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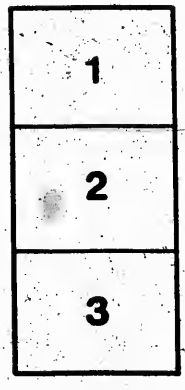

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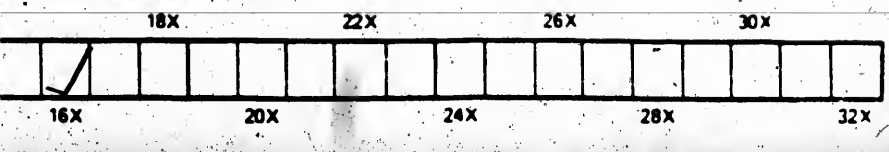

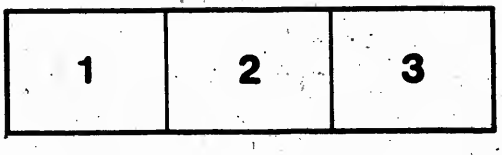

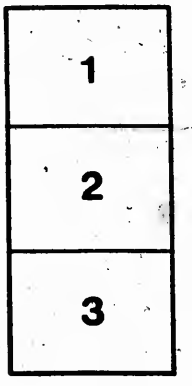

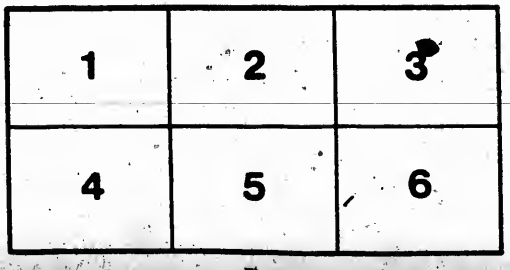

PREFACE.

. . .

. . . this series of Arithmetics " . . .
. . . to the school public for the . . .
. . . for popular favor. . . .
. . . were prepared by teachers actively . . .
. . . work of the schoolroom, and as . . . the great difficulty that the average teacher . . . the presentation of new and crisp problems . . .

. . . would most respectfully request a careful . . . these points in connection with their . . .

. . . Written Work. After pupils have . . . the mental text books provide but very . . . for mechanical operations. Pupils . . . quicker and more accurate as they . . . acquire the speed and accuracy . . . in the lower forms. To meet . . . series provides over 5,000 . . . with the teacher will find . . . labor (and loss of time) of performing . . . The tests alone should commend . . . every teacher of the subject.

. . . Answers. In the Pupils' Edition no . . . The Teachers' Edition alone . . .

. . . The time of the . . . the division of . . .

G. S. Howard

will tend to [illegible]
the mad rush in copying [illegible]

V. Understanding of Terms. [illegible]
definitions of terms, problems are [illegible]
fix in the pupil's mind a thorough [illegible]
technical terms of arithmetic.

VI. New Problems. The great [illegible]
lems of the series have been written [illegible]
"School Helps." They are not simply a [illegible]
of old, stereotyped problems.

VII. Problems Grouped. The prob[illegible]
ranged in the ordinary "hit and miss" [illegible]
grouped according to types, and carefully [illegible]
degree of difficulty.

VIII. Time Tests. The purely mechanical [illegible]
of addition, subtraction, etc., are intended to [illegible]
pupil's best speed, a specified time being [illegible]
teacher's experience finds suited to the [illegible]

IX. Book of Exercises. This series is not [illegible]
designed to displace either the teacher or the [illegible]
text. There is no attempt to show how [illegible] is
taken for granted. It merely furnishes [illegible]'s
hand bright, crisp, new problems with [illegible]
his teaching.

ARITHMETIC EXERCISES

FOR FIFTH BOOK CLASSES

Price 15 Cents; Teachers' Edition, with Answers, 20 Cents

Published by
THE EDUCATIONAL PUBLISHING CO.
Limited
TORONTO

PREFACE.

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...thors of this series of Arithmetics "School Helps" ...ecessary to the school public for the placing of these ...ntributions for popular favor. The several books ...ve are prepared by teachers actively engaged in ... work of the schoolroom, and as teachers they ... great difficulty that the average teacher ex... in the presentation of new and crisp problems for ... classes.

...rs would most respectfully request a considera... following points in connection with their series:

...anical Work. After pupils have passed ... ...ither the usual text books provide but very ... in the mechanical operations. Pupils instead of ... swifter and more accurate as they advance ... ...ually lose the speed and accuracy which ... ...ed in the lower forms. To meet this ... series provides over 5,000 operations ... work, which the teacher will find tested for ... labor (and loss of time) of performing the ... This feature alone should commend the ... ...y teacher of the subject.

Answers. In the Pupils' Edition no ... ...ded; the Teachers' Edition alone contains ...

... Time. The time of the teacher is ... ...ed up in the dictation of problems ... ...hile some pupils may be ...

MEASURES AND MULTIPLES.

A.

G.M. of 545, 26457, 1853 and 11421.

and 307328 into their prime factors,

L.C.M.

and 18018 into their prime factors, and

of these find their G.C.M.

prime factors of 13230, 29050, and

of these find their G.C.M. and L.C.M.

29250 and 42900 into their prime factors, and

find the quotient when their G.C.M.

into their L.C.M.

L.C.M. of $2\frac{1}{2}$, $3\frac{1}{3}$, $3\frac{4}{5}$, and $14\frac{6}{7}$.

L.C.M. of $\frac{12}{13}$, $1\frac{1}{2}$, and $3\frac{5}{14}$.

C.M. of $\frac{1}{10}$, $1\frac{1}{15}$, $2\frac{1}{7}$, and $2\frac{5}{6}$.

L.C.M. of $\frac{2}{3}$, $\frac{4}{7}$, $\frac{5}{6}$, and $\frac{7}{8}$, by the G.C.M. of

and $\frac{4}{7}$.

is the greatest number that will divide

68131, leaving remainders 49 and

is composed of the following

11 and 17; find the number.

the sum of all the divisors of 910.

B.

of the following:

, having 3 partial products.

6. [illegible]

7. [illegible] and 39795.

8. The L.C.M. of two numbers is 924; their G.C.M. is 11; [illegible]

9. The L.C.M. of two numbers is [illegible]; their G.C.M. is 9187; one of them is 4097; find the other.

10. The L.C.M. of 301 and another number is [illegible]; their G.C.M. is 23; find the other number.

11. The driving wheels of a locomotive [illegible] circumference, and the bracket [illegible] the train move to bring [illegible] same relative position as [illegible]

12. A hall 60 ft. long is to be carpeted [illegible] by stretching the carpet lengthwise [illegible] pieces—widths, respectively, [illegible] and 1¼ yds., will exactly fit the [illegible] each piece, worth $1.10 a yard. [illegible] it cost to carpet the hall?

II.—FRACTIONS.

Reduce to a simple fraction:

1. $\dfrac{\frac{1}{2}+\frac{1}{3}+\frac{1}{4}}{\frac{2}{3}+\frac{1}{3\frac{1}{2}}+\frac{1}{4\frac{1}{2}}} \times 7\frac{1}{2}$ of $\frac{11}{12}$.

2. $\left(\dfrac{\frac{1}{2}-\frac{1}{3}}{\frac{1}{2}+\frac{1}{3}}+\dfrac{\frac{1}{2}-\frac{1}{4}}{\frac{1}{2}+\frac{1}{4}}\right) \div \left(\dfrac{\frac{1}{2}-\frac{1}{3}}{\frac{1}{2}+\frac{1}{3}}-\dfrac{\frac{1}{2}-\frac{1}{4}}{\frac{1}{2}+\frac{1}{4}}\right)$.

3. $\dfrac{10\frac{1}{2}-7\frac{1}{4}}{13\frac{1}{12}-9\frac{1}{4}} - \left(\dfrac{8\frac{1}{2}}{19\frac{1}{7}} \times \dfrac{12\frac{5}{12}}{16\frac{1}{10}} + 3\frac{1}{28}\right) +$ [illegible]

2. A merchant bought a [illegible] $1,000; he sold 20 [illegible] der for $1,600, which [illegible] many bbls. did he buy?

3. A, B and C, having equal [illegible] spectively $\frac{1}{2}$, $\frac{2}{3}$ and $\frac{3}{4}$ of [illegible] and leaves his shares equally among [illegible] C's interest in the ship be now [illegible] what is the value of A's share?

4. The numerator of a certain fraction is $\frac{2}{3}$ [illegible] as its denominator and the sum of the [illegible] denominator is 362. Find the fraction.

5. Find what fraction must be subtracted from

$$\frac{1\frac{1}{2} \text{ of } 3\frac{1}{2}}{3\frac{1}{2} \text{ of } 2\frac{1}{2}} \text{ of } \frac{1\frac{1}{2} \text{ of } 1\frac{1}{2}}{1\frac{1}{2} \text{ of } \frac{32\frac{1}{2}}{3\frac{1}{2}}} + \frac{2\frac{1}{2} \text{ of } 6\frac{1}{2}}{3\frac{1}{2} \text{ of } 4\frac{1}{2}} \text{ to make it}$$

equal to $\frac{1}{28\frac{1}{2}}$ of $3\frac{1}{2}$ of $3\frac{1}{2}$ of $1\frac{1}{2} \times \frac{1}{2}$.

6. Out of a certain sum I take $2 more than [illegible]; then $10 less than $\frac{1}{2}$ of the remainder [illegible] than $\frac{2}{3}$ of what still remained; after [illegible] $10. Find the original sum.

7. A does $\frac{2}{3}$ of a piece of work in 6 hours; B [illegible] what remains in 2 hrs.; and C finishes the [illegible] of the work in 30 mins. In what time [illegible] working together do the work?

8. I bought $\frac{2}{3}$ of $4\frac{1}{2}$ cords of wood for $\frac{1}{2}$ of $\frac{2}{3}$ [illegible]; what were 2 cords worth at the same rate?

9. What fraction divided by $(\frac{1}{12} + \frac{1}{12}) \div (\frac{1}{2} + \frac{1}{2})$ will give $\frac{1}{12}$ of $\frac{4\frac{1}{2}}{6\frac{1}{2}}$ of $\frac{6\frac{1}{12}}{11\frac{1}{2}}$ of 247?

10. A can do a work in one-half the time [illegible] B can do it in two-thirds of the time [illegible] all

IV. Writing. The [illegible] scholar will tend to [illegible] the mad rush in copying questions from [illegible]

V. Understanding of Terms. [illegible] definitions of terms, problems are specially [illegible] fix in the pupil's mind a thorough [illegible] technical terms of arithmetic.

VI. New Problems. The great majority of the problems of the series have been written specially for the "School Helps." They are not simply a re-[illegible] of old, stereotyped problems.

VII. Problems Grouped. The problems are not arranged in the ordinary "hit and miss" fashion, but are grouped according to types, and carefully graded as to degree of difficulty.

VIII. Time Tests. The purely mechanical [illegible] of addition, subtraction, etc., are intended to be [illegible] a pupil's best speed, a specified time being allowed [illegible] the teacher's experience finds suited to the ability of the class.

IX. Book of Exercises. This series is not in any sense designed to displace either the teacher or the [illegible] text. There is no attempt to show how to teach; this is taken for granted. It merely furnishes ready to the teacher's hand bright, crisp, new problems with which to enforce his teaching.

TESTS IN ARITHMETIC

FOR FIFTH CLASSES.

ADDITION TESTS.

(2)	(3)	(4)	(5)
[illegible]	85276	32768	27683
85276	32768	27683	76892
32768	27683	76892	68327
27683	76892	68327	85276
76892	68327	85276	32768
68327	85276	32768	27683
85276	32768	27683	76892
32768	27683	76892	68327
27683	76892	68327	85276
76892	68327	85276	32768
68327	85276	32768	27683
85276	32768	27683	76892

(7)	(8)	(9)	(10)
59846	96465	84659	46598
95465	84659	46598	65984
84659	46598	65984	59846
46598	65984	59846	95465
65984	59846	95465	84659
59846	95465	84659	46598
95465	84659	46598	65984
84659	46598	65984	59846
46598	65984	59846	95465
65984	59846	95465	84659
59846	95465	84659	46598
95465	84659	46598	65984

12. [illegible] and [illegible] to [illegible] places.

13. 5.17 and 2.06 to four places.

14. .318 and .7439 to four places.

15. 3.145 and 4.297 to four places.

16. 17.373 and 365.04357 to four places.

17. Find to the nearest cent the value of [illegible]

18. Find to the nearest cent the value of [illegible]

19. Find to the nearest cent the value of [illegible]

20. Find to the nearest cent the value of [illegible]

VII.—DIVISION OF DECIMALS.

Divide to 3 places of decimals:

1. 1.5703 by 23.645.
2. 23.64785 by .866.
3. 1.23475 by .7071.
4. Divide [illegible] by 1.1512[illegible] to 5 places.
5. Divide .5 by 1.15629 to 5 places.
6. Divide 339 by 1005 to 4 places.
7. Divide .150515 by .21[illegible] to 4 places.

Find by the contracted method the quotient of

8. 6.931472 by .7[illegible] to 5 places.
9. 30.965 by [illegible] to 5 places.
10. 250÷3.1[illegible]
11. 10÷.[illegible]
12. .1÷3.1[illegible]
13. 2÷4.[illegible] to 8 places.
14. 93.725÷20.4173 to 3 places.
15. .45÷.11[illegible] to 4 places.
16. (1.23456)²÷.23456 to [illegible]
17. Find the quotient of 1 by [illegible] decimal places.

(11)	(12)	(13)	
67314	73146	31467	
53962	89625	96258	
73146	31467	14673	
89625	96258	62589	
31467	14673	46731	
96258	62589	25896	
14673	46731	67314	
62589	25896	53962	
46731	67314	73146	
25896	53962	89625	
67314	73146	31467	
53962	89625	96258	

(16)	(17)	(18)	
47963	25364	59172	
79634	53642	91725	
23456	34567	45678	
78912	89123	91234	
34567	45678	56789	
89123	91234	12345	
45678	56789	67891	
91234	12345	23456	
56789	67891	78912	
12345	23456	34567	
67891	78912	89123	
23456	34567	45678	

Add 66666 ten times consecutively to [illegible], beginning with the following lines, [illegible] secutive sums : (21) 66147 ; (22) [illegible] ; (24) 31480 ; (25) 97664.

Add 77777 ten times, etc. :

(26) 57294; (27) 68902 ; (28) 79218 ; [illegible]) 84137.

Add 88888 ten times, etc. :

(31) 57682 ; (32) 90063 ; (33) 21[illegible] ; [illegible] 27943.

VIII.

A.

[illegible] fractions:

[illegible] (3) .72, (4) .125, (5) .7293, (6) [illegible] (8) .86452, (9) 3.862, (10) .714285, [illegible] (12) 14.9153.

B.

[illegible] fractions to equivalent decimals.

[illegible] reduce to finite decimals?

[illegible] reduce to pure circulating deci[illegible]

[illegible] reduce to mixed circulating deci[illegible]

[illegible] know the number of digits in the finite decimal?

[illegible] the number of digits in the repe[illegible]

[illegible] then without division [illegible]

Multiply each by 8 twelve [illegible]
10656 ; (25) 14256 ; (25) 19036 ; (24) [illegible]
(26) 37422 ; (27) 42768 ; (28) 48114 ; [illegible]
74844.

Multiply each by 9 twelve times in [illegible]
13104 ; (32) 14742 ; (33) 19656 ; (34) [illegible]
(36) 29484 ; (37) 39312 ; (38) 44226 ; (39) [illegible]
58968.

Multiply each of the following by [illegible]
(42) 15063 ; (43) 16821 ; (44) [illegible]
33642 ; (47) 39249 ; (48) 52332 ; (49) [illegible]

Multiply each of the following by [illegible]
11664 ; (53) 13824 ; (54) 15552 ; (55) [illegible]
(57) 27648 ; (58) 31104 ; (59) 41472 ; (60) [illegible]

Find the cubes of : (61) 216 ; (62) 243 ; (63) [illegible]
324 ; (65) 432 ; (66) 486 ; (67) 648 ; (68) [illegible]
(70) 972.

DIVISION TESTS.

Divide each of the following numbers by 6 [illegible] consecutive times : (1) 93880268567008 ; (2) [illegible]
344 ; (3) 164290470027264 ; (4) [illegible] ; (5)
187760357174016.

Divide each by 7 twelve consecutive times : (6) [illegible]
239030454 ; (7) 599625044057272 ; (8) [illegible] ;
(9) 899157699151632 ; (10) [illegible]

Divide each by 8 twelve consecutive times : [illegible]
872842834944 ; (12) 257123426452416 ; [illegible]
378624 ; (14) 4215527580683184 ; (15) [illegible]

Divide each by 9 twelve consecutive times : [illegible]
535346548352 ; (17) 10243803019822528 ; [illegible]
529733792 ; (19) 204976060996450[illegible] ; (20) [illegible]
919232.

Divide each of the following by the factors of [illegible] (21)
15701796 : (22) 24425016 ; (23) 31403592 ; (24) [illegible] ;
(25) 47105388 ; (26) 48850032 ; (27) 62807184 ; [illegible]
0776 ; (29) 109912572 ; (30) 125614368.

Divide each of the following by 1296 : [illegible] ;
(32) 37340352 ; (33) 174254976 ; (34) [illegible] ; (35)
90018048.

I.—MEASURES AND MULTIPLES.

A.

Find L.C.M. of 545, 26487, 1853 and 11421.

Resolve 152352 and 107328 into their prime factors, and find their L.C.M.

Resolve 16335 and 18018 into their prime factors, and by inspection of these find their G.C.M.

Find the prime factors of 19230, 23050, and 29585. By means of these find their G.C.M. and L.C.M.

Resolve 34650 and 43890 into their prime factors, and by inspection find the quotient when their G.C.M. is divided into their L.C.M.

Find the L.C.M. of $2\frac{1}{2}$, $3\frac{1}{3}$, $3\frac{5}{12}$, and $14\frac{3}{14}$.

Find the L.C.M. of $\frac{10}{121}$, $1\frac{1}{3}$, and $3\frac{3}{14}$.

Find the G.C.M. of $\frac{3}{10}$, $1\frac{1}{14}$, $2\frac{1}{7}$, and $2\frac{1}{3}$.

Divide the L.C.M. of $\frac{3}{5}$, $\frac{1}{7}$, $\frac{5}{6}$, and $\frac{5}{8}$, by the G.C.M. of $\frac{1}{2}$, $\frac{5}{6}$, $\frac{3}{4}$, and $\frac{5}{12}$.

What is the greatest number that will divide 10725 and 68131, leaving remainders 49 and 26 respectively?

A number is composed of the following factors; 2^3, 3^2, 5^3, 11 and 17; find the number.

Find the sum of all the divisors of 810.

B.

Find the product of the following:

524288 and 326437, having 3 partial products.

IX.—MISCELLANEOUS EXERCISES ON DECIMALS.

A.

Find the value correct to 5 dec. places of :

1. $\frac{1}{2}+\frac{1}{3}+\frac{1}{5}+\frac{1}{7}+\frac{1}{11}+\cdots$

2. $\frac{1}{2}+\frac{1}{3}+\frac{1}{5}+\frac{1}{17}+\frac{1}{31}+\cdots$

3. $\frac{1}{2}+\frac{1}{3}+\frac{1}{10}+\frac{1}{24}+\frac{1}{110}+\cdots$

4. $\frac{1}{1}+\frac{1}{5}+\frac{1}{5^2}+\frac{1}{5^3}+\frac{1}{5^4}+\frac{1}{5^5}+\cdots$

5. $\frac{1}{1}+\frac{1}{6}+\frac{1}{6^2}+\frac{1}{6^3}+\frac{1}{6^4}+\cdots$

Find the value correct to 4 places :

6. $1+\frac{1}{1}+\frac{1}{1\times2}+\frac{1}{1\times2\times3}+\frac{1}{1\times2\times3\times4}+\cdots$

7. $1+\frac{1}{1}+\frac{1}{1\times3}+\frac{1}{1\times3\times5}+\frac{1}{1\times3\times5\times7}+\cdots$

8. $\frac{1}{5}+\frac{1}{3\times5^3}+\frac{1}{5\times5^5}+\frac{1}{7\times5^7}+\cdots$

9. Reduce to a decimal

$$2+\tfrac{1}{2}+\frac{1}{2\times3}+\frac{1}{2\times3\times4}+\frac{1}{2\times3\times4\times5}+\frac{1}{2\times3\times4\times5\times6}$$

10. Reduce to a decimal

$$2+\tfrac{1}{3}+\frac{2\times2}{3\times5}+\frac{2\times4\times6}{3\times5\times7}+\frac{2\times4\times6\times8}{3\times5\times7\times9}$$

4. [illegible] and [illegible], having [illegible]

5. [illegible] and [illegible], having [illegible]

6. 45678 and 19537, having [illegible]

7. 957654 and 39766, having [illegible]

8. The L.C.M. of two numbers [illegible] 924; their G.C.M. is 12; find the [illegible]

9. The L.C.M. of two numbers is [illegible] their G.C.M. is 9187; one of the [illegible] 4059; find the other.

10. The L.C.M. of 391 and another [illegible] their G.C.M. is 23; find the other [illegible]

11. The driving wheels of a locomotive [illegible] cumference, and the trucks $10\frac{1}{2}$; [illegible] the train move to bring wheel and [illegible] same relative position as at starting?

12. A hall 60 ft. long is to be carpeted. [illegible] by stretching the carpet lengthwise [illegible] pieces—widths, respectively, $\frac{3}{4}$ yd., $\frac{7}{8}$ yd. and $1\frac{1}{4}$ yds., will exactly fit the hall. [illegible] est piece, worth $1.10 a yard, be chosen, [illegible] it cost to carpet the hall?

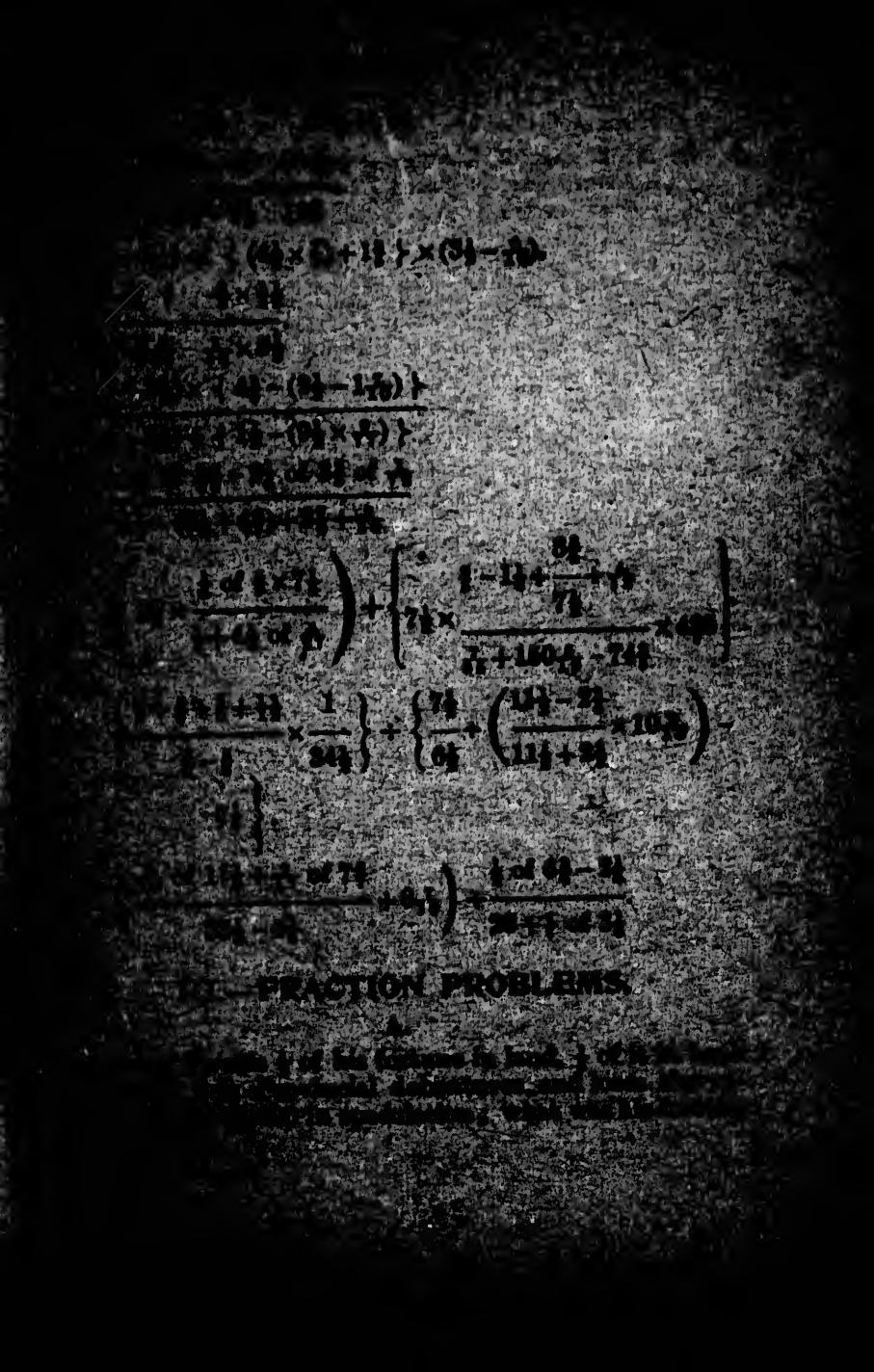
II.—FRACTIONS.

Reduce to a simple fraction:

1. $\dfrac{\frac{1}{2}+\frac{1}{3}+\frac{1}{4}}{\frac{1}{2\frac{1}{2}}+\frac{1}{3\frac{1}{3}}+\frac{1}{4\frac{1}{4}}} \times 7\frac{1}{2}$ of $\frac{11}{11}$.

2. $\left(\dfrac{\frac{1}{2}-\frac{1}{3}}{\frac{1}{2}+\frac{1}{3}}+\dfrac{\frac{1}{3}-\frac{1}{4}}{\frac{1}{3}+\frac{1}{4}}\right) \div \left(\dfrac{\frac{1}{2}-\frac{1}{3}}{\frac{1}{2}+\frac{1}{3}}-\dfrac{\frac{1}{3}-\frac{1}{4}}{\frac{1}{3}+\frac{1}{4}}\right)$.

3. $\dfrac{10\frac{1}{5}-7\frac{4}{15}}{12\frac{1}{5}-9\frac{1}{4}} - \left(\dfrac{8\frac{1}{3}}{10\frac{1}{17}} \times \dfrac{12\frac{1}{10}}{16\frac{1}{10}} + 3\frac{1}{3}\right) + 1$[illegible]



FRACTION PROBLEMS.

2. [illegible]

3. [illegible] to 48 gal. of wine, [illegible] per [illegible] water?

4. [illegible] will [illegible] 13 gal. of [illegible] [illegible] to [illegible]?

5. In an examination of 850 candidates, $12\frac{1}{2}\%$ of the whole [illegible] honors, and 60% of the remainder pass. How many fail to pass?

6. The demand of 10 hours' pay for 9 hours' work is equivalent to a demand of what increase per cent. in wages?

7. A grocer sells 11 lbs. of sugar for \$1, but the cost of sugar advances 10%; how many lbs. can he now sell for the dollar?

8. A man who owned $57\frac{1}{2}\%$ of a mine sold 45% of his share for \$57,000; what was the value of the mine?

9. A's money is $33\frac{1}{3}\%$ more than B's; how much per cent. is B's of A's?

10. One-sixth is what per cent. of three-fourths?

11. A speculator sold a house for 24% profit, and with the money purchased another, which he sold for \$4,620, losing $16\frac{2}{3}\%$. What did the first house cost him?

12. A bankrupt was able to pay 40% of his debts, but not a debt of \$[illegible] proved worthless; now he is able to pay only [illegible]c. on the \$. Find the total amount of his liabilities.

C.

1. [illegible] double another; $12\frac{1}{2}\%$ of the greater [illegible] makes \$[illegible]. Find their sum.

2. A [illegible] of his debts; the amount that a [illegible] is what per cent of that which he [illegible]?

2. A merchant bought a number of [illegible] $1,200; he used 20 bbls., and sold [illegible] der for $1,562, which was [illegible] many bbls. did he buy?

3. A, B and C, having equal shares of a [illegible] spectively $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$ of their shares to D, [illegible] and leaves his share equally among them. [illegible] C's interest in the ship be now worth [illegible], what is the value of A's share?

4. The numerator of a certain fraction is $\frac{1}{2}$ as [illegible] as its denominator and the sum of the [illegible] denominator is 352. Find the fraction?

5. Find what fraction must be subtracted from

$$\frac{1\frac{1}{2} \text{ of } 3\frac{1}{2}}{3\frac{1}{2} \text{ of } 2\frac{2}{3}} \text{ of } \frac{1\frac{1}{2} \text{ of } 1\frac{1}{2}}{32\frac{1}{2}} + \frac{2\frac{1}{2} \text{ of } 6\frac{2}{3}}{3\frac{1}{2} \text{ of } 4\frac{1}{2}} \text{ to make it}$$

$$1\frac{1}{2} \text{ of } \frac{1}{3\frac{1}{2}}$$

equal to $\frac{1}{28\frac{1}{7}}$ of $3\frac{1}{2}$ of $3\frac{1}{7}$ of $1\frac{1}{2} \times \frac{1}{3}$.

6. Out of a certain sum I take $2 more than the [illegible]; then $10 less than $\frac{1}{3}$ of the remainder; then [illegible] than $\frac{1}{4}$ of what still remained; after which I [illegible] $10. Find the original sum.

7. A does $\frac{2}{3}$ of a piece of work in 6 hours; B does $\frac{1}{2}$ of what remains in 2 hrs.; and C finishes the remainder of the work in 30 mins. In what time would all working together do the work?

8. I bought $\frac{2}{3}$ of $4\frac{1}{2}$ cords of wood for $\frac{1}{2}$ of $\frac{2}{3}$ of [illegible]; what were 2 cords worth at the same rate?

9. What fraction divided by $(\frac{1}{12} + \frac{1}{11}) + (3 - \frac{1}{3}) \times (\frac{1}{2} + \frac{1}{3})$ will give $\frac{5}{17}$ of $\frac{4\frac{2}{3}}{6\frac{1}{2}}$ of $\frac{6\frac{1}{11}}{11\frac{1}{7}}$ of 247?

10. A can do a work in one-half the time B requires; B can do it in two-thirds of the time C takes. All

[illegible] per hour [illegible] of the [illegible] at [illegible] times [illegible] of [illegible] ; after which he had [illegible] as much [illegible] he at first ?

[illegible] are worth 7 cows, and 5 cows cost as [illegible] 20 sheep, and 16 sheep cost $160 ; find the [illegible] of 12 horses.

[illegible] rides to town at the rate of 8½ miles per [illegible] per hour, and after resting 35 mins., walks [illegible] at the rate of 2½ miles per hour. The whole [illegible] occupied was 7 hrs. 20 mins. ; find the dis-[illegible]

[illegible]-quarter of the time which a man spent on a journey from M to T be travelled by steamboat at an average rate of 14 mi. per hour ; ⅔ of the time be travelled by railway at an average rate of 25 mi. hour ; and the remaining hour of the time he [illegible] the remaining 7 miles of his journey. Find [illegible] distance from M to T.

[illegible] is a mixture of vinegar and water in the pro-portion of 93 parts of vinegar to 7 parts of water ; [illegible] much water must be added, so that in 25 parts of the mixture there may be 2 parts of water ?

[illegible] assisted part of the time by a boy, completed [illegible] job in 15 hours. The man received ⅞ of the pay [illegible] the boy ⅛ ; but the man was paid at double the rate the boy was in proportion to the amount of work [illegible] did. How long would the man unassisted have taken to accomplish the job ?

[illegible] can run 6 times round a circular plot of ground [illegible] seconds ; another boy can run 5 times round [illegible] plot in 50 seconds. If they start from the

[illegible] marks
[illegible] shown 5% off
[illegible] of what the

7. What rate of discount
ounce of sugar with

8. What rate of discount
with each yard for

9. A grocer mixes a [illegible] with
vinegar. What trade discount will
to give?

10. At what advance on cost must a
goods, so that he may allow a
still gain 33⅓%?

11. What is the difference between
5 and 5% off?

12. A merchant gives a discount of
measure ½ inch too short; what
him the same rate of gain if the

C.

1. What must I ask for velvet, which
yard, so that I may fall 10%,
deducting 5% of the sales for

2. A merchant reduced the marked
a certain per cent. He gives
this reduced price for cash. The
⅝ of the original marked price?
cent.

3. From the list price of a line of goods
allowed a trade discount of 20%
of 10% of the trade price for
a still further discount of 5% of
Find his gain per cent. by selling
the list price.

4. A bookseller charges on
ling of the published
35%. What is his
shilling?

same place at [illegible]
direction. How [illegible]
the faster boy [illegible]

8. Find the least fraction [illegible] [illegible] and [illegible] will make the [illegible]

9. A person sold A [illegible] of his [illegible] and C [illegible] of what then [illegible] from D for what he [illegible] the number of acres he had at first.

10. B runs a mile race with C and loses [illegible] been a third greater he would have won [illegible]; what fraction is B's speed of C's?

11. A person buys four houses; for the [illegible] half as much again as for the [illegible] third as much again as for the [illegible] gether; for the fourth, a fourth as much [illegible] the first, second and third together; he [illegible] $90,690; what is the cost of the fourth?

IV.—ADDITION OF DECIMALS.

Find the sum of:

1. 87.4183, 679, 6.79, .679, 814.73 and .5.
2. 86.247153, .07, .6314, 1.3728, 71.7854, [illegible]
3. 457.39, 81.493, 9.7164, .51237, [illegible]
4. 4193, .384, .416, .1647, 31.3, [illegible], [illegible]
5. .701, .0001, .000601, 7.8, .78, and [illegible]

Add, without reducing to vulgar fractions:—

6. .312, 9.4, and .23.
7. 16.73, 14.219, 5.617, 3.2673.
8. 8.97, 12.936, 6.4173, 8.612.
9. 16.7, 2.8156, 3.235467, 91.34.

[illegible] [illegible], [illegible], [illegible], [illegible].

11. 7.[illegible], 16.[illegible], 157.[illegible], 19.[illegible], .[illegible].

12. 75.72[illegible], 11.[illegible], 16.718, 19.[illegible], 718.[illegible], 12.[illegible].

V.—SUBTRACTION OF DECIMALS.

1. Subtract 96.8764186 from 765.[illegible] six times consecutively and find the sum of the six remainders.
2. Subtract .74[illegible] six times consecutively from 6.0[illegible] and add the six remainders.
3. From 834.17689 take 587.[illegible].
4. From [illegible].631 take 879.29[illegible].
5. Find the difference between 1768.9324 and 987.[illegible].
6. Take 987.65[illegible] from 1234.5678.
7. Take 18.1234567 from 97.91342.
8. Subtract 79.896 from 106.621734.

VI.—MULTIPLICATION OF DECIMALS.

Find the product of:

1. [illegible] and 2.34.
2. [illegible].076 and .003.
3. [illegible] and 240.6.
4. 7[illegible].6 and .005006.
5. [illegible].643 and 3.6872.

Find by the contracted method the product of:

6. [illegible].29 and 58.97 to three places.
7. [illegible] and 3.2164 to three places.
8. [illegible] and .9999 to three places.
9. [illegible] and [illegible].789 to three places.
10. [illegible] and [illegible].971 to four places.
11. [illegible] and .[illegible] to four places.

12. 2.46346 and .96343 to four places.
13. 5.17 and 2.08 to four places.
14. .318 and .7432 to four places.
15. 3.145 and 4.297 to four places.
16. 17.373 and 385.04597 to four places.
17. Find to the nearest cent the value of $100.
18. Find to the nearest cent the value of $[illegible].
19. Find to the nearest cent the value of $[illegible].
20. Find to the nearest cent the value of $100.

VII.—DIVISION OF DECIMALS.

Divide to 3 places of decimals:

1. 1.5706 by 28.645.
2. 28.64785 by .366.
3. 1.22475 by .7071.
4. Divide .549305 by 1.1512925 to 5 places.
5. Divide .5 by 1.15629 to 5 places.
6. Divide 339 by 1065 to 4 places.
7. Divide .150515 by .217149 to 4 places.

Find by the contracted method the quotient of

8. 6.931472 by .2302585 to 3 places.
9. 89.965 by 3.003663 [illegible] places.
10. 250÷3.141593 to [illegible]
11. 10÷.43429448 to 4 [illegible]
12. .1÷3.14159265 to 5 [illegible]
13. 2÷4.60517018 to 3 places.
14. 93.723÷29.4173 to 3 places.
15. .45÷.116331 to 4 places.
16. $(1.23456)^2 \div .23456$ to the fourth [illegible]
17. Find the quotient of 1 by (3.14159)^2 to [illegible] decimal place.

VIII.

A.

...to simple vulgar fractions:

...(2) .00375, (3) .$\dot{7}\dot{2}$, (4) .$1\dot{3}\dot{6}$, (5) .$7\dot{2}0\dot{6}$, (6) ..., (7) .$0\dot{6}\dot{2}$, (8) .$0\dot{6}\dot{4}\dot{3}\dot{2}$, (9) 5.$8\dot{0}\dot{3}$, (10) .$\dot{7}1\dot{4}2\dot{8}\dot{5}$, (11) .$0\dot{7}1\dot{4}2\dot{8}\dot{5}$, (12) 14.9125.

B.

...fractions to equivalent decimals.

...Why do $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{8}$, $\frac{1}{10}$ reduce to finite decimals?

...Why do $\frac{1}{3}$, $\frac{1}{6}$, $\frac{1}{11}$, $\frac{1}{15}$ reduce to pure circulating decimals?

...Why do $\frac{1}{7}$, $\frac{1}{12}$, $\frac{1}{13}$, $\frac{1}{14}$ reduce to mixed circulating decimals?

...do you know the number of digits in the finite ... decimal?

...the limit to the number of digits in the repe...

...to a decimal; then without division write ... equivalent to $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$ respectively.

...to a decimal, and then write the decimals ... $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{10}$, $\frac{1}{11}$ respectively. Why ... write the decimal equivalent to $\frac{1}{12}$?

...(by a very short process) to a decimal; ... without division, the equivalents ... respectively.

...process, the following ...

(11) $\frac{1}{13}$, (12) $\frac{1}{14}$, (13) $\frac{1}{15}$, ...

$\frac{1}{16}$, (17) $\frac{1}{17}$, (18) $\frac{1}{18}$.

$11.25 and contains 200 lbs., what per cent. of the weight is lost in retailing?

9. A farm cost 2½ times as much as a house; by selling the house at 10% loss, and the farm at 7½% gain, $3,666.20 is received. Find the cost of each.

10. I bought 24 yards of cloth at $5.70 a yard. If it shrank 5% in length, find the selling price per yard to gain 20%.

C.

1. A bookseller deducts 10% from the marked price of his books, and after this has a gain of 25%. He sells a book for $7.20; find the cost price of it, and what per cent. the marked price is in advance of the cost price.

2. A man sold 2 horses for $120 each; on the one he gained 15% and on the other he lost 15%. What per cent. did he gain or lose?

3. A merchant bought sugar at $3.75 per cwt., and paid for freight and other charges ¼ of a cent per lb. How many lbs. can he sell for a dollar to make a clear gain of 25%?

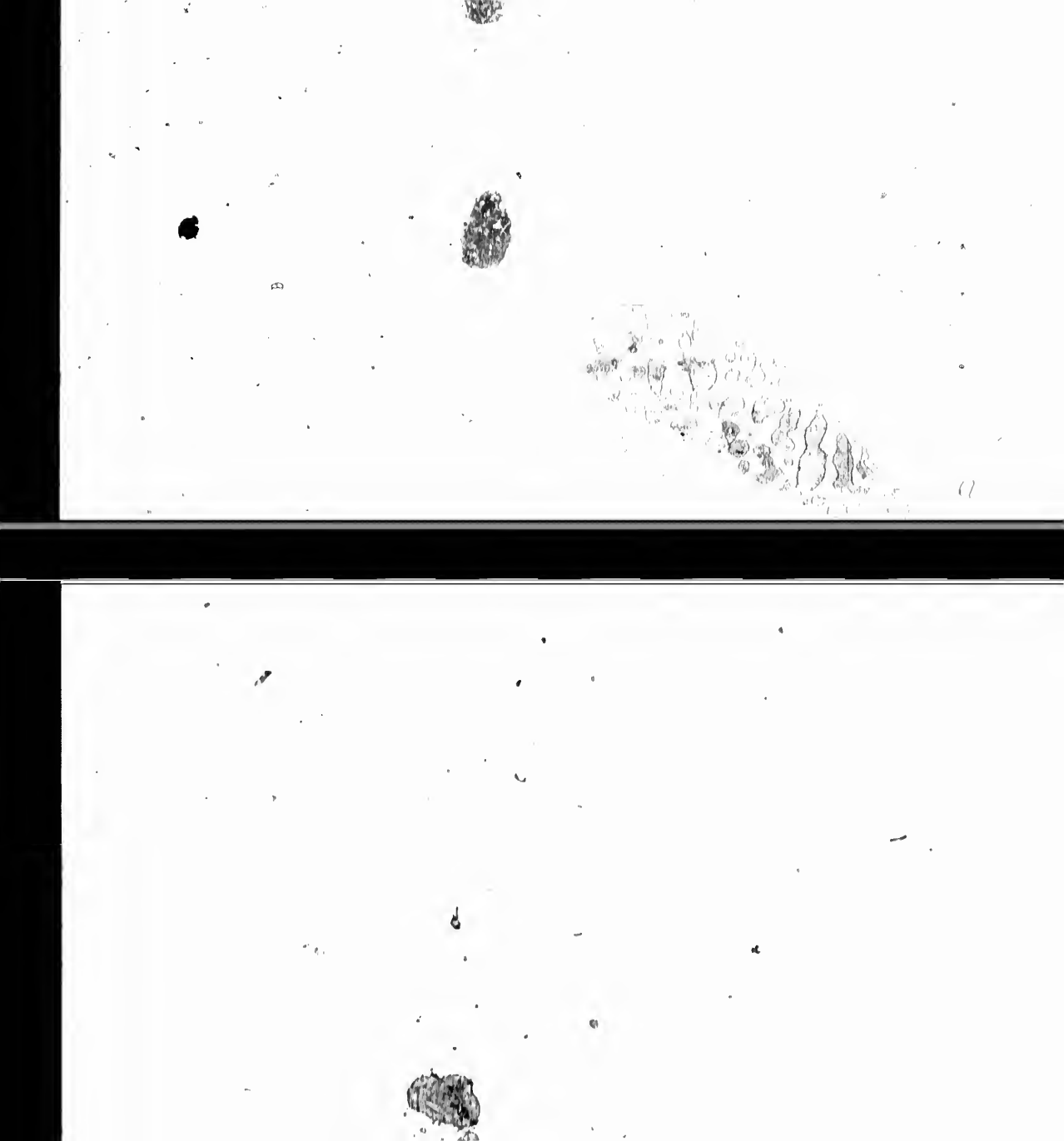
4. A merchant bought 124 yds. of cloth at $3.62½ per yd., and 87½ yds. at $4.12½ per yd. At what price per yd. must he sell the whole to realize a profit of 20%?

5. A merchant bought cloth at $2 per yard, and sold the whole at a profit of $120; had he sold it at 20% less he would have lost $96. How many yards did he buy?

6. Instead of a yard measure a draper uses a stick which is 36.36 inches long. What does he lose per cent. by doing so?

7. How much per cent. does a grocer gain or lose by selling half a bbl. of sugar, giving only 15 ozs. to the pound, and the other half giving 17 ozs. to the pound?

8. A speculator sold a piece of land at a profit of 50%, but the buyer becomes bankrupt, and pays only 75c.



on the dollar. What per cent. does he gain or lose?

9. A tailor buys cloth at $1.75 a yard, which shrinks 5%. At what price per yard must he sell to gain 20% on his outlay?

10. A druggist gives a pound troy of certain goods for a pound avoir. Find his gain per cent. and the loss per cent.

XIV.—TAXES.

A.

Find the taxes on:

1. Assessed value $3,760, rate 1½%.
2. Assessed value $2,500, rate 1¼%.
3. Assessed value $8,500, rate 1½%.
4. On $2,537 at 2c. on the $.
5. On $3,642 at 1½c. on the $.
6. On $3,900 at 15 mills on the $.
7. On $6,300 at 17 mills on the $.
8. On $8,240 at 17½ mills on the $.
9. When the rate of taxation is 15 mills on the dollar, what is the tax on property assessed at $[illegible]?
10. The total assessed value of the property [illegible] is $650,000. What tax will be raised at [illegible] 12½ mills on the dollar?
11. A tax of $100,000 is to be levied on [illegible] ratepayable property to the value of [illegible] is the amount borne by A whose property is assessed at $7,500?
12. A tax of $5,900 is levied for [illegible]. The assessed value of the town is [illegible] does a man pay whose property is assessed at [illegible]?
13. What sum must be assessed on a town to build a schoolhouse worth $[illegible] allowing 5% for collection?

14. A's income is $[illegible]. What tax does he pay, [illegible] below exemption, and the rate 15 mills on the dollar?

15. Find the net income of a man whose total income is $[illegible], upon which he pays a tax of 10 mills on the dollar.

B.

1. A tax of $[illegible] is to be levied on a town, the assessed valuation being 1.6 mills on the dollar; what tax does a man pay on an income of $1,100, of which $400 is exempted?

2. A farmer, whose property is assessed at $9,000, pays on the dollar 1¾ mills for township rates, 1½ for county rates, 1½ for railway bonus and 2½ for school rate. How much does he pay in all?

3. A man after paying an income tax of 15½ mills on the dollar, and spending $3.37½ per day on an average, is able to save $1,250.37½ per year (365 days). Find his gross income?

4. The expense of constructing a bridge was $5,000, which was raised by a tax on the assessable property of a town. The rate of taxation was $[illegible] on the $, and the [illegible]'s exemption was $[illegible]. Find the assessed value of the town's property.

5. The sum required by a village for taxes is $[illegible]. The rate of taxation is [illegible] mills on the $, and the collector charges 5% of the total amount. What is the amount of the assessment?

6. A [illegible] 12 horses on property worth $5,000 [illegible] for ¾ of its value. Find the rate.

7. A[illegible] with his [illegible] of his salary [illegible] what was the [illegible]?

8. A[illegible] pays

General City purposes 1.387 mills. How much does he pay in all?

9. A township has assessable property amounting to $475,000, and on a 3½ mill rate they raise $1,593, after paying the collector's charges. What per cent. of the taxes did the collector receive? 1.

10. A man bought a farm for $4,500; at the end of 3 mos. he paid his taxes levied on ⅔ of the purchased value at 18 mills on the dollar; in another 3 mos. he spent $425 on improvements, and at the end of the year he sold the farm for $6,000. Find his gain, money being worth 5 per cent. 2. 3.

XV.—INSURANCE.

A.

Find the premium of insurance on: 4.

1. Policy $1,200, rate ¼%.
2. Policy $6,000, rate ⅞%.
3. Policy $3,600, rate 2½% for 3 years. 5.
4. Policy $1,800, for 5 years, rate ⅝% for each year.
5. Policy $560, at 90c. per $100 for 3 years.
6. Policy $6,000, for 4 years, at 1⅛% per annum. 6.
7. Policy $5,000, at 1.17%.
8. What will it cost to insure a mill worth $18,000 for ⅔ of its value at 1¼%? 7.
9. What is the premium for insuring 4,840 bus. wheat, valued at $1.20 a bus., at 1½% on ⅚ of its value? 8.
10. A building was insured for $2,500 in one company at 1¼%, and for $3,000 in another company at 1½%. What was the total premium?
11. Find the premium paid to insure a house worth $7,500, for ⅔ of its value, for 4 years, the rate being ¼% for each year. 9.
12. A man insures a house worth $6,000, for ⅚ of its value, at 2% premium. If the house be destroyed,

find the total loss sustained by the owner after one premium has been paid.

B.

1. Find the premium paid to insure a house worth $7,500 for $\frac{2}{3}$ of its value, for 3 years, the rate being $\frac{3}{4}\%$ of the policy for each year.

2. A factory valued at $17,600 is insured for $\frac{1}{2}$ of its value in two companies, the first taking $\frac{3}{4}$ of the risk at $\frac{7}{8}\%$, the second the remainder at $\frac{3}{4}\%$. Find the total amount of premium.

3. A vessel running between Oswego and Hamilton is insured for $12,350 at the rate of $1\frac{3}{4}\%$ per month. To what does the premium of insurance amount from April 10th to November 10th?

4. An insurance company took a risk of $9,600 at $2\frac{1}{2}\%$, and immediately re-insured $\frac{1}{3}$ of it in another company at 3%. If the property be destroyed find the loss sustained by each company.

5. A company took a risk at $3\frac{1}{2}\%$, and re-insured $\frac{2}{3}$ of it at 3%. The premium received exceeded the premium paid by $144. Find the amount of the risk.

6. A man has property insured for $4,325, for which he paid $129.75 premium. He wishes to increase the policy to $6,600; what extra premium will he be required to pay if the rate for the latter is $\frac{1}{4}\%$ greater?

7. For what sum must I insure my house worth $2,450 at 2% so as to recover, in case of loss, both value and premium?

8. What will be the cost of insuring a property worth $7,500 at the rate of $\frac{3}{4}$ of 1%, so that in case of loss the owner may recover both the value of the property and the premium paid?

9. What will be the cost of insuring a ship worth $486, [illegible] at $3\frac{1}{2}\%$, so that in case of loss the owner may recover the value of the ship, and the amount paid for insurance?

10. A merchant bought 20,000 bushels of wheat and had it insured for ¾ of its cost, at 1½%; paying a premium of $136. At what price per bushel must he sell it to gain 20% of the cost of the wheat?

11. A dealer shipped 200 bbls. of apples to Liverpool; the average cost of the apples was $2.75 a bbl.; for what sum must he have the apples insured at 1% premium to guard against all loss in case of ship-wreck, his other expenses being $25?

12. A company took a risk at 1½%; re-insured 60% of it at 1¼%, and 40% of the remainder at 1½%. What rate did the company receive on the amount of risk it carried?

13. A merchant had 450 bbls. of flour insured for ¾ of its value at 2½%, paying $45 premium. At what price per bbl. must he sell it to gain 25% of the prime cost as well as of the premium paid?

14. A cargo worth $2,200 is insured for 80% of its value; the premium paid was $24; find the rate.

15. An insurance company took a risk at 2½%, and re-insured ⅔ of the risk at 2%. The premium received exceeded the premium paid by $45; find the amount of the risk.

XVI.—DUTIES AND CUSTOMS.

A.

What is the specific duty on:

1. 12 chests of tea, net weight 785 lbs., at 9c. per lb.?
2. 147 gals. of oil at 12c. per gal.?
3. 50 pianos at $95 each?
4. 4 hhds. sugar, each weighing 1,200 lbs., at 4½c. per lb., allowing tare 6 lbs. per 100?
5. 6 bags coffee, each weighing 75 lbs., at 5c. per lb., allowing 2% for tare?
6. 3 [illegible] each weighing 1,000 lbs., at [illegible]c. per lb., tare 14%?

IX.—MISCELLANEOUS EXERCISES IN DECIMALS.

A.

Find the value correct to 5 dec. places of :

1. $\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{10}+\cdots$
2. $\frac{1}{2}+\frac{1}{3}+\frac{1}{5}+\frac{1}{17}+\frac{1}{31}+\cdots$
3. $\frac{1}{2}+\frac{1}{4}+\frac{1}{10}+\frac{1}{24}+\frac{1}{130}+\cdots$
4. $\frac{1}{1}+\frac{1}{5}+\frac{1}{5^2}+\frac{1}{5^3}+\frac{1}{5^4}+\frac{1}{5^5}+\cdots$
5. $\frac{1}{1}+\frac{1}{6}+\frac{1}{6^2}+\frac{1}{6^3}+\frac{1}{6^4}+\cdots$

Find the value correct to 4 places :

6. $1+\frac{1}{1}+\frac{1}{1\times2}+\frac{1}{1\times2\times3}+\frac{1}{1\times2\times3\times4}+\cdots$
7. $1+\frac{1}{1}+\frac{1}{1\times3}+\frac{1}{1\times3\times5}+\frac{1}{1\times3\times5\times7}+\cdots$
8. $\frac{1}{5}+\frac{1}{3\times5^2}+\frac{1}{5\times5^5}+\frac{1}{7\times5^7}+\cdots$
9. Reduce to a decimal $2+\frac{1}{2}+\frac{1}{2\times3}+\frac{1}{2\times3\times4}+\frac{1}{2\times3\times4\times5}+\frac{1}{2\times3\times4\times5\times6}+\cdots$
10. Reduce to a decimal $2+\frac{2}{3}+\frac{2\times4}{3\times5}+\frac{2\times4\times6}{3\times5\times7}+\frac{2\times4\times6\times8}{3\times5\times7\times9}+\cdots$

B.

1. Simplify $\dfrac{.51 \text{ of } (.00617 - .00582) + (.357 \times .007)}{.51 \times .17}$

2. Find the difference between $\dfrac{\frac{2}{3} \text{ of } .005}{[illegible] \text{ of } .345}$ and $\dfrac{[illegible] \text{ of } ([illegible] - [illegible])}{.72 + [illegible]}$

3. Simplify $(.357 - .255)^2 \div \{(.357)^2 - (.255)^2\}$.

4. Simplify $\{(.086)^3 + (.014)^3\} \div \{(.086)^2 - (.086)(.014) + (.014)^2\}$.

5. Reduce to its simplest form:

$$\frac{(.05)^4 - (.025)^2(.0125)^2 - (.0375)^4}{(.0375)^2 - (.05)^2(.0125) - (.025)(.0125)^2}$$

6. Express as a vulgar fraction the average of

$$[illegible],\ \frac{[illegible]}{1[illegible]},\ .7,\ .4[illegible],\ \text{and } .486[illegible].$$

7. Find the average correct to 4 dec. places of 12[illegible], 21, $7\frac{1}{4}$, .034, 3.125, 0, 24.58 and $12\frac{[illegible]}{25}$.

8. Prove that .48732 = [illegible].

9. Reduce to a simple quantity

$$\frac{2.8 \text{ of } 2.27}{1.136} + \frac{4.4 - 2.83}{1.6 + 2.629} \text{ of } \frac{6.8 \text{ of } 3}{2.25}.$$

10. Simplify $3.875 \times 3.5 \div 5.63 \times \dfrac{15.25}{3.05}$

11. Find the simplest form of

$$\{(2.6 + 1.12 + .39) \times (7.24574 - 2.634)\} \div 110.6.$$

12. The average of four quantities is 18[illegible]; the first is 28.257, the second is 3.592, and the third is 38.06. Find the fourth.

X.—PERCENTAGE.

A.

1. How much is 5% of 360? 4% of 139? 6% of [illegible] of $316? 9% of $745?
2. Find 12½% of 608 men; 20% of 975 bus.; 35[illegible] inches; 62½% of 4840 sq. yds.; 8% of 3[illegible]
3. A clerk received $375 a year, and had his [illegible] 40%. What does he receive now?
4. A lawyer collected $2346, and charged 5% for [illegible] vices. How much money did he pay over?
5. Property which cost $2,356 increased in value [illegible] find the present value.
6. The rent of a house is $275, which is 11% of its value, what is the value?
7. A merchant sold $3750 worth of goods, and had [illegible] of his stock left. What was the entire stock worth?
8. Ten years ago the population of a town was [illegible]; it has increased 20%. What is the present population?
9. What number increased by 18% of itself is equal to 177?
10. What number diminished by 14¾% of itself is equal to 738?
11. A farm was sold for $6370, which was 18½% more than it cost. Find the cost.
12. The number of boys in a school is 20% of the number of girls. The number of boys is 172; how many pupils are there in the school?

B.

1. A man sold a lot for $643, gaining 17½% of [illegible] What would he have sold it for had he gained [illegible] of the cost?

2. A [illegible] How [illegible] the [illegible] to pay?

3. If 2 gal. of water are added to 48 gal. of wine, what per cent. of the mixture is water?

4. How much water will dilute 12 gal. of spirits 91% strong to [illegible]?

5. In an examination of 250 candidates, 12½% of the whole obtain honors, and 60% of the remainder pass. How many fail to pass?

6. The demand of 10 hours' pay for 9 hours' work is equivalent to a demand of what increase per cent. in wages?

7. A grocer sells 11 lbs. of sugar for $1, but the cost of sugar advances 10%; how many lbs. can he now sell for the dollar?

8. A man who owned 57½% of a mine sold 45% of his share for $27,000; what was the value of the mine?

9. A's money is 33⅓% more than B's; how much per cent. is B's of A's?

10. One-sixth is what per cent. of three-fourths?

11. A speculator sold a house for 24% profit, and with the money purchased another, which he sold for $4,020, losing 10⅔%. What did the first house cost him?

12. A bankrupt was able to pay 40% of his debts, but not a debt of $600 proved worthless; now he is able to pay only 25c. on the $. Find the total amount of his liabilities.

C.

1. One number is double another; 12½% of the greater and 16⅔% of the smaller make 80. Find their sum.

2. A bankrupt pays 40% of his debts; the amount that a creditor receives is what per cent of that which he loses?

3. Divide $916 among A, B and C, so that 5% of A's share may equal 7½% of B's, and 12½% of B's may equal 20% of C's.

4. A bankrupt had goods worth $7,200, which, if sold at their full value, would give his creditors 62½% of their claims. But ⅓ of them were sold at 17½% below their value, and the remainder at 25% below their value. How many c. on the $ did his creditors realize?

5. State the relation between the pound troy and the pound avoirdupois. What is the gain per cent. when the selling price per ounce avoir. is the same as the cost per ounce troy?

6. A dealer sells goods 6¼% below the marked price, and still gains 25%. Find the marked price of goods that cost $1.32 a yard.

7. For each of three succeeding months the population of a western town rose 50%; and at the end of the third month it was 2,700. What was the population at the beginning of the time?

8. A sold a lot of goods to B, B disposed of them to C, and C sold them to D for $62.37. A made 6%, B 10%, and C 5%. What did the goods cost A?

9. A man in building a house pays three times as much for material as for labor; had he paid 2⅓% more for material and 9% less for labor his house would have cost $7 more than it did. What was the cost of the house?

10. A merchant marked his goods at an advance of 25%, but in selling them he used a yard measure half an inch too short; his entire gain being $97.24. Find the cost price of the goods.

11. In an examination, arithmetic and grammar are valued at 200 marks each; education, history and geography at 150 marks each. A candidate obtains 75% in arith., 66% in gram., 60% in education, 80% in history and 40% in geography. Find his average rate per cent. (of the aggregate).

12. A grocer has 120 lbs. of tea, of which he sells 60 lbs. at 90c. a lb., and gains only 8%. He now raises the price so as to gain 20% on the whole outlay; what does he now sell at per pound?

XI.—TRADE DISCOUNT.

A.

Find the buying price:

1. List price, $253, Trade discount, 10% off.
2. List price, $437, Trade do. 8% off.
3. List price, $796, Trade do. 15% off.
4. List price, $406, Trade do. 20 and 5 off.
5. List price, $760, Trade do. 30 and 5 off.
6. List price, $660, Trade do. 10 and 4 off.
7. Invoice price, $1,000, Discount 10 and 5 off.
8. Invoice price, $1,728, do. 12½ and 4 off.
9. Invoice price, $2,040.90, do. 10, 5, and 3 off.
10. Invoice price, $604.36, do. 20, 5, and 2½ off.
11. Invoice price, $1,213.50, Discount 20, 10 and 3½ off.
12. Invoice price, $373.20, do. 25, 15½ and 12½ off.

B.

1. After a discount of 15% had been allowed, a grocer paid $793 for a bill of goods; what was the cost?
2. A merchant paid $459 for a bill of goods after being allowed $81 discount. Find the rate of discount.
3. At what price must a suit of clothes which cost $12 be marked, so that after a discount of 5% is allowed there may be a gain of $3.20.
4. A retailer bought a lot of carpet for 90c. a yard, at a discount of 10%. He received a further discount of 2% for cash; what did the carpet cost him per yard?
5. What is the difference between 20% off, and 15 and 10% off, the marked price being $1.20?

6. A merchant marks his goods [illegible] and allows 5% off for cash. [illegible] article if which the cash price is [illegible]

7. What rate of discount is equivalent to [illegible] ounce of sugar with each pound for good [illegible]

8. What rate of discount is equivalent to [illegible] with each yard for good measure?

9. A grocer mixes a pint of water with every [illegible] of vinegar. What trade discount will this [illegible] to give?

10. At what advance on cost must a merchant [illegible] his goods, so that he may allow a discount of [illegible] and still gain 33⅓%?

11. What is the difference between 20% discount, [illegible], 5 and 5% off?

12. A merchant gives a discount of 10%, but [illegible] measure ½ inch too short; what discount would allow him the same rate of gain if the measure was [illegible]?

C.

1. What must I ask for velvet, which cost me [illegible] a yard, so that I may fall 10%, and still make [illegible] after deducting 5% of the sales for bad debts?

2. A merchant reduced the marked price of [illegible] by a certain per cent. He gives the same [illegible] off this reduced price for cash. The cash price [illegible] of the original marked price; find the [illegible] per cent.

3. From the list price of a line of goods a purchaser is allowed a trade discount of 20%; a further discount of 10% off the trade price for taking a [illegible] and a still further discount of 5% off this [illegible]. Find his gain per cent. by selling at 10% [illegible] the list price.

4. A bookseller charges on certain books [illegible] shilling of the published price and gives a discount of 35%. What is the actual rate he charges [illegible] shilling?

5. A [illegible]

6. A [illegible] successive discounts of [illegible]. The [illegible] is payable in 60 days, [illegible] interest is to be charged at 7% per annum. On June 15, 1896, he paid $150. How much is due on July 1st, 1896?

7. A bookseller gives a discount of 5% for cash, and allows teachers a second discount of 10% on all cash prices. A teacher paid $5.13 for a book; what was the marked price?

8. The marked price of certain goods was reduced on account of damage by fire; a further reduction of 12½% was given for cash. Goods that were originally marked $5.40 were sold for $4.20 cash; what reduction in the marked price was made?

9. A merchant bought a quantity of cloth, and marked it at an advance of 25%, and in selling it used a yard measure ½ of an inch too long, his entire gain being $125. Find the cost price and the discount the merchant gave.

10. A merchant marked his goods so as to gain 20%, but sold them for 5% less than his asking price. He gained altogether $68.80; what did the goods cost?

XII.—COMMISSION.

A.

What is the commission for buying:

1. $[illegible] worth of goods, at 2% commission?
2. $[illegible] worth of goods, at 2½%?
3. $[illegible] worth of goods, at 1½%?
4. [illegible] lbs. of butter, at 18c. per lb., commission 2%?
5. [illegible] of flour at $4.80, at 3%?

What is the commission for selling:

6. 3,245 bus. wheat at $1.03, at ½% commission?
7. A house and lot for $4,850, at 2½%?
8. 420 acres at $18.50, at 2½%?
9. A commission merchant sold 10,500 bus. of potatoes at 45c. a bus., on a commission of 2%; what was his commission?
10. An agent sold 1,500 bus. of oats at 26c. a bus., on a commission of 1½%. Find his commission.
11. A commission merchant sold a consignment of apples for $1,755. What sum did he send his employer, his commission being 2½%?
12. A commission merchant retained $5.85 from the proceeds of the sale of 1,625 lbs. of butter at 16c. per lb. Find the rate of commission charged.

B.

1. An agent's commission for selling some land at $30 an acre was $50; how many acres did he sell, commission at ½%?
2. $1,648.27 includes the price paid by an agent for goods and his commission of 2½%. What was the cost of the goods?
3. A commission agent bought 13,450 bushels of wheat at 73c. a bu., and charged 1½% for buying. How much must his employer send him?
4. A broker received $11,500 to invest in pork at 5c. a lb. and pay his commission of 2%. How much pork did he buy?
5. A consignment of goods was sold for $9,450; the agent paid $225 for freight and other expenses, and remitted his employer $9,067.50. Find the rate of commission.
6. An agent charges 2% for selling and 3% for guaranteeing payment; the sales amount to $675. Find the amount the agent receives.

7. A commission merchant bought a lot, [illegible] with the money he realized from selling [illegible] 2½; the net proceeds of the wheat, after [illegible] the commissions, being $32,397.50. Find the [illegible] purchase price for the lot.

8. An agent sells and receives for $125 cash. He is to be responsible for bad debts, which amount to 12½% of the entire sales, and is to receive 20% of the good sales for his commission. What are his net earnings?

9. A firm became insolvent and owed $4,050; their assets amounted to $2,430.75. What per cent. of their indebtedness did they pay, having allowed the assignee 2½% on the amount distributed for their services?

10. I received $5,100 from my agent, who had deducted his commission at 5%, as proceeds of sale of goods; what were the goods sold for?

11. An agent sold, on a commission of ½%, a cargo of 1,200 tons of coal at $4.75 per ton; he invested the net proceeds on a commission of 1% in lumber, at $16 per M. How many feet of lumber did he buy?

12. A dealer shipped 400 bus. wheat at $1.40, 800 bus. at $1.62½, and 300 bus. at $1.20, to his agent, who sold the first at 20% gain, the second at 15% gain, and the third at 4½% loss. The agent's commission was 3%, and the other charges were $83.44; find the dealer's gain per cent.?

C.

1. An agent sold a consignment of flour for $4,200, and invested the proceeds (less his commission on both transactions) in the purchase of tea, receiving on the latter purchase 4% of the amount invested. His commission on both transactions being $301, find the rate of commission on the sale of the flour.

2. A commission merchant received 125 bbls. of flour from A, 150 bbls. from B, and 225 bbls. from C; he finds on inspection that A's is 10% better than B's,

and C's 5½% better than A's. He sold the lot at $7 a bbl., charging 4% commission. What sum must he remit to each?

2. A cheese factory shipped [illegible] to Liverpool, which a commission [illegible] 46s. 8d. per cwt. (112 lbs.). What per pound were realized on the [illegible] sion being 1%, and freight, insurance, etc., ing to $36.36 (£1 = $4.86⅔).

4. A commission merchant sells a consignment of wheat for $27,500, on a commission of 2½%. He pays $350 for freight and storage, and with the net proceeds buys pork at $6.25 per cwt., charging 2½% for buying. How many cwt. of pork does he buy, and what is the amount of his two commissions?

5. A merchant shipped $2,550 worth of barley to his agent, and received in return $2,425 worth of flax. The agent charged a certain rate for selling, and ½ per cent. less than this for buying. Find the rates charged?

6. A commission merchant has goods consigned to him to sell, and, after deducting 2% for both selling and investing, he finds that his commission for selling exceeds his commission for buying by $6. Find the value of the goods remitted to him.

7. An agent sold a consignment of apples on a commission of ½%. After deducting his commission and reserving a sufficient sum to pay the freight at 15c. per cwt., he bought flour at $2.75 per bbl., on a commission of 2%. The total commission was $16.80; find the amount of flour bought.

8. A commission merchant had shipped to him 200 bbls. of flour, and 5,000 bus. of wheat. He paid 5c. a bbl. for the storage of the flour, 2c. a bus. for the wheat, and $63.70 for freight. He sold the flour at $5.50 on a commission of 2%, and the wheat at 75c. a bus. on a commission of 2c. a bus.; what sum did he remit to his employer?

9. A commission merchant's terms are a certain rate of commission with guaranteed payment of sales, or 2½% without any guarantee. His employer accepts the former method (which is better than the latter by $20, owing to a bad debt of $64). If the total amount of sales was $4,200, what was the guarantee per cent.?

10. A merchant sent his agent $3,075 with instructions to deduct his commission of 2½%, and invest the remainder in flour at $6 a bbl. If the cost of freight and insurance amounts to $125, at what must the flour be sold a bbl. to make a clear profit of 15%?

11. A tradesman sends $898.20 in cash and butter to his agent, with instructions to sell the butter and invest the proceeds, less his commissions, in tea. The agent charges 5% on the goods he handles in each case; find the value of the butter shipped if his total commission amounts to $39.90.

XIII.—LOSS AND GAIN.

A.

Find the selling price:

1. Cost $674, gain 12½%.
2. Cost $713.40, gain 16⅔%.
3. Cost $1,024.16, gain 37½%.
4. Cost $1,260, loss 5%.
5. Cost $1,348.75, loss 4%.
6. 13 bbls. flour @ $5.30, gain 30%.
7. 432 bus. oats @ 31c., gain 25%.
8. 18 parlor sets @ $42.75, gain 33⅓%.
9. 24 pieces print, 48 yds. each, @ 5½c., gain 25%.
10. 425,250 ft. hemlock @ $22 per M., loss 6%.
11. 19 bbls. sugar @ $7.50, gain 2%.
12. A man invests $2,500 and sells at a loss of 17%; how much has he left?

13. A grocer bought coffee at 42c. per lb., and sold at a loss of 12½%. Find the selling price.

14. A grocer sold goods to the amount of $8.40, and gained 16⅔%. Had he gained 20% find what the goods would have sold for?

15. A newsboy buys papers for 8c. a dozen, and sells them for a cent each. Find his gain per cent.

B.

1. A market woman buys apples at the rate of 100 for 40c.; 10% of her apples is lost by decay. What per cent. does she gain by selling 5 for 3 cents?

2. When milk is sold at the rate of 20 quarts for $1, there is a gain of 20%; what would be the gain if 16 quarts were sold for the same sum?

3. A grain merchant bought wheat and sold at a gain of 12½%; reinvested the whole sum and made the same rate of gain; reinvested again and lost 25%. Find total gain or loss.

4. If 15% is lost when an article is sold for $2.04, for what should it be sold to gain 15%.

5. A sells a piano to B at a gain of 25%; B sells to C at a gain of 20%; C buys for $180 more than A. What did the piano cost A?

6. A machinist sold two seed drills for equal sums of money. He gained 25% on the one and lost 25% on the other, his total loss was $9.60; find the cost of each seed drill.

7. A man bought a bankrupt stock at 60c. on the $ of the invoice price, which was $4,340. He sold half of it at 10% advance on invoice price, half the remainder at 20% below the invoice price, and the balance at 50% of the invoice price. His expenses were 10% of his investment. Find his loss or gain, (a) in money, and (b) in rate per cent.

8. A grocer retailing sugar at the rate of 25 lbs. for $1 makes a profit of 11⅑%. If a bbl. of sugar cost

$11.25 and contains 200 lbs., what per cent. of the weight is lost in retailing?

9. A farm cost 2½ times as much as a house; by selling the house at 10% loss, and the farm at 7½% gain, $3,966.30 is received. Find the cost of each.

10. I bought 84 yards of cloth at $5.70 a yard. If it shrank 5% in length, find the selling price per yard to gain 20%.

C.

1. A bookseller deducts 10% from the marked price of his books, and after this has a gain of 25%. He sells a book for $7.20; find the cost price of it, and what per cent. the marked price is in advance of the cost price.

2. A man sold 2 horses for $120 each; on the one he gained 15%, and on the other he lost 15%. What per cent. did he gain or lose?

3. A merchant bought sugar at $3.75 per cwt., and paid for freight and other charges ¼ of a cent per lb. How many lbs. can he sell for a dollar to make a clear gain of 25%?

4. A merchant bought 124 yds. of cloth at $3.62½ per yd., and 87½ yds. at $4.12½ per yd. At what price per yd. must he sell the whole to realize a profit of 20%?

5. A merchant bought cloth at $2 per yard, and sold the whole at a profit of $120; had he sold it at 20% less he would have lost $96. How many yards did he buy?

6. Instead of a yard measure a draper uses a stick which is 36.36 inches long. What does he lose per cent. by doing so?

7. How much per cent. does a grocer gain or lose by selling half a bbl. of sugar, giving only 15 ozs. to the pound, and the other half giving 17 ozs. to the pound?

8. A speculator sold a piece of land at a profit of 50%, but the buyer becomes bankrupt, and pays only 75c.

on the dollar. What per cent. does the [illegible] gain or lose?

9. A tailor buys cloth at $1.75 a yard, which in [illegible] shrinks 5%. At what price per yard must he sell it to gain 20% on his outlay?

10. A druggist gives a pound troy of certain goods for a pound avoir. Find his gain per cent. and the buyer's loss per cent.

XIV.—TAXES.

A.

Find the taxes on:

1. Assessed value $3,700, rate 1½%.
2. Assessed value $2,500, rate 1¼%.
3. Assessed value $6,500, rate 1½%.
4. On $2,537 at 2c. on the $.
5. On $3,642 at 1½c. on the $.
6. On $3,900 at 15 mills on the $.
7. On $6,300 at 17 mills on the $.
8. On $8,240 at 17½ mills on the $.
9. When the rate of taxation is 15 mills on the dollar, what is the tax on property assessed at $[illegible]?
10. The total assessed value of the property of a village is $650,000. What tax will be raised at the rate of 12½ mills on the dollar?
11. A tax of $100,000 is to be levied on a county having rateable property to the value of $[illegible]. What is the amount borne by A whose property is assessed at $7,500?
12. A tax of $5,900 is levied for building a [illegible]. The assessed value of the town is $[illegible]. What does a man pay whose property is assessed at $[illegible]?
13. What sum must be assessed on a polled [illegible] to build a schoolhouse worth $[illegible], and pay for the collection?

14. A's income is $960. What tax does he pay, $400 being exempted, and the rate 15 mills on the dollar?

15. Find the net income of a man whose total income is $925, on $625 of which he pays a tax of 16 mills on the dollar.

B.

1. A tax of $24,750 is to be levied on a town, the assessed valuation being 1.6 mills on the dollar; what tax does a man pay on an income of $1,100, of which $400 is exempted?

2. A farmer, whose property is assessed at $9,600, pays on the dollar 1¼ mills for township rates, 1½ for county rates, 1½ for railway bonus and 2½ for school rate. How much does he pay in all?

3. A man after paying an income tax of 15½ mills on the dollar, and spending $3.37½ per day on an average, is able to save $1,230.87½ per year (365 days). Find his gross income?

4. The expense of constructing a bridge was $3,500, which was raised by a tax on the assessable property of a town. The rate of taxation was 2c. on the $, and the collector's commission was $160. Find the assessed value of the town property.

5. The net amount received by a village for taxes is $9,177. The rate of taxation is 17½ mills on the $, and the collector's charges 5% of the total taxes. What is the amount of the assessment?

6. A farmer pays $64.10 taxes on property worth $5,600 which is assessed for ⅞ of its value. Find the rate.

7. At a [illegible] a man who has $400 of his salary exempted pays $6.50. What was his salary?

8. A [illegible] property is assessed for $4,200, pays [illegible]

General City purposes 1.387 mills. How much does he pay in all?

9. A township has assessable property amounting to $475,000, and on a 3½ mill rate they raise $1,596, after paying the collector's charges. What per cent. of the taxes did the collector receive?

10. A man bought a farm for $4,500; at the end of 3 mos. he paid his taxes levied on ⅔ of the purchased value at 18 mills on the dollar; in another 3 mos. he spent $425 on improvements, and at the end of the year he sold the farm for $6,000. Find his gain, money being worth 5 per cent.

XV.—INSURANCE.

A.

Find the premium of insurance on:

1. Policy $1,200, rate ¼%.
2. Policy $6,000, rate ⅞%.
3. Policy $3,600, rate 2½% for 3 years.
4. Policy $1,800, for 5 years, rate ⅝% for each year.
5. Policy $560, at 90c. per $100 for 3 years.
6. Policy $6,000, for 4 years, at 1⅞% per annum.
7. Policy $5,000, at 1.17%.
8. What will it cost to insure a mill worth $18,000 for ⅔ of its value at 1¼%?
9. What is the premium for insuring 4,840 bus. wheat, valued at $1.20 a bus., at 1⅛% on ⅝ of its value?
10. A building was insured for $2,500 in one company at 1¼%, and for $3 000 in another company at 1½%. What was the total premium?
11. Find the premium paid to insure a house worth $7,500, for ⅘ of its value, for 4 years, the rate being ½% for each year.
12. A man insures a house worth $4,000, for ¾ of its value, at 2% premium. If the house be destroyed,

find the total loss sustained by the owner after one premium has been paid.

B.

1. Find the premium paid to insure a house worth $7,500 for $\frac{2}{3}$ of its value, for 3 years, the rate being $\frac{3}{4}\%$ of the policy for each year.

2. A factory valued at $17,600 is insured for $\frac{3}{4}$ of its value in two companies, the first taking $\frac{2}{3}$ of the risk at $\frac{7}{8}\%$, the second the remainder at $\frac{3}{4}\%$. Find the total amount of premium.

3. A vessel running between Oswego and Hamilton is insured for $12,350 at the rate of $1\frac{1}{2}\%$ per month. To what does the premium of insurance amount from April 10th to November 10th?

4. An insurance company took a risk of $9,600 at $2\frac{1}{2}\%$, and immediately re-insured $\frac{1}{3}$ of it in another company at 3%. If the property be destroyed find the loss sustained by each company.

5. A company took a risk at $3\frac{1}{2}\%$, and re-insured $\frac{2}{3}$ of it at 3%. The premium received exceeded the premium paid by $144. Find the amount of the risk.

6. A man has property insured for $4,325, for which he paid $129.75 premium. He wishes to increase the policy to $6,000; what extra premium will he be required to pay if the rate for the latter is $\frac{1}{4}\%$ greater?

7. For what sum must I insure my house worth $2,450 at 2% so as to recover, in case of loss, both value and premium?

8. What will be the cost of insuring a property worth $47,580 at the rate of $\frac{7}{8}$ of 1%, so that in case of loss the owner may recover both the value of the property and the premium paid?

9. What will be the cost of insuring a ship worth $486,-
[illegible] at $3\frac{1}{2}\%$, so that in case of loss the owner may recover the value of the ship, and the amount paid for insurance?

10. A merchant bought 20,000 bushels of wheat and had it insured for $\frac{1}{2}$ of its cost, at $1\frac{1}{10}\%$, paying a premium of $136. At what price per bushel must he sell it to gain 20% of the cost of the wheat?

11. A dealer shipped 200 bbls. of apples to Liverpool; the average cost of the apples was $3.75 a bbl.; for what sum must he have the apples insured at 4% premium to guard against all loss in case of shipwreck, his other expenses being $25?

12. A company took a risk at $1\frac{1}{4}\%$; re-insured 40% of it at $1\frac{1}{2}\%$, and 40% of the remainder at $1\frac{1}{4}\%$. What rate did the company receive on the amount of risk it carried?

13. A merchant had 450 bbls. of flour insured for $\frac{1}{2}$ of its value at $2\frac{1}{2}\%$, paying $45 premium. At what price per bbl. must he sell it to gain 25% of the prime cost as well as of the premium paid?

14. A cargo worth $2,700 is insured for 80% of its value; the premium paid was $24; find the rate.

15. An insurance company took a risk at $2\frac{1}{2}\%$, and re-insured $\frac{2}{3}$ of the risk at 2%. The premium received exceeded the premium paid by $42; find the amount of the risk.

XVI.—DUTIES AND CUSTOMS.

A.

What is the specific duty on:

1. 12 chests of tea, net weight 785 lbs., at 9c. per lb.?
2. 147 gals. of oil at 12c. per gal.?
3. 50 pianos at $235 each?
4. 4 hhds. sugar, each weighing 1,200 lbs., at 3½c. per lb., allowing tare 6 lbs. per 100?
5. 8 bags coffee, each weighing 75 lbs., at 4½c. per lb., allowing 4% for tare?
6. 3 hhds. sugar, each weighing 1,[illegible] lbs., at 2½c. per lb.; tare 14%?

Find the ad valorem duty :

7. Invoice $1,000 at 15%.
8. Invoice, boots and shoes, $769.40 at 15%.
9. Invoice, jewellery, $5,327.60 at 25%.
10. On 225 doz. kid gloves at $6.80 per doz., at 27%.
11. On 75 boxes of oranges at $2.90 a box, at 15%.
12. On a book, invoice price $4.60, at 15%.

B.

1. A dealer imports a book for me which was invoiced to him at $1.75 ; he pays 14c. postage, 20% ad valorem duty and makes a gain of 25% on his whole outlay. What do I pay for the book ?
2. Find the duty at 10c. a lb., and 12% ad valorem, on 325 bags of wool, each weighing 86 lbs., and valued at 18c. a lb.
3. A fruit dealer imports 30 boxes of oranges, each box containing 260 oranges, at $2.75 a box. The freight is $13.20, the duty 15%, the broker's fee $1.15, and the expense of delivery $4.25. How much will be gained by selling the oranges at 25c. a dozen ?
4. A dealer in musical instruments sells at an advance of 35% laid down in his store. I pay him $531.90 for a piano, on which he paid a specific duty of $20 and an ad valorem duty of 15%, and $25 for freight and cartage. What was the invoice price of the piano ?
5. A merchant pays $1,055 duty on an invoice of goods. If 10½% of the goods be exempt from duty, and 30½% is charged on the remainder, find the invoice price of the goods.
6. The duty on rubber fire hose is 6c. a lb. and 15% ad valorem. The duty on 1,000 feet of hose, invoiced at 18c. per foot, was $254.60 ; find its weight per foot.
7. 16% of a shipment of goods was admitted free of duty on account of damage, another [illegible] was charged on the [illegible] ; what was the invoice price ?

XXIV.—PARTNERSHIP.

1.

2.

3.

4.

5.

6.

8. A duty on coffee at 12½% in bags of 180 lbs. gross, an invoiced at 15c. a lb., was $777.60, tare having bee allowed at 4%. How many bags were there?

9. A grocer imported 120 cases of wine, with 36 bottle in each case. After 5% had been allowed for breal age, he paid an ad valorem duty of 20%; the freigh and other expenses were $73. The whole cost bein $4,177, what was the invoice price per bottle?

10. The duty on surgical instruments is 25% and 30% on the cases. A case of instruments was invoiced a $109. The duty being $28.45, find the invoice pric of the instruments.

XVII.—STOCKS AND INVESTMENTS.

A.

What is the market value of

1. 72 shares of stock at 80?
2. 168 shares of bank stock at 75?
3. 197 shares of mining stock at par?
4. 213 shares of stock at 112?
5. 350 shares of stock at 103⅓?
6. $3,600 in the 3 per cents at 94?
7. $4,000 in the 3½ per cents at 98½?
8. $2,240 in the 6¼ per cents at 106⅞?
9. $7,200 in the 7 per cents at 6½% premium?
10. 153 shares of stock at 7¼% discount?
11. 322 shares of 5% stock at 11⅓% below par?
12. $2,000 in the 6 per cents at 3¼% above par?

What will it cost to purchase

13. 98 shares in the 5 per cents at 79⅛, brokerage ⅛%?
14. $7,645 stock in the 6 per cents at 94¼, brokerage ¼%?
15. 76½ shares of 7% stock at 118½, brokerage ½%?
16. £3,850 in the 2½ per cents at 91½, brokerage ½%?
17. £2,600 railway stock at par, brokerage ½%?

What does a stockholder receive who sells

18. 25 shares bank stock at 131¼, brokerage ⅛%?
19. 18 shares in the 10 per cents at 137⅝, brokerage ⅛%?
20. 125 Telegraph Co. shares at 84, brokerage ¼%?
21. $75,000 Central R.R. stock at 121½, brokerage ⅛%?
22. $14,400 of 5% stock at 2½% discount, brokerage ⅛%?

Find the income from investing

23. $504 in the 6 per cents at 84.
24. $819 in the 7 per cents at 93⅓.
25. $4,788 in the 3½ per cents at 105.
26. $1,868.50 in 6% stock at 101.
27. $4,147 in 4% stock at 72⅜, brokerage ⅛%.
28. $6,720 in 5⅓% stock at 95¼, brokerage ¼%.
29. $8,475.50 in the 3 per cents at 92, brokerage ⅛%.

How much stock will

30. $4,200 buy in the 4 per cents at 75?
31. $2,963.50 buy in the 7 per cents at 117?
32. $1,878.75 buy in the 8 per cents at 125½?
33. £2,199 buy in the 3 per cents at 91½, brokerage ⅛%?
34. $3,741 buy in the 3½ per cents at 86¼, brokerage ¼%?
35. $4,706 buy in the 6 per cents at 90⅜, brokerage ⅛%?

What per cent. is made by investing in the

36. 8 per cents at 120?
37. 5 per cents at 95?
38. 3½ per cents at 75?
39. 7 per cents at 93⅞, brokerage ⅛%?
40. 7½ per cents at 96½, brokerage ⅛%?
41. 9 per cents at 102⅝, brokerage ⅛%?

How much stock must be sold in the

42. 8 per cents at 125 to produce $961?
43. 6 per cents at 112½ to produce $843.75?

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9 per cents at 102⅝, brokerage ⅛%?

w much stock must be sold in the
8 per cents at 125 to produce $961?
6 per cents at 112½ to produce $843.75?

44. 5 per cents at 101 to produce $984.75?
45. U.S. (10-40's) at 83½ to produce $2,250?
46. St. Paul R.R. stock at 69½, brokerage ¼%, to produce $11,000?

What sum invested gives an income of

47. $600 in the 8 per cents at 120?
48. $600 in the 6 per cents at 85?
49. $2,000 in the 5% at 89½, brokerage ¼%?
50. $672 in the 3½% at 66, brokerage ¼%?

B.

1. A broker invests $5,924.50 in stock at 37, on ½% commission; what are his charges?
2. Find the alteration in income occasioned by shifting $5,000 stock from the 3 per cents at 66¾, to the 4 per cents at 114¾, the brokerage being ¼% on each transaction.
3. Find the income derived from $22,831.50 invested in bank stock which sells at 184, and pays a dividend of 8% per annum, brokerage ½%.
4. Find the alteration in income occasioned by selling out $4,500 stock in the New York Central paying 6% at 115½, and investing the proceeds in 3% Government bonds at 91½, brokerage ¼% in each case.
5. Which is the better investment, 4% stock at 102, or 5% stock at 131; brokerage in each case ¼%?
6. Bought $4,750 stock at 75; at what price per share must I sell it to gain $190?
7. What rate per cent. do I receive on my money by investing in stock at 86½, brokerage ¼, paying an annual dividend of 5%?
8. What per cent. is made by investing in 4% stock at 75?
9. What is the price of a 6% stock which pays 8% on the money invested?

10. What is the price of a 6% stock paying [illegible] on the money invested, brokerage [illegible]?

11. Sold stock at a discount of 12½% and made [illegible] on my money; at what rate of discount did I buy?

12. If stock at 20% premium will pay 5% interest on the investment, at what premium would it have to be bought to pay 6% interest?

C.

1. A man owned $8,940 bank stock which paid a yearly dividend of 4½%. He sold out at 102⅞, and invested the proceeds in Michigan Central stock at 74⅞, paying a yearly dividend of 3%. By how much was his yearly income changed by the transfer, brokerage ⅛% in each case?

2. M invested money in 8% consolidated stock at 95, and an equal sum in factory stock at 190 paying an annual dividend of 7%. From the latter he received $10 a year more than from the former. How many fifty-dollar shares did he purchase?

3. A retired farmer invests 40% of his capital in 3½% stock at 90, and the remainder in 4% stock at 95; his income is $2098 per year. What capital has he invested?

4. A man sold his 5 per cents at 78 and invested the proceeds in 6 per cents at 104. His change in income being [illegible], find how much 5% stock he had.

5. A man invests $6,000 in 5% stock at 120; at the end of [illegible], having just received the yearly dividend, he sold out at 121½. How much better off is he than if he had loaned his money at 6% per annum?

6. What should be the market value of 6% stock, so that after paying an income tax of 16 m. on the $ it may yield [illegible] on the investment?

7. I bought a number of shares of stock at 75, and after a number of years sold out at [illegible], and found that I had made [illegible] per annum simple interest. How long did I hold the stock?

8. If a 5% stock sells at 105, how much must be invested in it to yield a yearly income of $794, after paying an income tax of 15 mills on the dollar, $400 of income being exempted from taxation?

9. Having received a stock dividend of 8%, I find I am now the owner of 297 shares; how many shares did I own at first?

10. A man having a certain sum of money to invest has an opportunity of purchasing 7% stock at 95, but delays until it has risen to 110. What per cent. is his income lessened by not purchasing at the first price?

11. How many railway shares at 40% discount must be sold, in order that the proceeds invested in bank stock, which is 4% below par, and pays a dividend of 7%, may yield an income of $1,650?

12. A man invests $12,000 in 3% stock at 75; he sells out at 80 and invests ⅗ of the proceeds in 3½% stock at 96, and the remainder in 5% stock at par. Find the change in his income.

XVIII.—SIMPLE INTEREST.

A.

Find to the nearest cent the simple interest on

1. $875 for 2½ years at 3% per annum.
2. $279.40 for 3 yrs. 2 mos. at 6%.
3. $631.90 for 3 yrs. 73 days at 8%.
4. $1,400 from May 3rd, 1897, to Nov. 16th, 1897, at 8%.
5. $1,275 from July 5th, 1894, to Jan. 16th, 1896, at 8%.
6. $1,830.63 from Aug. 16th, 1895, to June 19th, 1896, at 7%.
7. On March 1st, 1896, Fred. Harris gave his note for $75, for 8 mos., with interest at 6% per annum till due, and then at the rate of 8% per annum till paid. The note was settled in full June 29th, 1897; find the exact amount paid.

8. Find the rate when $144 is the interest on $[illegible] for 1 year and 8 mos.

9. Find the rate when $2,675 amounts to $3,317 in 3 years.

10. The interest on $340 for 511 days is $[illegible]; find the interest on $650 for 2 years at the same rate.

11. In what time will $3,200 amount to $3,520 at 7½%?

12. $1,160 amounts to $1,255.70 in a certain time at 9%; what would be the amount of $532 for the same time?

13. The interest on $1,805, loaned on May 14th at 5½% per annum, is $37.90½; on what day was the money returned?

14. The half-yearly interest on a mortgage at 7% per annum is $385. What is the face of the mortgage?

15. $350 amounts to $400 in a certain time; what sum will amount to $400 in half the time?

B.

1. A money lender has $1,500 out at 8% per annum, $1,200 at 7½%, and $1,000 at 6%; find the per cent. he receives on the average.

2. The amount of a sum of money at a certain rate is $593.35 for 8 years, and $640.80½ for 5½ years. Find the principal and the rate per cent.

3. At what rate per cent. will $1,520 amount to $1,733.75 in 2½ years?

4. A person borrows $500 on April 10th, and on June 22nd pays his debt with $510.20. At what rate per cent. per annum was he charged interest?

5. Divide $4,941 among A, B and C, so that nine months' interest on A's share at 3½% per annum, nine months' interest on B's share at 3¾%, and nine months' interest on C's share at 4¼%, may all be equal.

6. In what time will $30,441 gain $2,210.10 if at the same rate the gain on $24,944.10 for 1 year and 15

$178.92 is divided among 6 men, 8 women and 10 children, so that 2 men may get as much as 3 women, and 3 women as much as 2 children?

10. A man divided $17,040 among his 3 sons, whose ages are 16, 18 and 26 years, in proportion to their ages; three years afterwards he similarly divided an equal sum, and again after 3 years more; how much did each son receive altogether?

XXIX.—WORKING PROBLEMS.

1. A can chop 4 cords of wood in 3 days, B can chop as much in 3 days as A in 4 days. How long would both together be in chopping 28 cords?
2. A did $\frac{1}{3}$ of a piece of work, B did $\frac{1}{4}$ of the remainder, C did $\frac{1}{5}$ of what was left undone by B, and D finished the work. How much should D get for his work if A receives $8.40 for his?
3. Three men, A, B and C, working together can do a piece of work in 10 days. They undertake the job and work on it for 4 days; C then quits, and A and B finish the work in 10 days. If A could have done the whole work by himself in 30 days, in what time could each of the others have done it?
4. A and B can do a piece of work in 8 days when the days are 12 hours long; A, by himself could do the work in 12 days of 16 hours each. In how many days of 14 hours long could B do the work?
5. If 8 men and 5 boys mow $7\frac{1}{2}$ acres of grass in 3 days, and 6 men and 7 boys in another field mow 10 acres in 12 days, how long will it take these 14 men and 13 boys to mow 12 acres?
6. If 9 men in 10 weeks of 5 working days each, working 11 hours a day, dig 11 cellars, each 20 ft. long, 18 ft. wide and 8 feet deep; how many men will be required to dig 16 cellars, each 24 ft. square and 7 ft. deep, in 12 weeks of 6 days each, working 9 hours per day?

days is $5,863.62? What is the rate per cent. per annum (1 year = 365 days)?

7. On Jan. 1st, 1900, a person borrowed $2,445.50 at 6%, and promised to return it as soon as it amounted to $3,000.31. On what day did the loan expire?

8. Bought 9,000 bus. wheat at $1.12½ per bus. payable in 6 mos; I sold it immediately for $1.05 per bus. cash, and loaned the money at 10% per annum. Having received the money loaned in 6 mos. I paid for the wheat. What did I gain or lose by the transaction?

9. A man bought a house for $4,200; what monthly rent will pay the taxes on ⅞ of the value at 17½ m. on the $, and also 5% on the money invested?

10. Bought goods at $5.70 on 4 months' credit, and sold them immediately at $6.12, on such a term of credit as made my immediate gain 6⅔%. Reckoning interest at 4% per annum, how long credit did I give?

XIX.—PARTIAL PAYMENTS.

NOTE.—Each partial payment must, at least, be equal to the accrued interest; otherwise it is added to the next payment.

1. Note.—Prin. $300. Date, Jan. 1st, 1895. Time, 3 years.
   Paid.—Jan. 1st, 1896, $90; Jan. 1st, 1897, $120.36.
   How much was due Jan. 1st, 1898? Rate 6%.

2. Note.—Prin. $450. Date, Mar. 3rd, 1896. Time, 2 years.
   Paid.—Sept. 3rd, 1896, $135.25; May 3rd, 1897, $107.20.
   How much is due Mar. 3rd, 1898? Rate 5%.

3. Note.—$1,200. Date, Oct. 12th, 1895. Time, 1 year.
   Paid.—Oct. 12th, 1896, $1,000; April 12th, 1897, $200.
   How much remained due Oct. 12th, 1897? Rate 6%.

4. Note.—$900. Date, May 5th, 1897. Time, 6 mos.

Paid.—July 9th, $200; Aug. 31st, $[illegible]
$150.

How much is due at maturity (Nov. 4th, 1897)?
Rate 8%.

5. Note.—Prin. $600. Date, Oct. 1st, 1897. Time, 120 days.
Paid.—Nov. 15th, 1897, $110; Dec. 25th, 1897, $220.
How much is due at maturity? Rate 7%.

6. Note.—Prin. $1,000. Date, Mar. 1st, 1896. Payable on demand.
Paid.—June 1st, 1896, $300; Sept. 1st, 1896, $16; Jan. 1st, 1897, $100; June 1st, 1897, $400.
How much is due June 1st, 1898? Rate 8%.

7. Mortgage.—$3,400. Date, Sept. 13th, 1894. Rate 6%.
Paid.—April 20th, 1895, $300; July 2nd, 1895, $600; July 2nd, 1896, $1,000.
How much discharged the mortgage on Jan. 2nd, 1897?

8. Note.—$1,217.30. Date, June 2nd, 1895. Rate 6%.
Paid.—July 17th, 1895, $207.30; Oct. 6th, 1895, $[illegible].00; Dec. 11th, 1895, $360.00; Mar. 30th, 1896, $421.33.
How much redeemed the note on Oct. 7th, 1896?

9. Mortgage.—$000. Date, June 30th, 1893. Rate 7%
Paid.—Sept. 11th, 1896, $200; June 30th, 1897, $150.
How much paid the mortgage on Jan. 31st, 1898?

10. Note.—$[illegible]20. Date, Oct. 15th, 1896. Rate 6%.
Paid.—Nov. 26th, 1896, $47.50; Dec. 28th, 1896, $102.93; Feb. 11th, 1897, $216.18; June 6th, 1897, $60.10; Sept. 2nd, 1897, $153.25.
How much redeemed the note on Nov. 11th, 1897?

XX.—BANK DISCOUNT.

A.

Find to the nearest cent the proceeds of the following notes:

1. Face, $1,128.25, dated Feb. 15th, 1897, for 60 days. Discounted immediately at 6%.
2. Face, $[illegible], dated Jan. 15th, 1897, for 3 mos. Discounted Feb. 1st, 1897, at 6%.
3. Face, $137.50, dated April 1st, 1896, for 4 mos. Discounted June 4th, 1896, at 8%.
4. Face, $480, dated Feb. 6th 1897, for 3 mos., with interest at 5%. Discounted Feb. 13th, 1897, at 6%.
5. Face, $2,000, dated Mar. 4th, 1895, for 60 days, with interest at 6%. Discounted immediately at 8%.
6. Face, $4,200, dated Aug. 25th, 1896, for 90 days, with interest at 7%. Discounted Sept. 1st, 1896, at 8%.
7. Face, $730. Time, 3 mos. Date, Aug. 3. Discounted on Sept. 15th, at 7%.
8. Face, $500. Time, 45 days. Date, May 16th. Discounted immediately, at 6%. This note bears interest at 7%.
9. Principal, $480. Time, 3 mos. Date, Feb. 6th. Discounted Feb. 13th, at 6%. This note bears 5% interest.
10. A note of $2,450, dated New York, June 1st, 1896, for 4 months, bearing interest at 6%, was discounted at a bank on Aug. 15th, at 8%. Find the proceeds paid by the bank.

B.

1. A buys 600 yards of silk at 95c. a yard, and sells it at once, receiving in payment a 90-days' note for $700, which he at once discounts at a bank at 6% per annum. Find the gain.
2. A man got a 90-days' note for $1,360 for a lot which cost $1,200 cash just a year before. Money being worth 6%, find his net gain at the time of sale (360 days to the year; no days of grace).
3. A bill for $253.03, dated Oct. 7th, and payable at Chicago in 3 mos. from date, was discounted in Detroit on Oct. 20th; the discount being at the

4. [illegible]

5. [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

9. [illegible]

10. On [illegible] a banker discounts a note for $[illegible] made [illegible], at 3 mos., at the rate of 8% per annum. At what rate does he receive interest on the money?

XXI.—EQUATION OF PAYMENTS AND ACCOUNTS.

A.

The interest on what sum for 1 day equals

1. The int. on $100 for 4 days?
2. The int. on $60 for 16 days?
3. The int. on $[illegible] for 12 days?
4. The int. on $[illegible] for 15 days?
5. The int. on $[illegible] for 27 days?

How many days' int. on

6. $60 equals [illegible] days' int. on $[illegible] for 1 day?

XXXV.—SQUARE ROOT

7. $[illegible] equals the use of $3,600 for 1 day?
8. $30 equals the use of $37.50 for 64 days?
9. $22.50 equals the use of $37.50 for 27 days?
10. $32.25 equals the use of $50.16 for 25 days?
11. I loaned Mr. Smith $900 for 4 months; for how many months should he loan me $300 to balance the favor?
12. How many months' use of $600 is equal to the use of $240 for 10 months?
13. A loaned me $60 for six mos., $70 for 5 mos.; how much money loaned A for 1 month would balance the favor?
14. I loaned A $100 for 2 mos., $75 for 3 mos., and $[illegible] for 4 mos.; how much should A loan me for 1 month to balance the favor?
15. A person owes another $30 in six mos., $60 in 8 mos., and $90 in 12 mos. At what time may all be paid together, without loss or gain to either party?

B.

1. A debt of $500 is to be paid as follows: $100 immediately, $200 in 4 mos., and the balance in 6 mos. When should it be paid altogether?
2. I owe $1,700 to be paid down, $1,500 in 20 days, and $1,700 in 40 days. For how many days must my note be drawn so that the whole may be paid in one payment?
3. Find the equated time of $50 due in 2 mos., $[illegible] in 5 mos., and $90 in 7 mos.
4. Find the average term of credit of $350 due in 60 days, $520 in 90 days, and $[illegible] in 30 days.
5. Find the equated date of payment. On Jan. 1st a merchant bought goods as follows: $500 due in 60 days, $600 in 40 days, and $[illegible] in 30 days.
6. A merchant bought goods from a wholesale house as follows: Nov. [illegible], 18[illegible], $[illegible] worth on 30 days;

9. When is the balance of the following account due; and how much must be paid on Jan. 1st, 1898, to balance this account, allowing interest at 6%?

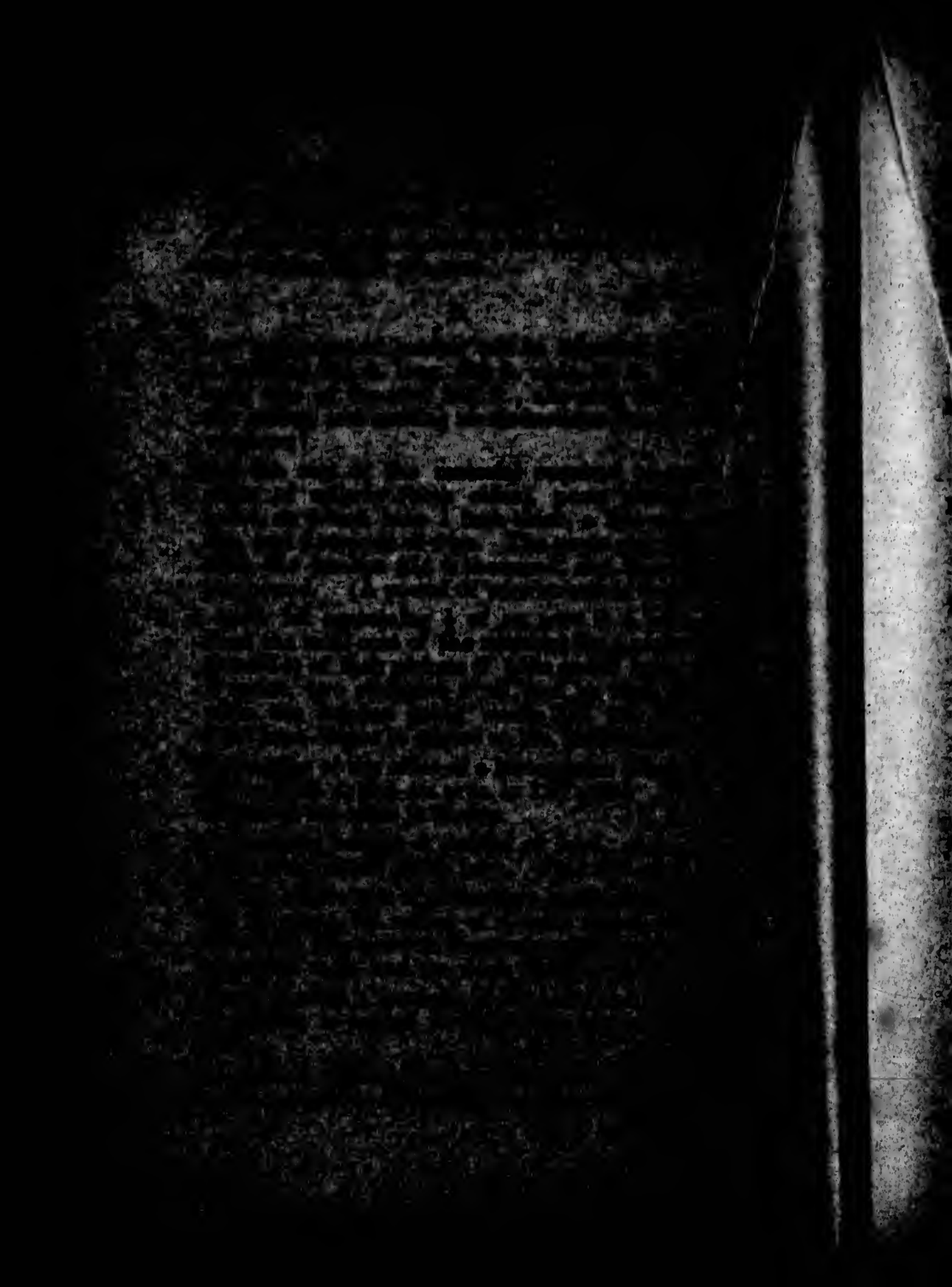
Dr. HARRY CHURCH. Cr.

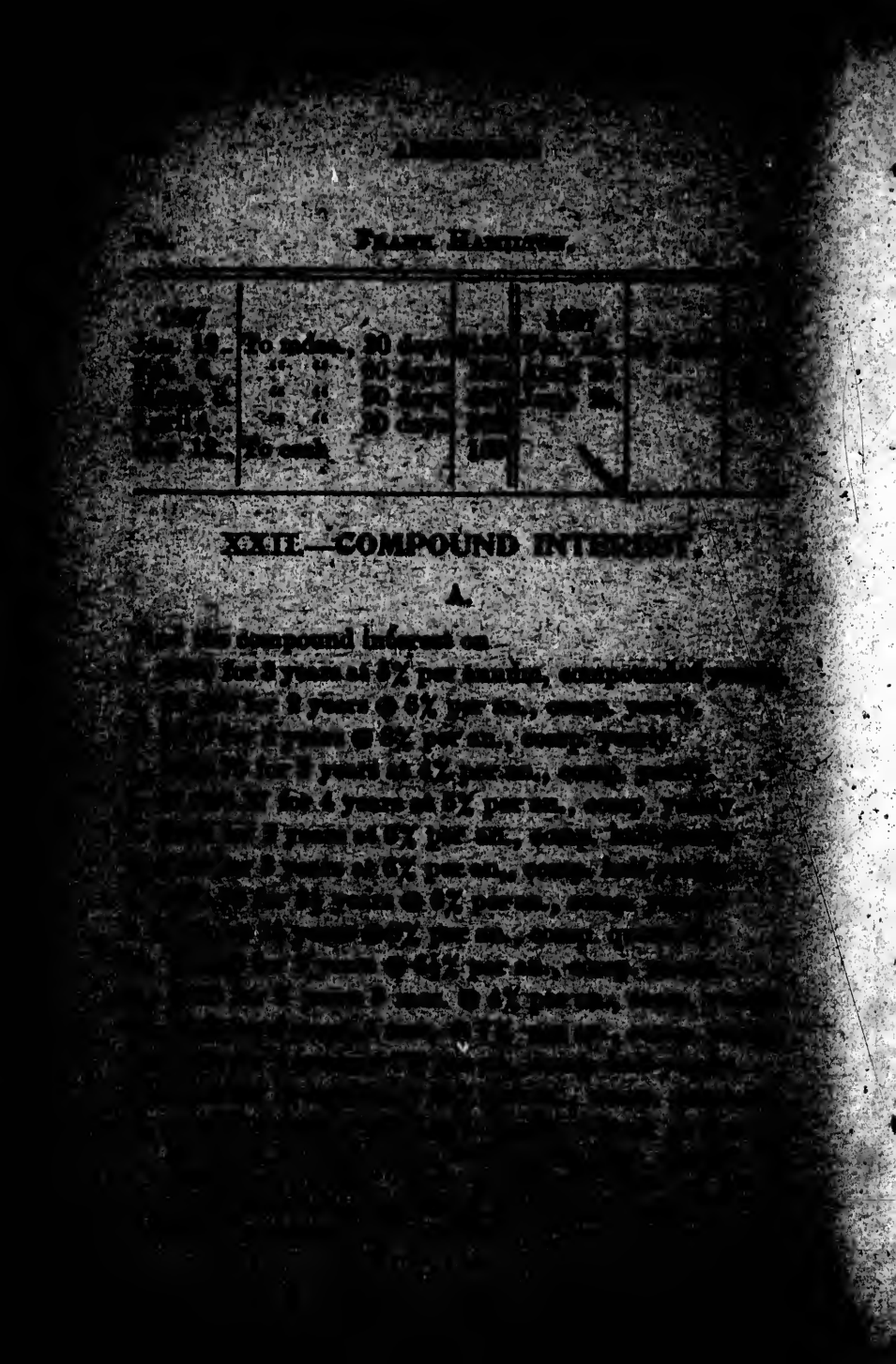
1897				1897		
May 1.	To sales, at 30 days	3600		May 20.	By cash	2000
May 15.	" " 30 days	600		June 15.	"	200
June 15.	" " 90 days	1000				

10. Find the equated time for the payment of the following account:

Dr. EDWARD H. BOSTON. Cr.

1898				1898		
June 10.	To sales, 30 days	[illegible]		July 10.	By [illegible]	[illegible]
July 15.	" " 45 days	[illegible]		Aug. 15.	"	[illegible]
Aug. 20.	" " 60 days	[illegible]		Sept. 5.	"	[illegible]
Sept. 5.	" " 90 days	150				





[illegible]. A lent a sum of money for [illegible] years at [illegible] per annum, compounded yearly. B lent an equal sum for the same time at 10% per annum, compounded yearly. B gained $20.25 more than A. Find the sum each lent.

XXIII.—PRESENT WORTH AND TRUE DISCOUNT.

Find the true present worth of :

1. $240 due 2 years hence, money worth 6%.
2. $3,025 due 3 years hence, money worth 7%.
3. $1,375 due 9½ years hence, money worth 4%.
4. $[illegible] due 4 years hence, money worth 8%.
5. $1,120 due 16 mos. hence, money worth 5%.

Find the true discount on :—

6. $[illegible] due in 2 years, 6 mos., money worth 6%.
7. $[illegible] due in 3 yrs., 4 mos., money worth [illegible]%.
8. $1,[illegible] due in 6 yrs., money worth 6%.
9. $[illegible] due in 2½ years, money worth [illegible]%.
10. $[illegible] due in 9 months, money worth 8%.
11. Find the P.W. of a note for $[illegible], payable in one year, money being worth 4%.
12. What sum will discharge a debt of $1,[illegible] to be paid in 3 mos., if money is worth 6%?
13. What is the T.D. allowed on a note for $[illegible], payable 19 mos. hence, money worth [illegible]%?
14. A merchant bought goods amounting to $[illegible] on a credit of 4 mos.; the discount off is [illegible]% for cash. If money is worth 9%, how much cheaper could he get the goods by paying cash?
15. A man rents a farm for [illegible] years at $[illegible] per annum, the rent to be paid at the end of each year. Money being worth [illegible]% per annum, [illegible] sum would now pay the [illegible] years' rent?

16. A owes B $[illegible] due in [illegible] years, $[illegible] [illegible] and $[illegible] due in [illegible] years. What sum would pay the debt, money worth [illegible]% [illegible] interest?

17. A gentleman had two sons aged 15 and [illegible]. What sum must be deposited in a [illegible] each now, so that each will receive $[illegible] when [illegible] years of age; money worth 4% per ann. [illegible] interest?

XXIV.—PARTNERSHIP.

A.

1. A and B form a partnership to carry on a dry goods business. A invests $[illegible],000 and B invests $[illegible],000; divide a gain of $1,575 between them.

2. Two men jointly purchase a house, the one paying $[illegible] of the purchase money, and the other $[illegible]. They rent the house for $1[illegible].75 a year. What part of this ought each to have?

3. A, B and C gain $12,771 in a speculation. A invested $1,[illegible]0, B $1,500, C $1,600. How much of the gain should C get?

4. B and C agreed to do a piece of work for $[illegible]. C worked [illegible] days of [illegible] hours each, and B worked [illegible] days of 6 hours each. How much was C paid?

5. [illegible] and Brown engaged in the lumber trade with a joint capital of $10,000. At the end of the year [illegible] gain amounted to $1,710, and Brown's to $1,[illegible]. How much capital did Brown put into the business?

6. A, B and C form a partnership; their respective shares of one year's gain are $[illegible],1[illegible]0, $[illegible],[illegible] and $[illegible]. A invested $[illegible] less than B. How much did C invest?

7. [illegible] in trade. A puts into the business [illegible] and [illegible] puts in $[illegible] for 7 [illegible]. How [illegible] $[illegible] be divided?

B.

in ... at first and at the end of 4 months ... $... more. They gained $2,000; find A's share.

5. Three persons, A, B and C, trade together, having a joint capital of $4,700. A's money is in the business 8 mos., B's for 5 mos., and C's for 10 mos. Each receives $300 as his share of the profit; how much of the capital did each contribute?

6. A and B engage in business, A contributing $7,500, B $6,500. The gross receipts for the first year were $2,800, of which 5% was paid for insurance, and 14% for other expenses; of the balance B received a certain sum for managing the business, and the rest was divided in proportion to the capital invested. A's share was $1,250; find B's allowance as manager.

7. A person in his will bequeathed all his property to his three children as follows: ⅓ to John, ¼ to James, and ⅖ to Mary. If his property was valued at $7,420 how much should Mary get?

8. At the beginning of a year, A, B and C formed a partnership, contributing $1,200, $1,500, $2,000, respectively. A acted as book-keeper at a salary of $240, and B as manager on a salary of half as much again, both salaries to be increased in proportion as the business increased. After 2 mos. C added $1,000 to his capital, after 4 mos. B added $500 to his, and in 6 months' time A added $300 to his. The total gain for the year was $9,025.00; find the share of each.

9. A and B engage in trade, A invests $6,000, and at the end of 5 mos. withdraws a certain sum. B invests $4,000, and at the end of 7 mos. $6,000 more. At the end of the year A's gain is $5,800 and B's $7,300; find the amount A withdrew.

10. A and B form a partnership, A supplying 25% more capital than B. At the end of the year A withdraws 30% of his capital, and B withdraws 40% of his. At the end of 2 years there is a gain of $2,383.50 to be divided; how much does each receive?

XXV.—EXCHANGE.

A.

Find the cost of a draft in

1. New Orleans on Chicago for $7,200 at ¼% premium.
2. St. Louis on St. Paul for $4,700 at ½% discount.
3. Mobile on New York for $3,600 at ¾% premium.
4. Toronto on New York for $1,500 at ¼% premium.
5. Montreal on Chicago for $1,625 at ½% discount.

Find the cost of a bill of exchange in

6. New York on London for £300 (£1 = $4.84).
7. Winnipeg on Liverpool for £420 10s. (£1 = $4.87½).
8. New Orleans on Glasgow for £600 (£1 = $4.87½).
9. How much must be paid for a sight draft on Vancouver for $3,240 at ¼% premium?
10. What amount of bill of exchange on London can be bought for $483.99 (£1 = $4.86)?
11. Find the cost of a bill of exchange on Paris for 1,725 francs at 5.16 francs for $1.
12. Find the value in English money of 7,264.25 francs when the course of exchange between Paris and London is at 25.5 francs per pound sterling.
13. What will be the cost of a bill of exchange on Berlin for 4,800 marks, the rate of exchange being 95¼ cents per 4 marks?
14. I purchase, through a New York broker, a bill of exchange on Manchester for £432 12s. 9d. at 4.84½. What was the cost, brokerage ¼%?
15. I sold, through a broker in Boston, a bill of exchange on Hamburg for 1,200 marks, at 95½c. for 4 marks. What did I receive, brokerage ¼%?

B.

NOTE.—Exchange quotations (when not given in $ and ¢) usually give the value of a £ as a certain per cent

1. [illegible] was $4.44½ for £1; the exchange at present is $4.86⅔ for £1. Find what [illegible] per cent. the present value is on the old value.

2. Find the cost of a 75-day bill of exchange on Liverpool for £960, exchange being quoted at 9⅛ (or par).

3. Find the cost of a demand-bill on London for £750, exchange at 9½.

4. Find the cost of a bill of exchange on Dublin for £316. 15s., exchange at 10⅛.

5. What amount of demand-bill can be bought for $2,850 exchange at 10?

6. What amount of bill of exchange can be bought for $4,887, exchange at 9¼?

7. What is the value of a 70-day draft on Chicago for $5,000 at ¼% premium, interest 6%?

8. I hold a 70-day draft on Baltimore for $2,750. I sold the draft at ¼% premium, and with discount off of 8% per annum. What did I receive?

9. A firm in Winnipeg bought a 60-day draft on Toronto for $7,500 at ½% discount, rate of interest 5%. What was the cost of the draft?

10. What is the value of a 93-day draft on San Francisco for $3,475, at ¼% premium and interest 7%.

C.

1. A merchant in Montreal drew on Hamburg for 10,000 guilders at $.415. How much more would he have received if he had ordered remittances through London to Montreal, exchange at Hamburg on London being 11½ guilders for £1, and at London on Montreal 9⅞%, brokerage being 1¼% for remittances from London?

2. An American tourist goes to Paris with $5,000, which he changes for French money at the rate of 1[illegible]

for 1 franc. He spends 600 francs in Paris, and thence goes to Vienna, where he exchanges what he has left at the rate of 135 florins for 200 francs. He spends 500 florins in Vienna, and then goes to Scotland, where he exchanges his money, getting 4s. 2d. for a florin. His outlay in England is £75 10s. How much American money has he left if £1 = $4.80?

3. A merchant in Vancouver, British Columbia, owes $4,000 in New York; exchange on New York is ¼% premium; but exchange on Chicago is ½% discount, and from Chicago on New York ¼% premium. Compare the cost of a draft on New York direct, with that of one through Chicago which would pay the debt.

4. A merchant in Quebec wished to remit 1,200 marks to Hamburg, and the exchange of Quebec on Hamburg was 35 cents for 1 mark. He found the exchange of Quebec on Paris was 18 cents for 1 franc; that of Paris on London was 25 francs for £1 sterling; that of London on Lisbon was 180 pence for 3 milreis; that of Lisbon on Hamburg was 5 milreis for 18 marks. He chose the circuitous exchange. What was his gain?

5. When the course of exchange between London and New York is quoted at 4.96⅜, London exchange is said to be at 2% premium. From this calculate the par of exchange.

6. How large a bill of exchange on Paris can be bought for $1,500 currency, exchange being at the rate of $1 for 5.25 francs, and gold being at a premium of 8½%?

MISCELLANEOUS EXERCISES.

XXVI.—ANALYSIS AND CANCELLATION.

1. If 6 iron bars 4 ft long, 3 in. broad and 2 in. thick, weigh 144 lbs., how much will 13 weigh, each 6½ ft. long, 4 in. broad and 3 in. thick?

2. If the assessor of a [illegible] a man whose property assessed at [illegible] taxes, what is the total tax levied?

3. If a ton of coal occupies 40 cu. ft.; what will it cost to fill a bin 12 ft. long, 6 ft. wide and 5 ft. deep, with coal at $5.25 a ton?

4. If $60.25 pay for 8½ tons of coal, what will ⅞ of a ton cost?

5. If ⅔ of ⅘ of 3½ yds. of cloth cost ⅗ of ⅞ of $4⅔, what fraction of a dollar will ⅞ of ⅓ of ⅔ of a yard cost?

6. If 8 men can saw 240 cords of wood in 36 days, each 12 hours long, how many men can saw 90 cords in 6 days, each 9 hours long?

7. If 600 bricks, 8 in. long and 2 in. wide, are required for a walk 100 ft. long and 4 ft. wide, how many bricks are required for a walk 20 ft. long and 6 ft. wide?

8. The pound Avoir. contains 7,000 grs. Troy, and 960 sovereigns weigh 20 lbs. Troy; find the number of sovereigns coined from an ounce Avoir.

9. A block of stone 5′ × 3′ 9″ × 2′ 6″ weighs 7,500 lbs. (112 lbs. = cwt.); what is the weight of a block of the same stone 12′ 6″ × 6′ 6″ × 8′ 3″?

10. Reduce to simplest form

$$\frac{15 \times 18 \times 21 \times 24 \times 27 \times 30 \times 33}{16 \times 19 \times 22 \times 25 \times 28 \times 31 \times 34}.$$

11. If $16\frac{1}{15}$ cords of wood last as long as $11\frac{2}{15}$ tons of coal, how many tons of coal will last as long as $22\frac{1}{2}$ cords of wood?

Find the value of:

12. $\frac{\frac{6}{11}}{1\frac{1}{4}} \times \frac{\frac{1}{2}}{1\frac{6}{13}} \times \frac{25}{16} \times \frac{21}{35} \times \frac{\frac{6}{11}}{\frac{1}{14}}$

13. $\frac{27}{37\frac{1}{2}} \times \frac{37\frac{1}{2}}{90\frac{1}{2}} \times \frac{2\frac{1}{2}}{2\frac{1}{2}} \times \frac{81\frac{5}{11}}{123} \times \frac{7\frac{1}{2}}{15}$

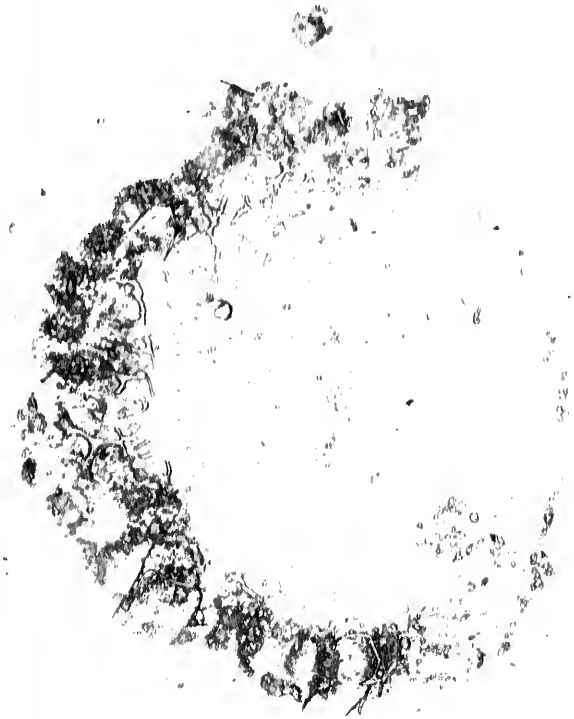
middle point of any side of the base

XLIII.—THE SPHERE.

; volume $= \frac{4}{3}\pi r^3$.

A.

In the following $\pi = \frac{22}{7}$.



10. $\frac{\frac{3}{4}\text{ of }\frac{1}{2}}{\frac{2}{3}\text{ of }\frac{1}{4}} \times \frac{\frac{1}{2}\text{ of }\frac{3}{4}}{\frac{7}{10}\text{ of }\frac{5}{7}} \times \frac{\frac{1}{11}\text{ of }\frac{3}{4}}{\frac{5}{11}\text{ of }\frac{2}{3}} \times \frac{\frac{5}{6}\text{ of }\frac{3}{5}}{\frac{1}{2}\text{ of }\frac{1}{3}}$

$\frac{\frac{1}{10}\text{ of }\frac{3}{4}}{\frac{1}{4}\text{ of }\frac{1}{2}} + \frac{\frac{1}{2}\text{ of }\frac{1}{4}}{\frac{1}{4}\text{ of }\frac{1}{2}} + \frac{\frac{1}{2}\text{ of }\frac{1}{4}}{4\frac{1}{2}\text{ of }\frac{1}{2}} + \frac{\frac{1}{2}\text{ of }\frac{1}{4}}{\frac{1}{2}\text{ of }\frac{1}{2}}$

XXVII.—RATIO AND PROPORTION.

1. Divide 35 in the proportion of 2 to 3.
2. Divide $60 among A, B and C in the proportion of 2, 3 and 7.
3. A can run 6 yds. while B can run 7. How many yards start can A give B in a half-mile race, so that they will win?
4. A can run 90 yards while B runs 100, and B can run 90 yds. while C runs 100. How much does C beat A in a 100 yard race?
5. Divide $284 among A, B and C, in the proportion of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{7}$.
6. A and B entered into partnership, their capitals being in the ratio of 7 to 9. After 3 months A withdrew part of his capital, so that the ratio was 2 to 3. At the end of the year A's share of the gain was $1,200; what was B's gain?
7. A farm is divided into two parts, whose areas are as 2 to 13; the area of the larger part exceeds that of the smaller by $16\frac{1}{2}$ acres. Find the number of acres in the farm.
8. Gunpowder is composed of nitre, charcoal and sulphur in the proportion of 83, 1, 5; how many lbs. of each ingredient are in 136 pounds of powder?
9. A vessel contains 3 parts brandy and 2 parts water. How much of the mixture must be drawn off and replaced by water that the ratio may be 2 to 3?
10. Divide $171.50 [illegible]
11. A debt of $[illegible] is paid in [illegible] the number of each denomination [illegible] to 6, 7 and 10; how many were [illegible]

XXVIII.—SHARING.

1. A bankrupt owes four creditors as follows: [illegible] B $[illegible], C $[illegible],200, and D $[illegible],800; his [illegible] amount to $[illegible]; what does each creditor [illegible]?

2. Divide $[illegible] among three boys, [illegible] B's share may be half as much again as A's, and [illegible] a third as much again as A's and B's together.

3. Divide $[illegible] among two boys that the simple interest on one share for 3 years at $4\frac{1}{2}$% will be equal to the simple interest on the other share for $2\frac{1}{2}$ years at [illegible].

4. A, B and C caught a certain number of fish; [illegible] A's fish and B's are put together they make [illegible], B's and C's 130; A's and C's 120. If the fish [illegible] shared equally among them, what is the share of each?

5. A farmer shared his farm among his three sons; to the youngest he gave 80 acres, to the eldest [illegible] of the whole, and to the second [illegible] as much as to both the others. How many acres did the farm contain?

6. The sum of $1,416 is to be divided among 18 [illegible] women and 30 children, in such a manner that a [illegible] and a child shall together receive as much as [illegible] woman, and all the women together shall receive $[illegible]. Find the amount received by each man, woman and child respectively.

7. If 13 men, 19 women, and [illegible] boys earn $[illegible] in a [illegible] working days; and if a woman earns [illegible] of what a man earns, and a boy [illegible] of what a woman earns, what is the daily earning of each?

8. A, B and C do a piece of work and are paid $[illegible] [illegible]. The money is divided according to [illegible] [illegible] and the time each worked; A's [illegible] [illegible] to B's, and B's to C's as 4 to [illegible]; A [illegible] [illegible] days, and C 8 days. How much [illegible] [illegible] receive?

9. [illegible] man, woman and child [illegible]

[illegible]

$22 is divided among 6 men, 8 women and 10 children, so that 2 men may get as much as 3 women, and 4 women as much as 3 children?

10. A man divided $17,940 among his 3 sons, whose ages are 16, 18 and 26 years, in proportion to their ages; three years afterwards he similarly divided an equal sum, and again after 3 years more; how much did each son receive altogether?

XXIX.—WORKING PROBLEMS.

1. A can chop 4 cords of wood in 3 days, B can chop as much in 3 days as A in 4 days. How long would both together be in chopping 28 cords?
2. A did $\frac{1}{3}$ of a piece of work, B did $\frac{2}{5}$ of the remainder, C did $\frac{1}{2}$ of what was left undone by B, and D finished the work. How much should D get for his work if A receives $8.40 for his?
3. Three men, A, B and C, working together can do a piece of work in 10 days. They undertake the job and work on it for 4 days; C then quits, and A and B finish the work in 10 days. If A could have done the whole work by himself in 30 days, in what time could each of the others have done it?
4. A and B can do a piece of work in 8 days when the days are 12 hours long; A by himself could do the work in 12 days of 16 hours each. In how many days of 14 hours long could B do the work?
5. If 8 men and 5 boys mow $7\frac{1}{2}$ acres of grass in 3 days, and 6 men and 7 boys in another field mow 25 acres in 12 days, how long will it take these 14 men and 12 boys to mow 12 acres?
6. If 9 men in 10 weeks of 5 working days each, working 11 hours a day, dig 11 cellars, each 20 ft. long, 18 ft. wide and 5 feet deep; how many men will be required to dig 16 cellars, each 24 ft. square and 4 ft. deep, in 12 weeks of 6 days each, working 9 hours per day?

7. A does $\frac{1}{3}$ of a piece of work in 16 days and [illegible] joins him. They work together for 3 days, when B leaves and A finishes the work in $3\frac{1}{2}$ days more. How long would it take B to do the whole work?

8. A can do a piece of work in 12 days, B in 15 and C in 16. They all begin together at the work but only C continues till the work is finished, A leaving in $2\frac{1}{2}$ days, and B $1\frac{1}{2}$ days after A. In what time is the work done?

9. A and B together can do a piece of work in $5\frac{1}{11}$ days. A and C together can do it in $6\frac{2}{3}$ days and B and C together in $7\frac{1}{2}$ days. How long would it take A, B and C together to do the work?

10. A, B and C can do a work in $3\frac{3}{7}$ days, A, B and D together in $3\frac{1}{2}$ days, A, C and D together in $3\frac{1}{11}$ days, and B, C and D together in 4 days. How long would it take all four together to do the work?

XXX.—ALLIGATION AND MIXTURES.

1. A grocer has teas worth 30, 40, 80 and $83\frac{1}{3}$ cents per lb.; he wishes to make a mixture of 80 lbs., so that he may sell at 70c. per lb., and make 20% profit. How much of each kind must he use?

2. A mixture of 7 lbs. black tea and 8 lbs. green are worth $5.28, while a mixture of 12 lbs. black and 3 lbs. green are worth $5.73. Find the value per lb. of each.

3. 6 geese and 5 turkeys are worth $5.95, and 7 geese and 8 turkeys are worth $8.35. Find the price of each.

4. A mixture of 60 lbs of two teas cost $24.60; the cheaper is worth 35c. per lb. and the dearer 45c. Find the number of lbs. of each in the mixture.

5. 11 horses and 8 cows are worth $1,096, and 7 horses and 5 cows are worth $695. How much is one of each worth?

6. A grocer mixed two kinds of wine, worth respectively

[illegible] $2.50 per gal., in what proportion must they be mixed that the mixture may be worth $2.80 per gal. by allowing 10%? Find the proportion in which the wines were mixed.

7. In what proportion must two kinds of coffee, which cost 30c. and 45c. per lb., respectively, be mixed, so that when sold at 60c. per lb., there may be a gain of 11⅓%?

8. When wheat is worth 90c. per bus., 17 bushels of a mixture of wheat and oats are worth $12.58; but if the proportions in the mixture were interchanged, the value would be $13.70. Find the price of oats per bushel.

9. A cask contains 7 parts of brandy and 5 parts of water; ⅓ of the mixture is drawn off and the cask filled with water; what is the strength of the mixture then?

10. A wine merchant mixes 8 gal. of wine worth $1.12½ a gal., 12 gal. worth $1.20 a gal., and 15 gal. worth $1.40 a gal., with 20 gal. of water, and sells the mixture at $1 a gal. Find his gain per cent.

11. A mixture of 50 gal. of alcohol and water contains 80% alcohol. (a) How much water must be added to reduce the strength to 62½%? (b) How much alcohol must be added to increase its strength to 87½%?

XXXI.—INVOLVING SUM AND DIFFERENCE.

1. The sum of two numbers is 5046, and their difference [illegible]; find the numbers.

2. The sum of two numbers is 8045; their difference [illegible]; find the product of the numbers.

3. The sum of two numbers is 7621, and their difference 1807. Find the difference of their squares.

4. There are 300 pupils in a school, and 17 more girls than boys. How many are there of each?

5. At an election, A and B were the only candidates,

[illegible] polled [illegible] How many voted [illegible]

6. [illegible] which B and C [illegible] by a majority of [illegible] number who voted [illegible] the [illegible] vote by 2452. How many votes did [illegible] receive?

7. Divide $[illegible] between John and Thomas so that John may have $127.40 more than Thomas.

8. The sum of two numbers is 9[illegible], and their difference is 4[illegible]. Four times the larger is how many times the smaller?

9. It takes 5040 rails for a 6-railed straight fence around a farm, the rails being 11 ft. long. If the length of the farm is 120 rods more than its breadth, how many acres does the farm contain?

10. Two men, by working together, can perform a piece of work in 16 days. If the job is worth $[illegible], and one man works five days less than the other, how should the money be divided?

11. The sum of two numbers is [illegible]; their common factor is 17; the difference between the other two factors is 21. What are the numbers?

12. A man rows down stream a distance of 24 miles in [illegible] hours, and back again in [illegible] hours. Find his rate of rowing in still water.

13. A man rowed down stream 22[illegible] miles in 3 hours, but it took him 9 hours to row up. Find the rate of the stream.

14. A man can row 6 miles an hour in still water. [illegible] the rate of rowing down with his [illegible] a stream which flows at the rate of [illegible]

15. [illegible] a certain distance down [illegible] in [illegible] minutes. If the [illegible] [illegible] miles per hour, find the distance.

14. Two trains respectively [illegible] and 120 yds. long, going in opposite directions [illegible] yards; when moving in the same direction the faster passes the other in 45 seconds. Find their rates in miles per hour.

17. Two trains, moving on parallel tracks, [illegible] 132 yds. and 99 yds. long, pass each other in 3 seconds. When moving in the same direction the one passes the other in 9 seconds. Find their rates per hour.

18. The duty on imported axes is $1.80 per dozen, and 35% ad valorem. The whole duty paid on a lot of axes was $45, the specific duty being $19.80 more than the ad valorem. Find the number of axes imported.

XXII.—SOLAR AND STANDARD TIMES.

1. How are solar and standard times reckoned?
2. Where is the zero zone? How wide is it? What meridian lines bound the east and west sides?
3. Name the centre meridians of the time zones between 52½° W. and 142½° W. longitude. By what local names are some of these zones known?
4. When it is 2 p.m. at Greenwich, find standard times at 75°W.; 90°W.; 104°W.; 106°W.; 118°W.
5. When it is 11.15 a.m. at New York, 73½°W., find the standard times at Washington, 77°W.; Toronto, [illegible] W.; San Francisco, 122½°W.; Chicago, 88°W.; [illegible]ifax, 63½°W.; Glasgow, 4½°W.; Limerick, [illegible]; Hamburg 10° E.
6. When it is 7.30 a.m. solar time at Winnipeg, 97°15' W., find the solar times at places: 44°W.; 120°30' W.; 55°45'W.; 30° E.; 4°30'E.; 12°15'E.
7. When it is 7.15 a.m. true time at Rio Janeiro 43°W., find the longitude of places whose true times are 5.30 a.m.; 7.45 a.m.; 6 a.m.; 10 a.m.; 11.30 a.m.; 2.45 p.m.; 10.03 a.m.

9. What is the [illegible] at Winnipeg 97°15' W. at 10.12 [illegible]?

[illegible] time at Boston 71°10' W. at 2.43 [illegible]?

10. What is the difference between the true and the standard time at Goderich 81°40' W.?

11. A vessel left Liverpool 3° W. on Monday, June 1st at 6.15 a.m., and reached New York 73½° W., in 6 days, 10 hrs., 40 min. When did the vessel arrive?

12. A vessel left Capetown 18° E. on Monday, July 6th, at 8.30 a.m., and arrived at Montreal 73° W. in 12 days, 3 hours. Find the time of arrival?

13. Find the longitude of the Falkland Islands, if it is 6 a.m. there, when it is 1 p.m. at Ras el Had, the longitude of which is 60° E.

14. Calcutta is 88° E. longitude, and Rome 12° 30' E. What is the time at Calcutta when it is 9.13 a.m. at Rome?

15. Quebec is 71° 18' W. and Vienna 16° 24' E. longitude. When it is 2 p.m. at Vienna, find the standard time at Quebec.

16. At 2.30 p.m. a telegram is sent from St. Petersburg long. 30° E. to St John, New Brunswick, long. 66° W. Allowing 75 minutes for delays and transmission, when will it be received at St. [illegible]?

XXIII.—CLOCK PROBLEMS.

1. At what time are the hands of a clock together: Between 3 and 4? Bet. 6 and 7? Bet. 8 and 9?

2. At what times are the hands of a clock at right angles: Between 4 and 5? Between 7 and 8?

3. At what times are the hands directly opposite: Between 2 and 3? Between 4 and [illegible]?

4. At what times are the hands 10 minute spaces apart: Between 4 and 5? Between 6 and 7?

5. When will the minute hand be midway between the hour hand, and the figure IV. after 4 o'clock? And the figure III. after 5 o'clock? And the figure II. after 6 o'clock?

6. At what time between 4 and 5 o'clock are the hands of a watch (1) coincident? (2) 2 spaces apart?

7. At what two times between 3 and 4 are the hands equally distant from the figure III.?

8. When first after 7 o'clock will the hour hand be midway between the figure V. and the minute hand?

9. What is the time when $\frac{1}{n}$ of the time past noon is $\frac{1}{m}$ of the time till midnight?

10. The hands of a clock move irregularly, the hour hand moving 5% too fast, and the minute hand 10% too slow. In 15 minutes (true time) they will be together. How many minutes measured on the face of a clock are they apart now?

11. The three hands of a clock rotate on the same axis. When first after 3 will the minute hand be half-way between the second hand and the hour hand?

XXIV.—ON ALGEBRAIC FORMULÆ.

1. The square of 2345 is 5499025. Find the square of 2347.

2. The square of 4567 is 20857489. Find the square of 4563.

3. Find the sum of the squares of 9998 and 10002.

4. Find the product (1) of 1003 and 997; (2) 9015 and [illegible].

5. Find the continued product of (a) 9, 11, 101 and [illegible]; (b) 10001, 100, 13 and 7.

6. Find the value of $(1+4+4^2+4^3+4^4+4^5)(4-1)$; also the value of $(6^4-6^3+6^2-6+1)(6+1)$.

7. $\frac{(276)^3-(125)^3}{(276)^2+(276)(125)+(125)^2}$ [illegible]

8. Simplify $\dfrac{(a+b)(a^2-b^2)(a-b)}{(a^2+b^2)^2-(2ab)^2}$.

9. Find the value of $(\frac{1}{2})^3+(\frac{1}{3})^3+(\frac{1}{12})^3+3(\frac{1}{2})(\frac{1}{3})+3(\frac{1}{3})(\frac{1}{12})+3(\frac{1}{12})(\frac{1}{2})$.

10. Find the value of $\frac{1}{12}+\frac{1}{144}+\frac{1}{1728}+\frac{1}{20736}+\frac{1}{248832}+\frac{1}{2985984}$.

11. Simplify $(\frac{a}{b})^3+3(\frac{a}{b})^2(\frac{b}{c})+3(\frac{a}{b})(\frac{b}{c})^2+(\frac{b}{c})^3$.

12. Simplify $(\frac{a}{b})^3-3(\frac{a}{b})^2(\frac{b}{c})+3(\frac{a}{b})(\frac{b}{c})^2-(\frac{b}{c})^3$.

13. Find the value of $\frac{1}{2}+\frac{3}{10}+\frac{11}{50}+\frac{31}{250}$; also of $\frac{11}{1728}-\frac{5}{144}+\frac{1}{12}-\frac{1}{24}$.

14. Simplify $\dfrac{(\frac{1}{2})^4-(\frac{1}{3})^4}{(\frac{1}{2})^4+(\frac{1}{6})^4(\frac{1}{3})+(\frac{1}{2})^2(\frac{1}{6})^2+(\frac{1}{2})(\frac{1}{3})^3+(\frac{1}{3})^4}$.

15. Simplify $(\frac{a}{b}-\frac{b}{a})\times(\frac{a^4}{a^2b^2}+\frac{a^2b^2}{a^2b^2}+\frac{b^4}{a^2b^2}+\frac{a^2}{b^2}+\frac{b^2}{a^2})$.

16. Simplify $(\frac{a}{b}+\frac{b}{a})\times(\frac{a^4}{a^2b^2}-\frac{a^2b^2}{a^2b^2}+\frac{b^4}{a^2b^2}-\frac{a^2}{b^2}+\frac{b^2}{a^2})$.

17. Simplify $(\frac{1}{12})^3+(\frac{1}{3}+\frac{1}{4}+\frac{1}{6})(\frac{1}{12})^2+(\frac{1}{3}\cdot\frac{1}{4}+\frac{1}{3}\cdot\frac{1}{6}+\frac{1}{4}\cdot\frac{1}{6})\frac{1}{12}+\frac{1}{3}\cdot\frac{1}{4}\cdot\frac{1}{6}$.

18. Find the value of (a) $(\frac{11}{12}+\frac{1}{6})^3-(\frac{11}{12}-\frac{1}{6})^3$; (b) $(\frac{11}{1728}+\frac{1}{144})^3-(\frac{11}{1728}-\frac{1}{144})^3$.

Reduce to their simplest forms:

19. $\dfrac{2+4+8+16+32+64+128}{3+6+12+24+48+96+192}$.

20. $\dfrac{3+6+18+72+432+3024+24192}{5+8+24+96+576+4032+32256}$.

XXXV.—SQUARE ROOT

Find the square root of:

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible] to five decimal places.
7. [illegible] figures of decimals.

[illegible] six dec. places.

[illegible] four dec. places.

[illegible] to six dec. places.

11. $\frac{5}{6}$ to five dec. places.

12. $12\frac{1}{2}$ to five places of decimals.

13. $\frac{11}{13}$ to five places.

14. .047619 + 1.120476.

15. Find within one inch the side of a square whose area is 5 acres.

16. A square field, containing 16 acres 401 sq. yds., has a walk around it outside, 12 ft. in width. Find the area of the walk in yards.

17. A rectangular field, whose length is three times its breadth, contains 6 acres 900 yds.; find its breadth.

18. The L.C.M. of two numbers is 100,793; their G.C.M. is 17; their difference 1,224. Find the numbers.

19. The side of a square field is 48 rods; find the length of the side of a square field containing $2\frac{1}{4}$ times as much land.

20. The product of the sum of two numbers by their difference is 27,426,663. The smaller number is 2,6[illegible]. Find the larger.

XXXVI.—CUBE ROOT.

Find the cube root of:

1. 1953125.

2. [illegible]2007.

3. [illegible]317.

4. [illegible]

5. [illegible]

6. [illegible]7.[illegible]

7. [illegible]

8. .[illegible]

9. [illegible]103.

MENSURATION.

XXXVII.—RECTANGLES.

A.

1. A rectangle measures 40 ft. by 30 ft.; find the area of a square which has the same perimeter.
2. A building lot is 10 rods long. A 5-strand wire fence is put around it. How much wire at 5c. per lb. will be required if 2 yards cost 3 cents?
3. What is the surface of a board 19 in. wide at one end, and 11 in. wide at the other, and 10 ft. long?
4. If it cost $11.20 for paper for a room 20′ long, 18′ 6″ wide, and 11′ high, when the paper is ½ yd. wide, find the cost of the paper per linear yard. (No allowance for doors and windows).
5. What is the cost of boards, at $1 for 50 sq. feet, to make a closed box 7′ 10″ long, 3′ 8″ wide, and 2′ 6″ high (outside dimensions), the boards being 1 inch thick?
6. Find the cost of gravelling, at 12½c. per square yard, a path 2 yards wide, running around the inside of a square field containing 40 acres.
7. A country in the form of a rectangle, 300 miles long by 200 miles broad, supports a population of 20,000,000; find the average number of acres required to support one person.
8. At what cost per yd. is to carpet a room 22 ft. 6 in. long, with carpet 27 in. wide, at $1.75 per yard; find the width of the room.
9. A railway company pays $24.75 per acre for a portion of land 100 miles long and 264 ft. wide. Find the purchase money.

[illegible] areas of the following triangles [illegible]

1. [illegible], height [illegible] ft.
2. [illegible], height 25 ft.
3. Base 7 yds. 1 ft., height 5 yds. 2 ft.
4. Base 9 yds. 2 ft. 9 in., height 7 yds. 1 ft. 5 in.

Find the areas of triangles whose sides are

5. 68 in., 77 in., 75 in.
6. 60 ft., 65 ft., 112 ft.
7. 26 in., 28 in., 30 in.
8. 24 yds., 25 yds., 26 yds.
9. 313, 444 and 455.
10. 17, 65 and 78.

In right angled triangles whose

11. Base = 8 ft., perpendicular = 6 ft., find hypotenuse.
12. Base = 40 ft., perpendicular = 9 ft., find hypotenuse.
13. Base = 15 ft., perpendicular = 112 ft., find hypotenuse.
14. Perpendicular = 13 ft., hypotenuse = 85 ft., find base.
15. Base = 15 yds., hypotenuse = 17 yds., find perpendicular.
16. Hypotenuse = 9.72 ft., perpendicular = 8.6 ft., find the base.
17. The sides of a triangle are 25, 39 and 56 ft. respectively; find its area.
18. The sides of a triangular field are 315 yds., [illegible] yds. and 675 yds.; the field is rented at $11 an acre, find the rent.

B.

1. A footpath goes up the side and then along the end of a rectangular field 432 yards by [illegible] yards. What distance will be saved by cutting right across in the direction of the diagonal?
2. The sides of a triangle are 13, 14 and 15 ft.; find the perpendicular length of the 14 ft. side from the angle opposite; also find the area of each of the two parts into which the triangle is divided.
3. Find the length of the diagonal of a quad[illegible]

6. A rectangular field containing [illegible] acres has a diagonal [illegible] rods. What is the length of the field?

4. The base of an isosceles triangle is 30 ft., and each of the two equal sides is 15½ ft. What is the altitude of the triangle?

7. A man can walk the length of the diagonal of a rectangular field containing 6 acres, whose sides are as 5 to 12, in 3¼ minutes; find his rate of walking in miles per hour.

8. Find the perimeter of a right-angled triangle whose area is 270 sq. ft., and the base 15 feet.

9. The sides of a triangle are 40, 45 and 50 feet, respectively. Find the length of the perpendicular from the vertex to the side 45 feet.

10. The diagonals of a rhombus are 8 in. and 10 in., respectively. Find the area.

11. The top of a ladder reaches to the top of a wall when its foot is at a distance of 10 ft. from the bottom of the wall, but if the foot of the ladder be drawn 4 ft. further from the wall, the top of the ladder will reach a point 2 ft. below the top of the wall. Find the length of the ladder.

12. There is a garden-plot in the form of a trapezoid, whose two parallel sides are 40 yds. and 50 yds. respectively, the other sides being, respectively, 30 yds. and 24 yds. Show that the perpendicular distance between the parallel sides is $4\sqrt{11}$.

XXXIX.—RIGHT PARALLELOPIPED AND PRISM.

A.

1. Find the number of cubic ft. and in. in a cube whose length is 2 ft. [illegible] in.

...ft. 4 in., 3 ft. 6 in., 4 ft. 0 in.

...ft. 7 in., 4 ft. 6 in., 6 ft. 3 in.

...ft. square, height 6 ft. 9 in.

...12 sq. ft. 36 sq. in., height 21 in.

...ft. and in. in a prism

...ft., height 3 ft. 6 in.

...ft. by 3 ft., height 3 ft. 3 in.

...6"; height 41".

...sides of the base 7, 25, 20 in. height 3 ft. 9 in.

...sides of the base 15, 40, 51 in. height 4 ft. 10 in.

12. Rain falling uniformly for 5 hours on a rectangular horizontal dimensions are 10 yards by 10 ... each 3 ft. 3 in. by 3 ft. 6 in., and 4 ft. deep ... the depth of the rain-fall per hour.

13. An orchard is 24½ rods long, and 15½ rods wide. ... trees per cubic ft.; what will it cost to ... ditch around it 3 ft. 6 in. wide and 4 ft. ...

14. A reservoir is 26 ft. 6 in. long and 12 ft. ... find how many cubic feet of water must ... to make the surface sink 1 foot.

15. Each edge of a cube is diminished by ... by what fraction of itself is the volume ...

B.

1. Find the surface and volume of a rectangular ... whose height is 36 ft., its base being 8 ft. ... 4 ft. wide.

2. Find the surface and volume of a prism whose ... is 20 ft., and base an equilateral ... of which is 4 ft.

3. ... box with a lid is made of plank 1½ ...

XI.—ON THE CIRCLE.

A.

Note: (1) $c = \pi D$. (2) Area $= \frac{1}{2}c. \times \frac{1}{2} D$. (3) Area $= \pi r^2$.

In the following examples, $\pi = 3\frac{1}{7}$.

14. Find the circumference, having given (1) Diameter = 6 ft. (2) Diameter = 6½ yds. (3) Diameter = 3 yds. 2 ft. 4 in. (4) Radius = 10 ft. (5) Radius = 3½ yds. (6) Radius = 2 yds. 1 ft. 9 in.

15. Find the area of the circle whose—(7) Radius = 7 ft. (8) Radius = 5 yds. 2 ft. (9) Radius = 3 ft. 9 in. (10) Diameter = 8½ in. (11) Diameter = 6 ft. 5 in. (12) Diameter = 3 yds. 1 ft. 7 in. (13) Circumference = 11 feet. (14) Circumference = 75 feet. (15) Circumference = 11 ft. 3 in.

16. What will the wire cost for a fence five wires high around a circular fish-pond, 60 ft. in diameter, 100 yds. of wire costing $1.35?

17. Find the length of the radius of a wheel which makes 4,000 revolutions in going 13 miles.

18. The radius of a carriage wheel is 15 in.; how many turns will the wheel make in travelling one mile?

19. Find the length of the arc which subtends an angle of 30° at the centre of a circle whose radius is 21 in.

20. Over what fraction of an acre can a cow, which is tethered with a rope 63 ft. long, graze?

B.

In the following examples, $\pi = 3.1416$.

1. Find the difference between the area of a rectangle 37 ft. by 23 ft., and a circle whose circumference is the same as the perimeter of the rectangle.

2. The radius of a circle is 6 ft.; find the radius of another circle of twice the area.

5. A road runs around a [illegible] field; the outer circumference is 440 yards, and the width of the road is 20 yards. Find the area of the road.

6. The area of a circle is equal to that of a rectangle which is 352 ft. by 200 feet; find the circumference of the circle.

7. Find the side of a square which is equal to the area of a circle of 160 ft. diameter.

8. Find the perimeter of a semicircle whose area is [illegible] sq. feet.

9. A circle is 11 ft. in circumference; find the area of a square inscribed in it.

10. A circle is 78.54 inches in circumference; find the area of a square described about it.

11. Two wheels of a carriage are 3 ft. 9 in. and 4 ft. 3 in. respectively, in diameter. How far will the smaller have gone when one wheel has gained 12 revolutions on the other?

12. Find the diameter of a circle whose area is equal to the sum of the areas of two circles, whose diameters are 15 in. and 16 in., respectively.

13. [illegible] of a circular plate of lead is [illegible] cut out a circular plate [illegible] the remainder of thickness [illegible] of a circular plate with [illegible] thickness. Find the [illegible]

14. [illegible] circles of radius of [illegible] find the [illegible] the two [illegible]

15. [illegible]

[illegible]

[illegible] ... 72.

17. Find the area of a circular [illegible] two circles, whose d[illegible] 120.

XLI.—THE CYLINDER.

NOTE.—Surface = perim. of base × h. + twice area base. Volume = area of base × h.

A.

Find the area of the curved surface of a cylinder.

1. Height 8 in., circum. of base 12 ft.
2. Height 2 ft. 6 in., circum. of base 6 ft.
3. Height 1 ft. 10 in., circum. of base 4 ft. 6 in.
4. Height 30 ft., radius of base 8 in., $\pi = 3.1416$.

Find the area of the whole surface

5. Height 6 ft., radius 2 ft.
6. Height 5 ft., radius 3 ft. 6 in.
7. Height 5 ft. 6 in., circumference 20 ft.

Find the volume

8. Radius 2 ft., height 7 feet.
9. [illegible] 30 in., height 4 ft. 8 in.
10. [illegible] 10 ft. 8 in., height 70[illegible] in.
11. How many cub. ft. of earth must be dug out to [illegible] a well [illegible] feet deep and 3 ft. in diameter?
12. The diameter of a well is 3 ft. 6 in., and its depth [illegible] [illegible] the cost of excavating it [illegible] [illegible] per cub. yard?
13. [illegible] the cost of polishing a cylindrical [illegible] [illegible] in diameter and 12 ft. long, at [illegible] [illegible]?

B.

1. [illegible] dimensions of a cylindrical [illegible] [illegible] in height, the radius of [illegible] [illegible]

Arithmetic.

1. Slant height 26 in., radius of base 1 ft. 6 in.
2. Slant height 2 ft. 5 in., diameter of base 2 ft. 6 in.

Find the area of the whole surface

3. Slant height 4 ft., radius of base 24 in.
4. Slant height 5 ft. 2 in., diameter of base 6.4 ft.
5. Slant height 12 in., circumference of base 3 ft.

Find the volume of a cone

6. Height 4 ft., radius of base 2 ft.
7. Height 5 ft., radius of base 42 in.
8. Diameter of base 8.4 ft., height 5.2 ft.
9. Circumference of base 12 ft., height 6 ft.

Find the volume of the square pyramid

10. Base 3 ft. square, height 4 ft.
11. Base 7 ft. 6 in. square, height 8 ft.
12. Base 14 sq. ft. 96 sq. in., height 3 ft. 9 in.

Find the volume of the triangular pyramids

13. Sides of base 3, 4, 5 ft., height 7 ft.
14. Sides of base 7, 9, 11 ft., height 4 ft.
15. Sides of base 5, 6, 9 ft., height 6 ft.
16. Sides of base 13, 14, 15 ft., height 16 ft.

B.

1. Find the contents of a cone whose altitude is 27 ft., and radius of base 10 ft.
2. The diameter of the base of a cone is 20 in., and its height 32 in.; find its volume.
3. The base of a pyramid is a square, each side of which is 2 ft. 6 in., and its height is 3 ft. 9 in.; find its
4. The height of a right circular cone, whose slant height is 41 feet, is 40 feet; find the volume.
5. [illegible] yards of canvas 25 in. [illegible] a conical tent 15 ft. wide and 12 ft. [illegible] of the canvas being cut away or [illegible] seams?

6. [illegible] find the [illegible] pyramid [illegible] [illegible] height [illegible] ft. [illegible] in.

7. [illegible] pyramid [illegible] whose [illegible] and [illegible] height [illegible] ft. [illegible] in.

8. [illegible] pyramid on a square are equilateral [illegible]; the side of the base being 30 ft., find the [illegible].

9. The base of a pyramid is a rectangle which is [illegible] ft. [illegible] ft.; find the volume, each of the edges which [illegible] the vertex being 30 ft.

10. The base of a pyramid is a square, each side of which is [illegible] ft.; the length of the straight line drawn from the vertex to the middle point of any side of the base is 13 ft. Find the volume.

XLIII.—THE SPHERE.

[illegible]—Surface $= 4\pi r^2$; volume $= \frac{4}{3}\pi r^3$.

A.

In the following $\pi = 3\frac{1}{7}$.

Find the surface area of a sphere

1. [illegible] [illegible] ft.
2. [illegible] $10\frac{1}{2}$ in.
3. [illegible] 8 ft. 2 in.
4. [illegible] 11 feet.

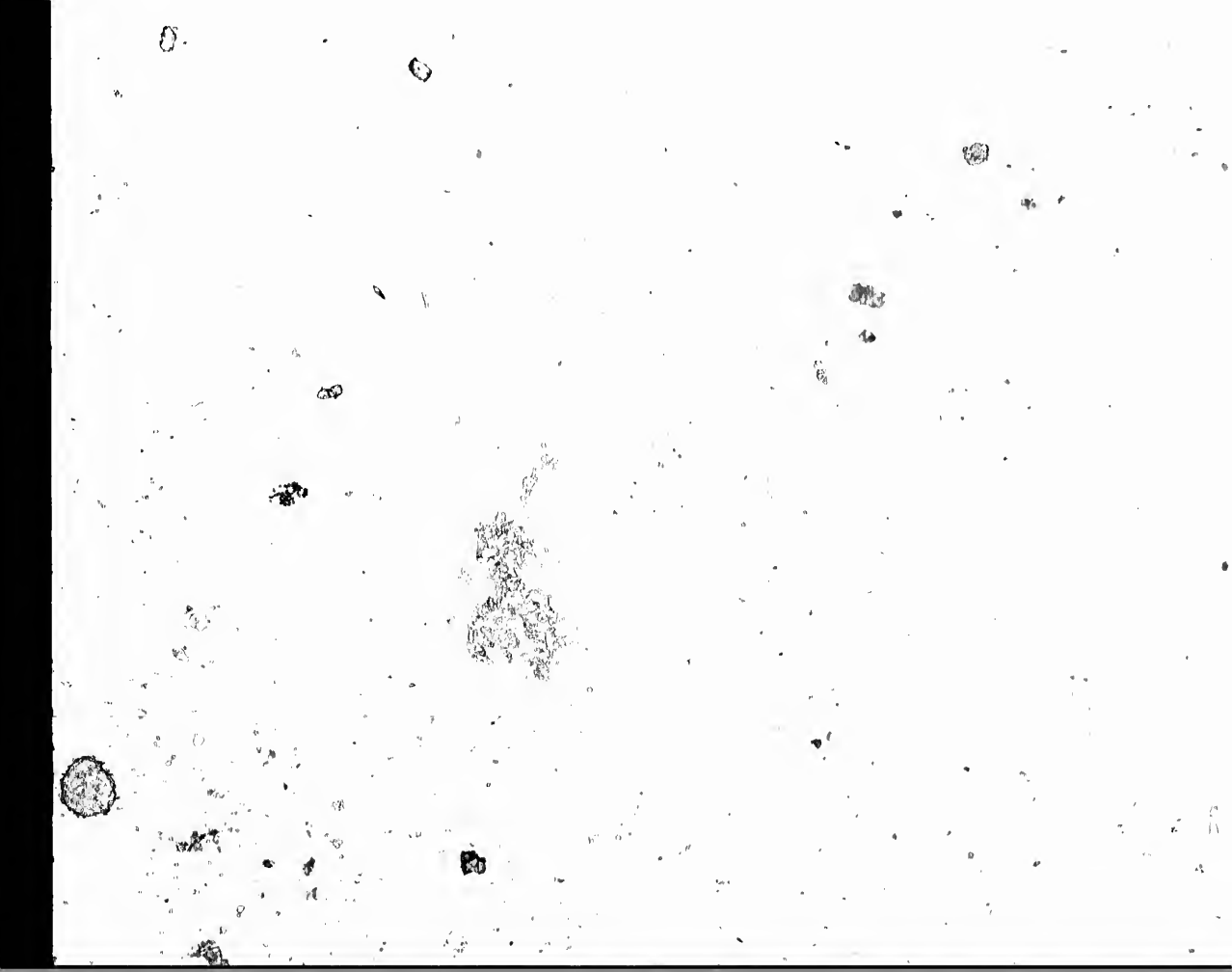
Find the volume of a sphere

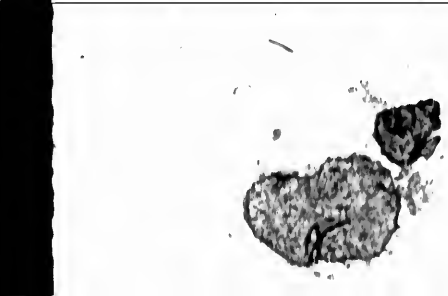
5. [illegible] inches.
6. [illegible] inches.
7. [illegible] [illegible] in., and surface 616 sq. in.
8. [illegible] 11 inches.
9. [illegible] 31.5 feet.
10. [illegible] 3 ft. [illegible] in.

B.

[illegible]

[illegible] will be required to fill a hollow





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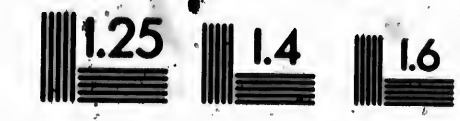

the whole at 15c per quart?

16. A farmer sold two loads of wheat, in all 119 bus. for $94.25. One load was sold at 97c. per bus., and the other at 72c. per bus. How many bushels were there in each load?

17. If silver is worth $1.10 per ounce, and gold $17 per ounce, find the weight of a $10 coin containing 37 parts in 40 of gold, and the rest silver.

18. Equal volumes of iron and copper are found to weigh 77 oz. and 80 oz. respectively. Find the weight of $10\frac{1}{2}$ ft. of circular copper rod, when 9 in. of iron rod of equal diameter weigh $31\frac{3}{16}$ ounces.

19. Find when first after 2 o'clock the hour and minute hands of a clock make an angle of 60° with each other.

20. One kind of brick is $4\frac{1}{2}$ in. long and $2\frac{1}{4}$ in. thick; another kind is 5 in. long and $2\frac{1}{2}$ in. thick. What is the size of the least piece of wall (height being the

26. A man rows 3 miles down stream in 40 minutes; without the aid of the stream it would take him an hour; how long will it take him to return against the stream?

27. A certain kind of brass is made by fusing together old brass, refined copper and zinc, in the proportion of 33, 55 and 24; how much refined copper must be taken to produce 170 lbs. of the brass, after allowing 3% for waste?

28. At an election in a constituency in which the number of votes was 1800, the votes polled by the candidates were in the ratio of 7 to 5, and the successful candidate was elected by a majority of 240. Find the number who did not vote.

29. Water is composed of two gases, oxygen and hydrogen, in the proportion of 88.9 to 11.1; what weight is there of each in a cub. yard of water (a cub. ft. of water weighs 1000 ounces)?

bbl.; on a credit of 8 mos. He sold it at $3.50 per bbl. on a credit of 4 mos. Find his cash gain, money being worth 12%.

36. Sold 20,900 ft. of lumber for $331.62½ gaining thereby $78.37½. What had it cost per C.?

37. A runs a mile race with B and loses; had his speed been a third greater he would have won by 22 yards. Find the ratio of A's speed to B's.

38. How far may a rower go up a stream, the rate of which is 4 miles an hour, so that the round trip may take only 8 hours, if his speed is 8 miles an hour in still water?

39. Bought a lot of sheep at $4 each, as many and $6 more at $6 each; sold the whole lot at $5.50 each and gains $85. Find the number bought.

40. If my goods had cost 20% more my rate of gain would have been 25% less. Find my gain %.

47. Find the equated time: one half of a debt is due in 4 months, $\frac{1}{3}$ of it in 5 mos., and the balance in 6 mos.

48. One-sixth of a debt was due 16 days ago; one-half is due now; and the balance in 17 days. Find the equated time of payment.

49. A workman was hired for 45 days at $1.80 a day for every day he worked, but with this condition, that for every day he was idle he was to forfeit 27 cents. On the whole he made $64.44; how many days did he work?

50. Divide $960 among 4 men, 16 women and 20 children, on the supposition that 1 man does as much as 3 women or 5 children.

51. A farmer employs a number of men and 8 boys; he pays the men $1.10 a day and the boys 65c. The amount that he paid to all was as much as if each hand received 92c. per day; how many men were employed?

its selling price, what is the gain %?

59. A broker invests $6,136 in stock at 95¾ and charges ½%; find his brokerage.

60. A merchant sells two kinds of flour, the superior at $6.50 per bbl., and the other at $5 per bbl. He sold 140 bbls. in all and realized $740; how many of each kind did he sell?

61. A note for $75 was given March 1, 1896, to be paid in 8 mos., with interest at 6% per annum till due, and then at 8% per annum till paid. The note was settled in full on June 26, 1897; find the amount.

62. Three persons, A, B and C, trade together; having a joint capital of $4,700. A's money is in the business 6 mos., B's 8 mos., and C's 10 mos. Each receives $600 as his share of the profit. How much money did each contribute?

67. An officer can form the men of his regiment into a hollow square 12 deep. The number in the regiment is 1,296; how many men are in the front of the square?

68. If a snail crawl up a pole 31 inches during 12 hrs. of the night, and slip down 16 inches during 12 hours of the day, how long will it take the snail to get to the top of a pole 35 feet high?

69. A merchant in buying certain goods uses a pound weight $\frac{1}{2}$ oz. too heavy, and in selling them a pound weight $\frac{1}{2}$ oz. too light, and gains $19 by his dishonesty. Find what he paid for the goods.

70. A boy starts from home, and walks to school at the rate of 11 yds. in 9 sec., and is 1 min. late. If he had walked at the rate of 22 yds. in 15 sec., he would have been half a minute early. Find the distance to the school.

71. A man in harrowing a field walks 25 miles in a day,

76. A has ½ as much money as B, and B has ⅔ as much as C; C gives A $35, and still has twice as much as A. How much money has A?

77. A grocer sells 42 lbs. of tea and sugar for $18.50. He sells the tea at 65c. per lb., and the sugar at 7c. per lb. Find how much he sold of each.

78. Find the number of cubic yards removed in excavating a tunnel half-a-mile long in the form of a half circle, the diameter being 20 feet.

79. A manufacturer sells goods to a merchant at a profit of 62½%; but the merchant fails and pays 62½c. on the dollar. What per cent. will the manufacturer gain or lose?

80. A merchant sells goods for $1,287. Half he sold at an advance of 33⅓% on the cost; ⅓ at an advance of 20%, and the remainder at 10% below cost. What did he pay for the goods?

81. An agent sold flour on a commission of 3%, and with the proceeds, minus his commission on both

87. A's farm is ½ mile square; B's contains ¼ of a square mile; C's is ⅔ larger than A's and B's put together. How many acres are in C's farm?

88. I mix 60 gal. Madeira wine, costing $3.50 a gal., with 40 gal. of superior quality, and sell the mixture at $4.44 per gal., thereby gaining 20%. Find the cost per gal. of the superior quality.

89. A circular garden 300 feet in diameter has a walk 6 feet wide around it on the outside, and another concentric walk of the same width whose outer circumference is 12 feet from the centre. Find the cost of gravelling these walks at 40c. per sq. yd.

90. The whole time occupied by a train 140 yds. long, travelling at the rate of 20 miles an hour, in crossing a bridge, is 18 seconds. Find the length of the bridge.

91. A and B begin business with $1,666, and gained $204, of which B received $60 more than A. How much stock did each contribute?

98. A circle whose radius is 10 in. has a square inscribed and a square circumscribed. Find the area of the spaces enclosed between the circumscribed square and the circumference of the circle; and, also the area of the spaces enclosed between the circumference of the circle and the inscribed square.

99. A man's income consists of a fixed salary of £310 per annum, of dividends on shares paying 5% per annum, and of rents; if his dividends form $\frac{1}{4}$ of his total income and the rents $\frac{1}{3}$, find the amount of capital he has invested in shares.

100. The capital of a firm has been contributed by the partners as follows: A $1,200, B $1,600, C [illegible] and it is agreed that the active partners, A [illegible] shall receive 20% and 12½% respectively of the profits for managing the business. The gross profits are $1,800; find the share of each partner.

101. Find the cost of a draft in Montreal for [illegible]

...depth, length and breadth each increased 10%. What is the capacity after this is done?

106. A grain dealer sent his agent in Chicago 3,000 bus. wheat, which was sold at 80c. a bu. The agent deducted his commission, and also a 4% commission in advance on ten purchased for his employer. The two commissions amounted to $200; find the rate of the first one.

107. A man invested 40% of his capital in 3½% stock at 90, and the remainder in 4% at 95, and his income was $1,745 per year. What was the amount invested?

108. A dealer shipped 200 bbls. of apples to Liverpool, the cost being $2.75 per bbl. For what sum must he have the apples insured at ¾% prem. to guard against all loss in case of shipwreck, his other expenses being $75?

109. ... and B are partners, A's capital being ⅔ of B's. ... end of five months A withdraws ⅓ of his cap... and at the end of nine months B withdraws ⅓ of ... How should they divide a gain of $4,928.25 at ... of the year?

of a 13-inch cannon-ball, the metal being 2 inches thick.

115. How much would it cost to kalsomine the walls and ceiling of a class-room at 6c. a sq. yd., the room being 20 ft. by 25 ft., and high enough to allow 150 cub. ft. of air to each of 50 pupils (no allowance for doors, windows or basing)?

116. Assuming that the 4-lb. loaf sells for 9c. when flour is $6 a bbl., and the cost of making and delivering bread is one-half the cost of the flour, what should the 4-lb. loaf sell for if flour advances 50%, and the cost of making and delivering remain as before?

117. A merchant marks his goods at 50% advance on cost, but allows two successive discounts of 20% and 5%. What is his gain on sales which amount to $2,280?

118. What is the quotation of exchange between Boston and London, England, when a bill of £240 costs $1,107.36, the broker's commission being ½%?

119. Find the volume of the largest sphere that can be formed from a cube whose volume is 2.744 cub. ft.

number of acres in the field.

138. The sides of a triangle are 30, 40 and 50, respectively. Find the area of the triangle formed by joining the middle points of these sides.

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