 hr.

Subtracting Compound Numbers

Sight Exercises

Give remainders :

a. 17 lb. 10 oz. − 5 lb.	*b.* 13 yr. 10 mo. − 8 yr.	*c.* 10 wk. 6 da. − 7 wk.
d. 18 ft. 9 in. − 9 ft.	*e.* 17 lb. 10 oz. − 5 lb. 9 oz.	*f.* 13 yr. 10 mo. − 8 yr. 7 mo.

Written Exercises

1. A man began a piece of work at 7.45 A.M. How long did he take to do it if he completed it (*a*) at 11.50 A.M. ? (*b*) at 12 noon ? (*c*) at 12.10 P.M. ?

PROCESS

b.	12 hr. (60)	*c.*	12 hr. 10 min. (70)
	− 7 hr. 45 min.		− 7 hr. 45 min.
Ans.	4 hr. 15 min.	*Ans.*	4 hr. 25 min.

In (*b*) think 45 min. and 15 min. (writing 15 min.) are 1 hr. Carry 1 hr. to 7 hr., which makes 8 hr., etc.

2. Subtract :

a. 45 lb. 15 oz. − 26 lb. 10 oz.	*b.* 32 yr. 11 mo. − 15 yr. 9 mo.	*c.* 56 ft. 10 in. − 29 ft. 8 in.
d. 22 hr. 52 min. − 8 hr. 31 min.	*e.* 45 lb. − 26 lb. 10 oz.	*f.* 32 yr. 6 mo. − 15 yr. 9 mo.

Sight Exercises

Give remainders :

a. 18 lb. 2 oz. − 8 lb.	*b.* 16 yr. 2 mo. − 7 yr.	*c.* 17 wk. 3 da. − 5 wk.
d. 15 ft. 3 in. − 9 ft.	*e.* 18 lb. 2 oz. − 1 lb. 8 oz.	*f.* 16 yr. 2 mo. − 1 yr. 7 mo.

Multiplying Compound Numbers

Preparatory Exercises

1. At 4 ounces each, how many ounces will 3 packages of tea weigh?

2. If a box of candy weighs 8 ounces, (*a*) how many ounces will 2 boxes weigh? (*b*) How many pounds?

Sight Exercises

1. Give products:

a. 2 oz. × 7	*b.* 1 lb. 2 oz. × 5	*c.* 1 ft. 3 in. × 3	*d.* 3 yd. 1 ft. × 2
e. 4 oz. × 4	*f.* 1 lb. 2 oz. × 8	*g.* 1 ft. 3 in. × 4	*h.* 1 yd. 1 ft. × 3

Written Exercises

1. Find the length of 9 pieces of wire each measuring (*a*) 102 ft. 1 in. (*b*) 102 ft. 4 in. (*c*) 102 ft. 6 in.

PROCESS

a. 102 ft. 1 in. × 9	*b.* 102 ft. 4 in. × 9	*c.* 102 ft. 6 in. × 9
Ans. 918 ft. 9 in.	*Ans.* 921 ft.	*Ans.* 922 ft. 6 in.

In (*b*) think 9 times 4 in. are 36 in., or 3 ft. Think 9 times 2 ft. are 18 ft.; carrying 3 ft. makes 21 ft.; etc.

In (*c*) think 9 times 6 in. are 54 in., or 4 ft. 6 in. Write 6 in. in its column, and carry 4 ft. to the product of 2 ft. by 9; etc.

2. Multiply:

a. 17 lb. 3 oz. × 5	*b.* 13 da. 2 hr. × 9	*c.* 25 ft. 1 in. × 11
d. 17 lb. 4 oz. × 4	*e.* 13 da. 4 hr. × 6	*f.* 25 ft. 4 in. × 3

Dividing Compound Numbers

Preparatory Exercises

1. When 12 ounces of tea are put into 3 equal packages, what is the weight of each?

2. How many ounces of candy does each receive when a pound is divided equally (*a*) between 2 children? (*b*) Among 4 children? (*c*) Among 8 children?

Sight Exercises

a. 4)1 lb. *b.* 4)5 lb. *c.* 4)1 lb. 4 oz. *d.* 4)13 lb. 4 oz.

e. 4)2 lb. *f.* 4)6 lb. *g.* 4)2 lb. 4 oz. *h.* 4)10 lb. 4 oz.

i. 4)1 da. *j.* 4)6 da. *k.* 4)1 da. 4 hr. *l.* 4)13 da. 4 hr.

Written Exercises

1. A man divides a coil of wire into 9 equal portions. What is the length of each when the coil contains (*a*) 198 ft. 9 in.? (*b*) 201 ft.? (*c*) 202 ft. 6 in.?

PROCESS

a. 9)198 ft. 9 in.	*b.* 9)201 ft.	*c.* 9)202 ft. 6 in.
Ans. 22 ft. 1 in.	*Ans.* 22 ft. 4 in.	*Ans.* 22 ft. 6 in.

In (*b*) divide 201 ft. by 9, which gives a quotient of 22 ft. with 3 ft. remaining. Reduce 3 ft. to inches, which gives 36 inches. Divide 36 inches by 9, and write the quotient after 22 ft.

In (*c*) reduce the remainder 4 ft. 6 in. to 54 inches. Divide this by 9, and write the quotient 6 in. underneath the inches in the dividend.

2. Divide:

a. 6)81 lb. *b.* 6)78 lb. 6 oz. *c.* 7)71 lb. 5 oz.

d. 9)93 yd. *e.* 7)98 ft. 7 in. *f.* 8)97 yr. 4 mo.

Sight Problems

1. At $12 per month, what is the rent of a house for 3 yr. 7 mo.?

2. At the rate of 30 miles per hour, how far will a train go in 3 hr. 20 min.?

3. How many feet are there in the four sides of a rectangle 2 ft. 6 in. long, 1 ft. 6 in. wide?

4. From a piece of cloth 10 yards long, a dealer sold 6 yd. 1 ft. How much remained?

5. John is 16 yr. 8 mo. old; James is 1 yr. 8 mo. older than John. How old is James?

6. At $\frac{3}{4}$ inch each, how many nails can be made from a foot of wire?

7. Mr. Brown's age is 48 yr. 4 mo., Mrs. Brown's 40 yr. 6 mo. What is the difference in their ages?

8. If it takes 4 ft. 6 in. of ribbon to trim a hat, (*a*) how many feet will be required to trim a dozen hats? (*b*) How many yards?

9. Find the cost of 4 ft. 6 in. at 60 cents per yard.

10. A train leaves X at 9.20 A.M. and reaches Y at noon. How long does it require to take the trip?

11. When a train takes 3 hr. 20 min. to go 100 miles, how many miles does it average per hour?

12. (*a*) How many rods are there in $\frac{5}{8}$ mile? (*b*) How many yards?

13. It takes 1 mile of fencing to enclose a square field. Find the length of each side in rods.

14. Change 3600 pounds (*a*) to tons and pounds. (*b*) To tons and the fraction of a ton. (*c*) To tons and the decimal of a ton.

Written Problems

1. At $48 per month, what is the rent of a house for 3 yr. 7 mo.?

2. How far will a train go in 3 hr. 45 min. at the rate of 36 miles per hour?

3. How many feet are there in the three sides of a triangle which measure, respectively, 13 ft. 9 in., 13 ft. 9 in., and 12 ft. 6 in.?

4. From a piece of cloth 40 yards long, a dealer sold 3 pieces each measuring 4 yd. 2 ft. How many yards remained?

5. William is 16 yr. 8 mo. old. Mary is 1 yr. 8 mo. older than William. Find the sum of their ages.

6. At $\frac{3}{4}$ inch each, how many nails can be made from 12 ft. 3 in. of wire?

7. Mr. Smith is 48 yr. $4\frac{1}{2}$ mo. old; Mrs. Smith is 39 yr. $6\frac{2}{3}$ mo. old. Find the difference in their ages.

8. If it requires 2 ft. 9 in. of ribbon to trim a jacket, (*a*) how many feet will it require for 4 dozen jackets? (*b*) How many yards?

9. Find the cost of 2 ft. 8 in. at $1.26 per yard.

10. A train leaves P at 8.47 A.M. and is due at Q at noon. (*a*) How long is it allowed for the trip? (*b*) How much time does it take when it is delayed 2 hr. 30 min.?

11. When a train takes 13 hr. 45 min. to go 550 miles, how many miles does it average per hour?

12. (*a*) How many rods are there in 8 miles? (*b*) How many yards?

13. The perimeter of a square field is 2 miles 84 rods; what is the length of each side in rods?

Areas of Rectangles

Preparatory Exercises

1. How many panes of glass are there in a window that has 3 panes in its width and 4 in its length?

2. How many square inches are there in a rectangle 4 inches long and 3 inches wide?

3. Measure the top of your desk and calculate the number of square inches in its surface.

4. What measurements must you make to find out the number of square feet in the floor of the classroom?

Written Exercises

1. How many square feet are there in a piece of carpet 22 ft. 8 in. long, 16 ft. 6 in. wide?

PROCESS

As the area is required in square feet, express each dimension in feet.

22 ft. 8 in. $= 22\frac{2}{3}$ ft. 16 ft. 6 in. $= 16\frac{1}{2}$ ft.

Area in square feet $= 22\frac{2}{3}$ (ft.) $\times$ $16\frac{1}{2}$ (ft.)

$22\frac{2}{3} \times 16\frac{1}{2} = \frac{68}{3} \times \frac{33}{2}$. Cancel.

NOTE. — The length and the width of a rectangle are called its *dimensions.*

2. Give the area in square feet of rectangles whose dimensions are, respectively:

a. 18 ft. 9 in. by 12 ft. 9 in. *b.* 10′ 4″ $\times$ 16′ 6″

c. 10′ 10″ $\times$ 5′ 4″ *d.* 12 ft. 9 in. by 10 ft. 8 in.

The signs ′ and ″ are used to express feet and inches, respectively. Thus, 16′ 6″ is read 16 feet 6 inches. The sign $\times$ meaning "by" is frequently placed between the dimensions. Thus, 16′ 6″ $\times$ 13′ 4′ is read 16 feet 6 inches by 13 feet 4 inches.

Written Problems

1. (*a*) How many square rods are there in a field $37\frac{1}{2}$ rods long, $25\frac{3}{5}$ rods wide? (*b*) At 160 square rods to the acre, how many acres does it contain? (*c*) What did it cost at \$75 per acre?

2. (*a*) How many rods of fencing will be required to enclose a field $37\frac{1}{2}$ rods long, $25\frac{3}{5}$ rods wide? (*b*) At \$2 per rod what will be the cost of the fence?

3. How many square feet are there in a strip of hall carpet 8 yards long, $\frac{3}{4}$ yard wide?

4. Change 54 inches (*a*) to feet and a fraction. (*b*) To yards and a fraction.

5. (*a*) How many square yards are there in a piece of oilcloth 24 feet long, 54 inches wide. (*b*) What would it cost at 75 cents per square yard?

6. A box of glass contains 50 square feet. How many panes of glass does it contain when each pane measures $\frac{1}{2}$ ft. by $\frac{2}{3}$ ft.?

7. Measure a blackboard in the classroom, and find its cost at 60 cents a square yard.

8. Measure a pane of glass in a window of the classroom and (*a*) find the number of square inches it contains. (*b*) Find the total number of square inches in all the panes of one window.

NOTE. — In measuring a pane of glass allow for the portion of the glass that is covered by the putty.

9. Measure the floor of the classroom, and calculate the number of square feet it contains.

10. Find the number of square feet (*a*) in the north wall of the classroom. (*b*) In the south wall. (*c*) In the west wall. (*d*) In the east wall.

Volumes of Rectangular Solids

Preparatory Exercises

1. The top layer of a box of caramels has 4 rows of 6 caramels each. (*a*) How many caramels are there on the top layer? (*b*) On the bottom layer? (*c*) How many caramels does the box contain if there are 3 layers?

2. How many 1-inch cubes could be placed in a box 6 inches long, 5 inches wide, 4 inches deep, inside measurement?

3. What is the capacity of a box 4 feet long, 3 feet wide, 2 feet deep?

Written Exercises

1. A freight car is 32 feet long and 8 feet wide. If it is loaded with grain to the depth of 5 feet, how many cubic feet of grain does it contain?

PROCESS

32 (ft.) × 8 (ft.) × 5 (ft.) = 1280 (cu. ft.). The number of cubic feet is equal to the continued product of the number of feet in the length multiplied by the number of feet in the width multiplied by the number of feet in the depth.

2. When a cubic foot will hold $\frac{4}{5}$ bushel, how many bushels of wheat are there (*a*) in 1280 cubic feet? (*b*) In 1600 cubic feet?

3. (*a*) How many cubic feet of corn are there in a corn-crib 16 feet long, 10 feet wide, when the corn is 10 feet deep? (*b*) How many bushels of ear corn are there in the crib at $\frac{4}{5}$ bushel to the cubic foot? (*c*) If 2 bushels of corn in the ear make 1 bushel of shelled corn, how many bushels of shelled corn does the crib contain?

Inexact Division

Preparatory Exercises

1. If 51 marbles are divided among 6 boys, how many marbles will each receive?

2. What is the average price of a pig when 6 pigs cost $51?

3. How many hens can be properly accommodated in a pen containing 51 square feet, if each hen requires 6 square feet?

4. How many trips must a lifeboat make to bring ashore 51 passengers if 6 can be taken on each trip?

Although each of the foregoing questions involves the division of 51 by 6, each answer differs from the others. To the first, the answer should indicate that there are 3 marbles left after the division is made; the answer to the second is $\$8\frac{1}{2}$; to the third, the answer is 8 hens, no reference being necessary to the three extra square feet; to the fourth, the answer is 9 trips.

Written Problems

1. At $6 each, how many pigs can be bought for $500?

2. If each pupil requires 18 square feet of floor space, how many pupils can be properly accommodated in a classroom 25 feet long and 24 feet wide?

3. When a lifeboat can carry 24 persons, how many boats are required to carry 500 persons?

4. A farmer raised 500 bushels of wheat on a field of 40 acres. What was the average yield per acre?

5. How many men must be hired to do a piece of work in 16 days if 1 man would require 500 days to do it?

6. What is the average number of pupils to a class when 16 classes contain 500 pupils?

NOTE. — In giving *averages*, express fractions of pupils, etc.

Indicating Operations

Preparatory Exercises

1. A boy spends 100 cents for a baseball suit, 20 cents for a ball, and 5 cents for a bat. How much did he spend in all?

The operation required to solve this problem may be indicated by signs as follows:

(*a*) Total cost in cents = 100 + 20 + 5.

2. How many cubic feet of water are there in a swimming pool 100 feet long and 20 feet wide, when the water is 5 feet deep?

(*b*) Number of cubic feet = 100 × 20 × 5.

3. How much money would a girl have out of 100 cents if she paid 20 cents for yarn and 5 cents for needles?

If she bought the yarn in one store and the needles in another, the operations could be indicated thus:

(*c*) Number of cents remaining = (100 − 20) − 5.

If she bought both in one store, the operations might be expressed in this form:

(*d*) Number of cents remaining = 100 − (20 + 5).

NOTE. — A parenthesis indicates that the numbers it encloses are to be combined before combining them with the others.

4. If a man pays 100 cents for 20 bags of marbles, each containing 5 marbles, what is the price of one marble?

If the cost of a bag is first found, and then divided by the number of marbles, the operations could be indicated thus:

Cost of a marble in cents = (100 ÷ 20) ÷ 5.

If the total cost is divided by the number of marbles, the operations might be given in this form:

Cost of a marble in cents = 100 ÷ (20 × 5).

Sight Exercises

1. Give answers:

a. $100 + 20 + 5$	*b.* $(100 + 20) + 5$	*c.* $100 + (20 + 5)$
d. $100 \times 20 \times 5$	*e.* $(100 \times 20) \times 5$	*f.* $100 \times (20 \times 5)$
g. $100 - 20 - 5$	*h.* $(100 - 20) - 5$	*i.* $100 - (20 - 5)$
j. $100 \div 20 \div 5$	*k.* $(100 \div 20) \div 5$	*l.* $100 \div (20 \div 5)$

2. What answers are the same in the first line? In the second? In the third? In the fourth?

3. How do the answers in the first column compare with those (*a*) in the second? (*b*) In the third?

4. Give answers:

a. $100 + 20 \times 5$	*b.* $100 + (20 \times 5)$	*c.* $(100 + 20) \times 5$
d. $100 - 20 \times 5$	*e.* $100 - (20 \times 5)$	*f.* $(100 - 20) \times 5$
g. $100 + 20 \div 5$	*h.* $100 + (20 \div 5)$	*i.* $(100 + 20) \div 5$
j. $100 - 20 \div 5$	*k.* $100 - (20 \div 5)$	*l.* $(100 - 20) \div 5$

Order of Signs

While it is agreed among mathematicians that in such examples as those in the first column the multiplication or division must first be performed before the additions or subtractions are made, it is better to show this in each case by the use of a parenthesis, as in the second column, in which the answers are the same as those in the first.

Written Exercises

Find answers:

a. $24\frac{1}{2} + 16\frac{3}{4} + 7\frac{5}{6}$	*b.* $(15\frac{1}{2} + 40\frac{1}{4}) \times 12\frac{1}{3}$
c. $35\frac{2}{3} - 14\frac{1}{4} - 6\frac{3}{8}$	*d.* $(24\frac{1}{2} + 16\frac{3}{4}) \div 13\frac{3}{4}$
e. $12\frac{1}{2} \times 10\frac{2}{5} \times 8\frac{3}{10}$	*f.* $(10\frac{1}{2} \div 12\frac{1}{4}) + 52\frac{5}{6}$
g. $48\frac{1}{3} + 18\frac{3}{4} - 4\frac{5}{9}$	*h.* $(89\frac{1}{2} \div 17\frac{1}{2}) - 4\frac{2}{7}$

Preparatory Exercises

1. Find the cost of 8 cows at \$50 each; *i.e.* $8 \times \$50 = ?$

2. How much is paid for 8 cows at \$50 each and 4 horses at \$200 each?

$$(8 \times \$50) + (4 \times \$200)$$

3. How much more than \$1000 will be the total cost of 8 cows at \$50 each and 4 horses at \$200 each?

$$[(8 \times \$50) + (4 \times \$200)] - \$1000$$

4. Mrs. Griffin has \$2000. How many dollars will she have after paying for 8 cows at \$50 each and 4 horses at \$200 each?

$$\$2000 - [(8 \times \$50) + (4 \times \$200)]$$

5. Mr. Ziegler spent \$12,000, paying \$10,000 for a farm, \$50 each for 8 cows, \$200 each for 4 horses, and the remainder for machinery, tools, etc. What did the machinery, etc., cost him?

$$\$12{,}000 - [\$10{,}000 + (8 \times \$50) + (4 \times \$200)]$$

6. Mrs. Collins bought 100 acres of land at \$100 per acre; tools, machinery, etc., to the amount of \$800; 8 cows at \$50 each; and 4 horses. If the total cost was \$12,000, how much apiece did the horses cost?

$$\frac{\$12{,}000 - [(100 \times \$100) + \$800 + (8 \times \$50)]}{4}$$

Indicate division by writing the divisor below a horizontal line.

7. Mr. Kelly sold his farm, implements, stock, etc., for \$12,000. He obtained \$50 apiece for his 12 cows, \$150 apiece for his 4 horses, \$600 for his implements, and the remainder for the land, 120 acres. What did the land bring per acre?

Written Problems

Before working the following problems, indicate the operations required for their solution, omitting the denominations; cents, pupils, etc.

1. After spending 75 cents for a ball and 15 cents for a bat, John still had 5 cents. How much money had he at first?

2. There were 75 pupils in a school on the opening day. During the month 15 new pupils entered and 5 old pupils left. How many pupils were there in the school at the end of the month?

3. A man raised 75 tons of hay on 5 fields. How many tons did he raise to the acre if each field contained 15 acres?

4. At $5 each how many pigs should be exchanged for a cow worth $75 and a calf worth $15?

5. A man had 75 head of cattle. He sold 15 head and divided the remainder among his 5 sons. What was the share of each?

6. At 15 bushels to the acre, what is the yield of 5 fields each containing 75 acres?

7. After buying 15 acres of land at $75 per acre a man still has $5. How much had he at first?

8. To buy 5 cows at $75 each a man needs $15 more. How much money has he?

9. A man exchanged 15 acres of land at $75 per acre for pigs at $5 each. How many pigs did he get?

10. A dealer sold 75 sheep to A and 15 to B. How much did he receive if the sheep brought $5 each?

11. A girl has saved 75 cents. How much will she have after spending 15 cents for a reader and 5 cents for a pencil?

SECTION III

DECIMALS, DENOMINATE NUMBERS, MEASUREMENTS, REVIEWS, SHORT METHODS, BILLS AND RECEIPTS

Decimals

Preparatory Exercises

1. With what four pieces of money can you pay a bill of $11.11?

2. If you received $43.21 in 4 + 3 + 2 + 1 pieces of money, what is the value (*a*) of each of the 4 gold coins? (*b*) Of each of the 3 paper bills? (*c*) Of each of the 2 silver coins? (*d*) Of the bronze piece?

Writing Decimals

Forty-three dollars and twenty-one cents is generally written $43.21.

The mixed number 43 and 21 hundredths is written in the decimal form as 43.21, a period, called the decimal point, being used to separate 43 (the whole number) from 21 hundredths (the decimal).

Three and seven tenths is written 3.7; forty-three hundredths is written .43; nine hundredths is written .09.

Reading Decimals

In reading a mixed decimal, use *and* between the whole number and the decimal. Read a one-place decimal, such as .2, .3, etc., as *tenths;* a two-place decimal, such as .16, .07, etc., as *hundredths.*

Written Exercises

1. Write the following as decimals :

a. 314 ten-thousandths.

Since $\frac{1}{10000}$ has a denominator containing four ciphers, the decimal must have four places ; insert a decimal cipher after the decimal point. *Ans.* .0314.

b. 217 hundred-thousandths.

c. 83 hundredths.

d. 7 thousandths.

e. 345 thousandths.

f. 27 ten-thousandths.

g. 325 and 7 thousandths.

Ans. 325.007. This is called a *mixed decimal*, which consists of an integer and a decimal.

Changing Common Fractions to Decimals

Written Exercises

1. Reduce $\frac{3}{32}$ to a decimal.

$\frac{3}{32}$ means $3 \div 32$. Perform the indicated division, which gives the quotient .09375. $\frac{3}{32} = .09375$, *Ans.*

$$
\begin{array}{r}
.09375 \\
32\overline{)3.00} \\
\underline{288} \\
120 \\
\underline{96} \\
240 \\
\underline{224} \\
160 \\
\underline{160}
\end{array}
$$

Divide the numerator, with the necessary ciphers annexed, by the denominator. Place the decimal in the quotient over the decimal point in the dividend.

2. Reduce to decimals :

a. $\frac{3}{4}$ *b.* $\frac{3}{8}$ *c.* $\frac{7}{8}$ *d.* $\frac{1}{16}$

e. $\frac{1}{25}$ *f.* $\frac{3}{16}$ *g.* $\frac{2}{25}$ *h.* $\frac{1}{32}$

Changing Decimals to Common Fractions

Reduce the following to common fractions — lowest terms.

3. Reduce .0064 to a common fraction — lowest terms.

$$.0064 = \frac{64}{10000} = \frac{16}{2500} = \frac{4}{625}, \textit{ Ans.}$$

4. Reduce to common fractions :

a. .04 *b.* .125 *c.* .12 *d.* 375

Addition and Subtraction

Sight Exercises

1. Give sums:

a.	*b.*	*c.*	*d.*	*e.*
6.5	16.21	24.3	4.5	12.09
+ 4.12	+ 5.04	+ 8.09	+ .6	+ 3.1

2. Add (*a*) 12.6 miles and 3.4 miles. (*b*) 12.75 feet and 2.25 feet. (*c*) 12.05 acres and 12.05 acres.

PROCESS

a. 12.6 mi.	*b.* 12.75 ft.	*c.* 12.05 A.
+ 3.4	+ 2.25	+ 2.05
Ans. 16 mi.	*Ans.* 15 ft.	*Ans.* 14.1 A.

In (*a*) omit .0. In (*b*) omit .00. In (*c*) omit the terminal 0.

3. Give sums:

a.	*b.*	*c.*	*d.*	*e.*
12.6	16.99	18.75	14.06	13.03
+ .4	+ 1.01	+ .25	+ 1.04	+ .07

4. From 18.25 miles take (*a*) 9.25 miles. (*b*) 9.75 miles. From 10 acres (*c*) 9.5 acres. (*d*) 9.25 acres.

PROCESS

a. 18.25 mi.	*b.* 18.25 mi.	*c.* 10 A.	*d.* 10 A.
− 9.25	9.75	9.5	9.25
Ans. 9 mi.	*Ans.* 8.5 mi.	*Ans.* .5 A.	*Ans.* .75 A.

5. Give remainders:

a.	*b.*	*c.*	*d.*	*e.*
6.5	16.21	24.3	4.5	12.09
− 4.25	− 5.04	− 8.09	− .6	− 3.19

Written Exercises

1. A man's farm consists of 3 and 45 hundredths acres in woods, 8 tenths of an acre as a garden, 150 and 6 hundredths acres in grain, and 25 and 39 hundredths acres as an orchard. How many acres are there in the farm?

PROCESS

3.45 A. .8 150.06 25.39 *Ans.* 179.7 A.	Keep the decimal points in a column. Think: 15, 20; do not write 0. Carrying 2, think, 5, 13, 17; write 7; etc. Place a decimal point in the sum underneath the decimal point in the addends. Test by adding downward.

2. Add:

a. 3.47 + .34 + 2.5 + 46.6 + 210.7 + 25.39

b. 12.25 + 6.76 + 4.4 + 89.3 + 165.02 + .84

c. .21 + 186.4 + 98.08 + 13.2 + 5.57 + 213.6

3. An engineer is making a trip of 108.2 miles. How far has he still to go when he has gone (*a*) 69.35 miles? (*b*) 69.2 miles?

PROCESS

a. 108.2 mi. 69.35 *Ans.* 38.85 mi.	Do not write a terminal cipher in the minuend of *a*. In *b* omit decimal cipher.	*b.* 108.2 mi. − 69.2 *Ans.* 39 mi.

4. Subtract:

a. 49.5 − 9.76	*b.* 68.03 − 28.4	*c.* 100.43 − 25.68
d. 58.3 − 8.64	*e.* 813.47 − 10.9	*f.* 201.71 − 65.84
g. 60.4 − 7.85	*h.* 92.15 − 36.8	*i.* 315.22 − 96.67

Reductions

Sight Exercises

1. Change to common fractions — lowest terms:

a. .2	*b*. .02	*c*. .12	*d*. .32	*e*. .42	*f*. .52
g. .4	*h*. .04	*i*. .24	*j*. .44	*k*. .64	*l*. .84
m. .5	*n*. .05	*o*. .35	*p*. .55	*q*. .75	*r*. .95
s. .6	*t*. .06	*u*. .46	*v*. .66	*w*. .86	*x*. .96

2. Change the fractions in the first column to *tenths;* those in the other columns to *hundredths.*

a. $\frac{1}{2}$	*b*. $\frac{1}{25}$	*c*. $\frac{1}{50}$	*d*. $\frac{9}{20}$	*e*. $\frac{6}{25}$	*f*. $\frac{41}{50}$
g. $\frac{1}{4}$	*h*. $\frac{1}{20}$	*i*. $\frac{3}{50}$	*j*. $\frac{11}{20}$	*k*. $\frac{8}{25}$	*l*. $\frac{31}{50}$
m. $\frac{1}{5}$	*n*. $\frac{2}{25}$	*o*. $\frac{7}{50}$	*p*. $\frac{13}{20}$	*q*. $\frac{11}{25}$	*r*. $\frac{21}{50}$
s. $\frac{2}{5}$	*t*. $\frac{3}{20}$	*u*. $\frac{9}{50}$	*v*. $\frac{17}{20}$	*w*. $\frac{21}{25}$	*x*. $\frac{43}{50}$

Multiplying Decimals

Preparatory Exercises

Give results in decimals, lowest terms.

1. Multiply 3 tenths (*a*) by 2; (*b*) by 3; (*c*) by 5; (*d*) by 9; (*e*) by 8.

2. Multiply 12 hundredths (*a*) by 4; (*b*) by 5; (*c*) by 7; (*d*) by 9; (*e*) by 10.

3. Multiply .25 (*a*) by 3; (*b*) by 2; (*c*) by 5; (*d*) by 4; (*e*) by 6.

4. Multiply 2.5 (*a*) by 5; (*b*) by 2; (*c*) by 4; (*d*) by 8; (*e*) by 3.

5. Multiply 1.25 (*a*) by 4; (*b*) by 7; (*c*) by 9; (*d*) by 8; (*e*) by 10.

Decimal in Multiplicand

Written Exercises

1. At 37.25 tons each, what is the weight (*a*) of 5 cars? (*b*) Of 6? (*c*) Of 8?

PROCESS

a. 37.25 T.	*b.* 37.25 T.	*c.* 37.25 T.
× 5	× 6	× 8
Ans. 186.25 T.	*Ans.* 223.5 T.	*Ans.* 298 T.

Write the decimal point in the product when it is reached in performing the multiplication. In (*b*) omit the cipher in hundredths' place. In (*c*) omit both decimal ciphers.

2. Find products:

a. 7×82.5 *b.* 18.55×8 *c.* 3×9.56 *d.* 98.5×2
e. 5×73.9 *f.* 27.35×6 *g.* 5×8.44 *h.* 37.5×4

3. (*a*) At 26 bushel to the acre, how many bushels of wheat will 8.75 acres yield? (*b*) What will be the yield of 54 acres of potatoes at 87.5 bushels to the acre?

PROCESS

a. 8.75		*b.* 87.5 bu.
× 26 bu.	In (*a*) use 26 as the multiplier. Reject the terminal decimal cipher in the product.	× 54
5250		3500
1750	Omit decimal points in the partial products.	4375
Ans. 227.5∅ bu.		*Ans.* 4725.∅ bu.

4. Find products:

a. 23×69.7 *b.* 9.25×24 *c.* 92×69.75 *d.* 17.5×96
e. 32×58.9 *f.* 7.34×45 *g.* 88×58.25 *h.* 23.4×85

Decimal Quotients

Preparatory Exercises

1. Give answers: *a.* 4)$2.84. *b.* 5)$2.05. *c.* 4)$1.64.

2. Divide by 3: *a.* 9 tenths. *b.* 69 hundredths.

3. Divide by 2: *a.* 10 hundredths. *b.* 1 tenth.

Sight Exercises

Give quotients:

a. 2).46 *b.* 2)1.24 *c.* 2).1 *d.* 4)2 *e.* 4)18.

f. 3).99 *g.* 3)1.86 *h.* 5).3 *i.* 6)3 *j.* 5)18.

Written Exercises

1. (*a*) What is the weight of a spike, when 375 weigh 120 pounds? (*b*) A piece of ground containing 145.2 acres is divided into 24 building plots; how many acres are there in each?

PROCESS

a.

```
      .32 lb.   Ans.
375)120.0  lb.
   112 5
     7 50
     7 50
```

b.

```
     6.05 A.   Ans.
24)145.2  A.
   144
     1 20
     1 20
```

Divide as in the case of whole numbers, annexing decimal ciphers in the dividend when necessary. Place a decimal point in the quotient over the decimal point in the dividend.

2. Divide:

a. $35.25 \div 15$ *b.* $700 \div 56$ *c.* $11 \div 44$ *d.* $13.44 \div 24$

e. $69.75 \div 25$ *f.* $909 \div 36$ *g.* $36 \div 48$ *h.* $10.24 \div 32$

Multiplying by 10 and by 100

Preparatory Exercises

1. Multiply by 10: *a*. 2. *b*. 3 tenths. *c*. 2 and 3 tenths. *d*. 23 hundredths.

> *To multiply a decimal by* 10, *move the decimal point in the multiplicand one place to the right.*

Sight Exercises

2. Give products:

a. 10×1.2	*b*. 1.23×10	*c*. 12.3×10	*d*. 10×12.34
e. 10×2.3	*f*. 2.34×10	*g*. 23.4×10	*h*. 10×23.45
i. 10×3.4	*j*. 3.45×10	*k*. 34.5×10	*l*. 10×45.67
m. 10×4.5	*n*. 4.56×10	*o*. 45.6×10	*p*. 10×67.89

Preparatory Exercises

3. Multiply by 100: *a*. 2. *b*. 3 tenths. *c*. 2 and 3 tenths. *d*. 22 hundredths.

> *To multiply a decimal by* 100, *move the decimal point in the multiplicand two places to the right, adding a cipher if necessary.*

Sight Exercises

4. Give products:

a. 100×1.23	*b*. 1.2×100	*c*. 100×12.3	*d*. 100×12.34
e. 100×2.34	*f*. 2.3×100	*g*. 100×23.4	*h*. 100×23.45
i. 100×3.45	*j*. 3.4×100	*k*. 100×34.5	*l*. 100×34.56
m. 100×4.56	*n*. 4.5×100	*o*. 100×45.6	*p*. 100×45.67

Dividing by 10 and by 100

Preparatory Exercises

1. Divide by 10: *a.* 20. *b.* 3. *c.* 23. *d.* 3 tenths.

> *To divide a number by* 10, *move the decimal point in the dividend one place to the left; to divide by* 100 *move it two places.*

2. Divide by 100: *a.* 200. *b.* 230. *c.* 33. *d.* 233.

3. Give quotients:

a. $846 \div 10$ *b.* $846 \div 100$ *c.* $84.6 \div 10$ *d.* $8460 \div 10$
e. $846 \div 20$ *f.* $846 \div 200$ *g.* $84.6 \div 20$ *h.* $8460 \div 20$

Written Exercises

1. *a.* If 89.2 tons of hay are raised on 40 acres, what is the average per acre? *b.* Divide 892 ft. by 400.

PROCESS

a. 4Ø)8.9/2 T.
Ans. 2.23 T.

Cancel 0 in the divisor and move the decimal point in the dividend one place to the left. Divide 8.92 by 4.

b. 4ØØ)8.92/ ft.
Ans. 2.23 ft.

Cancel two ciphers in the divisor and point off two decimal places in the dividend.

In changing the divisor 40 to 4, by what has 40 been divided? In changing 892 to 8.92, by what has 892 been divided?

A quotient is not changed when the divisor and the dividend are divided by the same number.

2. Find quotients:

a. $488 \div 40$ *b.* $486 \div 300$ *c.* $48.8 \div 40$ *d.* $486 \div 40$
e. $584 \div 40$ *f.* $675 \div 500$ *g.* $64.8 \div 30$ *h.* $486 \div 50$

Sight Problems

1. John is driving to Burktown, 20 miles away. How many miles has he to go after driving 9.5 miles?

2. Find the area of a rectangular piece of ground 4.25 rods long and 4 rods wide.

3. If a machine can cut a field of grass in 5 days, what decimal of the field can it cut in one day?

4. How long would a machine take to cut a field of grain if it cuts .25 of it in a day?

5. A can do .07 of a piece of work in a day, B can do .08 of it in a day, and C .1 of it in a day. (*a*) What decimal of the work can all three do in a day? (*b*) How many days would all three require, working together, to do it?

6. After selling 12.6 acres of land, a man has 12.4 acres remaining; how many acres had he at first?

7. How many miles would a train go in 4 hours at the rate of 40.5 miles per hour?

8. How many hours would a train require to go 90.6 miles at the rate of 30.2 miles per hour?

9. How much longer than a yard is the French meter which contains 39.37 inches?

10. A man bought a horse for $200. He sold it at a profit of .2 times the cost. (*a*) What profit did he make? (*b*) What was the selling price?

11. A farmer bought a cow for $50. He sold it for $60. (*a*) What was his profit? (*b*) What fraction of the cost was the profit? (*c*) What decimal?

12. At $8 per thousand what is the cost of 4.5 thousand bricks?

Written Problems

1. A train starts for Seattle, 1000 miles distant. How far is it from Seattle when it has gone 897.54 miles?

2. A rectangular field is 51.2 rods long and 42.5 rods wide. (*a*) How many square rods does it contain? (*b*) How many acres are there in the field at 160 square rods to the acre?

3. If a man can plow a field in 12.5 days, what decimal of the field can he plow in 1 day?

4. How many days would a man require to plow a field if he plows .16 of it in 1 day?

5. A can do .12 of a piece of work in a day, B can do .13 of it in a day, and C can do .15 of it in a day. (*a*) What decimal of it can all three do in a day? (*b*) How many days would it take the three together to do the work?

6. After selling 87.3 acres of land, Mr. Draper has 72.7 acres remaining. How many acres had he at first?

7. How many miles would a train go in 12.8 hours at the rate of 42.5 miles per hour?

8. How many hours would a train require to go 900 miles at the rate of 37.5 miles per hour?

9. There are 3300 feet in $\frac{5}{8}$ mile. How many more inches are there in $\frac{5}{8}$ mile than in 1000 meters of 39.37 inches each?

10. A man bought a horse for $240. He sold it at a profit of .15 times the cost. (*a*) What profit did he make? (*b*) What was the selling price?

11. A farmer bought a cow for $48. He sold it for $57.60. (*a*) What fraction of the cost was the profit? (*b*) What decimal? (*c*) What fraction of the selling price was the profit?

Multiplying and Dividing by .5 and .25

Written Exercises

1. How much bread does a family use in a year if it averages per day (*a*) 2.5 lb.? (*b*) 3.25 lb.?

PROCESS

a.	*b.*
2.5 lb.	3.25 lb.
× 365	× 365
182.5	91.25
730	1095
Ans. 912.5 lb.	1186.25 lb.

In (*a*) use 2.5 as the multiplier. Multiply 365 by .5 by dividing 365 by 2. In (*b*) multiply 365 by .25 by dividing 365 by 4.

2. Find products: *a.* 364 × .5. *b.* 432 × 1.5. *c.* 388 × .25. *d.* 486 × 1.25.

3. Find quotients: *a.* 359 ÷ .5. *b.* 297 ÷ .25. *c.* 398 ÷ .25. *d.* 486 ÷ .25.

Sight Exercises

1. A factory decreased the quantity of coal used per day from 2.8 tons to 2.3 tons. (*a*) What decimal of a ton was saved per day? (*b*) How many tons were saved in a year of 296 working days? (*c*) How many tons are saved in the same period when the daily saving is .25 ton per day?

2. How many days are required to save 49 tons of coal when the daily saving is (*a*) .5 ton? (*b*) .25 ton?

3. Give products:

a. 84 × .5 *b.* .5 × 66 *c.* 48 × .25 *d.* .25 × 36

4. Give quotients:

a. 84 ÷ .5 *b.* 91 ÷ .5 *c.* 42 ÷ .25 *d.* 31 ÷ .25

Division of Fractions — Divisor a Whole Number

Preparatory Exercises

1. Give answers:

a. 3)6 sevenths *b.* 4)8 ninths *c.* 2)4 fifths

d. $\frac{8}{9} \div 2 = ?$ *e.* $\frac{9}{10} \div 3 = ?$ *f.* $\frac{4}{3} \div 2 = ?$

2. When $\frac{1}{2}$ of an apple is divided into 2 equal parts, what fraction of the apple is each part?

3. When $\frac{1}{2}$ a pie is divided into 3 equal parts, what fraction of the pie is each part?

> *To divide a fraction by a whole number, divide its numerator by the number, or multiply its denominator by the number.*

Sight Exercises

1. Divide by 2:

a. $\frac{1}{2}$ *b.* $\frac{1}{3}$ *c.* $\frac{2}{3}$ *d.* $\frac{1}{4}$ *e.* $\frac{3}{4}$ *f.* $\frac{3}{2}$ *g.* $1\frac{1}{2}$
h. $\frac{2}{5}$ *i.* $\frac{6}{5}$ *j.* $\frac{3}{5}$ *k.* $\frac{1}{6}$ *l.* $\frac{5}{6}$ *m.* $\frac{4}{3}$ *n.* $1\frac{1}{3}$

2. Divide by 3:

a. $\frac{2}{3}$ *b.* $\frac{3}{4}$ *c.* $\frac{1}{5}$ *d.* $\frac{3}{5}$ *e.* $\frac{9}{10}$ *f.* $\frac{3}{2}$ *g.* $1\frac{1}{2}$
h. $\frac{3}{10}$ *i.* $\frac{2}{5}$ *j.* $\frac{1}{6}$ *k.* $\frac{5}{6}$ *l.* $\frac{4}{5}$ *m.* $\frac{4}{3}$ *n.* $1\frac{1}{3}$

3. Divide by 4:

a. $\frac{2}{3}$ *b.* $\frac{3}{4}$ *c.* $\frac{4}{5}$ *d.* $\frac{5}{6}$ *e.* $\frac{3}{10}$ *f.* $\frac{8}{3}$ *g.* $2\frac{2}{3}$
h. $\frac{2}{5}$ *i.* $\frac{1}{6}$ *j.* $\frac{1}{2}$ *k.* $\frac{1}{10}$ *l.* $\frac{8}{9}$ *m.* $\frac{3}{2}$ *n.* $1\frac{1}{2}$

4. Give quotients:

a. $2)\underline{8\frac{1}{2}}$ *b.* $2)\underline{10\frac{1}{3}}$ *c.* $2)\underline{12\frac{2}{3}}$ *d.* $2)\underline{20\frac{1}{3}}$

e. $3)\underline{9\frac{1}{3}}$ *f.* $3)\underline{15\frac{3}{5}}$ *g.* $3)\underline{12\frac{1}{2}}$ *h.* $3)\underline{24\frac{1}{3}}$

Written Exercises

1. How many acres would there be in each part of a farm of $435\frac{3}{4}$ acres, if it were divided (*a*) into 3 equal parts? (*b*) Into 4? (*c*) Into 5? (*d*) Into 6?

PROCESS

a. $3\overline{)435\frac{3}{4}}$ A. *Ans.* $145\frac{1}{4}$ A.	*a.* Divide $\frac{3}{4}$ (the remainder) by 3 by dividing the numerator.
b. $4\overline{)435\frac{3}{4}}$ A. *Ans.* $108\frac{15}{16}$ A.	*b.* Change the remainder $3\frac{3}{4}$ into $\frac{15}{4}$. Divide $\frac{15}{4}$ by 4 by multiplying the denominator.
c. $5\overline{)435\frac{3}{4}}$ A. *Ans.* $87\frac{3}{20}$ A.	*c.* Divide $\frac{3}{4}$ (the remainder) by 5 by multiplying the denominator.
d. $6\overline{)435\frac{3}{4}}$ A. *Ans.* $72\frac{5}{8}$ A.	*d.* Change $3\frac{3}{4}$ (the remainder) into $\frac{15}{4}$. Multiply the denominator by 6, which gives $\frac{15}{24}$ for the quotient. Reduce it to $\frac{5}{8}$.

Test each quotient by multiplying it by the divisor.

2. Divide:

a. $2\overline{)296\frac{2}{3}}$	*b.* $2\overline{)387\frac{1}{3}}$	*c.* $2\overline{)432\frac{1}{2}}$	*d.* $2\overline{)585\frac{1}{4}}$
e. $5\overline{)895\frac{5}{9}}$	*f.* $6\overline{)967\frac{1}{5}}$	*g.* $3\overline{)741\frac{3}{8}}$	*h.* $4\overline{)652\frac{4}{5}}$
i. $7\overline{)435\frac{1}{6}}$	*j.* $8\overline{)578\frac{2}{3}}$	*k.* $9\overline{)380\frac{1}{4}}$	*l.* $8\overline{)432\frac{1}{2}}$
m. $4\overline{)894\frac{2}{3}}$	*n.* $5\overline{)947\frac{1}{3}}$	*o.* $6\overline{)749\frac{1}{2}}$	*p.* $7\overline{)604\frac{2}{5}}$

Sight Exercises

Give quotients:

a. $2\overline{)19\frac{1}{2}}$	*b.* $2\overline{)21\frac{1}{3}}$	*c.* $2\overline{)13\frac{2}{3}}$	*d.* $2\overline{)21\frac{1}{4}}$
e. $3\overline{)10\frac{1}{3}}$	*f.* $3\overline{)16\frac{3}{5}}$	*g.* $3\overline{)14\frac{1}{2}}$	*h.* $3\overline{)25\frac{1}{4}}$

Fractional Divisors

Preparatory Exercises

1. When muslin costs 8 cents per yard, what is the cost (*a*) of 2 yards? (*b*) Of $2\frac{1}{4}$ yards? (*c*) Of $1\frac{1}{2}$ yards? (*d*) Of $\frac{5}{8}$ yard?

2. What is the product of 8¢ (*a*) by 2? (*b*) By $2\frac{1}{4}$? (*c*) By $1\frac{1}{2}$? (*d*) By $\frac{5}{8}$?

3. When muslin costs 8 cents per yard, what quantity can be bought (*a*) for 16 cents? (*b*) For 18¢? (*c*) For 12¢? (*d*) For 5¢?

4. What is the quotient of (*a*) 16¢ ÷ 8¢? (*b*) 18¢ ÷ 8¢? (*c*) 12¢ ÷ 8¢? (*d*) 5¢ ÷ 8¢?

5. What is the cost of muslin per yard (*a*) when 2 yards cost 16 cents? (*b*) When $2\frac{1}{4}$ yards cost 18¢? (*c*) When $1\frac{1}{2}$ yards cost 12¢? (*d*) When $\frac{5}{8}$ yard costs 5¢?

ANALYSIS

b. $2\frac{1}{4}$) 18¢ — ×4 ×4 — 9) 72¢ — *Ans.* 8¢

c. $1\frac{1}{2}$) 12¢ — ×2 ×2 — 3) 24¢ — *Ans.* 8¢

d. $\frac{5}{8}$) 5¢ — ×8 ×8 — 5) 40¢ — *Ans.* 8¢

Multiply the divisor and the dividend in (*b*) by 4, in (*c*) by 2, and in (*d*) by 8, making the new divisors 9, 3, and 5, respectively; and the new dividends 72¢, 24¢, and 40¢, respectively. Divide the new dividends by the new divisors.

Test each result by multiplying it by the *original* divisor. The product should be the *original* dividend.

b. $2\frac{1}{4} \times 8¢$ *c.* $1\frac{1}{2} \times 8¢$ *d.* $\frac{5}{8} \times 8¢$

6. Find the quotient (*a*) of 16¢ ÷ 2. (*b*) Of 20¢ ÷ $2\frac{1}{2}$. (*c*) Of 10¢ ÷ $1\frac{1}{4}$. (*d*) Of 5¢ ÷ $\frac{5}{8}$.

Sight Exercises

1. Divide by 1 half: *a.* 3 halves. *b.* 4 halves. *c.* 5 halves. *d.* 7 halves. *e.* 9 halves.

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

3. Divide by 3 halves: *a.* 6 halves. *b.* 9 halves. *c.* 12 halves. *d.* 15 halves.

4. Divide by $\frac{3}{2}$: *a.* $\frac{6}{2}$. *b.* $\frac{9}{2}$. *c.* $\frac{12}{2}$. *d.* $\frac{15}{2}$. *e.* $\frac{21}{2}$.

5. Divide by $1\frac{1}{2}$: *a.* 3. *b.* $4\frac{1}{2}$. *c.* 6. *d.* $7\frac{1}{2}$. *e.* $10\frac{1}{2}$.

6. Divide by $\frac{3}{4}$: *a.* $\frac{9}{4}$. *b.* $\frac{12}{4}$. *c.* $\frac{24}{4}$. *d.* $\frac{30}{4}$. *e.* $\frac{21}{4}$.

7. Divide by $\frac{3}{4}$: *a.* $2\frac{1}{4}$. *b.* $1\frac{2}{4}$. *c.* $1\frac{1}{2}$. *d.* 3. *e.* $2\frac{1}{4}$.

8. At $\$\frac{3}{4}$ per yard, how many yards of silk can be bought (*a*) for $\$5\frac{1}{4}$? (*b*) For $\$7\frac{1}{2}$? (*c*) For \$9? (*d*) For $\$9\frac{1}{4}$? (*e*) For $\$9\frac{1}{2}$?

ANALYSIS

a	*b*	*c*	*d*	*e*
$\frac{3}{4})5\frac{1}{4}$	$\frac{3}{4})7\frac{1}{2}$	$\frac{3}{4})9$	$\frac{3}{4})9\frac{1}{4}$	$\frac{3}{4})9\frac{1}{2}$

Multiply the divisor and the dividend in each case by 4. This changes the foregoing to the following:

aa	*bb*	*cc*	*dd*	*ee*
$3)21$	$3)30$	$3)36$	$3)37$	$3)38$
Ans. 7 (yd.)	10 (yd.)	12 (yd.)	$12\frac{1}{3}$ (yd.)	$12\frac{2}{3}$ (yd.)

Observe that in dividing $5\frac{1}{4}$, etc., by $\frac{3}{4}$, the dividend ($5\frac{1}{4}$) is multiplied by 4 and the product is divided by 3; that is,

To divide by $\frac{3}{4}$, multiply by $\frac{4}{3}$; to divide by $\frac{1}{2}$, multiply by $\frac{2}{1}$; to divide by $\frac{1}{4}$, multiply by $\frac{4}{1}$; to divide by $\frac{3}{2}$, multiply by $\frac{2}{3}$.

To divide by a fraction, multiply by the inverted fraction.

Written Exercises

1. A farmer raised 32 bushels of corn on $\frac{3}{4}$ acre. (*a*) What was the yield per acre? (*b*) He raised $25\frac{5}{8}$ tons of alfalfa on $3\frac{3}{4}$ acres. Find the yield per acre.

PROCESS

a. $32 \text{ bu.} \div \frac{3}{4} = \frac{32}{1} \text{ bu.} \times \frac{4}{3} = \frac{128}{3} \text{ bu.} = 42\frac{2}{3} \text{ bu.}$ *Ans.*

b. $25\frac{5}{8} \text{ T.} \div 3\frac{3}{4} = \frac{205}{8} \text{ T.} \div \frac{15}{4} = \frac{\cancel{205}^{41}}{\cancel{8}_{2}} \text{ T.} \times \frac{\cancel{4}}{\cancel{15}_{3}} = \frac{41}{6} \text{ T.}$

$= 6\frac{5}{6} \text{ T.}$ *Ans.*

In (*b*) first reduce the mixed numbers to improper fractions. Invert the divisor. Cancel.

2. Divide:

a. $78 \div \frac{3}{4}$	*b.* $77\frac{2}{5} \div \frac{3}{4}$	*c.* $79\frac{1}{3} \div 1\frac{3}{4}$	*d.* $79\frac{1}{3} \div 15\frac{3}{4}$
e. $48 \div \frac{2}{3}$	*f.* $48\frac{2}{9} \div \frac{2}{3}$	*g.* $48\frac{4}{9} \div 2\frac{2}{3}$	*h.* $47\frac{2}{9} \div 16\frac{2}{3}$
i. $82 \div \frac{7}{8}$	*j.* $82\frac{3}{5} \div \frac{7}{8}$	*k.* $82\frac{4}{5} \div 3\frac{3}{8}$	*l.* $82\frac{4}{5} \div 13\frac{1}{2}$

Written Problems

First indicate the operation required to solve each of the following:

1. When material costs $\$\frac{3}{8}$ per yard, how much can be bought (*a*) for $\$\frac{3}{4}$? (*b*) For \$1? (*c*) For $\$1\frac{1}{2}$?

2. What is the cost of 156 baseballs at $\$\frac{3}{4}$ each?

3. At $\frac{7}{8}$ inch each, how many inches of wire will be required for 112 nails?

4. How many nails $\frac{7}{8}$ inch long can be made from 112 inches of wire?

5. (*a*) What is $\frac{4}{5}$ of 240 acres? (*b*) If $\frac{4}{5}$ of a farm contains 240 acres, how many acres are there in the farm?

6. When tea is $\frac{3}{5}$ dollar per pound, how many pounds can be bought for $\$3\frac{3}{10}$?

Aliquot Parts of a Dollar

Preparatory Exercises

1. How many cents are there (*a*) In $\$\frac{1}{2}$? (*b*) In $\$\frac{1}{4}$?

2. What part of a dollar is (*a*) 50¢? (*b*) $12\frac{1}{2}$¢? (*c*) 25¢?

3. At $\$\frac{1}{4}$ each, find the cost (*a*) of 24 baseballs. (*b*) Of 36 baseballs. (*c*) Of 48 baseballs. (*e*) Of 88 baseballs.

Written Exercises

1. Find the cost of 48 yards of cloth (*a*) at \$2.25 per yard. (*b*) At $\$2.12\frac{1}{2}$ per yard.

PROCESS

a.	$\$2\frac{1}{4}$	In (*a*) indicate the product of $\$2\frac{1}{4}$ by 48. Use, however, $2\frac{1}{4}$ as a multiplier. Write 12, ($\frac{1}{4}$ of 48) then 96 (twice 48). Combine the partial products.	*b.*	$\$2\frac{1}{8}$
	$\times 48$			$\times 48$
	12			6
	96			96
	\$108 *Ans.*			\$102 *Ans.*

2. Find answers (change the cents to fraction of a dollar):

a.	*b.*	*c.*	*d.*	*e.*
$\$2.50$	$\$3.12\frac{1}{2}$	$\$4.25$	$\$5.50$	$\$6.12\frac{1}{2}$
$\times 72$	$\times 72$	$\times 72$	$\times 72$	$\times 72$

Sight Exercises

1. Give products :

a.	*b.*	*c.*	*d.*	*e.*
$\$0.25$	$\$0.12\frac{1}{2}$	$\$0.50$	$\$0.50$	$\$0.12\frac{1}{2}$
$\times 36$	$\times 48$	$\times 24$	$\times 22$	$\times 88$

f.	*g.*	*h.*	*i.*	*j.*
$\$0.50$	$\$0.12\frac{1}{2}$	$\$0.25$	$\$0.25$	$\$0.12\frac{1}{2}$
$\times 224$	$\times 808$	$\times 484$	$\times 448$	$\times 816$

Preparatory Exercises

1. At 50 cents each, how many articles can be bought (*a*) for $1? (*b*) For $2? (*c*) For $3? (*d*) For $\frac{1}{2}$?

2. At 25 cents each, how many baseballs can be bought (*a*) for $1? (*b*) For $2? (*c*) For $3? (*d*) For $\frac{1}{4}$? (*e*) For $\frac{1}{2}$? (*f*) For $\frac{3}{4}$? (*g*) For $1\frac{1}{4}$? (*h*) For $1\frac{1}{2}$?

3. At $12\frac{1}{2}$ cents per yard, how many yards can be bought (*a*) for $1? (*b*) For $2? (*c*) For $3? (*d*) For $\frac{1}{2}$? (*e*) For $\frac{1}{4}$? (*f*) For $1\frac{1}{8}$? (*g*) For $1\frac{1}{4}$? (*h*) For $1\frac{1}{2}$?

Sight Exercises

1. Give quotients :

a. $\frac{1}{2}$)$25 *b*. $\frac{1}{4}$)$21 *c*. $\frac{1}{8}$)$11 *d*. $\frac{1}{2}$)$13

e. $\frac{1}{2}$)24\frac{1}{2}$ *f*. $\frac{1}{4}$)21\frac{1}{4}$ *g*. $\frac{1}{8}$)11\frac{1}{8}$ *h*. $\frac{1}{4}$)11\frac{1}{2}$

Written Exercises

1. At $12\frac{1}{2}$ cents per yard, how many yards can be bought (*a*) for $24\frac{1}{4}$? (*b*) For $37\frac{3}{8}$? (*c*) For $42\frac{1}{2}$?

PROCESS

a	*b*	*c*
$.12$\frac{1}{2}$)$24$\frac{1}{4}$	$.12$\frac{1}{2}$)$37$\frac{3}{8}$	$.12$\frac{1}{2}$)$42$\frac{1}{2}$
Ans. 194 (yd.)	*Ans.* 299 (yd.)	*Ans.* 340 (yd.)

The quotient (*a*) of 24\frac{1}{4}$ by $\frac{1}{8}$ is 8 times $24\frac{1}{4}$.

2. At 8 yards for $1, how many yards can be bought for (*a*) $33? (*b*) $42\frac{1}{4}$? (*c*) $62\frac{1}{2}$? (*d*) $37\frac{3}{4}$?

3. Find quotients :

a. $.25)$37 *b*. $.25)$42$\frac{1}{4}$ *c*. $.25)$63$\frac{1}{2}$

d. $.25)$18$\frac{3}{4}$ *e*. $.12$\frac{1}{2}$)$62 *f*. $.12$\frac{1}{2}$)$56$\frac{1}{4}$

Multiplying by $12\frac{1}{2}$, 25, 50

Preparatory Exercises

1. What is (*a*) $\frac{1}{2}$ of 100? (*b*) $\frac{1}{4}$ of 100? (*c*) $\frac{1}{8}$ of 100?

2. What part of 100 is (*a*) 50? (*b*) 25? (*c*) $12\frac{1}{2}$?

3. *a*. $50 \div 100 = ?$ *b*. $12\frac{1}{2} \div 100 = ?$ *c*. $25 \div 100 = ?$

4. *a*. $12\frac{1}{2} = \frac{100}{?}$ *b*. $25 = \frac{100}{?}$ *c*. $50 = \frac{100}{?}$

5. Multiply. First cancel 24 and the denominator of each fraction.

a. $24 \times \frac{100}{2}$ *b*. $24 \times \frac{100}{8}$ *c*. $24 \times \frac{100}{4}$

6. Give products:

a. 25×24	*b*. 50×24	*c*. $12\frac{1}{2} \times 24$	*d*. 24×25
e. 25×48	*f*. 50×48	*g*. $12\frac{1}{2} \times 48$	*h*. 36×25
i. 25×26	*j*. 50×27	*k*. $12\frac{1}{2} \times 96$	*l*. 50×96
m. 25×64	*n*. 50×86	*o*. $12\frac{1}{2} \times 64$	*p*. 96×25

Sight Problems

1. At 3 pairs for \$1, what will be the cost of 24 pairs of stockings?

2. Find the area of a piece of ground 25 feet wide, 124 feet long.

3. At 48 bushels per acre, how many bushels of corn will $12\frac{1}{2}$ acres yield?

4. How many miles will a train go in 18 hours at the rate of 25 miles per hour?

5. At 25 cents per hour, how much will a man earn in 6 days of 8 hours each?

Written Exercises

1. Find the area of a rectangle 264 yards long, when its width is (*a*) $12\frac{1}{2}$ yards? (*b*) 25 yards? (*c*) 50 yards?

SUGGESTION. — Write the examples as shown below. Mentally affix two ciphers to the multiplicand. Divide the new multiplicand (*a*) by 8, (*b*) by 4, and (*c*) by 2, respectively.

PROCESS

	a	*b*	*c*
	264	264	264
	$\times 12\frac{1}{2}$	$\times 25$	$\times 50$
Ans.	3300 (sq. yd.)	6600 (sq. yd.)	13,200 (sq. yd.)

Test the results by rejecting two ciphers and multiplying by 8, by 4, and by 2, respectively.

2. Multiply by 25 : *a*. 136. *b*. 256. *c*. 332. *d*. 464.

3. Multiply by $12\frac{1}{2}$: *a*. 136. *b*. 256. *c*. 336. *d*. 464.

4. Multiply by 50 : *a*. 136. *b*. 256. *c*. 336. *d*. 474.

Written Problems

1. At $3 per dozen pairs, what will be the cost of 42 pairs of socks?

2. Find the area of a building lot 25 feet by 138 feet.

3. At 46 bushels per acre, how many bushels of corn would $112\frac{1}{2}$ acres yield?

4. How many miles could a steamer go in a week at the rate of 25 miles per hour?

5. At 25 cents per hour, how much could a man earn in a year of 309 working days if he worked 8 hours per day?

6. At $12\frac{1}{2}$ cents per pound, find the value of 8 chickens averaging $7\frac{1}{2}$ pounds each.

Dividing by 50, 25, $12\frac{1}{2}$

Preparatory Exercises

1. What part of 100 is (*a*) 50? (*b*) 25? (*c*) $12\frac{1}{2}$?
2. *a*. $50 = 100 \times ?$ *b*. $25 = 100 \times ?$ *c*. $12\frac{1}{2} = 100 \times ?$
3. *a*. $50 \div 100 = ?$ *b*. $25 \div 100 = ?$ *c*. $12\frac{1}{2} \div 100 = ?$

Sight Exercises

1. How long will it require a man to travel 675 miles at the rate of (*a*) 25 miles per hour? (*b*) $12\frac{1}{2}$ miles? (*c*) 50 miles?

Divide the dividend and the divisor by 100. This makes the former $6\frac{3}{4}$ in each case, and the latter $\frac{1}{4}$, $\frac{1}{8}$, and $\frac{1}{2}$, respectively. Divide the new dividend by the new divisor; that is, multiply the former by the latter inverted; 4, 8, 2, respectively.

2. Divide 3025 (*a*) by 25. (*b*) By $12\frac{1}{2}$. (*c*) By 50.
3. Divide 1250 (*a*) by 50. (*b*) By 25. (*c*) By $12\frac{1}{2}$.
4. Divide 2175 (*a*) by 50. (*b*) By 25. (*c*) By $12\frac{1}{2}$.

Sight Problems

1. A row of houses extends 800 feet along a street. How many houses are there when each is (*a*) 20 feet wide? (*b*) 25 feet wide?

2. When the average yield per acre is 25 bushels, how many acres will yield 925 bushels?

3. A drover paid \$1125 for 25 cows; what was the average price?

4. A rectangular field contains 2225 square rods. Its width is 25 rods. What is its length?

Written Exercises

1. How many acres will yield 2450 bushels of grain when the yield per acre is (*a*) $12\frac{1}{2}$ bushels? (*b*) 25 bu.? (*c*) 50 bu.?

ANALYSIS

(*a*) $2450 \div 12\frac{1}{2} = 24\frac{1}{2} \div \frac{1}{8} = 24\frac{1}{2} \times 8 = 196$ (A.). *Ans.*
(*b*) $2450 \div 25 = 24\frac{1}{2} \div \frac{1}{4} = 24\frac{1}{2} \times 4 = 98$ (A.). *Ans.*
(*c*) $2450 \div 50 = 24\frac{1}{2} \div \frac{1}{2} = 24\frac{1}{2} \times 2 = 49$ (A.). *Ans.*

2. Divide by $12\frac{1}{2}$: *a.* 2700. *b.* 3850. *c.* 4300. *d.* 5550. *e.* 6200.

3. Divide by 25: *a.* 2900. *b.* 3650. *c.* 4400. *d.* 5350. *e.* 6400.

4. Divide by 50: *a.* 2700. *b.* 3950. *c.* 4700. *d.* 5750. *e.* 6900.

Written Problems

1. At 25 passengers to a boat, how many lifeboats would carry 675 passengers?

2. How many acres would be required to produce 2125 bushels of wheat at the rate of 25 bushels to the acre?

3. At 50 pounds to the bushel, what is the weight of 47 bushels of apples?

Sight Problems

1. If a cow gives 750 pounds of milk during June, what is the average per day?

2. If $\frac{1}{25}$ of the milk is butter fat, how many pounds of butter fat are contained in 750 pounds of milk?

3. At \$1.50 per week for feed and labor, what is the cost of keeping a cow for 52 weeks?

Decimals of Three Places

Decimals of three places are read as *thousandths.*

The number 12.345 is read 12 and 345 thousandths; .023 is read 23 thousandths; 1.006 is read 1 and 6 thousandths.

Sight Exercises

Read the following:

a. 3.4	*b.* 2.34	*c.* 1.02	*d.* .102	*e.* 1.023	*f.* 4.001
g. 4.5	*h.* 3.45	*i.* 2.03	*j.* .203	*k.* 2.034	*l.* 5.002
m. 5.6	*n.* 4.56	*o.* 3.04	*p.* .304	*q.* 3.045	*r.* 6.003
s. 6.7	*t.* 5.67	*u.* 4.05	*v.* .405	*w.* 4.056	*x.* 7.004

Comparisons

Preparatory Exercises

Express as common fractions in lowest terms:

1. *a.* 5 tenths *b.* 50 hundredths *c.* 500 thousandths

2. *a.* 2 tenths *b.* 20 hundredths *c.* 200 thousandths

Sight Exercises

1. Compare the following sets:

a. .5, .50, and .500 *b.* .3, .30, and .300 *c.* .4, .40, and .400

2. What is the effect of writing one or more ciphers at the right of a decimal?

3. Compare the following sets:

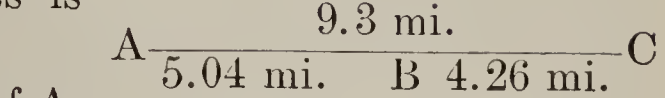
a. .1 and .01	*b.* .01 and .001	*c.* .1 and .001
d. .5 and .05	*e.* .05 and .005	*f.* .5 and .005

4. What is the effect of prefixing (*a*) one decimal cipher? (*b*) Two decimal ciphers?

Adding and Subtracting Decimals

5. (*a*) B is 5.04 miles east of A. C is 4.26 miles east of B. How many miles is C from A?

(*b*) C is 9.3 miles east of A. B is 5.04 miles east of A. How far is it from B to C?



PROCESS

a		*b*
5.04 mi.	To add or to subtract decimals, write the decimal points in the same vertical line. Omit terminal decimal ciphers.	9.3 mi.
+4.26		−5.04
Ans. 9.3 mi.		*Ans.* 4.26 mi.

6. Give answers:

a. 4.5	*b.* 3.25	*c.* 5.004	*d.* 2.89	*e.* 2.009
+.6	+1.5	+ .6	+3.107	+3.021

Subtract:

f. 4.5	*g.* 3.25	*h.* 5.004	*i.* 3.89	*j.* 3.021
−.6	−2.5	− .6	−2.108	−2.009

Written Exercises

1. A mark is worth $.238 and a franc is worth $.193. What is the total value of the two coins?

2. Add the following:

a. 3.47 + .375 + 2.5 + 46.05 + 11.7 + 8.18

b. 12.25 + 5.76 + 83.64 + 4.068 + 18.235

3. Find the difference in our money between the value of a mark and that of a franc.

Multiplying Decimals

Preparatory Exercises

1. Multiply by 3: *a.* 1 tenth. *b.* 11 hundredths. *c.* 13 thousandths. *d.* 1 and 1 tenth. *e.* 2 and 3 hundredths. *f.* 4 and 7 thousandths.

2. Give products:

a.	*b.*	*c.*	*d.*	*e.*	*f.*
.1	.3	.07	.13	.7	3.2
$\times .3$	$\times .3$	$\times .3$	$\times .3$	$\times .3$	$\times .4$

In the product of two decimals, point off as many decimal places as there are decimal places in the multiplier and the multiplicand together.

Written Exercises

1. How far will a train travel in 6.4 hours at the rate of 32.15 miles per hour?

	PROCESS	TEST
32.15 mi.	Omit the decimal point in the	32.15
$\times 6.4$	partial products. Point off three	$\times 8$
12860	(2+1) places in the product. Can-	257.2
19290	cel the terminal decimal cipher.	$\times .8$
Ans. 205.76Ø mi.	Test by multiplying 32.15 by 8, and this product by .8.	205.76

NOTE. — In multiplying decimals, as in all other arithmetical operations, examine the reasonableness of the answer. A pupil that notes that 6 times 32 is nearly 200 will not write the answer as 20.576 or 2057.6.

2. Find products:

a. 3.508×8	*b.* 3508×8.1	*c.* 35.08×8.3	*d.* 3.508×85
e. 2.345×7	*f.* 2345×7.2	*g.* 23.45×7.3	*h.* 2.345×74
i. 4.062×9	*j.* 4003×9.7	*k.* 40.64×9.8	*l.* 4.066×96

Division — Decimal in Quotient

Written Exercises

1. (*a*) At \$125 per acre, how many acres of land will cost \$10,507? (*b*) How many cords of wood, at 128 cubic feet to the cord, are there in a pile of wood containing 720 cubic feet?

a	PROCESS	*b*
Ans. 84.056 (A.)		*Ans.* 5.625 (cords)
125)10507.		128)720.
1000		640
507		800
500		768
700		320
625		256
750		640
750		640

Place a decimal point in the quotient when it is reached in performing the division, and continue the latter, annexing decimal ciphers to the partial dividends as may be required.

Test by multiplying the quotient by the divisor.

2. Find answers:

a. $196 \div 32$ *b.* $42.6 \div 24$ *c.* $1.359 \div 9$ *d.* $6.5 \div 125$
e. $520 \div 64$ *f.* $72.6 \div 15$ *g.* $3.008 \div 8$ *h.* $9.6 \div 128$

Reductions

Sight or Written Exercises

1. Express in lowest terms:

a. $\frac{4}{10}$ *b.* $\frac{4}{100}$ *c.* $\frac{25}{100}$ *d.* $\frac{4}{1000}$ *e.* $\frac{25}{1000}$ *f.* $\frac{125}{1000}$
g. $\frac{2}{10}$ *h.* $\frac{5}{100}$ *i.* $\frac{32}{100}$ *j.* $\frac{5}{1000}$ *k.* $\frac{32}{1000}$ *l.* $\frac{375}{1000}$

Sight or Written Exercises

1. Change $\frac{7}{125}$ to a decimal.

PROCESS

$$125\overline{)7.00}\quad .056\ \textit{Ans.}$$
$$625$$
$$750$$
$$750$$

Since $\frac{7}{125}$ indicates that 7 is to be divided by 125, perform the division. Place a decimal point in the quotient over the decimal point in the dividend. As 70 does not contain 125, place a cipher over the 0, and take 700 for the first partial dividend.

2. Reduce to a decimal:

a. $\frac{1}{25}$ *b.* $\frac{8}{125}$ *c.* $\frac{17}{125}$ *d.* $\frac{23}{125}$ *e.* $\frac{107}{125}$ *f.* $\frac{119}{125}$

3. Express as a common fraction in lowest terms:

a. .036 *b.* .135 *c.* .027

PROCESS

a. $.036 = \frac{36}{1000} = \frac{9}{250}$. *Ans.*

b. $.135 = \frac{135}{1000} = \frac{27}{200}$. *Ans.*

c. $.027 = \frac{27}{1000}$. *Ans.*

Write each in the form of a common fraction and reduce to lowest terms by dividing the numerator and the denominator by the same number; 2, 4, 8; 5, 25, 125.

NOTE. — A fraction having 10, 100, or 1000 for its denominator can be reduced to lower terms only when its numerator is either an even number, or terminates in 5.

4. Change to common fractions in lowest terms:

a. .062 *b.* .065 *c.* .068 *d.* .064 *e.* .069 *f.* .008
g. .012 *h.* .015 *i.* .024 *j.* .025 *k.* .123 *l.* .234

5. Express as the fraction of a dollar:

a. 2 mills *b.* 3 mills *c.* 4 mills *d.* 5 mills
e. 6 mills *f.* 7 mills *g.* 8 mills *h.* 9 mills

Multiplying a Decimal by 10, 100, etc.

Preparatory Exercises

1. Multiply by 10: *a.* 3 tenths. *b.* 5 hundredths. *c.* 23 thousandths. *d.* 1 and 5 tenths.

2. Multiply by 100: *a.* .32. *b.* 3.65. *c.* 42.7. *d.* .003. *e.* 1.234. *f.* 3.5.

3. Multiply by 1000: *a.* 2.7. *b.* 4.03. *c.* .502. *d.* .007. *e.* 1.234. *f.* 3.7.

> *To multiply a decimal by* 10, 100, 1000, *etc., move the decimal point one, two, three, etc., places to the right, annexing ciphers when necessary.*

Sight Exercises

1. Give products:

a. 10×8.46	*b.* 13.07×10	*c.* $.05 \times 1000$
d. 100×9.5	*e.* 24.6×100	*f.* $1000 \times .22$
g. 10×6.09	*h.* 10×23.75	*i.* 100×4.09

2. Multiply:

a. $30 \times .12$	*b.* 22.06×40	*c.* 20×6.034
d. 20×4.5	*e.* 1.2×500	*f.* $300 \times .421$
g. 200×3.21	*h.* $.232 \times 30$	*i.* 50×1.02

Written Exercises

1. At \$800 per mile, find the cost of building a road 7.845 miles long.

2. Multiply:

a. 80×3.745	*b.* 4.076×700	*c.* 900×3.18
d. 50×463.4	*e.* $.069 \times 8000$	*f.* $7000 \times .49$
g. $600 \times .085$	*h.* 23.819×60	*i.* 400×23.8

Dividing by 10, 100, 1000, etc.

Preparatory Exercises

1. Divide by 10: *a.* 3. *b.* 7 tenths. *c.* 17 hundredths. *d.* 1 and 5 tenths.

2. Divide by 100: *a.* 23. *b.* 2.3. *c.* 3 tenths. *d.* 2 and 8 tenths.

3. Divide by 1000: *a.* 37. *b.* 3. *c.* 149. *d.* 1875. *e.* 21437.

> *To divide a decimal by* 10, 100, *etc., move the decimal point one, two, etc., places to the left, prefixing decimal ciphers when necessary.*

Sight Exercises

1. Give quotients:

a. 846 ÷ 10	*b.* 957 ÷ 100	*c.* 8 ÷ 1000
d. 73.9 ÷ 10	*e.* 83.5 ÷ 100	*f.* 16 ÷ 1000
g. 6.45 ÷ 10	*h.* 6.3 ÷ 100	*i.* 253 ÷ 1000

Divisors ending in Ciphers

1. A piece of ground contains 204.8 square rods. At 160 square rods to the acre, find its area in acres.

```
Ans.  1.28 (A.)
16∅)20.4/8
    16
     44
     32
     128
     128
```

PROCESS

Divide the divisor by 10 by canceling the terminal cipher. Divide the dividend by 10 by moving the decimal point one place to the left.

Divide 20.48 (the new dividend) by 16 (the new divisor).

Written Exercises

2. Find quotients:

a. $483 \div 40$	*b.* $984 \div 60$	*c.* $483 \div 300$
d. $690 \div 80$	*e.* $72.1 \div 50$	*f.* $248 \div 500$
g. $51.7 \div 20$	*h.* $576 \div 90$	*i.* $11.9 \div 700$

Decimal Divisors

1. At 16.5 feet to the rod how many rods are there (*a*) in 79.596 feet? (*b*) In 20,361 feet?

(*a*)	PROCESS	(*b*)
Ans. 4.824 (rods)		*Ans.* 1234 (rods)
16,5)79,5.96		16,5)20361,0
660		165
1359		386
1320		330
396		561
330		495
660		660
660		660

Change 16.5 (the divisor) to the whole number 165 by moving the decimal point one place to the right, which multiplies it by 10. Multiply each of the two dividends by 10, in (*a*) by moving the decimal point one place to the right, and in (*b*) by annexing a cipher.

2. Find quotients:

a. $2.08 \div 3.2$ *b.* $76.8 \div .24$ *c.* $1.368 \div .9$ *d.* $6.5 \div .125$

3. Divide:

a. $12.124 \div 3.5$ *b.* $8.4 \div .032$ *c.* $.252 \div .48$ *d.* $209 \div 1.6$

Sight Problems

1. What is the cost of silk per yard, when 8 yards cost $9?

2. At 5 mills each, what is the cost of 144 pens?

3. After walking 11.9 miles, how far must a boy walk to complete 20 miles?

4. How many inches are there in 1000 meters, a meter being 39.37 inches?

5. A surveyor's chain consists of 100 links of 7.92 inches each. How many inches long is the chain?

6. Change 10 ounces to the decimal of a pound.

7. How many inches are there in .75 yard?

8. Find the cost of 4125 bricks at $8 per 1000.

9. The difference in the size of two fields is 1.5 acres; the smaller contains 8.35 acres; how many acres does the other contain?

10. After spending 75 hundredths of his money a boy has 21 cents; how much did he spend?

11. How many inches are there in 3.25 feet?

12. The owner of $\frac{5}{8}$ of a vessel sold .6 of the vessel; what decimal of the vessel did he then own?

13. How much must be added to $\frac{18}{25}$ of a dollar to make 8 dimes?

14. Reduce .25 of a yard to the decimal of a foot.

15. Change 3 hours to the decimal of a day.

16. (*a*) What fraction of a bushel is 12 qt.? (*b*) What decimal?

17. How many mills in .25 dollar?

18. What is the value of a German 20-mark piece in United States money at 23.8 cents to the mark?

Written Problems

1. What is the cost of cloth per yard when 164 yards cost $184.50?

2. At 4 mills on the dollar how much taxes must be paid on property valued at $12,450?

3. After traveling 34.875 miles, how far must a man go to travel 40 miles?

4. What is the cost in United States money of an automobile valued at 8000 francs, at 19.3 cents each?

5. A surveyor's chain consists of 100 links of 7.92 inches each. What is its length (*a*) in feet? (*b*) In rods?

6. Change 22.5 minutes to the decimal of an hour.

7. How many cubic feet are there in 9.375 cords at 128 cubic feet to the cord?

8. Find the cost of 78,625 feet of lumber at $16 per 1000 feet.

9. The difference in the size of two fields is 10.375 acres; the smaller contains 24.65 acres. How many acres does the other contain?

10. After selling 875 thousandths of his hay, a man has 112 tons left. How many tons had he at first?

11. How many minutes are there in 55 hundredths of an hour?

12. The owner of .75 of a schooner sold .8 of his share. (*a*) What decimal of the boat did he sell? (*b*) At the rate of $1500 for the share sold, what is the value of the schooner?

13. How much less than $500 are 100 pounds sterling, which are equal to $486.65?

Multiplying and Dividing by .125

Sight Exercises

1. At 320 rods to the mile, how many rods are there in .125 mile?

PROCESS

320 rd. $\times$ .125 = 320 rd. $\times \frac{1}{8}$ = 320 rd. $\div$ 8 = 40 rd. *Ans.*

2. Find products:

a. 24 $\times$ .125 *b.* .125 $\times$ 32 *c.* 168 $\times$ .125 *d.* .125 $\times$ 488
e. 64 $\times$ .125 *f.* .125 $\times$ 96 *g.* 248 $\times$ .125 *h.* .125 $\times$ 648

3. Into how many building sites each containing .125 acre can a field containing 31 acres be divided?

Written Exercises

1. How many cubic feet are there in 9.125 cords of wood at the rate of 128 cubic feet to the cord?

PROCESS

128 cu. ft.
$\times$ 9.125
16
1152
Ans. 1168 cu. ft.

Even if 9.125 is indicated as the multiplier, use $9\frac{1}{8}$. The former may be written as is here shown, with the decimal extending beyond the ones' figure of the multiplicand.

2. Find products:

a. 256 $\times$ .125 *b.* 2.125 $\times$ 368 *c.* 496 $\times$ 3.125

3. How many pieces of ribbon each .125 yd. long can be cut from a roll containing (*a*) 32 yd.? (*b*) 31.75 yd.? (*c*) 32.625 yd.?

PROCESS	
(*a*) .125 yd.)32 yd. *Ans.* 256 (pieces)	(*a*) Indicate the division of 32 by .125, but obtain the result by multiplying the former by 8.
(*b*) .125 yd.)31.75 yd. *Ans.* 254 (pieces)	(*b*) In writing the product of 31.75 by 8, omit the decimal ciphers.
(*c*) .125 yd.)32.625 yd. *Ans.* 261 (pieces)	(*c*) If you remember that .625 = $\frac{5}{8}$, think at once .625 × 8 = 5, and carry 5 to the product of 8 times 2.

4. Find quotients:

a. 28 ÷ .125 *b.* 28.125 ÷ .125 *c.* 28.5 ÷ .125
d. 34 ÷ .125 *e.* 34.375 ÷ .125 *f.* 36.4 ÷ .125

Denominate Numbers

Liquid Measure		Dry Measure	
2 pints (pt.)	1 quart (qt.)	8 quarts (qt.)	1 peck (pk.)
4 quarts	1 gallon (gal.)	4 pecks	1 bushel (bu.)

Preparatory Exercises

1. (*a*) How many quarts of milk does a 10-gallon can contain? (*b*) How many pints?

2. What is the cost of 2 qt. 1 pt. of ice cream at the rate of 15 cents a pint?

3. How much does a farmer receive for a 40-quart can of milk at 13 cents a gallon?

4. How many $\frac{1}{2}$-pint plates of ice cream are there in a gallon?

Reductions — Lower Denominations

Sight Exercises

1. Reduce:

a. 12 ft. to inches
b. 7 ft. 6 in. to inches
c. 4 yd. to inches
d. 41 yd. to feet
e. 9 yd. 2 ft. to feet
f. 2 rd. to feet

2. Change:

a. $\frac{3}{4}$ ft. to inches
b. .2 T. to pounds
c. .75 lb. to ounces
d. $\frac{2}{3}$ yd. to feet
e. .5 ft. to inches
f. .25 yd. to inches

Written Exercises

1. When 1 inch of wire is required to make a tack, how many tacks can be made (*a*) from 43 yards of wire? (*b*) From 129 ft. 9 in.?

PROCESS

(*a*) 43 (yd.)
3 ft.
129 (ft.)
12 in.
1548 in. *Ans.*

(*b*) 129 ft. 9 in.
12
1557 in. *Ans.*

(*a*) Since there are 3 ft. in 1 yd., in 43 yd. there are 43 times 3 ft., or 129 ft. Since there are 12 inches in 1 ft., in 129 ft. there are 129 times 12 in., or 1548 in. In practice, however, use 3 and 12 as the multipliers.

(*b*) Multiply 129 by 12 and "add in" 9. Think 12 nines are 108; adding in 9, makes 117; write 7 and carry 11. Think 12 twos are 24; carrying 11, makes 35; write 5 and carry 3; etc.

2. Reduce:

a. 47 yd. to inches
b. 27. ft. 6 in. to inches
c. 28 bu. to quarts
d. 22 pk. 6 qt. to quarts
e. 83 gal. to pints
f. 39 qt. 1 pt. to pints

Higher Denominations

Sight Exercises

1. Reduce:

a. 120 in. to ft. *b.* 129 in. to ft. and in.
c. 160 qt. to gal. *d.* 161 qt. to gal. and qt.

2. Change to a fraction of the next higher denomination:

a. 40 sec. *b.* 1 pt. *c.* 2 qt. *d.* 8 in. *e.* 2 ft.

3. Change to a decimal of the next higher denomination:

a. 45 min. *b.* 12 sec. *c.* 3 mo. *d.* 10 oz. *e.* 3 pk.

Written Exercises

1. When 1 inch of wire is required to make a tack, how much wire will be required to make (*a*) 900 tacks? (*b*) 1000 tacks?

PROCESS

(*a*) 12)900 (in.)
3)75 (ft.)
25 (yd.) *Ans.*

(*b*) 12)1000 (in.)
3)83 (ft.) 4 in.
Ans. 27 yd. 2 ft. 4 in.

(*a*) Divide 900 in. by 12 in.; this gives 75 as the number of feet. Divide 75 by 3 to get the number of yards.

(*b*) Divide 1000 in. by 12 in.; this gives 83 as the number of feet, with 4 inches remaining. Divide 83 feet by 3 feet; this gives 27 as the number of yards with 2 feet remaining.

2. Reduce to yards:

a. 648 in. *b.* 996 in. *c.* 864 in. *d.* 756 in.

3. Reduce to yards and feet:

a. 397 ft. *b.* 865 ft. *c.* 578 ft. *d.* 899 ft.

4. Reduce to feet and inches:

a. 150 in. *b.* 400 in. *c.* 625 in. *d.* 795 in.

Compound Numbers. Addition and Multiplication

A number containing two or more related denominate units is called a *compound* number.

Sight Exercises

1. Give sums in bu. and pk., gal. and qt., etc.

a. 3 pk. + 2 pk.	*b.* 1 bu. 3 pk. + 2 pk.	*c.* 1 gal. 3 qt. + 2 qt.	*d.* 1 gal. 3 qt. + 1 gal. 3 qt.
e. 9 oz. + 9 oz.	*f.* 1 lb. 9 oz. + 9 oz.	*g.* 1 yd. 2 ft. + 2 ft.	*h.* 2 yd. 2 ft. + 3 yd. 1 ft.

2. Give products:

a. 3 pk. × 2	*b.* 1 bu. 3 pk. × 3	*c.* 1 gal. 3 qt. × 2	*d.* 1 gal. 3 qt. × 4
e. 9 oz. × 2	*f.* 1 lb. 9 oz. × 2	*g.* 2 lb. 6 oz. × 3	*h.* 1 pk. 7 qt. × 2

Written Exercises

1. A dealer sold 10 gal. 2 qt. of gasoline to one customer, 12 gal. 1 qt. to another, and 13 gal. 3 qt. to a third. How much did he sell the three customers?

2. Add the following:

a. 17 bu. 3 pk. + 13 bu. 2 pk. + 6 bu. 1 pk.

b. 18 gal. 2 qt. + 13 gal. 2 qt. + 4 gal. 2 qt.

3. If an automobile uses 3 gal. 3 qt. of gasoline per day, how much will it use in 6 da.?

4. Multiply:

a. 17 bu. 3 pk. by 5 *b.* 18 gal. 2 qt. by 7

c. 14 pk. 7 qt. by 2

Subtracting Compound Numbers

Sight Exercises

1. Give remainders:

a. 1 pk. − 5 qt.	*b.* 2 pk. 1 qt. − 5 qt.	*c.* 1 bu. 1 pk. − 3 pk.	*d.* 3 gal. 2 qt. − 3 qt.
e. 2 pk. 1 qt. − 1 pk. 5 qt.	*f.* 3 bu. 2 pk. − 1 bu. 3 pk.	*g.* 4 gal. 2 qt. − 2 gal. 3 qt.	*h.* 4 ft. 6 in. − 2 ft. 8 in.

Written Exercises

1. From a barrel of oil containing 45 gal., 28 gal. 2 qt. are sold. How many gallons remain?

2. Subtract:

a. 84 bu. − 35 bu. 3 pk.	*b.* 68 gal. 1 qt. − 39 gal. 3 qt.	*c.* 32 pk. 4 qt. − 18 pk. 6 qt.
d. 48 qt. − 29 qt. 1 pt.	*e.* 45 lb. 7 oz. − 26 lb. 9 oz.	*f.* 72 yd. − 25 yd. 1 ft.

Dividing Compound Numbers

Written Exercises

1. An automobile uses 19 gal. 2 qt. of gasoline in 6 da. How many gallons and quarts does it use, on an average, per day?

2. Divide:

a. 23 lb. 2 oz. ÷ 5	*b.* 16 pk. 4 qt. ÷ 6	*c.* 69 lb. ÷ 8
d. 33 bu. 1 pk. ÷ 7	*e.* 31 gal. 2 qt. ÷ 9	*f.* 80 yd. ÷ 3

3. When a machine uses gasoline at the rate of 3 gal. 2 qt. per day, how long will 84 gal. last?

Measurements — Areas of Rectangles

Preparatory Exercises

1. (*a*) How many inches are there in each side of a 1-foot square? (*b*) How many square inches are there in a square 12 inches long and 12 inches wide? (*c*) How many square inches are there in a square foot?

2. (*a*) How many feet are there in each side of a 1-yard square? (*b*) How many square feet are there in a square 3 feet long, 3 feet wide? (*c*) How many square feet are there in a square yard?

3. (*a*) How many square yards are there in a square $5\frac{1}{2}$ yards long, $5\frac{1}{2}$ yards wide? (*b*) How many square yards are there in a square rod?

Square Measure

144 square inches (sq. in.)	1 square foot (sq. ft.)
9 square feet	1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards	1 square rod (sq. rd.)
160 square rods	1 acre (A.)
640 acres	1 square mile (sq. mi.)

Sight Problems

1. A field is 40 rods long, 40 rods wide. (*a*) How many square rods does it contain? (*b*) How many acres?

2. What are the dimensions of a square field containing 1600 square rods?

3. (*a*) What fraction of a square mile is there in a field $\frac{1}{2}$ mile square? (*b*) How many acres?

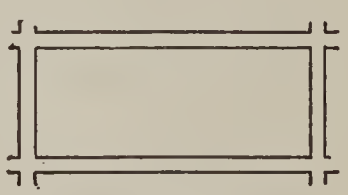
4. It takes a mile of wire fencing to enclose a square field. (*a*) What fraction of a square mile does the field contain? (*b*) How many acres?

Written Problems

1. How many acres are there in a field 60 rods wide, 120 rods long?

$\frac{60 \times 120}{160} = ?$ (A.)	PROCESS Indicate the number of *square rods* in the area by writing 60×120. Indicate the number of *acres* by writing 160 as the divisor of the foregoing. Cancel.

2. How many acres are there in a city block (*a*) 16 rods wide and 40 rods long? (*b*) $\frac{1}{20}$ mile wide and $\frac{1}{8}$ mile long? (*c*) $\frac{1}{20}$ mile wide and $\frac{1}{6}$ mile long?



3. (*a*) How many feet wide is a block, including its share of the street, when there are 20 blocks to a mile? How long is a block when (*b*) there are 8 blocks to a mile? (*c*) 6 blocks to a mile? (*d*) 10 blocks to a mile?

4. At \$2 per square yard, find the cost of a concrete sidewalk 9 ft. wide, 20 ft. long.

Preparatory Exercises

1. The top layer of a box of caramels has 4 rows of 3 caramels each. (*a*) How many caramels are there in the top layer? (*b*) In the bottom layer? (*c*) How many caramels does the box contain if there are two layers?

2. How many 1-inch cubes could be placed in a box 6 inches long, 5 inches wide, 4 inches deep, inside measurement?

3. What is the capacity of a box 4 ft. long, 3 ft. wide, 2 ft. deep?

Volumes of Rectangular Solids

The term *solid*, in connection with measurements, is applied as well to an empty box as to a brick; and the term *volume* is used to denote the *capacity* of the former and also the *cubic contents* of the latter.

A *rectangular solid* has six faces, each of which is a rectangle.

Sight Problems

1. How many cubic inches are there in a brick (*a*) 8 inches long, 4 inches wide, $2\frac{1}{2}$ inches thick? (*b*) 8 inches long, 4 inches wide, 2 inches thick?

2. What fraction of a cubic foot is there in a brick $\frac{2}{3}$ ft. long, $\frac{1}{3}$ ft. wide, $\frac{1}{6}$ ft. thick?

3. (*a*) How many cubic feet are there in a 3-foot cube? (*b*) How many cubic yards? (*c*) How many cubic feet are there in a cubic yard?

Written Exercises

1. How many cubic inches are there in a 12-inch cube?

2. At 231 cubic inches to the gallon, how many cubic inches are there in $7\frac{1}{2}$ gallons?

3. At $1\frac{1}{4}$ cubic feet to the bushel, (*a*) what fraction of a bushel is 1 cubic foot? (*b*) What decimal?

4. How many cubic inches are there in $1\frac{1}{4}$ cubic feet?

5. A cubic foot of water weighs $62\frac{1}{2}$ pounds. Find the weight of a gallon of water, taking $7\frac{1}{2}$ gallons to the cubic foot.

6. How many ounces does a cubic foot of water weigh?

Surfaces of Rectangular Solids

Sight Problems

1. How many square yards are there (*a*) in the floor of a room 6 yards long, 5 yards wide? (*b*) In the ceiling of a room 18 feet long, 15 feet wide? If the room is 9 feet high, (*c*) how many square yards are there in each of the two larger walls? (*d*) In each of the two smaller walls?

2. The top of a brick measures 8 inches by 4 inches. (*a*) What fraction of a square foot would the bottom of a brick cover? (*b*) How many would be required to cover a square foot? One side of a brick measures 8 inches by 2 inches. (*c*) What fraction of a square foot would the side of a brick cover? (*d*) How many bricks laid on the side would cover a square foot?

3. How many square feet of sheet iron are there in the sides and the bottom of a tank 6 feet long, 5 feet wide, and 4 feet deep, allowing 1 square foot for overlapping at the joints?

Sight Exercises

1. Give in square inches the areas of rectangles having dimensions as follows:

a. 36 in. by 25 in. *b.* 3 ft. by 2 ft. 1 in. *c.* 1 yd. by 25 in.
d. 25 in. by 44 in. *e.* 2 ft. by 4 ft. 2 in. *f.* 1 yd. by 10 in.

2. Give areas in square feet:

a. 25 ft. by 16 ft. *b.* 8 ft. by 6 ft. 6 in. *c.* 9 yd. by 16 in.
d. 88 ft. by 50 ft. *e.* 9 ft. by 4 ft. 4 in. *f.* 8 yd. by 18 in.

3. Give areas in square yards:

a. 36 yd. by 25 yd. *b.* 6 yd. by 1 ft. 6 in. *c.* 4 yd. by 18 in.
d. 36 ft. by 20 yd. *e.* 4 yd. by 2 ft. 3 in. *f.* 8 yd. by 27 in.

Sight Problems

1. A bin is 5 ft. long, 5 ft. wide, and 5 ft. high. (*a*) How many cubic feet of grain will it hold? (*b*) How many bushels of grain will it hold at 1.25 cubic feet to the bushel?

2. At the rate of 16 bushels of wheat to the acre, how many acres will yield 100 bushels of wheat?

3. A train goes 720 miles in 18 hours. What is its average rate per hour?

4. A man sold a farm at 1.25 times the price he paid for it. If he sold it for $12,500, what did he pay for it?

5. A boy raised 88 bushels of corn on .8 acre. What is the yield to the acre at that rate?

6. At 80 bushels to the acre what would be the yield on 1.2 acres?

7. Assuming that a pint of water weighs a pound, what would be the weight of $7\frac{1}{2}$ gallons of water?

8. What is the weight of a gallon of milk when 8 gallons weigh 69 pounds?

9. When it takes 25 pounds of milk to make 1 pound of butter, (*a*) what decimal of a pound of butter does a pound of milk make? (*b*) At 30 cents per pound for the butter, what is the value of the butter made from a pound of milk?

10. A train travels 360 miles from 9 A.M. to 7 P.M. What is its average rate per hour?

11. How many square inches are there in a moving picture film 12,000 inches long, $1\frac{1}{4}$ inches wide?

12. A man worked 300 days in a year at the rate of $3 a day. If his expenses averaged $50 per month, what were his yearly savings?

Written Problems

1. A bin is 6.25 ft. long, 3.2 ft. wide, and 4.5 ft. high. (*a*) How many cubic feet of grain will it hold? (*b*) How many bushels will it hold at the rate of 1.25 cubic feet to the bushel?

2. At the rate of 62.5 bushels of corn to the acre, how many acres will be required to yield 1000 bushels of corn?

3. A train goes 851 miles in 18.4 hours. What is its average rate per hour?

4. A man sold a farm at 1.25 times the price he paid for it. If he received $3000 for the farm, what did it cost him?

5. A boy raised 90 bushels of corn on .72 acre. What could he have raised on an acre at this rate?

6. At 84 bushels of corn to the acre, what would be the yield of 87.5 acres?

7. Milk is how many times as heavy as water when the former weighs $8\frac{5}{8}$ lb. per gal. and the latter $8\frac{1}{3}$ lb.? Give answer as a mixed decimal.

8. When milk weighs 8.625 pounds per gallon, how many gallons of milk are there in 690 pounds?

9. If it takes 25 pounds of milk to make 1 pound of butter, (*a*) what decimal of a pound of butter is made from 8.625 pounds of milk? (*b*) What is the butter worth at 30 cents per pound?

10. How many square feet are there in a moving-picture film 1500 feet long, $1\frac{1}{4}$ inches wide?

11. A man worked 300 days in a year, for which he received on an average $3.50 per day. His expenses averaged $2.50 per day for 365 days. How much could he save in a year?

Reviews

Reading and Writing Numbers — Roman Notation

The Romans used I, V, X, L, C, D, and M to indicate, respectively: one, five, ten, fifty, one hundred, five hundred, and one thousand. Their method of expressing other numbers is shown in the following:

TABLE

One I	Ten X	One Hundred C
Two II	Twenty XX	Two Hundred CC
Three III	Thirty XXX	Three Hundred CCC
Four IV	Forty XL	Four Hundred CD
Five V	Fifty L	Five Hundred D
Six VI	Sixty LX	Six Hundred DC
Seven VII	Seventy LXX	Seven Hundred DCC
Eight VIII	Eighty LXXX	Eight Hundred DCCC
Nine IX	Ninety XC	Nine Hundred CM

To express numbers between ten and twenty, twenty and thirty, etc., annex to X, XX, etc., the characters representing the numbers one to nine. To express numbers between one hundred and two hundred, two hundred and three hundred, etc., annex to C, CC, CCC, etc., the characters representing the numbers from one to ninety-nine.

1. Read the following:

a. XVIII	*b.* CCCXIX	*c.* MDCC	*d.* MDCCVI
e. XXXIV	*f.* DCLVII	*g.* MCM	*h.* MCMXV
i. XLIX	*j.* DCCCL	*k.* MCDL	*l.* MCDLX
m. LXXIV	*n.* CDIX	*o.* MCMX	*p.* MCML
q. XCIX	*r.* CMXIV	*s.* MDCX	*t.* MDCCXL

2. Write in Roman numbers:

a. 25	*b.* 470	*c.* 478	*d.* 1,205	*e.* 1,111
f. 74	*g.* 650	*h.* 605	*i.* 1,407	*j.* 1,333

Arabic Numbers

1. Read 30 607 089.

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

The names of the periods are given in the following

TABLE

Millions	Thousands	Ones
30,	607,	089

To read a number, begin at the highest period and read separately the number constituting each period. To each period but the last affix the name of the period.

The foregoing number is read: 30 million, 607 thousand, 89.

NOTE. — Do not use "and" in reading whole numbers.

2. Read the following:

a. 1,307	*b.* 1,256,450	*c.* 4,306,729
d. 25,004	*e.* 370,607	*f.* 45,290,010
g. 163,400	*h.* 38,547,623	*i.* 4,004,004
j. 47,050	*k.* 7,056,008	*l.* 370,056,030

Writing Numbers

1. Write 15 million, 674.

As the millions' period is the third, insert three ciphers for the missing period.

2. Write 216 million, 14 thousand.

Affix three ciphers for the missing ones' period. Prefix a cipher to 14 in the second period.

Reviews — Addition and Subtraction

Oral Drills

To increase a number by 19, 39, 99, etc., increase it by 20, 40, 100, etc., and from the sum subtract 1. Why?

To add 157 and 29, think 187 (157 + 30), 186 (subtracting 1).

1. Give sums:

a. 166 + 19	*b.* 567 + 29	*c.* 215 + 499	*d.* 618 + 299
e. 223 + 59	*f.* 634 + 49	*g.* 374 + 199	*h.* 225 + 699
i. 368 + 39	*j.* 716 + 79	*k.* 183 + 599	*l.* 130 + 899
m. 425 + 69	*n.* 892 + 89	*o.* 437 + 399	*p.* 154 + 799

To subtract 29 from 157, think 127 (157 − 30), 128 (adding 1).

2. Give remainders:

a. 166 − 19	*b.* 567 − 29	*c.* 615 − 499	*d.* 618 − 399
e. 283 − 59	*f.* 634 − 49	*g.* 374 − 199	*h.* 925 − 699
i. 368 − 39	*j.* 716 − 79	*k.* 883 − 599	*l.* 830 − 799
m. 495 − 69	*n.* 823 − 89	*o.* 437 − 299	*p.* 422 − 199

Sight Problems

1. One field yielded 528 bushels of wheat and another yielded 399 bushels. (*a*) What was the yield of the two fields? (*b*) How many more bushels did one yield than the other?

2. In 1915 Jamesville had 899 inhabitants; in 1916 it had 975. What was the increase for the year?

3. A girl bought a hat for $8.25 and dry goods to the amount of 69 cents. How much did she spend for both?

4. William has read 199 pages of a book containing 317 pages. How many pages has he still to read?

Addition and Subtraction

Written Exercises

1. Mr. A bought goods during January to the following amounts:

$57.81, $505, $98.87, $47.64, $0.88, $5.43, $677.42, $98.89, $6.64, and $175.53.

What was the total amount of his January purchases?

2. Add the following. Test.

a. 3783 lb., 59,046 lb., 763,750 lb., 654,528 lb., 9876 lb., 605,231 lb., 67,899 lb., 8500 lb., 4095 lb., and 387 lb.

b. $58, $346.75, $88.77, $1909.36, $4687.34, $504.02, $1986.35, $0.85, $675.98, and $2345.67.

3. Mrs. B has $480. How much will she have after paying bills of $34.78, $65.43, $176.39, and $79.44?

PROCESS

$480.		Think 13, 16, 24, and **6** (writing 6) are 30.
34.78		Think 7, 10, 14, 21, and **9** (writing 9) are 30.
65.43		Think 12, 18, 23, 27, and **3** (writing 3) are 30.
176.39		Think 10, 17, 23, 26, and **2** (writing 2) are 28.
79.44		Think 3 and **1** (writing 1) are 4.
$123.96	*Ans.*	

Test by covering the minuend, $480, with a piece of paper. Write on this the sum of the remainder and the subtrahends adding downwards.

4. From 12,345 take the sum of 3478, 654, 936, and 895.

5. From 6803 take the sum of 478, 654, 2176, 639, and 1234.

Written Exercises

1. From the following table find (*a*) the total number of bushels of each kind of grain received during the week; (*b*) the whole number of bushels of grain received each day in the week; and (*c*) the whole number of bushels of grain received.

Days	Bushels					Totals
	Wheat	Rye	Corn	Oats	Barley	
Monday	2,617	1,484	4,865	6,876	983	16,825
Tuesday	3,208	1,676	3,723	5,943	1,025	(*b*)
Wednesday . . .	1,579	1,520	5,179	5,150	868	(*b*)
Thursday	2,987	1,799	2,344	6,382	1,129	(*b*)
Friday	3,166	2,047	4,777	4,464	748	(*b*)
Saturday	998	1,613	2,983	5,876	1,234	(*b*)
Totals . . .	14,555	(*a*)	(*a*)	(*a*)	(*a*)	(*c*)

Verify the correctness of the work by comparing the sum of the totals of the last line with the sum of the totals of the last column.

2. A farmer sold 6 loads of hay at 50 cents per 100 pounds. Fill out the missing items in the following statement:

Gross Weight	Weight of Wagon	Net Weight	Value at 50¢ per 100 lb.
3,576 lb.	1,328 lb.	2,248 lb.	$11.24
3,424	1,284		
3,562	1,356		
3,517	1,381		
3,449	1,273		
3,463	1,209		
Totals (*a*) lb.	(*b*) lb.	(*c*) lb.	$ (*d*)

3. The following table shows the attendance of each of the eight grades in the Hillside School for each school day of a week :

Days	Grades								School
	1st	2d	3d	4th	5th	6th	7th	8th	
Monday	42	39	36	34	29	25	21	19	245
Tuesday	43	38	37	33	28	24	22	19	(*b*)
Wednesday . . .	42	39	36	34	26	26	20	19	(*b*)
Thursday	44	40	39	35	29	26	22	19	(*b*)
Friday	44	39	37	34	28	24	20	19	(*b*)
Weekly aggregate .	215	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	(*c*)
Daily average . .	43	(*d*)	(*d*)	(*d*)	(*d*)	(*d*)	(*d*)	(*d*)	(*e*)

Find (*a*) the weekly aggregate attendance of each grade; (*b*) the attendance of the school for each day; (*c*) the aggregate attendance of the school for the week; (*d*) the average daily attendance by grades; and (*e*) the average daily attendance of the school.

4. On March 1, a man bought goods amounting to $100. During the month he made payments as follows: $27.48, $8.94, $13.27, and $29.88. Find the balance due March 31.

(See page 97.)

$100.
27.48
8.94
13.27
29.88
$??.43

5. From 2345 take the sum of 456, 789, 28, 142, 356, and 25.

6. Deduct the sum of $13.29, $8.86, $4.57, and $9.50 from $50.

7. A woman deposited $85.50 in the bank. She took out at different times $4.75, $23.90, $8.64, and $17.77. How much had she remaining in the bank?

Sight Problems

1. Find the cost of a pair of shoes at $3.50 and a hat at $1.80.

Think three fifty and one eighty. Omit the words *dollars* and *cents* in giving oral answers.

2. How much change out of $10 is received by the purchaser of articles costing $5.40?

3. How old in 1915 is a boy born in 1904?

4. In 1915 a girl is 16 years old. In what year was she born?

5. A man's yearly salary was $2050. He spent $1650. How many dollars did he save?

6. Two trains start at the same time from the same point and go in opposite directions. If one goes 44 miles in an hour, and the other 48 miles, how far apart are they (*a*) in 1 hour? (*b*) In two hours?

7. Two trains start at the same time from cities 200 miles apart and go towards each other. How far apart are they when one goes 32 miles and the other 34 miles?

8. What is the perimeter of a rectangle 28 rods long 18 rods wide?

9. A machine threshed in a day 800 bushels of oats and 430 bushels of wheat. How many bushels of grain did it thresh in a day?

10. How many men are there in an army when there are 20,000 in the infantry, 7000 in the cavalry, 3000 in the artillery, and 1000 others?

11. A barrel filled with cement weighs 404 pounds. The barrel weighs 24 pounds. What is the weight of the cement?

Multiplication. Short Methods

Sight Drills

Announce the product of 30×43 as twelve ninety; that of 25×88 as 22 hundred.

1. Give products:

a. 33 × 30	*b.* 62 × 40	*c.* 81 × 50	*d.* 51 × 70	*e.* 71 × 80	*f.* 84 × 20
g. 91 × 60	*h.* 44 × 25	*i.* 84 × 25	*j.* 48 × 25	*k.* 24 × 25	*l.* 36 × 25

Written Exercises

1. If a cow gives on an average 147 pounds of milk per week, how many pounds will she give (*a*) in 42 weeks? (*b*) In 24 weeks?

PROCESS

(*a*)		(*b*)	
147 lb.	In (*a*) multiply 294 by 2 to get the product of 147 by 4.	147 lb.	
42		24	
294	In (*b*) multiply first by 2 (tens) placing the right-hand figure of the product under 2.	294	
588		588	
Ans. 6174 lb.	Multiply this product by 2 to get the product of 147 by 4. Place the right-hand figure of the second product under the 4 in the multiplier.	3528 lb.	

2. Find products:

a. 325×42	*b.* 165×24	*c.* 235×93	*d.* 365×39
e. 234×62	*f.* 345×26	*g.* 456×63	*h.* 567×36

3. An engine pumps (*a*) 631 tons of water per day. How many tons does it pump in a year? (*b*) How many tons are pumped in a year by an engine that pumps 136 tons per day?

PROCESS

(*a*)	365×631 T.	To avoid writing an unnecessary line, use 365 for the first partial product. To get the product by 6, take twice the product by 3.	(*b*)	365×136 T.
	1095			1095
	2190			2190
Ans.	230315 T.		*Ans.*	49640 T.

4. Find products:

a. 523×421 *b.* 632×124 *c.* 234×631 *d.* 342×136

Multiplying by $33\frac{1}{3}$; by $16\frac{2}{3}$

Preparatory Exercises

1. *a.* What is $\frac{1}{3}$ of 100? *b.* $33\frac{1}{3}$ is what part of 100?
2. *a.* $33\frac{1}{3} = 100 \times ?$ *b.* $16\frac{2}{3} = 100 \times ?$
3. *a.* $33\frac{1}{3} \div 100 = ?$ *b.* $16\frac{2}{3} \div 100 = ?$

Sight Problems

1. How far will a train go in 24 hours at the rate of (*a*) $33\frac{1}{3}$ miles per hour? (*b*) $16\frac{2}{3}$ miles per hour?

PROCESS

(*a*) $24 \times 33\frac{1}{3} = 2400 \div 3 = 800$ (mi.) *Ans.*
(*b*) $24 \times 16\frac{2}{3} = 2400 \div 6 = 400$ (mi.) *Ans.*

2. At $33\frac{1}{3}$ cents per pair what will be the cost of 3 dozen pairs of stockings?

3. Find the area of a rectangle 123 yards long, $33\frac{1}{3}$ yards wide.

Multiplying by 125

Sight Exercises

1. A building lot is 125 feet deep. How many square feet does it contain when its width is (*a*) 24 feet? (*b*) 25 feet?

PROCESS

(*a*) $24 \times 125 = 24$ thousand $\div 8 = 3$ thousand. *Ans.* 3000 ft.
(*b*) $25 \times 125 = 25$ thousand $\div 8 = 3\frac{1}{8}$ thousand. *Ans.* 3125 sq. ft.

2. Give products: *a*. 48×125. *b*. 125×49. *c*. 56×125. *d*. 125×68.

3. How many square yards are there in a piece of ground 68 yards long and (*a*) $16\frac{2}{3}$ yards wide? (*b*) $33\frac{1}{3}$ yd. wide?

PROCESS

(*a*) $68 \times 16\frac{2}{3} = 68$ hundred $\div 6 = 11\frac{1}{3}$ hundred $= 1133\frac{1}{3}$ (sq. yd.)
(*b*) $68 \times 33\frac{1}{3} = 68$ hundred $\div 3 = 22\frac{2}{3}$ hundred $= 2266\frac{2}{3}$ (sq. yd.)

4. Multiply 25 (*a*) by 25. (*b*) By $16\frac{2}{3}$. (*c*) By $33\frac{1}{3}$. (*d*) By $12\frac{1}{2}$. (*e*) By 125.

Written Exercises

1. Find the cost of 217 building plots at \$125 each.

PROCESS

	\$125	Use 125 as the multiplier. Divide 217 (thou-
	$\times 217$	sand) by 8, which gives $27\frac{1}{8}$ (thousand) for
Ans.	\$27125	quotient. Affix 125 to 27.

Always refrain from employing unnecessary figures. Arrange the example in some such form as the above. Do not affix ciphers to 217.

2. Find products :

a. 125×231 *b.* 432×125 *c.* 125×521 *d.* 618×125

3. Multiply :

a.	*b.*	*c.*	*d.*	*e.*
279	322	487	542	653
$\times 33\frac{1}{3}$	$\times 33\frac{1}{3}$	$\times 16\frac{2}{3}$	$\times 16\frac{2}{3}$	$\times 16\frac{2}{3}$

Written Problems

1. How many square feet are there in a building plot 225 feet long, 125 feet wide ?

2. When the average yield of wheat is 12.5 bushels to the acre, what profit is made on 40 acres if it is sold for 96 cents per bushel and the cost of producing it is $\$8.12\frac{1}{2}$ per acre ?

3. How many hours are spent in a year in washing dishes if 30 minutes are spent three times a day ?

4. What is the profit on 32 acres of potatoes averaging 125 bushels to the acre when they are sold at 75 cents per bushel and the cost of raising them is $\$30$ per acre ?

5. At 3200 hills to the acre, how many bushels of corn will be raised on an acre when each hill yields 4 ears and 125 ears make a bushel ?

Dividing by $16\frac{2}{3}$, $33\frac{1}{3}$, 125

Sight Exercises

1. (*a*) At $16\frac{2}{3}$ miles per hour, how long would it take an automobile to go 1200 miles ? (*b*) At the rate of $33\frac{1}{3}$ bushels to the acre, how many acres would yield 3200 bushels ?

PROCESS

(*a*) $1200 \div 16\frac{2}{3} = 12 \div \frac{1}{6} = 12 \times 6 = 72$. *Ans.* 72 hr.

(*b*) $3200 \div 33\frac{1}{3} = 32 \div \frac{1}{3} = 32 \times 3 = 96$. *Ans.* 96 A.

2. Give quotients:

a. $16\frac{2}{3})\underline{300}$ *b.* $33\frac{1}{3})\underline{900}$ *c.* $16\frac{2}{3})\underline{800}$

3. Divide 350 (*a*) by $16\frac{2}{3}$. (*b*) By $33\frac{1}{3}$.

PROCESS

(*a*) $350 \div 16\frac{2}{3} = 3\frac{1}{2} \div \frac{1}{6} = 3\frac{1}{2} \times 6 = 21$. *Ans.*
(*b*) $350 \div 33\frac{1}{3} = 3\frac{1}{2} \div \frac{1}{3} = 3\frac{1}{2} \times 3 = 10\frac{1}{2}$. *Ans.*

4. Divide:

a. $16\frac{2}{3})\underline{316\frac{2}{3}}$ *b.* $16\frac{2}{3})\underline{233\frac{1}{3}}$ *c.* $16\frac{2}{3})\underline{550}$

d. $16\frac{2}{3})\underline{433\frac{1}{3}}$ *e.* $16\frac{2}{3})\underline{283\frac{1}{3}}$ *f.* $16\frac{2}{3})\underline{450}$

5. At \$125 each, how many building lots can be bought (*a*) for \$2125? (*b*) For \$3250? (*c*) For \$4375? (*d*) For \$5500? (*e*) For \$6625?

PROCESS

(*a*) $2125 \div 125 = 2\frac{1}{8} \div \frac{1}{8} = 2\frac{1}{8} \times 8 = 17$. *Ans.* 17 lots.
(*b*) $3250 \div 125 = 3\frac{1}{4} \div \frac{1}{8} = 3\frac{1}{4} \times 8 = 26$. *Ans.* 26 lots.
(*c*) $4375 \div 125 = 4\frac{3}{8} \div \frac{1}{8} = 4\frac{3}{8} \times 8 = 35$. *Ans.* 35 lots.
(*d*) $5500 \div 125 = 5\frac{1}{2} \div \frac{1}{8} = 5\frac{1}{2} \times 8 = 44$. *Ans.* 44 lots.
(*e*) $6625 \div 125 = 6\frac{5}{8} \div \frac{1}{8} = 6\frac{5}{8} \times 8 = 53$. *Ans.* 53 lots.

6. Divide by 125:

a. 1125	*b.* 3125	*c.* 5125	*d.* 7125	*e.* 9125
f. 2250	*g.* 4250	*h.* 3375	*i.* 1375	*j.* 5375
k. 3500	*l.* 1500	*m.* 2625	*n.* 4625	*o.* 1625
p. 1750	*q.* 2750	*r.* 3875	*s.* 5875	*t.* 7875

Remainders in Division — Lowest Terms

Written Exercises

1. What is the average yield per acre when 475 tons of hay are raised on 175 acres?

NOTE. — In a problem of this kind, express a fraction in the answer in lowest terms.

2. Divide:

a. $1684 \div 32$ *b.* $1050 \div 125$ *c.* $24250 \div 375$ *d.* $1545 \div 75$
e. $2425 \div 80$ *f.* $1092 \div 144$ *g.* $30500 \div 625$ *h.* $1920 \div 45$

3. A farmer raised 481 tons on 185 acres. Find the average yield per acre.

PROCESS

$$185\overline{)481}\text{ T.} \qquad 2\tfrac{111}{185}\text{ T.} = 2\tfrac{3}{5}\text{ T. } \textit{Ans.}$$
$$\underline{370}$$
$$111$$

When it is difficult to obtain by inspection a number that will divide both terms of a fraction, find their greatest common divisor.

GREATEST COMMON DIVISOR

Divide 185 by 111. Divide 111 (the first divisor) by 74 (the first remainder). Divide 74 (the second divisor) by 37 (the second remainder). As 37 is an exact divisor of 74, it is the greatest common divisor of 111 and 185. Divide both terms of $\frac{111}{185}$ by 37, which reduces it to lowest terms.

$$\frac{111 \div 37}{185 \div 37} = \frac{3}{5}$$

Test by multiplying 185 by $2\frac{3}{5}$.

$$\begin{array}{r} 1 \\ \hline 111\overline{)185} \\ \underline{111} \quad 1 \\ \hline 74\overline{)111} \\ \underline{74} \quad 2 \\ \hline 37\overline{)74} \\ \underline{74} \end{array}$$

4. Divide:

a. $1161 \div 172$ *b.* $5795 \div 228$ *c.* $24089 \div 104$ *d.* $1537 \div 174$
e. $8717 \div 115$ *f.* $1295 \div 296$ *g.* $69657 \div 155$ *h.* $4141 \div 123$

Multiplication and Division — Cancellation

Written Exercises

1. When 74 men require 87 days to lay a sidewalk, how many days would 111 men require?

	PROCESS
(*a*) 87 da. × 74	Indicate the time required by 1 man, which is 74 times the time required by 74 men.
(*b*) $\frac{87 \text{ da.} \times 74}{111} =$	As 111 men will require $\frac{1}{111}$ of the time required by 1 man, indicate the division of (*a*) by 111, which gives the form shown in (*b*). Cancel. Find the result.

2. At the rate of \$84 profit a month when 15 men are employed, what is the monthly profit when 35 men are employed?

	PROCESS
(*a*) $\frac{\$84}{15}$	Indicate the profit of 1 man by writing \$84 divided by 15, as at (*a*). Indicate the profit of 35 men by writing 35 times (*a*) as shown at (*b*).
(*b*) $\frac{\$84 \times 35}{15}$	

Sight Exercises

Give the largest number that will cancel both numbers in each of the following sets:

a. 15 and 40	*b*. 25 and 60	*c*. 21 and 39	*d*. 27 and 63
e. 17 and 51	*f*. 48 and 86	*g*. 20 and 70	*h*. 24 and 36
i. 26 and 39	*j*. 28 and 52	*k*. 48 and 54	*l*. 18 and 45

Sight Problems

1. If 3 men can do a piece of work in 21 days, how long will 7 men require to do the same work?

2. When 7 half-pounds of sugar cost 21 cents, what will be the cost of 13 half-pounds?

3. How many yards of cloth will be required for 16 coats if 5 coats require 15 yards?

4. A farmer has hay to last 12 cows for 6 weeks. How many cows must he sell to make the hay last 9 weeks?

5. If 12 men require 9 days to do a piece of work, how long will 4 men require to do the same work?

Written Problems

1. When an automobile goes 57 miles in 1 hour 16 minutes, (*a*) what fraction of a mile does it go in 1 minute? (*b*) How many minutes does it require to go a mile?

2. The bill for 56 tons of copper amounted to $812. What was the price per ton?

3. It takes 18 minutes to run a film 1000 feet long. (*a*) How many feet run per minute? (*b*) How many seconds does it require per foot? (*c*) When there are 16 pictures to a foot, how many pictures are seen per minute?

4. A farmer paid 5¢ per pound for cows averaging 800 lb. He fed them at a cost of $1 per head, and paid $1 per head to market them. What was his profit per cow if each gained 200 pounds in weight and sold for 6¢ per pound?

5. (*a*) What does the packer receive for a cow weighing alive 1000 pounds and sold at 12¢ per pound dressed weight, the latter being .52 of the live weight? (*b*) What is his profit on a cow for which he paid $60, provided he obtains $5.40 for the hide and other by-products?

Cancellation

Sight Exercises

Give answers:

$a.\ \frac{36\times11}{12}$ $b.\ \frac{84}{17\times21}$ $c.\ \frac{25\times13}{5}$ $d.\ \frac{69}{23\times41}$ $e.\ \frac{17\times16}{34}$

$f.\ \frac{15\times22}{30}$ $g.\ \frac{99}{33\times19}$ $h.\ \frac{48\times22}{24}$ $i.\ \frac{75}{25\times16}$ $j.\ \frac{12\times84}{21}$

$k.\ \frac{99\times13}{33}$ $l.\ \frac{48}{11\times24}$ $m.\ \frac{46\times32}{23}$ $n.\ \frac{86}{43\times43}$ $o.\ \frac{20\times22}{88}$

Written Exercises

1. Divide $13\times17\times9\times8\times14$ by $27\times4\times7\times51$.

PROCESS

$$\frac{13\times\overset{1}{\cancel{17}}\times\overset{3}{\cancel{9}}\times\overset{2}{\cancel{8}}\times\overset{2}{\cancel{14}}}{\underset{3}{\cancel{27}}\times\cancel{4}\times7\times\underset{3}{\cancel{51}}}=\frac{52}{9}=5\tfrac{7}{9}.\quad \textit{Ans.}$$

Write the dividend above the line and the divisor below. Cancel each factor common to the divisor and the dividend. Write the product of the remaining factors of the dividend over the remaining factors of the divisor. When the former product is larger than the latter, perform the indicated division.

2. Divide:

a. $25\times76\times84\times54$ by $70\times20\times19\times36$
b. $74\times32\times95\times16$ by $19\times40\times37\times64$
c. $36\times96\times51\times17$ by $51\times72\times68\times56$
d. $92\times70\times54\times17$ by $24\times45\times16\times34$
e. $10\times88\times72\times63$ by $44\times49\times45\times18$
f. $58\times93\times57\times45$ by $90\times38\times31\times87$
g. $86\times52\times30\times63$ by $65\times42\times35\times43$

Written Problems

Indicate operations and solve by cancellation. Place divisors below a horizontal line.

1. Find the length of a rectangular field 36 rods wide that will be equal in area to a field 54 rods wide 88 rods long.

$$\text{Length in rods} = (54 \times 88) \div 36.$$

2. How deep must be a bin 14 feet long and 12 feet wide to contain the same quantity of grain as a bin 16 feet wide, 18 feet long, and 7 feet deep?

$$(16 \times 18 \times 7) \div (14 \times 12).$$

3. How many bushels of wheat at 98¢ per bushel will pay for 3 pieces of silk 14 yards to the piece costing 63 cents per yard?

4. If 36 acres of land yield 555 bushels of oats, how many bushels will 48 acres yield at the same rate?

5. What should be the cost of 9 pieces of cloth each containing 24 yards, if 8 pieces of the same cloth 27 yards each cost $162?

$\$162 \div (27 \times 8) \times 9 \times 24$; that is, $(\$162 \times 9 \times 24) \div (27 \times 8)$.

6. When a train goes 45 miles per hour, it requires 24 hours to make a trip. How many hours would it take if the speed were 36 miles per hour?

7. Find the cost of 4768 lb. oats at 48¢ per bushel of 32 lb.

8. A farmer exchanged 240 bushels of wheat at 95 cents per bushel for potatoes at 50 cents per bushel. How many bushels of potatoes did he receive?

9. If 1600 bushels of wheat were sold for $1500, what would 700 bushels bring at the same rate?

Denominate Numbers

Counting

1 dozen (doz.) = 12. 1 gross = 12 doz.
1 great gross = 12 gross. A score = 20.

Paper Measure

A ream of wrapping paper consists of 20 quires of 24 sheets each.

A ream of printing paper contains 500 sheets.

Sight Exercises

1. How many are three score and ten?
2. What fraction of a dozen is $\frac{1}{2}$ score?
3. How many pencils in $\frac{1}{4}$ gross?
4. When pencils sell for $6 per gross what is the cost of a dozen at that rate?
5. How much does a dealer receive for a gross of pencils sold at 5 cents each?
6. How many sheets of wrapping paper in a ream?
7. Change 6 sheets to the decimal of a quire.

Written Exercises

1. Change 7 lb. 12 ounces to ounces.
2. How many pounds and ounces in 260 ounces?
3. How many weeks will 63 gallons of gasoline last if $\frac{9}{16}$ pint is used each day?
4. How many tons of 2000 pounds each are there in 100 long tons of 2240 pounds each?
5. How many yards are there in 3600 meters of 39.37 inches each? (Cancel.)

Rate per 100, 1000, ton, etc.

Written Exercises

1. Find the cost of 125,440 lb. coal at \$6.72 per long ton of 2240 lb.

This example may be worked (*a*) by finding the number of tons and multiplying the cost per ton by this number. The result may also be obtained by finding the cost per pound and multiplying this by the number of pounds.

$$(a)\ \$6.72 \times \frac{125440}{2240} \qquad (b)\ \frac{\$6.72}{2240} \times 125440$$

A general method (*c*) is to indicate the operation by placing the multipliers above the line and the divisors below.

$$(c)\ \frac{\$6.72 \times 125440}{2240}$$

In the following examples first indicate the operations. A divisor of 100 or 1000 should not always be canceled.

2. Find the cost of the following:

a. 37580 bricks at \$7.50 per M (1000).
b. 44976 lb. hay at $87\frac{1}{2}$ ¢ per cwt. (100 lb.)
c. 71456 lb. oats at 48 ¢ per bushel of 32 lb.
d. 15280 lb. herrings at \$1.25 per kit of 20 lb.
e. 28028 lb. flour at \$5.75 per barrel of 196 lb.
f. 54250 shingles at \$4.80 per M.
g. 63336 lb. corn at 63 ¢ per bushel of 56 lb.
h. 84375 ft. lumber at \$5.60 per 1000 ft.
i. 91136 cu. ft. wood at \$4.50 per cord (128 cu. ft.).
j. 12960 sheets of paper at \$1.44 per ream (480 sheets).
k. 49464 lb. potatoes at 85 ¢ per bushel of 60 lb.
l. Interest on \$487.50 at \$6 per \$100.
m. Taxes on \$24375 at \$8 per \$1000.
n. 37482 pencils at \$2.88 per gross (144).
o. 24056 eggs at 18 ¢ per dozen.
p. 86418 lb. wheat at 90 ¢ per bushel of 60 lb.

Rate per dozen, ton, 100, 1000, etc.

Sight Exercises

Find the cost of the following:

a. 375 bricks at $8.40 per 1000.

$\frac{3}{8}$ of $8.40.

b. 480 lb. hay at $87\frac{1}{2}¢$ per hundredweight.

480 lb. at $\frac{7}{8}¢$ per pound.

c. 640 lb. oats at $53¢$ per bushel of 32 lb.

20 bu. at $53¢$.

d. 240 lb. herrings at $1.25 per kit of 20 lb.

12 kits at $1\frac{1}{4}$.

e. 800 lb. pork at $12.10 per barrel of 200 lb.

f. 3000 shingles at $4.20 per M (1000).

g. 692 lb. corn at $56¢$ per bushel of 56 lb.

h. 840 ft. lumber at $7.50 per 1000 ft.

$\frac{3}{4}¢$ per foot.

i. 256 cu. ft. wood at $4.25 per cord (128 cu. ft.).

j. 888 sheets paper at $1.25 per ream (500 sheets).

k. 360 lb. potatoes at $80¢$ per bushel of 60 lb.

l. Interest on $300 at $4 per $100.

m. Taxes on $11,000 at $8 per $1000.

n. 232 pencils at $2.88 per gross (144).

o. 162 eggs at $24¢$ per dozen.

p. 180 lb. wheat at $1 per bushel of 60 lb.

q. 1200 lb. mackerel at $21 per barrel of 200 lb.

r. 312 qt. milk at $16¢$ per gallon.

s. 480 lb. barley at $62¢$ per bushel of 48 lb.

t. 200 gal. oil at $3¢$ per quart.

u. 100 rods wire at $2¢$ per foot.

Review of Fractions. Lowest Terms

Written Exercises

A fraction is reduced to lowest terms by dividing both terms by their G. C. D. When, however, a factor common to the numerator and the denominator is apparent, both terms are divided by a common factor until the terms are seen to be prime to each other.

1. Express $\frac{144}{180}$ in its lowest terms.

PROCESS

$\frac{144}{180} = \frac{72}{90} = \frac{8}{10} = \frac{4}{5}$. *Ans.* or $\frac{144}{180} = \frac{16}{20} = \frac{4}{5}$. *Ans.*

2. Reduce to lowest terms:

a. $\frac{126}{168}$	*b.* $\frac{168}{192}$	*c.* $\frac{165}{180}$	*d.* $\frac{135}{162}$
e. $\frac{150}{225}$	*f.* $\frac{126}{210}$	*g.* $\frac{128}{224}$	*h.* $\frac{336}{432}$
i. $\frac{288}{320}$	*j.* $\frac{168}{308}$	*k.* $\frac{180}{432}$	*l.* $\frac{208}{256}$

3. Reduce $\frac{299}{391}$ to its lowest terms.

As 299 is not an even number, it is not divisible by 2; the sum of its digits being 20, it is not divisible by 3; not ending in 5, it is not divisible by 5; etc. In this case the G. C. D. is found by continued division to be 23.

NOTE. — A number is divisible by 3 when the sum of its digits is divisible by 3.

4. Reduce $\frac{475}{855}$ to its lowest terms:

In this case both terms are divisible by 5, which reduces the fraction to $\frac{95}{171}$. To ascertain if 95 and 171 have a common divisor, test by the method of continued division. (See p. 134.)

5. Reduce to lowest terms:

a. $\frac{205}{246}$	*b.* $\frac{129}{172}$	*c.* $\frac{118}{177}$	*d.* $\frac{168}{231}$
e. $\frac{148}{185}$	*f.* $\frac{124}{217}$	*g.* $\frac{115}{184}$	*h.* $\frac{116}{261}$

Adding Mixed Numbers

Written Exercises

1. How many square feet are there in five steel plates containing, respectively, $12\frac{7}{9}$ sq. ft., $48\frac{1}{6}$ sq. ft., $9\frac{3}{8}$ sq. ft., $70\frac{5}{9}$ sq. ft., and $3\frac{7}{16}$ sq. ft.?

LEAST COMMON MULTIPLE

When the least common denominator cannot readily be determined by inspection, write the denominators in a horizontal row.

$$2)\underline{9-6-8-9-16}$$
$$\quad 3 \quad 9 \quad 8$$
$$2\times 9\times 8=144 \text{ (L. C. M.)}$$

Cancel one 9; also 8, which is a factor of 16. Divide by the smallest number which is a factor of more than one of the denominators, 2 in this case. Under 6 and 16 write 3 and 8 (their respective quotients), and bring down 9, which is not a multiple of 2. Cancel 3, which is a factor of 9. Since 9 and 8 (the remaining numbers) have no common factor, multiply 72 (their product) by 2 (the divisor), which gives 144 as the least common multiple of the denominators.

2. Find sums:

a.
$6\frac{4}{9}$
$20\frac{7}{15}$
$12\frac{3}{20}$

b.
$10\frac{4}{7}$
$20\frac{3}{4}$
$6\frac{5}{12}$

c.
$18\frac{7}{20}$
$26\frac{3}{10}$
$5\frac{2}{9}$

d.
$23\frac{5}{6}$
$14\frac{7}{9}$
$8\frac{3}{20}$

e.
$18\frac{1}{2}$
$24\frac{3}{4}$
$16\frac{4}{5}$
$36\frac{7}{10}$

f.
$7\frac{1}{2}$
$33\frac{5}{8}$
$6\frac{7}{10}$
$21\frac{8}{15}$

g.
$13\frac{3}{4}$
$6\frac{2}{3}$
$17\frac{5}{9}$
$32\frac{3}{8}$

h.
$27\frac{5}{24}$
$11\frac{7}{8}$
$1\frac{5}{9}$
$8\frac{7}{12}$

i.
$6\frac{3}{4}$
$17\frac{2}{5}$
$8\frac{3}{8}$
$11\frac{5}{16}$

j.
$62\frac{1}{2}$
$7\frac{2}{3}$
$48\frac{3}{7}$
$5\frac{4}{15}$

k.
$13\frac{5}{9}$
$23\frac{3}{16}$
$6\frac{7}{18}$
$8\frac{1}{3}$

l.
$6\frac{1}{3}$
$28\frac{2}{9}$
$30\frac{3}{7}$
$5\frac{5}{14}$

Multiplication and Division Drills

1. Give products:

a. $\frac{1}{2}$ of 96	*b.* $\frac{1}{4}$ of 96	*c.* $\frac{1}{3}$ of 96	*d.* $\frac{1}{6}$ of 96	*e.* $\frac{1}{8}$ of 96
f. $\frac{2}{3}$ of 48	*g.* $\frac{3}{4}$ of 96	*h.* $\frac{5}{6}$ of 48	*i.* $\frac{3}{8}$ of 96	*j.* $\frac{5}{8}$ of 96
k. $\frac{1}{8}$ of 96	*l.* $\frac{1}{5}$ of 62	*m.* $\frac{2}{3}$ of 36	*n.* $\frac{3}{5}$ of 45	*o.* $\frac{5}{9}$ of 81
p. $\frac{1}{2}$ of 97	*q.* $\frac{1}{4}$ of 35	*r.* $\frac{1}{6}$ of 75	*s.* $\frac{1}{8}$ of 98	*t.* $\frac{3}{7}$ of 84.

2. Divide:

a. $\frac{2}{5}$ by 2	*b.* $\frac{3}{5}$ by 2	*c.* $1\frac{1}{3}$ by 2	*d.* $1\frac{1}{2}$ by 2	*e.* $1\frac{1}{3}$ by 6
f. $\frac{3}{4}$ by 3	*g.* $\frac{3}{4}$ by 4	*h.* $2\frac{1}{2}$ by 5	*i.* $1\frac{1}{3}$ by 3	*j.* $3\frac{1}{3}$ by 4
k. $\frac{5}{6}$ by 5	*l.* $\frac{5}{6}$ by 7	*m.* $3\frac{1}{5}$ by 4	*n.* $1\frac{1}{4}$ by 4	*o.* $1\frac{1}{5}$ by 9
p. $\frac{9}{8}$ by 4	*q.* $\frac{2}{3}$ by 5	*r.* $4\frac{1}{2}$ by 3	*s.* $1\frac{1}{5}$ by 5	*t.* $3\frac{3}{5}$ by 8

3. Give quotients:

a. $2\overline{)24\frac{2}{9}}$	*b.* $3\overline{)30\frac{3}{5}}$	*c.* $4\overline{)48\frac{4}{7}}$	*d.* $5\overline{)45\frac{5}{6}}$
e. $6\overline{)66\frac{6}{7}}$	*f.* $2\overline{)24\frac{1}{2}}$	*g.* $3\overline{)30\frac{2}{3}}$	*h.* $4\overline{)40\frac{3}{5}}$
i. $5\overline{)40\frac{2}{3}}$	*j.* $6\overline{)60\frac{1}{5}}$	*k.* $2\overline{)21\frac{1}{3}}$	*l.* $3\overline{)31\frac{1}{5}}$
m. $4\overline{)41\frac{3}{5}}$	*n.* $5\overline{)41\frac{1}{9}}$	*o.* $6\overline{)61\frac{1}{5}}$	*p.* $2\overline{)23\frac{1}{4}}$

Relation of Numbers

4. State what fraction (proper or improper):

a. 24 is of 18	*b.* 18 is of 24	*c.* 40 is of 24	*d.* 24 is of 40
e. 24 is of 36	*f.* 36 is of 24	*g.* 35 is of 28	*h.* 28 is of 35

5. State what number increased:

a. By $\frac{1}{2}$ of itself is 24	*b.* By $\frac{1}{3}$ of itself is 24
c. By $\frac{1}{4}$ of itself is 20	*d.* By $\frac{1}{5}$ of itself is 24

6. State what number diminished:

a. By $\frac{1}{2}$ of itself is 44	*b.* By $\frac{2}{3}$ of itself is 33
c. By $\frac{3}{4}$ of itself is 32	*d.* By $\frac{4}{5}$ of itself is 21

Written Problems

1. Mr. Kelly has sold $\frac{13}{16}$ of his farm of 336 acres. How many acres has he left?

2. After completing $\frac{3}{4}$ of her reader a girl has read 156 pages. How many pages are there in the reader?

3. Of a drove of 96 pigs 68 are black. What fraction of the drove consists of black ones?

4. After buying $\frac{1}{4}$ as many yards of carpet as he had, a dealer has 240 yards; how many yards had he before?

5. By selling a wagon for \$108, a woman loses $\frac{1}{7}$ of the cost. What did it cost?

6. In a school there are 175 boys and 200 girls. What fraction of the pupils are (*a*) boys? (*b*) Girls?

7. When he has gone $27\frac{3}{4}$ miles a boy has still $\frac{1}{4}$ of the distance to go. (*a*) How far has he yet to go? (*b*) What is the length of the whole journey?

Sight Problems

1. The owner of a farm of 400 acres sells $\frac{2}{5}$ of it. How many acres does he sell?

2. John has read $\frac{3}{4}$ of his book. If he has read 120 pages, how many pages are there in the book?

3. Of a flock of 64 geese 48 are white. What fraction of the flock consists of white geese?

4. After buying $\frac{1}{2}$ as many marbles as he had, a boy has 42 marbles. How many had he at first?

5. By selling a wagon for \$120, a man loses $\frac{1}{3}$ of the cost. What did it cost?

6. William and Mary divided some cherries, the former taking 35 and the other 40. What fraction does each receive?

Aliquot Parts of a Dollar

Preparatory Exercises

1. How many cents are there (*a*) in $\$\frac{1}{3}$? (*b*) In $\$\frac{1}{6}$?

2. What part of a dollar is (*a*) $16\frac{2}{3}¢$? (*b*) $33\frac{1}{3}¢$?

3. At $\$\frac{1}{3}$ per yard, how many dollars will be paid for (*a*) 36 yards? (*b*) 69 yards? (*c*) 96 yards?

4. At $\$\frac{1}{6}$ per pound, how much will be the cost of (*a*) 48 pounds? (*b*) 66 pounds? (*c*) 126 pounds?

Written Exercises

1. Find the cost of 48 yards of cloth (*a*) at $\$2.16\frac{2}{3}$ per yard. (*b*) At $\$2.33\frac{1}{3}$.

(*a*)			(*b*)	
$\$2\frac{1}{6}$	PROCESS		$\$2\frac{1}{3}$	
$\times 48$	In (*a*) multiply 48 by $2\frac{1}{6}$. In (*b*) multiply 48 by $2\frac{1}{3}$.		$\times 48$	
8			16	
96			96	
$\$104$		*Ans.*	$\$112$	*Ans.*

2. Find answers:

a. $\$2.33\frac{1}{3} \times 66$ *b.* $\$3.16\frac{2}{3} \times 48$ *c.* $\$4.33\frac{1}{3} \times 84$ *d.* $\$5.16\frac{2}{3} \times 96$

Sight Exercises

Give products:

a. $\$0.16\frac{2}{3} \times 96$ *b.* $\$0.25 \times 96$ *c.* $\$0.33\frac{1}{3} \times 96$ *d.* $\$0.50 \times 96$ *e.* $\$0.12\frac{1}{2} \times 96$

f. $\$0.12\frac{1}{2} \times 72$ *g.* $\$0.25 \times 92$ *h.* $\$0.16\frac{2}{3} \times 84$ *i.* $\$0.50 \times 98$ *j.* $\$0.33\frac{1}{3} \times 69$

Preparatory Exercises

1. At $\frac{1}{3}$ of a dollar per pair, how many pairs of stockings can be bought (*a*) for $1? (*b*) For $2? (*c*) For $10?

2. At $16\frac{2}{3}$ cents each, how many collars can be bought (*a*) for $1? (*b*) For $2? (*c*) For $4?

Sight Exercises

Give quotients:

a. $\$\frac{1}{3})\$63$ *b.* $\$\frac{1}{6})\$31$ *c.* $\$\frac{1}{4})\$62$ *d.* $\$\frac{1}{8})\$31$

e. $\$\frac{1}{3})\$21\frac{1}{3}$ *f.* $\$\frac{1}{6})\$12\frac{1}{6}$ *g.* $\$\frac{1}{3})\$22\frac{2}{3}$ *h.* $\$\frac{1}{6})\$12\frac{1}{3}$

i. $\$\frac{1}{8})\$12\frac{1}{2}$ *j.* $\$\frac{1}{4})\$12\frac{1}{2}$ *k.* $\$\frac{1}{6})\$12\frac{1}{2}$ *l.* $\$\frac{1}{6})\$12\frac{2}{3}$

Written Exercises

1. At $16\frac{2}{3}$ cents per yard, how many yards can be bought (*a*) for $37\frac{1}{6}$? (*b*) For $45\frac{1}{3}$? (*c*) For $87\frac{1}{2}$?

PROCESS

(*a*)	(*b*)	(*c*)
$\$.16\frac{2}{3})\$37\frac{1}{6}$	$\$.16\frac{2}{3})\$45\frac{1}{3}$	$\$.16\frac{2}{3})\$87\frac{1}{2}$
Ans. 223 (yd.)	*Ans.* 272 (yd.)	*Ans.* 525 (yd.)

(*a*) The quotient of $37\frac{1}{6}$ by $\frac{1}{6}$ is 6 times $37\frac{1}{6}$.
(*b*) The quotient of $45\frac{1}{3}$ by $\frac{1}{6}$ is 6 times $45\frac{1}{3}$.
(*c*) The quotient of $87\frac{1}{2}$ by $\frac{1}{6}$ is 6 times $87\frac{1}{2}$.

2. At 3 pairs for a dollar, how many pairs of stockings can be bought for (*a*) $37\frac{1}{3}$? (*b*) $48\frac{2}{3}$?

3. Find quotients:

a. $\$.12\frac{1}{2})\$23\frac{1}{4}$ *b.* $\$.16\frac{2}{3})\$37\frac{1}{2}$ *c.* $\$.33\frac{1}{3})\$48\frac{2}{3}$

d. $\$.16\frac{2}{3})\$23\frac{2}{3}$ *e.* $\$.33\frac{1}{3})\$68\frac{1}{3}$ *f.* $\$.16\frac{2}{3})\$48\frac{5}{6}$

Sight Problems

1. (*a*) How many pounds will 125 bushels of corn weigh at 56 pounds to the bushel? (*b*) Give weight in tons and a decimal.

2. Find the cost of 28 baseballs at $1.25 each.

3. At 125 nails to the pound, how many nails will weigh 32 pounds?

4. What is the cost of 3125 bricks at $8 per thousand?

5. How many square rods are there in a field 64 rods wide, 125 rods long?

6. What is the annual salary of a man that receives $125 per month?

7. Find the freight on 96 tons of coal at $1.12\frac{1}{2}$ per ton.

8. At 128 cubic feet to the cord, how many cubic feet are there in 125 cords of wood?

9. In a school of 200 pupils, there are 98 girls. How many more boys are there than girls?

10. How many eggs will 125 hens lay in a year at an average of 84 eggs each?

11. At 125 ears of corn to a bushel, how many ears would make 80 bushels?

12. How wide is a building lot 125 feet deep when it contains 24,000 square feet?

13. What is the cost of 8 dozen baseballs at 75 cents each?

14. At 25 cents per dozen what would be received for the eggs of 10 hens if each laid 120 eggs?

15. A farmer obtained 75 tons of alfalfa at the first cutting and 59 at the second. How many tons did he obtain at both?

Written Problems

1. How many tons will 125 barrels of apples weigh when each barrel contains $2\frac{1}{2}$ bushels of 50 pounds each?

2. Find the cost of 36 dozen catchers' gloves at $1.25 apiece.

3. At 4 nails to the square foot, how many pounds of nails will be required to lay a floor 50 feet long, 40 feet wide, when there are 125 nails to the pound?

4. Find the cost of 15,625 pressed brick at $14 per thousand.

5. How many acres are there in a field 125 rods long, 64 rods wide?

6. How much does a man save in a year when his monthly salary is $125, and his expenses are .84 of his salary?

7. What is the freight on 964 tons of coal at $1.12\frac{1}{2}$ per ton?

8. Find the weight in tons of 125 cords of wood weighing 40 pounds to the cubic foot.

9. In a school of 975 pupils there are 493 boys. How many fewer girls are there than boys?

10. At an average of 25 cents per dozen, what will be received for the eggs of 125 hens if each lays on an average 120 eggs?

11. Assuming 3000 hills to an acre and 3 ears of corn to a hill, how many bushels of corn will be produced on an acre when 100 ears make a bushel?

12. Change .375 yd. (*a*) to feet and a decimal. (*b*) to inches and a decimal.

13. Change $2\frac{2}{3}$ hours to the fraction of a day.

Bills and Accounts

A *bill* is a written statement made out by the seller of goods and sent to the buyer.

It shows the date of each purchase, the quantity of each article, the price of each, the total cost of each, and the total amount of the bill.

Copy the following bill, filling out the missing items: (*a*), (*b*), (*c*), (*d*), and (*e*).

COVINGTON, KY., Nov. 30, 1914

REGAN, REILLY, & CO.
487 Market St.

Sold to MRS. J. J. CASHMAN
70 Rutland Road

Nov.	*3*	*1 bag Coffee, 130 lb.*	*.14*	*(a)*			
		(b) doz. Corn	*1.80*	*4*	*50*		
	8	*30 lb. Sugar*	*(c)*	*1*	*65*		
	22	*1 bbl. Flour*		*(d)*			
	29	*1 bu. Apples*		*1*	*50*		
	"	*$5\frac{1}{2}$ lb. Butter*	*.32*	*(e)*			
						$34	*11*
		Received payment					
		Dec. 1, 1914					
		Regan, Reilly, & Co.					
		per E. McG.					

The total cost of each item, which is placed in the first double column, is called an *extension*, the total amount of the bill, which is placed in the second double column, is called the *footing*.

When a bill is receipted by a clerk, he writes his initials below the name of the firm.

Written Exercises

Make out bills for the following purchases, supplying names, dates, etc.

1. 12 yd. Silk at $1.20; 6 spools of Thread at 8¢, 24 yd. Lining at 12½¢; 3 papers Needles at 2¢, 1 Hat for $4.50, 2 pr. Gloves at $1.75, 3 pcs. Braid at 35¢.

2. 24 yd. Carpet at $1.25, 1 Rug for $16.25, 4 Chairs at $1.50, 1 Table for $18.75, 2 Mats at 75¢.

3. 16 lb. Ham at 12½¢, 25 lb. Meal at 2¢, 1 kit Mackerel for $1.75, 24 gal. Oil at 16¢, 4 bars Soap at 22¢.

Statement of Account

BUFFALO, N.Y., DEC. 1, 1915

MR. WM. KENTLER
1420 Broad St.

To JOHN MCNAMEE, Dr.

Nov.	*10*	*To 4 bdl. Shingles*	*$1.25*			
		" 6 lb. Nails	*.15*			
		" 3 da. Labor	*3.00*			(*a*)
		Cr.				
Nov.	*13*	*By Cash*		*5*	—	
Nov.	*25*	*" 3 bu. Potatoes*	*.75*			(*b*)
		Balance due				(*c*)

4. Copy the foregoing statement, supplying missing extensions, also items (*a*), (*b*), and (*c*).

A charge for goods, etc., is called a *debit*, and is preceded by the word "To"; an allowance for money, goods, etc., is called a *credit*, and is preceded by the word "By". The foregoing bill contains three debit and two credit items.

Written Exercises

Make out statements as follows, giving credits as specified. Supply names and dates.

1. Debits: 14 ft. pipe at 7¢; 2 lb. solder at $23\frac{1}{2}$¢; 1 bowl for $.50; labor 3 da. at $3.50.

Credits: 2 lb. tea at 60¢; 3 lb. coffee at 28¢; 1 bag flour for 75¢.

2. Debits: 24 roses at 25¢; 16 geraniums at 10¢; 4 doz. hyacinths at 50¢; 10 doz. crocuses at 25¢; $\frac{1}{2}$ da. labor at $3; fertilizer, 50¢.

Credits: Cash, $5; 3 bu. potatoes at 60¢.

Receipts

When Mr. Kentler paid $5 to Mr. McNamee on Nov. 13, as shown in the statement on p. 149, he was entitled to an acknowledgment, which would be made out in the following form:

Receipt on Account

BUFFALO, N.Y., NOV. 13, 1915

Received of Wm. Kentler, Five $\frac{00}{100}$ Dollars, on account.

JOHN MCNAMEE

5\frac{00}{100}$

When he paid the balance due, Mr. Kentler would obtain the following receipt in case he did not present the statement to be receipted and if he did not owe McNamee any additional sum.

Receipt in Full

BUFFALO, N.Y., DEC. 5, 1915

Received of Wm. Kentler, Seven $\frac{65}{100}$ Dollars, in full of account to date.

JOHN MCNAMEE

7\frac{65}{100}$

Rent Receipt

NEWARK, N.J., MAY 1, 1916

Received of Mr. M. A. Ahern, Fourteen $\frac{50}{100}$ Dollars, in full of rent of house No. 865 Fourteenth St., to May 31, 1916.

MAGNUS SCHULER
PER M. E. K.

$\$14\frac{50}{100}$

It will be observed that the sum paid is written twice, the number of *dollars* being first given in words, then in figures. The *cents* are expressed in both places as hundredths of a dollar.

Receipts of payment for services rendered, etc., are made in the same form as the foregoing, and they may be either receipts in full or receipts on account.

The following items should appear in a receipt.

1. The place and the date.
2. The name of the person for whose benefit the money is paid (the debtor).
3. The sum paid.
4. The account to which the payment is applied.
5. A statement showing that the indebtedness is wholly settled or only partially settled.
6. The signature of the person to whom the money is due (the creditor).

When the money is received by a clerk, etc., the latter adds his initials to the name of the creditor, as in the case of a receipt on a bill.

Written Exercises

1. Copy the foregoing receipts.
2. Write a receipt for a part of a month's rent (receipt on account).
3. Write a mechanic's receipt for labor performed and materials furnished.

Furnishing a House

Mrs. Farley has $250 with which to furnish an apartment of five rooms, stoves being supplied by the owner. She pays for kitchen utensils as follows:

Table	$2.00	Meat knife	$.50
Chairs	1.50	Knife-stone	.15
China	4.00	Broiler	.10
Silver	2.50	Corkscrew	.12
Table linen	15.00	Frying pan	.10
Ice box	7.00	Roasting pan	.10
Sadirons	1.25	Egg beater	.08
Wash boiler	1.60	Layer pans	.10
Saucepans (2)	.90	Funnel	.10
Soup kettle	.75	Chopping knife	.15
Saucepans (2)	.50	Can opener	.10
Coffee pot	.50	Vegetable knife	.05
Broom	.40	Pie pans (2)	.12
Teapot	.30	Pudding pan	.10
Muffin pan	.20	Tea strainer	.10
Scrub pail	.25	Grater	.06
Dustpan and brush	.50	Cake turner	.06
Stove brush	.25	Potato masher	.05
Chopping bowl	.20	Washboard	.26

Written Exercises

1. Find the total. How much remains for the other four rooms?

2. She allows for the furniture of each of the two bedrooms $3 less than one-fourth of the remainder. For each she buys the following articles:

Blankets	$4.75	Pillows	$1.50
Sheets	1.50	Comforter	1.00
Pillow cases	.75	Towels	1.50
Spread	1.00	Bath Towels	1.00

Find the total of these items.

3. Make out a list of the bedroom furniture, with the prices, that will not exceed the sum allowed.

4. She allows $1 more than the average for the dining room furniture. Make out the list with the prices.

5. Make out a list of the furniture that can be bought for the living room, with the remainder of the money.

The following are minimum prices for some articles:

Chairs	$0.75	Curtains	$2.00
Dining table	5.50	Rocker	1.75
Sideboard	10.00	Mattress	6.00
Center table	6.00	Spring	2.00
Rug	7.50	Dresser	8.00
Bed	1.75	Pictures	1.00

6. A man works 305 days in a year at $3 per day. He spends $\frac{1}{5}$ of his earnings for rent. What is his rent per month?

7. (*a*) How many square feet of linoleum will be needed to cover the floor of a kitchen 14 ft. long, 13 ft. 6 in. wide? (*b*) How many square yards? (*c*) Find the cost at 85 cents per square yard.

8. A man that earns $900 per year spends .2 of this sum for rent, .25 for food for his family, .2 for clothing, .15 for car fares, mending, coal, etc. How much is left for other purposes?