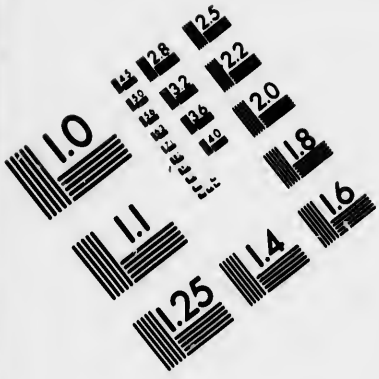

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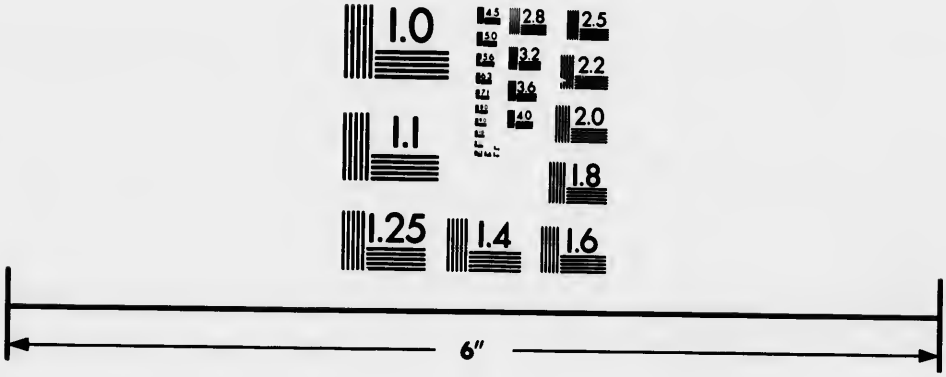

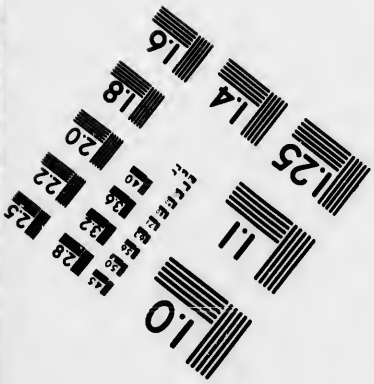

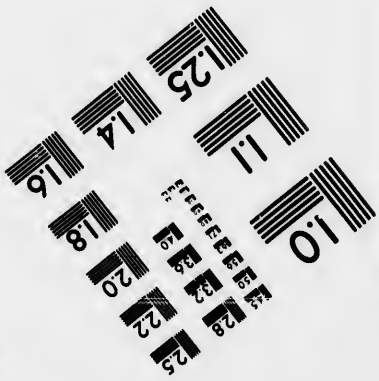

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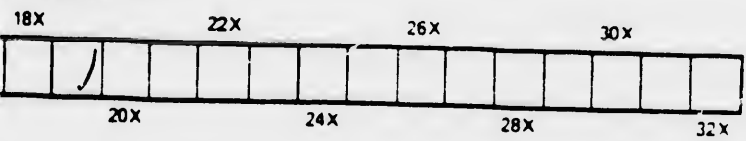

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"SCHOOL HELPS" SERIES.

ARITHMETIC EXERCISES

FOR FIFTH BOOK CLASSES.

BY

G. E. HENDERSON,
Editor of "The Canadian Teacher" and "The Entrance."

AND

E. W. BRUCE, M.A.,
Principal Huron Street Public School, Toronto.

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

THE EDUCATIONAL PUBLISHING COMPANY,
TORONTO, 1898.

PREFACE.

• • •

The authors of this series of Arithmetic "School Helps" offer no apology to the school public for the placing of their books as candidates for popular favor. The several numbers of the series are prepared by teachers actively engaged in the busy work of the schoolroom, and as teachers they know the great difficulty that the average teacher encounters in the presentation of new and crisp problems for his Arithmetic classes.

The authors would most respectfully request a consideration of the following points in connection with their series:

I. **Mechanical Work.** After pupils have passed the Second Reader the usual text books provide but very scanty practice in the mechanical operations. Pupils instead of becoming swifter and more accurate as they advance in years frequently lose the speed and accuracy which they had acquired in the lower forms. To meet this difficulty the present series provides over 5,000 operations in mechanical work, which the teacher will find tested for him without the labor (and loss of time) of performing the work himself. This feature alone should commend the present series to every teacher of the subject.

II. **No Answers.** In the Pupils' Edition no answers are provided; the Teachers' Edition alone contains the answers.

III. **Saving in Time.** The time of the teacher is too valuable to be taken up in the dictation of problems to a class, when for a mere trifle each pupil may be provided with a set of exercises for himself.

IV. **Writing.** The possession of these exercises by the scholar will tend to preserve his handwriting—it prevents the mad rush in copying questions from dictation.

V. **Understanding of Terms.** Without giving formal definitions of terms, problems are specially constructed to fix in the pupil's mind a thorough **understanding** of the technical terms of arithmetic.

VI. **New Problems.** The great majority of the problems of the series have been written specially for these "School Helps." They are not simply a re-arrangement 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 graduated in degree of difficulty.

VIII. **Time Tests.** The purely mechanical operations of addition, subtraction, etc., are intended to be done at a pupil's best speed, a specified time being allowed as the teacher's experience finds suited to the ability of his class.

IX. **Book of Exercises.** This series is not in any sense designed to displace either the teacher or the authorized 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.

THE AUTHORS.

Toronto, April, 1898.

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THE AUTHORS.

EXERCISES IN ARITHMETIC

FOR FIFTH CLASSES.

ADDITION TESTS.

(1)	(2)	(3)	(4)	(5)
76832	68327	83276	32768	27683
68327	83276	32768	27683	76832
83276	32768	27683	76832	68327
32768	27683	76832	68327	83276
27683	76832	68327	83276	32768
76832	68327	83276	32768	27683
68327	83276	32768	27683	76832
83276	32768	27683	76832	68327
32768	27683	76832	68327	83276
27683	76832	68327	83276	32768
76832	68327	83276	32768	27683
68327	83276	32768	27683	76832

(6)	(7)	(8)	(9)	(10)
65984	59846	98465	84659	46598
59846	98465	84659	46598	65984
98465	84659	46598	65984	59846
84659	46598	65984	59846	98465
46598	65984	59846	98465	84659
65984	59846	98465	84659	46598
59846	98465	84659	46598	65984
98465	84659	46598	65984	59846
84659	46598	65984	59846	98465
46598	65984	59846	98465	84659
65984	59846	98465	84659	46598
59846	98465	84659	46598	65984

(11)	(12)	(13)	(14)	(15)
67314	73146	31467	14673	46731
58962	89625	96258	62589	25896
73146	31467	14673	46731	67314
89625	96258	62589	25896	58962
31467	14673	46731	67314	73146
96258	62589	25896	58962	89625
14673	46731	67314	73146	31467
62589	25896	58962	89625	96258
46731	67314	73146	31467	14673
25896	58962	89625	96258	62589
67314	73146	31467	14673	46731
58962	89625	96258	62589	25896

(16)	(17)	(18)	(19)	(20)
47963	25864	59172	67382	97864
79634	58642	91725	73826	78649
23456	34567	45678	56789	67891
78912	89123	91234	12345	23456
34567	45678	56789	67891	78912
89123	91234	12345	23456	34567
45678	56789	67891	78912	89123
91234	12345	23456	34567	45678
56789	67891	78912	89123	91234
12345	23456	34567	45678	56789
67891	78912	89123	91234	12345
23456	34567	45678	56789	67891

Add 66666 ten times consecutively to the line above, beginning with the following lines, and add the ten consecutive sums : (21) 68147 ; (22) 71689 ; (23) 45783 ; (24) 31489 ; (25) 27684.

Add 77777 ten times, etc :

(26) 57294; (27) 68302 ; (28) 79218 ; (29) 97143 ; (30) 84127.

Add 88888 ten times, etc. :

(31) 57682 ; (32) 90083 ; (33) 21987 ; (34) 19478 ; (35) 27946.

Add 99999 ten times, etc. :

(36) 98146 ; (37) 88793 ; (38) 71698 ; (39) 27083; (40) 94586.

SUBTRACTION TESTS.

From each of the following subtract 44444 ten times in succession, and add the ten consecutive remainders: (1) 578631; (2) 619372; (3) 736418 ; (4) 631474 ; (5) 489732.

From each of the following subtract 55555 ten consecutive times, and add, etc. : (6) 684321 ; (7) 596832 ; (8) 706241 ; (9) 896142 ; (10) 776834.

From each of the following subtract 66666 ten consecutive times, and add, etc. : (11) 679843 ; (12) 782167; (13) 804392; (14) 716829 ; (15) 878937.

From each subtract 77777 ten consecutive times, and add, etc.: (16) 779891 ; (17) 808372 ; (18) 900189 ; (19) 909163 ; (20) 849784.

From each subtract 88888 ten consecutive times, and add, etc.: (21) 967891 ; (22) 987654 ; (23) 898793 ; (24) 998637 ; (25) 936895.

From each subtract 99999 ten consecutive times, and add, etc.: (26) 1673204; (27) 1768041 ; (28) 1803197; (29) 1688913 ; (30) 1787878.

From each subtract 35972 ten consecutive times, and add, etc.: (31) 417683 ; (32) 509472; (33) 596415 ; (34) 683386 ; (35) 455669.

From each subtract 24687 ten consecutive times, and add, etc.: (36) 435769 ; (37) 357692 ; (38) 576923 ; (39) 417682 ; (40) 593178.

MULTIPLICATION TESTS.

Multiply each of the following by 6 twelve times in succession : (1) 11924 ; (2) 20367 ; (3) 23848 ; (4) 26829 ; (5) 35772 ; (6) 41734 ; (7) 47696 ; (8) 53658 ; (9) 62601 ; (10) 71544.

Multiply each by 7 twelve times in succession : (11) 12654 ; (12) 14763 ; (13) 18981 ; (14) 25308 ; (15) 29526 ; (16) 37962 ; (17) 44289 ; (18) 50616 ; (19) 56943 ; (20) 59052.

Multiply each by 8 twelve times in succession: (21) 10692; (22) 14256; (23) 16038; (24) 24057; (25) 32076; (26) 37422; (27) 42768; (28) 48114; (29) 57024; (30) 74844.

Multiply each by 9 twelve times in succession: (31) 13104; (32) 14742; (33) 19656; (34) 22113; (35) 26208; (36) 29484; (37) 39312; (38) 44226; (39) 52416; (40) 58968.

Multiply each of the following by 579: (41) 11214; (42) 13083; (43) 16821; (44) 22428; (45) 26166; (46) 33642; (47) 39249; (48) 52332; (49) 67284; (50) 78498.

Multiply each of the following by 468: (51) 10368; (52) 11664; (53) 13824; (54) 15552; (55) 20736; (56) 23328; (57) 27648; (58) 31104; (59) 41472; (60) 46656.

Find the cubes of: (61) 216; (62) 243; (63) 288; (64) 324; (65) 432; (66) 486; (67) 648; (68) 729; (69) 864; (70) 972

DIVISION TESTS.

Divide each of the following numbers by 6 twelve consecutive times: (1) 938802685870O8; (2) 125173691449-344; (3) 1642904700272G4; (4) 166898255265792; (5) 187760537174016.

Divide each by 7 twelve consecutive times: (6) 299719-233050454; (7) 399625644067272; (8) 599438466100908; (9) 8991576991516З2; (10) 1348736548727448.

Divide each by 8 twelve consecutive times: (11) 1580-822842834944; (12) 2371234264252416; (13) 3556851396-378624; (14) 4215527580893184; (15) 4742468528504832.

Divide each by 9 twelve consecutive times: (16) 6832-535346548352; (17) 102488030198225З8; (18) 15373204-529733792; (19) 20497606039645056; (20) 23913873712-919232.

Divide each of the following by the factors of 132: (21) 15701796: (22) 24425016; (23) 31403592; (24) 36637524; (25) 47105388; (26) 48850032; (27) 62807184; (28) 9421-0776; (29) 109912572; (30) 125614368.

Divide each of the following by 1296: (31) 16003008; (32) 37340352; (33) 174254976; (34) 112021056; (35) 96018048.

Divide each of the following by 1764 : (36) 373022496 ; (37) 559533744 ; (38) 839300616; (39) 979184052; (40) 652789368.

Divide each of the following by 5184 : (41) 1112652288 ; (42) 1483536384 ; (43) 989024256 ; (44) 3956097024 ; (45) 2472560640 ; (46) 618140160 ; (47) 4945121280 ; (48) 1978048512 ; (49) 2967072768 ; (50) 4450609152.

I.—MEASURES AND MULTIPLES.

A.

1. Find L.C M. of 545, 26487, 1853 and 11421.
2. Resolve 132288 and 107328 into their prime factors, and find their L.C.M.
3. Resolve 16335 and 18018 into their prime factors, and from inspection of these find their G.C.M.
4. Find the prime factors of 13230. 22050, and 23625. By means of these find their G.C.M. and L.C.M.
5. Resolve 34650 and 43890 into their prime factors, and from inspection find the quotient when their G.C.M. is divided into their L.C.M.
6. Find the L.C.M. of $2\frac{1}{4}$, $3\frac{3}{8}$, $3\frac{9}{32}$, and $14\frac{9}{14}$.
7. Find the L.C.M. of $\frac{20}{161}$, $1\frac{5}{7}$, and $3\frac{3}{14}$.
8. Find the G.C.M. of $\frac{21}{40}$, $1\frac{1}{56}$, $2\frac{1}{7}$, and $2\frac{2}{5}$.
9. Divide the L.C.M. of $\frac{3}{8}$, $\frac{4}{5}$, $\frac{5}{6}$, and $\frac{6}{7}$, by the G.C.M. of $\frac{5}{6}$, $\frac{5}{8}$, $\frac{35}{24}$, and $\frac{5}{48}$.
10. What is the greatest number that will divide 107275 and 68131, leaving remainders 49 and 28 respectively ?
11. A number is composed of the following factors ; 2^3, 3^2, 5^3, 11 and 17 ; find the number.
12. Find the sum of all the divisors of 810.

B.

Find the product of the following :

1. 9876543 and 336427, having 3 partial products.

2. 541728 and 72639, having 3 partial products.
3. 400867 and 15613, having 2 partial products.
4. 142835 and 819264, having 3 partial products.
5. 135792468 and 384672968, having 4 partial products.
6. 45678 and 19537, having 3 partial products.
7. 937654 and 39768, having 3 partial products.
8. The L.C.M. of two numbers one of which is 84, is 924; their G.C.M. is 12; find the other.
9. The L.C.M. of two numbers is 634938944494, and their G.C.M. is 9187; one of the numbers is 8504-4059; find the other.
10. The L.C.M. of 391 and another number is 12121, and their G.C.M. is 23; find the other number.
11. The driving wheels of a locomotive are $17\frac{1}{2}$ ft. in circumference and the trucks $10\frac{5}{8}$; what distance must the train move to bring wheel and truck into the same relative position as at starting?
12. A hall 60 ft. long is to be carpeted. It is found that by stretching the carpet lengthwise, any one of 4 pieces—widths, respectively, $\frac{3}{4}$ yd., 1 yd., $1\frac{1}{4}$ yds., and $1\frac{1}{2}$ yds., will exactly fit the hall. If the narrowest piece, worth \$1.10 a yard, be chosen, what will it cost to carpet the hall?

II.—FRACTIONS.

Reduce to a simple fraction:

1. $\dfrac{\frac{1}{3}+\frac{1}{5}+\frac{1}{7}}{\frac{1}{2\frac{1}{3}}+\frac{1}{3\frac{1}{2}}+\frac{1}{4\frac{1}{2}}} \times 7\frac{1}{3} \text{ of } \frac{13}{14}$.

2. $\left(\dfrac{\frac{1}{2}-\frac{1}{3}}{\frac{1}{2}+\frac{1}{3}}+\dfrac{\frac{1}{3}-\frac{1}{4}}{\frac{1}{3}+\frac{1}{4}}\right) \div \left(\dfrac{\frac{1}{4}-\frac{1}{6}}{\frac{1}{4}+\frac{1}{6}}-\dfrac{\frac{1}{6}-\frac{1}{8}}{\frac{1}{6}+\frac{1}{8}}\right)$.

3. $\dfrac{10\frac{5}{8}-7\frac{3}{16}}{12\frac{5}{32}-9\frac{7}{64}}-\left(\dfrac{8\frac{2}{9}}{19\frac{5}{27}} \times \dfrac{12\frac{7}{10}}{16\frac{7}{20}} \div 3\frac{54}{109}\right)+18\frac{88}{91}$.

4. $\dfrac{5\frac{5}{8} \div \frac{2}{3}}{1\frac{1}{5} \text{ of } \frac{5}{9} \div 10\frac{1}{3}} \times \frac{3}{5} \text{ of } \dfrac{1\frac{1}{2} \text{ of } 4\frac{1}{9}}{13\frac{7}{8} \text{ of } 5\frac{1}{3}}$.

5. $\dfrac{27}{37\frac{1}{5}} \times \dfrac{87\frac{2}{9}}{98\frac{1}{8}} \times \dfrac{\frac{7}{8}}{2\frac{1}{3}} \times \dfrac{81\frac{5}{11}}{128}$.

6. $(7\frac{3}{4} \div 5\frac{1}{4}) \text{ of } \left\{(4\frac{1}{2} \times \frac{7}{8}) + \frac{3}{5}\right\} \times (3\frac{1}{2} - \frac{9}{10})$.

7. $\dfrac{\frac{5}{9} \text{ of } \frac{3}{7}}{6\frac{1}{5} - 5\frac{4}{15}} \div \dfrac{\frac{3}{8} \times \frac{11}{12}}{\frac{1}{18} \times 5\frac{1}{2}}$.

8. $\dfrac{(7\frac{1}{4} - 3\frac{1}{2}) \times \left\{4\frac{1}{5} - (2\frac{1}{3} - 1\frac{7}{10})\right\}}{(7\frac{1}{4} + 3\frac{1}{2}) \div \left\{1\frac{1}{2} - (9\frac{1}{2} \times \frac{2}{17})\right\}}$

9. $\dfrac{\frac{3}{4} \text{ of } \frac{7}{9} \text{ of } 1\frac{5}{28} - 2\frac{1}{4} \text{ of } 3\frac{3}{5} \text{ of } \frac{1}{12}}{4\frac{1}{2} - (3\frac{1}{3} + 4\frac{2}{7}) + 3\frac{7}{8} + \frac{3}{56}}$

10. $\left(3\frac{1}{2} \times \dfrac{\frac{1}{4} \text{ of } \frac{5}{9} \times 7\frac{1}{5}}{\frac{1}{3} + 4\frac{1}{2} \text{ of } \frac{4}{27}}\right) \div \left\{7\frac{1}{2} \times \dfrac{\frac{2}{5} - 1\frac{1}{6} + \frac{3\frac{3}{4}}{7\frac{1}{2}} + \frac{4}{15}}{9\frac{7}{15} + 150\frac{5}{19} - 74\frac{2}{5}} \times 425\right\}$

11. $\left\{\dfrac{\frac{2}{3} + \frac{5}{6} + \frac{7}{8} + 1\frac{1}{12}}{\frac{3}{4} - \frac{5}{8}} \times \dfrac{1}{3\frac{1}{2}}\right\} \div \left\{\dfrac{7\frac{1}{2}}{6\frac{1}{2}} + \left(\dfrac{11\frac{1}{2} - 2\frac{2}{5}}{11\frac{1}{2} + 2\frac{2}{5}} \times 10\frac{9}{13}\right) - 7\frac{1}{8}\right\}$.

12. $\left(\dfrac{\frac{2}{15} \text{ of } 11\frac{1}{4} + \frac{2}{17} \text{ of } 7\frac{2}{7}}{33\frac{1}{8} - 6\frac{1}{8}} + 8\frac{7}{16}\right) \div \dfrac{\frac{1}{2} \text{ of } 6\frac{3}{4} - 2\frac{1}{8}}{25 + \frac{1}{7} \text{ of } 3\frac{1}{8}}$.

III.—FRACTION PROBLEMS.

A.

1. A man invests $\frac{1}{2}$ of his fortune in land, $\frac{1}{5}$ of it in bank stock, $\frac{1}{6}$ in Provincial debentures, and loses the remainder $8,000 in speculation; what was his fortune at first?

2. A merchant bought a number of bbls. of flour for $1,800; he used 20 bbls., and sold $\frac{4}{5}$ of the remainder for $1,568, which was $224 more than cost. How many bbls. did he buy?

3. A, B and C, having equal shares of a ship, sell respectively $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$ of their shares to D, who dies and leaves his share equally among them If B's and C's interest in the ship be now worth $37,300, what is the value of A's share?

4. The numerator of a certain fraction is $\frac{1}{5}$ as much again as its denominator and the sum of the numerator and denominator is 352. Find the fraction?

5. Find what fraction must be subtracted from

$$\frac{1\frac{1}{2} \text{ of } 3\frac{1}{3}}{3\frac{1}{2} \text{ of } 2\frac{2}{3}} \text{ of } \frac{1\frac{3}{7} \text{ of } 1\frac{1}{6}}{32\frac{2}{3}} + \frac{2\frac{1}{8} \text{ of } 6\frac{2}{3}}{3\frac{1}{5} \text{ of } 4\frac{1}{2}} \text{ to make it}$$

$$1\frac{2}{7} \text{ of } \frac{1}{3\frac{1}{2}}$$

equal to $\frac{1}{28\frac{2}{7}}$ of $3\frac{3}{4}$ of $3\frac{1}{7}$ of $1\frac{3}{7} \times \frac{3}{5}$.

6. Out of a certain sum I take $2 more than the fifth; then $10 less than $\frac{4}{5}$ of the remainder; then $2 less than $\frac{3}{5}$ of what still remained; after which I had left $10. Find the original sum.

7. A does $\frac{2}{3}$ of a piece of work in 6 hours; B does $\frac{3}{4}$ 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 $\frac{2}{5}$ of $4\frac{1}{3}$ cords of wood for $\frac{2}{3}$ of $\frac{2}{3}$ of $30; what were 2 cords worth at the same rate?

9. What fraction divided by $(\frac{2}{1\frac{1}{9}} + \frac{1}{13}) \div (3 - \frac{1}{3}) \times (\frac{1}{3} + \frac{1}{5})$ will give $\frac{3}{14}$ of $\frac{4\frac{5}{9}}{6\frac{1}{6}}$ of $\frac{6\frac{8}{11}}{11\frac{5}{7}}$ 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

working together do it in 18 days. How long would it take each one separately?

B.

1. John had a sum of money. He spent \$5 more than $\frac{1}{7}$ of it in books; \$3 less than $\frac{2}{5}$ of the remainder in clothing; and \$1 more than $\frac{2}{3}$ of what still remained in shoes; after which he had left \$5. What sum had he at first?

2. If 3 horses are worth 7 cows, and 5 cows cost as much as 30 sheep, and 16 sheep cost \$165; find the value of 12 horses.

3. A person rides to town at the rate of $8\frac{1}{4}$ miles per miles per hour, and after resting 35 mins., walks back at the rate of $2\frac{3}{4}$ miles per hour. The whole time occupied was 7 hrs. $20\frac{5}{11}$ mins.; find the distance.

4. One-quarter of the time which a man spent on a journey from M to T he travelled by steamboat at an average rate of 14 mi. per hour; $\frac{2}{5}$ of the time he travelled by railway at an average rate of 25 mi. per hour; and the remaining hour of the time he rode the remaining 7 miles of his journey. Find the distance from M to T.

5. There is a mixture of vinegar and water in the proportion of 93 parts of vinegar to 7 parts of water; how much water must be added, so that in 25 parts of the mixture there may be 2 parts of water?

6. A man, assisted part of the time by a boy, completed a job in 15 hours. The man received $\frac{5}{6}$ of the pay and the boy $\frac{1}{6}$; but the man was paid at double the rate the boy was in proportion to the amount of work each did. How long would the man unassisted have taken to accomplish the job?

7. A boy can run 6 times round a circular plot of ground in 52 seconds; another boy can run 9 times round the same plot in 80 seconds. If they start from the

same place at the same time, and run in the same direction, how many rounds will each take before the faster boy overtakes the slower?

8. Find the least fraction which, added to the sum of $\frac{7}{9}$, $\frac{11}{13}$ and $\frac{38}{39}$ will make the result an integer.

9. A person sold A $\frac{3}{4}$ of his land, B $\frac{2}{3}$ of the remainder, and C $\frac{3}{7}$ of what then remained, and received \$60 from D for what he had left, at \$75 an acre; find the number of acres he had at first. 14 acres

10. B runs a mile race with C and loses; had his speed been a third greater he would have won by 22 yards; what fraction is B's speed of C's?

11. A person buys four houses; for the second he gives half as much again as for the first; for the third, a third as much again as for the first and second together; for the fourth, a fourth as much again as for the first, second and third together; he pays in all \$39,690; what is the cost of the fourth?

IV.—ADDITION OF DECIMALS.

Find the sum of:

1. 27.4183, 679, 6.79, .679, 814.73 and .5.
2. 89.247153, .07, .6314, 1.3728, 71.7854, 26.9, 31.007.
3. 457.29, 81.493, 9.7164, .51327, .049763, .0097168.
4. 4192, .384, .416, .1647, 31.8, 9.00417, 189.14763.
5. .701, .0001, .000001, 7.8, .78, and .0789.

Add, without reducing to vulgar fractions:—

6. .$3\dot{1}\dot{2}$, 9.$\dot{4}$, and .$2\dot{3}$.
7. 16.$7\dot{3}$, 14.$2\dot{1}\dot{9}$, 5.$8\dot{1}\dot{7}$, 3.$2\dot{6}\dot{7}\dot{8}$.
8. 8.$9\dot{7}$, 13.$9\dot{2}\dot{6}$, 5.$4\dot{1}\dot{7}\dot{3}$, 6.$8\dot{1}\dot{2}$.
9. 16 $\dot{7}$, 2.$8\dot{1}\dot{5}\dot{6}$, 3.$2\dot{3}\dot{5}\dot{4}\dot{6}\dot{7}$, 91.$3\dot{4}$.

10. 5.8$\dot{1}$, 16.23$\dot{4}$5, 19.16$\dot{8}$1$\dot{4}$, 26.189$\dot{6}$7$\dot{8}\dot{4}$.
11. 7.$\dot{5}$, 16.23$\dot{4}$, 157.45$\dot{6}\dot{7}$, 19.24$\dot{6}\dot{8}\dot{1}$, .5$\dot{7}\dot{9}\dot{3}\dot{2}$.
12. 73.7$\dot{2}\dot{3}$, 11.3$\dot{4}\dot{2}$, 16.713, 19.0$\dot{3}\dot{4}$, 713.213$\dot{4}\dot{3}\dot{7}$, 12.3$\dot{4}\dot{5}\dot{6}\dot{7}\dot{8}$

V.—SUBTRACTION OF DECIMALS.

1. Subtract 95.8764138 from 768.9147683 six times consecutively and find the sum of the six remainders.
2. Subtract .74385609 six times consecutively from 8.00314257 and add the six remainders.
3. From 834.1768$\dot{9}$ take 587.32$\dot{5}$.
4. From 946.6$\dot{3}\dot{1}$ take 579.2985$\dot{3}$.
5. Find the difference between 1768.9$\dot{3}\dot{2}\dot{4}$ and 987.59$\dot{7}\dot{8}$.
6. Take 987.65$\dot{8}$43$\dot{2}$ from 1234.56$\dot{7}\dot{8}$.
7. Take 18.1234567 from 97.91$\dot{3}\dot{4}\dot{2}$.
8. Subtract 79.8$\dot{9}\dot{6}$ from 108.6$\dot{2}\dot{1}\dot{7}\dot{3}\dot{4}$.

VI.—MULTIPLICATION OF DECIMALS.

Find the product of :

1. 47.672 and 2.34.
2. 302.076 and .603.
3. .3060724 and 240.6.
4. 73009.6 and .005006.
5. 2985.643 and 3.6872.

Find by the contracted method the product of :

6. 846.29 and 53.97 to three places.
7. 213.579 and 3.2164 to three places.
8. 12345.6 and .9999 to three places.
9. 98.610275 and 35.789 to three places.
10. 37.0607 and 4.071 to four places.
11. 7.9384 and .5238 to four places.

12. 2.46846 and .96248 to four places.
13. $5.\dot{1}\dot{7}$ and $2.0\dot{8}$ to four places.
14. $.3\dot{1}\dot{8}$ and $.743\dot{2}$ to four places.
15. $3.14\dot{5}$ and $4.\dot{5}9\dot{7}$ to four places.
16. $17.37\dot{3}$ and $385.043\dot{9}\dot{7}$ to four places.
17. Find to the nearest cent the value of $\$100 \times (1.03)^8$
18. Find to the nearest cent the value of $\$100 \times (1.01)^5$
19. Find to the nearest cent the value of $\$100 \times (1.035)^6$
20. Find to the nearest cent the value of $\$100 \times (1.045)^6$.

VII —DIVISION OF DECIMALS.

Divide to 3 places of decimals :

1. 1.5708 by 28.645.
2. 28.64785 by .866.
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 .217145 to 4 places

Find by the contracted method the quotient of :

8. 6.931472 by .2302585 to 3 places.
9. 89.985 by 3.003882 to 3 places
10. $250 \div 3.141593$ to 4 places.
11. $10 \div .43429448$ to 4 places.
12. $.1 \div 3.14159265$ to 5 places.
13. $2 \div 4.60517018$ to 8 places.
14. $93.7\dot{2}\dot{3} \div 29.4\dot{1}\dot{7}\dot{3}$ to 3 places.
15. $.4\dot{5} \div .\dot{1}18881\dot{}$ to 4 places.
16. $(1.23456)^3 \div .23456$ to the fourth decimal place.
17. Find the quotient of 1 by $(3.14159)^2$ to the fourth decimal place.

VIII.

A.

Reduce to simple vulgar fractions :

(1) .8125, (2) .96875, (3) $.\dot{7}\dot{2}$, (4) $.\dot{1}3\dot{5}$, (5) $.7\dot{2}0\dot{5}$, (6) $.20\dot{4}\dot{5}$, (7) $.0\dot{8}3$, (8) $.9643\dot{2}$, (9) $5.8\dot{9}\dot{2}$, (10) $.714285\dot{7}$, (11) $.0714285\dot{7}$, (12) $14.912\dot{3}$.

B.

Reducing fractions to equivalent decimals.

1. Why do $\frac{1}{2}$, $\frac{5}{8}$, $\frac{11}{16}$, $\frac{3}{5}$, $\frac{17}{20}$ reduce to finite decimals ?
2. Why do $\frac{2}{3}$, $\frac{4}{7}$, $\frac{8}{11}$, $\frac{9}{13}$ reduce to pure circulating decimals ?
3. Why do $\frac{5}{6}$, $\frac{7}{12}$, $\frac{23}{28}$, $\frac{29}{55}$ reduce to mixed circulating decimals.
4. How do you know the number of digits in the finite part of the decimal ?
5. What is the limit to the number of digits in the repetend ?
6. Reduce $\frac{5}{7}$ to a decimal ; then without division write the decimals equivalent to $\frac{1}{7}$, $\frac{2}{7}$, $\frac{3}{7}$, $\frac{4}{7}$, $\frac{6}{7}$ respectively.
7. Reduce $\frac{11}{13}$ to a decimal, and then write the decimals equivalent to $\frac{2}{13}$, $\frac{5}{13}$, $\frac{6}{13}$, $\frac{7}{13}$, $\frac{8}{13}$ respectively. Why cannot you write the decimal equivalent to $\frac{9}{13}$?
8. Reduce $\frac{8}{19}$ (by a very short process) to a decimal ; then write down, without division, the equivalent decimals of $\frac{3}{19}$, $\frac{11}{19}$, $\frac{17}{19}$ respectively.

Reduce to decimals, by short process, the following fractions : (9) $\frac{11}{17}$; (10) $\frac{13}{19}$; (11) $\frac{17}{23}$; (12) $\frac{15}{29}$; (13) $\frac{6}{31}$; (14) $\frac{31}{37}$; (15) $\frac{6}{41}$; (16) $\frac{12}{43}$; (17) $\frac{29}{53}$; (18) $\frac{20}{61}$.

IX.—MISCELLANEOUS EXERCISES ON DECIMALS.

A.

Find the value correct to 5 dec. places of :

1. $\frac{1}{1}+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\text{- - -}$
2. $\frac{1}{1}+\frac{1}{3}+\frac{1}{9}+\frac{1}{27}+\frac{1}{81}+\text{- - -}$
3. $\frac{1}{1}+\frac{1}{4}+\frac{1}{16}+\frac{1}{64}+\frac{1}{256}+\text{- - -}$
4. $\frac{1}{1}+\frac{1}{5}+\frac{1}{5^2}+\frac{1}{5^3}+\frac{1}{5^4}+\frac{1}{5^5}+\text{- - -}$
5. $\frac{1}{1}+\frac{1}{6}+\frac{1}{6^2}+\frac{1}{6^3}+\frac{1}{6^4}+\text{- - - - -}$

Find the value correct to 4 places :

6. $1+\frac{1}{1}+\frac{1}{1\times2}+\frac{1}{1\times2\times3}+\frac{1}{1\times2\times3\times4}+\text{- - -}$
7. $1+\frac{1}{1}+\frac{1}{1\times3}+\frac{1}{1\times3\times5}+\frac{1}{1\times3\times5\times7}+\text{- - -}$
8. $\frac{1}{5}+\frac{1}{3\times5^3}+\frac{1}{5\times5^5}+\frac{1}{7\times5^7}+\text{- - -}$
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
$$2+\tfrac{2}{3}+\frac{2\times4}{3\times5}+\frac{2\times4\times6}{3\times5\times7}+\frac{2\times4\times6\times8}{3\times5\times7\times9}.$$

B.

1. Simplify $\dfrac{.51 \text{ of } (.00617 - 00532) + (.357 \times .007)}{.51 \times .17}$

2. Find the difference between $\dfrac{\frac{4}{5} \text{ of } .065}{\frac{1}{6} \text{ of } .345}$ and $\dfrac{\frac{2}{5} \text{ of } (\frac{11}{30} - \frac{1}{150})}{.72 + \frac{11}{120}}$.

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 :

$$\frac{(.05)^4 - (.025)^2(.0125)^2 - (.0375)^4}{(.0375)^3 - (.05)^2(.0125) - (.025)(.0125)^2}$$

6. Express as a vulgar fraction the average of

$$\frac{3}{8}, \frac{\frac{5}{4}}{1\frac{1}{5}}, .7, .4\frac{4}{9}, \text{ and } .486\frac{1}{9}.$$

7. Find the average correct to 4 dec. places of $12\frac{1}{14}$, 21, $7\frac{3}{4}$, .034, 3.125, 0, 24.58 and $12\frac{9}{20}$.

8. Prove that $.48732 = \frac{48684}{99900}$.

9. Reduce to a simple quantity

$$\frac{2.8 \text{ of } 2.\dot{2}\dot{7}}{1.1\dot{3}\dot{6}} + \frac{4.\dot{4} - 2.8\dot{3}}{1.\dot{6} + 2.\dot{6}2\dot{9}} \text{ of } \frac{6.8 \text{ of } 3}{2.25}$$

10. Simplify $3.875 \times 3.\dot{5} \div 5.6\dot{3} \times \dfrac{15.25}{3.0\dot{5}}$

11. Find the simplest form of

$$\{ (2.\dot{5} + 1.1\dot{2} + .\dot{3}\dot{2}) \times (7.24574 - 2.6\dot{3}\dot{4}) \} \div 110.\dot{6}.$$

12. The average of four quantities is $18\frac{35}{207}$; the first is $26.20\dot{7}$. the second is $3.\dot{5}9\dot{2}$, and the third is $38.0\dot{6}$. Find the fourth.

X.—PERCENTAGE.

A.

1. How much is 5% of 360? 4% of 139? 6% of $243? 7% of $316? 9% of $745?
2. Find 12½% of 608 men; 20% of 975 bus.; 37½% of 1728 inches; 62½% of 4840 sq. yds.; 8% of 3475 horses.
3. A clerk received $375 a year, and had his salary raised 40%. What does he receive now?
4. A lawyer collected $2346, and charged 5% for his services. How much money did he pay over?
5. Property which cost $2,356 increased in value 125%; 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 33⅓% of his stock left. What was the entire stock worth?
8. Ten years ago the population of a town was 3840; 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 14⅔% of itself is equal to 738?
11. A farm was sold for $6370, which was 16⅔% more than it cost. Find the cost.
12. The number of boys in a school is 80% of the number of girls. The number of boys is 172; how many pupils are there in the school?

B.

A man sold a lot for $648, gaining 17½% of the proceeds. What would he have sold it for had he gained 17½% of the cost?

2. A bankrupt's liabilities were $7,500, his assets $5,145; the assignee charged 2% of the assets for his work. How many cents on the dollar is the bankrupt able 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 78%?

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 37½% 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 34% profit, and with the money purchased another, which he sold for $4,020, losing 16⅔%. What did the first house cost him?

12. A bankrupt was able to pay 40% of his debts, had not a debt of $500 proved worthless; now he is able to pay only 24c. 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 30. 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 $7\frac{1}{2}\%$ of B's, and $12\frac{1}{2}\%$ of B's may equal 20% of C's.

4. A bankrupt had goods worth $7,950, which, if sold at their full value, would give his creditors $81\frac{1}{4}\%$ of their claims. But $\frac{3}{5}$ of them were sold at $17\frac{1}{2}\%$ below their value, and the remainder at $23\frac{3}{4}\%$ 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 $6\frac{1}{4}\%$ 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 $61.37. A made 8%, 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 $3\frac{1}{3}\%$ 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 $37.24. 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 70% in arith., 65% in gram., 60% in education, 50% in history and 40% in geography. Find his average rate per cent. (of the aggregate).

12. A grocer has 180 lbs. of tea, of which he sells 60 lbs. at 30c. 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, $487, Trade do. 8% off.
3. List price, $796, Trade do. 15% off.
4. List price, $496, Trade do. 20 and 5 off.
5. List price, $760, Trade do. 30 and 5 off.
6. List price, $690, Trade do. 10 and 4 off.
7. Invoice price, $1,000, Discount 10 and 5 off.
8. Invoice price, $1,728, do. $12\frac{1}{2}$ and 4 off.
9. Invoice price, $2,040.90, do. 10, 5, and 3 off.
10. Invoice price, $804.36, do. 20, 5, and $2\frac{1}{2}$ off.
11. Invoice price, $1,213.50, Discount 20, 10 and $3\frac{1}{3}$ off.
12. Invoice price, $673.20, do. 25, $16\frac{2}{3}$ and $12\frac{1}{2}$ off.

B.

1. After a discount of 16% had been allowed, a grocer paid $798 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 25% off, and 15 and 10% off, the marked price being $1.20?

6. A merchant marks his goods at an advance of 30%, and allows 5% off for cash. Find the cost price of an article of which the cash price is $7.41.
7. What rate of discount is equivalent to giving an ounce of sugar with each pound for good weight?
8. What rate of discount is equivalent to giving one inch with each yard for good measure?
9. A grocer mixes a pint of water with every gallon of vinegar. What trade discount will this enable him to give?
10. At what advance on cost must a merchant mark his goods, so that he may allow a discount of $33\frac{1}{3}\%$ and still gain $33\frac{1}{3}\%$?
11. What is the difference between 20% discount, and 10, 5 and 5% off?
12. A merchant gives a discount of 10%, but uses a yard measure $\frac{1}{2}$ inch too short; what discount would allow him the same rate of gain if the measure was correct?

C.

1. What must I ask for velvet, which cost me $3.42 a yard, so that I may fall 10%, and still make 20% after deducting 5% of the sales for bad debts?
2. A merchant reduced the marked price of an article by a certain per cent. He gives the same per cent. off this reduced price for cash. The cash price is now $\frac{25}{36}$ of the original marked price; find the rate 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 quantity, and a still further discount of 5% off this bill for cash. Find his gain per cent. by selling at 10% less than the list price.
4. A bookseller charges on certain books 35c. on the shilling of the published price and gives a discount of 35%. What is the actual rate he charges on the shilling?

7. A merchant marks his goods, so that he may allow a discount of 5%, and still make a profit of 15%. Find the marked price of broadcloth that cost him $3.80 a yard.

8. A storekeeper on March 1st, 1894, bought goods amounting, at catalogue prices, to $840, on which he was allowed successive discounts of 33⅓% and 5%. The account is payable in 60 days, after which time interest is to be charged at 7% per annum. On June 1st, 1894, he paid $100. How much is due on July 1st, 1894?

9. 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?

10. 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 $6.40 were sold for $4.20 cash; what reduction in the marked price was made?

11. A merchant bought a quantity of cloth, and marked it at an advance of 25%, and in selling it used a yard measure ¾ of an inch too long, his entire gain being $132. Find the cost price and the discount the merchant gave.

12. A merchant marked his goods so as to gain 20%, but sold them for 5% less than his asking price. He gained altogether $58.80; what did the goods cost?

XII.—COMMISSION.

A.

What is the commission for buying:

1. $542 worth of goods, at 2% commission?
2. $56.20 worth of goods, at 2½%?
3. $508.60 worth of goods, at 1¼%?
4. 75,640 lbs. of butter, at 15c. per lb., commission 2%?
5. 715 bbls. of flour at $4.80, at 3%?

What is the commission for selling :

6. 3,245 bus. wheat at $1.08, at ½% commission ?
7. A house and lot for $4,850, at 2¼% ?
8. 420 acres at $18.50, at 2¼% ?
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 36c. a bus., on a commission of 1⅝%. Find his commission.
11. A commission merchant sold a consignment of apples for $1,756. What sum did he send his employer, his commission being 2¼% ?
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 $80 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 2¼%. What was the cost of the goods ?
3. A commission agent bought 13,450 bushels of wheat at 78c. a bus., and charged 1½% for buying. How much must his employer send him ?
4. A broker received $11,560 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 $875. Find the amount the agent receives.

A commission merchant bought a lot, 50 ft. frontage, with the money he realized from selling wheat at $2\frac{1}{2}\%$; the net proceeds of the wheat, after deducting the commission, being $23,887.50. Find the price per foot paid for the lot.

An agent sells 256 reapers for $125 each. He is to be responsible for bad debts, which amount to $12\frac{1}{2}\%$ of the entire sales, and is to receive 20% of the good sales for his commission. What are his net earnings?

A firm became insolvent and owed $4,050; their assets amounted to $2,490.75. What per cent. of their indebtedness did they pay, having allowed the assignee $2\frac{1}{2}\%$ on the amount distributed for their services?

I received $4.100 from my agent, who had deducted his commission at 5%, as proceeds of sale of goods; what were the goods sold for?

An agent sold, on a commission of $\frac{1}{2}\%$, 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 $18 per M. How many feet of lumber did he buy?

A dealer shipped 400 bus. wheat at $1.40, 800 bus. at $1.62\frac{1}{2}$, 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 $4\frac{1}{6}\%$ loss. The agent's commission was 3%, and the other charges were $83.44; find the dealer's gain per cent.?

C.

An agent sold a consignment of flour for $4,800, 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 $300, find the rate of commission on the sale of the flour.

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 $5\frac{5}{11}\%$ better than A's. He sells the whole lot at \$7 a bbl., charging 4% commission. What sum must he remit to each?

3. A cheese factory shipped 30,000 lbs. of cheese to Liverpool, which a commission merchant sold for 46s. 8d. per cwt. (112 lbs.). Find how many cents per pound were realized on the cheese, the commission being 1%, and freight, insurance, etc., amounting to \$86.25 (£1 = $\$4.86\frac{2}{3}$).

4. A commission merchant sells a consignment of wheat for \$27,500, on a commission of $2\frac{1}{2}\%$. He pays \$250 for freight and storage, and with the net proceeds buys pork at \$6.25 per cwt, charging $2\frac{1}{2}\%$ 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 tea. The agent charged a certain rate for selling, and 1 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 $\frac{1}{2}\%$. After deducting his commissions and reserving a sufficient sum to pay the freight at 18c per cwt., he bought flour at \$2.75 per cwt., 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 800 bbls. of flour, and 5,000 bus. of wheat. He paid 8c. a bbl. for the storage of the flour, 2c. a bus. for the wheat, and \$53.79 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 $2\frac{1}{2}\%$ without any guarantee. His employer accepts the former method (which is better than the latter by $21, owing to a bad debt of $84). 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 $2\frac{1}{2}\%$, 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 $898.90 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 $3\frac{1}{2}\%$ on the goods he handles in each case ; find the value of the butter shipped if his total commission amounts to $38.90.

XIII.—LOSS AND GAIN.

A.

Find the selling price:

1. Cost $674, gain $12\frac{1}{2}\%$.
2. Cost $713.40, gain $16\frac{2}{3}\%$.
3. Cost $1,024.16, gain $37\frac{1}{2}\%$.
4. Cost $1,250, 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 $33\frac{1}{3}\%$.
9. 24 pieces print, 48 yds. each, @ $5\frac{1}{2}$c., 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 48c. per lb., and sold at a loss of $12\frac{1}{2}\%$. Find the selling price.

14. A grocer sold goods to the amount of $8.40, and gained $16\frac{2}{3}\%$. 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 $12\frac{1}{2}\%$; 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 $4,840. 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 22 lbs. for $1 makes a profit of $11\frac{1}{9}\%$. If a bbl. of sugar costs

$11.25 and contains 290 lbs., what per cent. of the weight is lost in retailing?

9. A farm cost $3\frac{3}{4}$ times as much as a house; by selling the house at 10% loss, and the farm at $7\frac{1}{2}$% gain, $3,993.30 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 $\frac{1}{4}$ 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 3.62\frac{1}{2}$ per yd., and 87$\frac{1}{2}$ yds. at 4.12\frac{1}{2}$ 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 36.35 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 speculator gain or lose?

9. A tailor buys cloth at $1.75 a yard, which in sponging 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 $3,760, rate $1\frac{1}{8}$%.
2. Assessed value $2,500, rate $1\frac{1}{4}$%.
3. Assessed value $8,500, rate $1\frac{1}{2}$%.
4. On $2,537 at 2c. on the $.
5. On $3,642 at $1\frac{1}{2}$c. 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 $17\frac{1}{2}$ mills on the $.
9. When the rate of taxation is 15 mills on the dollar what is the tax on property assessed at $3,500?
10. The total assessed value of the property of a village is $650,000. What tax will be raised at the rate of $12\frac{1}{2}$ mills on the dollar?
11. A tax of $100,000 is to be levied on a county having rateable property to the value of $5,793,000; what is the amount borne by A whose property is valued at $7,500?
12. A tax of $5,900 is levied for building a schoolhouse. The assessed value of the town is $2,242,000; what does a man pay whose property is assessed at $6,650?
13. What sum must be assessed on a school district to build a schoolhouse worth $6,175, and pay 5% for 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 $525 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 1.5 mills on the dollar; what tax does a man pay on an income of $1,100, of which $100 is exempted?

2. A farmer, whose property is assessed at $9,600, pays on the dollar $1\frac{3}{4}$ mills for township rates, $1\frac{1}{4}$ for county rates, $1\frac{1}{2}$ for railway bonus and $2\frac{1}{2}$ for school rate. How much does he pay in all?

3. A man after paying an income tax of $15\frac{1}{2}$ mills on the dollar, and spending $\$3.37\frac{1}{2}$ per day on an average, is able to save $\$1,230.87\frac{1}{2}$ per year (365 days). Find his gross income?

4. The expense of constructing a bridge was $8,590, 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 $17\frac{1}{4}$ mills on the $, and the collector's charges 5% of the total taxes. What is the amount of the assessment?

6. A farmer pays $56.70 taxes on property worth $3,600 which is assessed for $\frac{3}{4}$ of its value. Find the rate.

7. At a 16-mill rate, a man who has $400 of his salary exempt pays $5.60. What was his salary?

8. A citizen, whose property is assessed for $5,235, pays on the dollar for interest and other charges on general city debt 5.763 mills, for interest and other charges on Public and High Schools 3.486 mills, for Administration of Justice 2.035 mills, for Free Library rate .206 mills, for Street Local rate 3.373 mills, and for

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 $3\frac{1}{2}$ 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 $\frac{2}{3}$ 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 $\frac{3}{4}\%$.
2. Policy $6,000, rate $\frac{7}{8}\%$.
3. Policy $3,600, rate $2\frac{1}{2}\%$ for 3 years.
4. Policy $1,800, for 5 years, rate $\frac{5}{8}\%$ for each year.
5. Policy $560, at 90c. per $100 for 3 years.
6. Policy $6,000, for 4 years, at $1\frac{7}{8}\%$ per annum.
7. Policy $5,000, at 1.17%.
8. What will it cost to insure a mill worth $18,000 for $\frac{2}{3}$ of its value at $1\frac{3}{4}\%$?
9. What is the premium for insuring 4,840 bus. wheat, valued at $1.20 a bus., at $1\frac{1}{8}\%$ on $\frac{5}{8}$ of its value?
10. A building was insured for $2,500 in one company at $1\frac{1}{4}\%$, and for $3 000 in another company at $1\frac{1}{2}\%$. What was the total premium?
11. Find the premium paid to insure a house worth $7,500, for $\frac{2}{3}$ of its value, for 4 years, the rate being $\frac{1}{8}\%$ for each year.
12. A man insures a house worth $4,000, for $\frac{4}{5}$ 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 $\frac{3}{5}\%$ 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 $1\frac{3}{4}\%$ 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 $6,000; what extra premium will he be required to pay if the rate for the latter is $\frac{1}{2}\%$ 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,-$28\frac{1}{8}$ at $3\frac{1}{3}\%$, 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 $\frac{4}{5}$ of its cost, at $1\frac{1}{16}\%$, 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 $\frac{3}{4}\%$ premium to guard against all loss in case of shipwreck, his other expenses being $75?
12. A company took a risk at $1\frac{1}{2}\%$; re-insured 40% of it at $1\frac{3}{4}\%$, and 40% of the remainder at $1\frac{7}{8}\%$. What rate did the company receive on the amount of risk it carried?
13. A merchant had 450 bbls. of flour insured for $\frac{3}{5}$ 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 $2,250 is insured for 80% of its value; the premium paid was $24; find the rate.
15. An insurance company took a risk at $2\frac{1}{4}\%$, and re-insured $\frac{3}{5}$ 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. 59 pianos at $25 each?
4. 4 hhds. sugar, each weighing 1,200 lbs., at $3\frac{1}{2}$c. per lb., allowing tare 6 lbs. per 100?
5. 8 bags coffee, each weighing 75 lbs., at $3\frac{1}{4}$c. per lb., allowing 4% for tare?
6. 8 hhds. sugar, each weighing 1,280 lbs. gross at $2\frac{3}{4}$c. per lb.; tare 14%?

Find the ad valorem duty :

7. Invoice $1,650 at 18%.
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 250 oranges, at $2.75 a box. The freight is $13.20, the duty 16%, the broker's fee $1.15, and the expense of delivery $1.25. 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 $29 for freight and cartage. What was the invoice price of the piano ?
5. A merchant pays $1,085 duty on an invoice of goods. If $16\frac{2}{3}$% of the goods be exempt from duty, and $33\frac{1}{3}$% is charged on the remainder, find the invoice price of the goods.
6. The duty on rubber fire hose is 5c. a lb. and 15% ad valorem. The duty on 1,000 feet of hose, invoiced at 18c. per foot, was $127.70 ; find its weight per foot.
7. 16% of a shipment of goods was admitted free of dnty on account of damage received, and 25% was charged on the remainder. The duty amounted to $201.60 ; what was the invoice price ?

8. A duty on coffee at 12½% in bags of 180 lbs. gross, and invoiced at 15c. a lb., was $777.60, tare having been allowed at 4%. How many bags were there?
9. A grocer imported 120 cases of wine, with 36 bottles in each case. After 5% had been allowed for breakage, he paid an ad valorem duty of 20%; the freight and other expenses were $73. The whole cost being $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 at $109. The duty being $28.45, find the invoice price 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 103⅛?
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. $7,300 in the 7 per cents at 6½% premium?
10. 153 shares of stock at 7¼% discount?
11. 322 shares of 5% stock at 11½% below par?
12. $2,900 in the 6 per cents at 3¾% above par?

What will it cost to purchase

13. 98 shares in the 5 per cents at 79⅞, brokerage ⅛%?
14. $7,645 stock in the 6 per cents at 94¼, brokerage ¼%?
15. 76½ shares of 7% stock at 118¼, brokerage ¼%?
16. £3,850 in the 2½ per cents at 91½, brokerage ½%?
17. £2,600 railway stock at par, brokerage ⅛%?

What does a stockholder receive who sells

18. 25 shares bank stock at 131¼, brokerage ¼%?
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 93⅜.
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 5½% stock at 95¾, 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. $2,983.50 buy in the 7 per cents at 117?
32. $1,878.75 buy in the 8 per cents at 125¼?
33. £2,199 buy in the 3 per cents at 91½, brokerage ⅛%?
34. $3,741 buy in the 3½ per cents at 86¾, 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 102⅞, brokerage ⅛%?

How much stock must be sold in the

42. 8 per cents at 123 to produce $861?
43. 6 per cents at 112½ to produce $843.75?

44. 5 per cents at 101 to produce $934.25 ?
45. U.S. (10-40's) at $83\frac{1}{3}$ to produce $2,250 ?
46. St. Paul R.R. stock at $69\frac{1}{4}$, brokerage $\frac{1}{8}\%$, to produce $11,060 ?

What sum invested gives an income of

47. $320 in the 8 per cents at 120 ?
48. $600 in the 6 per cents at 85 ?
49. $2,500 in the 5% at $89\frac{7}{8}$, brokerage $\frac{1}{8}\%$?
50. $672 in the $3\frac{1}{2}\%$ at 68, brokerage $\frac{1}{8}\%$?

B.

1. A broker invests $5,924.50 in stock at 87, on $\frac{1}{8}\%$ commission ; what are his charges ? 8.37
2. Find the alteration in income occasioned by shifting $5,000 stock from the 3 per cents at $86\frac{3}{8}$, to the 4 per cents at $114\frac{7}{8}$, the brokerage being $\frac{1}{8}\%$ 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 $\frac{1}{8}\%$.
4. Find the alteration in income occasioned by selling out $4,500 stock in the New York Central paying 5% at $115\frac{1}{8}$, and investing the proceeds in 3% Government bonds at $91\frac{7}{8}$, brokerage $\frac{1}{8}\%$ in each case.
5. Which is the better investment, 4% stock at 105, or 5% stock at 131 ; brokerage in each case $\frac{1}{8}\%$?
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 $95\frac{7}{8}$, brokerage $\frac{1}{8}$, paying an annual dividend of 5% ?
8. What per cent. is made by investing in $4\frac{1}{2}\%$ stock at 75
9. What is the price of a $6\frac{1}{2}\%$ stock which pays 5% on the money invested ?

0. What is the price of a 6% stock paying 4½% on the money invested, brokerage ⅛% ?

1. Sold stock at a discount of 12½% and made 16⅔% on my money ; at what rate of discount did I buy ?

2. If stock at 26% premium will pay 5% interest on the investment, at what premium would it have to be bought to pay 6% interest ?

[C.

. A man owned $8,940 bank stock which paid a yearly dividend of 4½%. He sold out at 102⅜, and invested the proceeds in Michigan Central stock at 74⅜, paying a yearly dividend of 3%. By how much was his yearly income changed by the transfer, brokerage ⅛% in each case ?

. M invested money in 3% 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 ?

. A retired farmer invests 40% of his capital in 3½% stock at 90, and the remainder in 4% stock at 95 ; his income is $698 per year. What capital has he invested ?

. A man sold his 5 per cents at 78 and invested the proceeds in 6 per cents at 104. His change in income being $385, find how much 5% stock he had.

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

. What must be the market value of 6% stock, so that after paying an income tax of 16 m. on the $ it may yield 5% on the investment ?

. I bought a certain 4% stock at 75, and after a number of years sold out at 95, and found that I had made 7½% 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 $1,680?
12. A man invests $12,000 in 3% stock at 75; he sells out at 80 and invests $\frac{1}{3}$ of the proceeds in $3\frac{1}{2}$% 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 $2\frac{1}{2}$ 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 28th, 1897; find the exact amount paid.

Find the rate when $144 is the interest on $2,880 for 1 year and 8 mos.

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

The interest on $840 for 511 days is $58.80; find the interest on $650 for 2 years at the same rate.

In what time will $3,200 amount to $3,820 at 7½%?

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

The interest on $1,805, loaned on May 14th at 5¼% per annum, is $37.90½; on what day was the money returned?

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

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

B.

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.

The amount of a sum of money at a certain rate is $693.33 for 8 years and $640 80½ for 5½ years. Find the principal and the rate per cent.

At what rate per cent. will $1,520 amount to $1,733.75 in 2¼ years?

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?

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.

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

days is $2,596.92? What is the rate per cent. per annum (1 year = 365 days)?

7. On Jan. 1st, 1890, a person borrowed $2,445.50 at 6¾% and promised to return it as soon as it amounted to $2,608.31. 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 $1.06 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 ⅔ 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, $80; Jan. 1st, 1897, $120.28.
   How much was due Jan. 1st, 1898? Rate 6%.

2. Note.—Prin. $450. Date, Mar. 3rd, 1896. Time, 2 years.
   Paid—Sept. 3rd, 1896, $125.25; 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.—$600. Date, May 5th, 1897. Time, 6 mos.

Paid.—July 9th, $250; Aug. 31st, $100; Oct. 2nd $150.

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

Note.—Prin. $500. Date, Oct. 1st, 1897. Time, 125 days.

Paid.—Nov. 15th, 1897, $110; Dec. 28th, 1897, $220

How much is due at maturity? Rate 7%.

Note.—Prin. $1 000. Date, Mar. 1st, 1896. Payable on demand.

Paid.—June 1st, 1896, $300; Sept. 1st, 1896, $10; Jan. 1st, 1897, $100; June 1st, 1897, $400.

How much is due June 1st, 1898? Rate 8%.

Mortgage.—$3,400. Date, Sept. 13th, 1894. Rate 5%.

Paid.—April 20th, 1895, $800; July 2nd, 1895, $600; July 2nd, 1896, $1,000.

How much discharged the mortgage on Jan. 2nd, 1897?

Note.—$1,217.30. Date, June 2nd, 1895. Rate 6%.

Paid.—July 17th, 1895, $207.80; Oct. 6th, 1895. $209.60; Dec. 11th, 1895, $320.90; Mar. 29th 1896, $421.83.

How much redeemed the note on Oct. 7th, 1896?

Mortgage.—$600. Date, June 30th, 1896. Rate 7½%

Paid.—Sept. 11th, 1896, $200; June 30th, 1897, $150.

How much paid the mortgage on Jan. 31st, 1898?

Note.—$620. Date, Oct. 18th, 1896. Rate 6%.

Paid.—Nov. 26th, 1896, $47.50; Dec. 28th, 1896 $108.93; Feb. 11th, 1897, $216.18; June 6th 1897, $60.10; Sept. 2nd, 1897, $183.25.

How much redeemed the note on Nov. 11th, 1897?

XX.—BANK DISCOUNT.

A.

d 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, $625, dated Jan. 15th, 1897, for 3 mos. Discounted Feb. 1st, 1897, at 6½%.
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. 18th, 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. 18th, at 6%. This note bears 5% interest.
10. A note of $2,450, dated New York, June 1st, 1886, 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

rate of 9% per annum, and 45 cents being charged for exchange, find the proceeds of the bill.

I owe a man $850, and give him my note at 90 days; what must be the face of the note to pay the exact sum, if discounted at 1¼% per month?

For what sum must I draw my note, Mar. 23rd, 1896, for 90 days, so that when discounted at 7% on May 1st the proceeds may be $490?

On March 23rd, a bank gives me $845 for a note of $860. When is the note due, interest 8%?

For what sum must a note be drawn on June 1st, 1897, payable in 90 days, so that when discounted on June 14th, at 8%, the proceeds will be $717.20?

The discount on a note for $3.650, which matured on Aug. 21st, and was discounted on June 24th, was $40.60. Find the rate of discount.

What rate of interest is made by a bank which discounts a 70-day note at 6% per annum?

On July 10th, a banker discounts a note for $500, made May 10th, at 6 mos., at the rate of 8% per annum. At what rate does he receive interest on his money?

XXI.—EQUATION OF PAYMENTS AND ACCOUNTS.

A.

The interest on what sum for 1 day equals

The int. on $100 for 4 days?

The int. on $50 for 10 days?

The int. on $130 for 12 days?

The int. on $225 for 15 days?

The int. on $350 for 27 days?

How many days' use of

$50 equals the use of $800 for 1 day?

7. $70 equals the use of $1,260 for 1 day?
8. $80 equals the use of $37.50 for 64 days?
9. $62.50 equals the use of $87.50 for 30 days?
10. $52.25 equals the use of $50.16 for 25 days?
11. I loaned Mr. Smith $300 for 4 months; for how many months should he loan me $200 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 $50 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 $50 for 4 mos.; how much should A loan me for 1 month to balance the favor?
15. A person owes another $20 in six mos., $50 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., $40 in 5 mos., and $30 in 7 mos.
4. Find the average term of credit of $350 due in 60 days, $520 in 90 days, and $175 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 $400 in 30 days.
6. A merchant bought goods from a wholesale house as follows: Nov. 6th, 1897, $600 worth on 30 days'

credit; Dec. 9th, 1897, $900 on 36 days' credit. When may the merchant equitably pay the $1,500?

7. Bought mdse. from Messrs. Walker & Sons as follows: Aug. 27th, $325 at 60 days; Sept. 20th, $280 at 30 days; and Oct. 31st. $785 at 90 days. Find the equated time of payment.

8. Melrose Morrison bought goods as follows: Jan. 15th, 1897, $500 worth at 30 days' credit; Feb. 25th, $300 at 40 days; and March 20th, $800 at 15 days. Find the date from which interest should be reckoned on the entire debt of $1600.

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 CHIPMAN. CR.

1897			1897		
May 1..	To mdse	at 30 dys $800	May 20.	By cash	$1000
May 15.	" "	30 dys 600	June 15.	"	500
June 12.	" "	60 dys 1000			

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

DR HERBERT H. BURGESS. CR.

1888				1888		
June 10	To mdse	@ 30 days	$950	July 10	By cash	$450
July 15.	" "	45 days	300	Aug. 15	"	350
Aug 20	" "	60 days	250	Sept. 5..	"	200
Sept. 1..	" "	30 days	150			

11. Charging interest at 6%, what sum is due to-day June 29th, 1897, on the following ledger account?

Dr. FRANK HAMILTON. Cr

1897				1897		
Jan. 12..	To mdse.,	30 days	$130	Feb. 18..	By cash	$100
Feb. 6	" "	60 days	180	April 20	"	140
March 8.	" "	90 days	460	June 24.	"	312
April 4..	" "	30 days	362			
May 12..	To cash		160			

XXII.—COMPOUND INTEREST.

A.

Find the compound interest on

1. $800 for 3 years at 5% per annum, compounded yearly
2. $2,000 for 2 years @ 6% per an., comp. yearly.
3. $270 for 2 years @ 8% per an., comp. yearly.
4. $230.75 for 3 years at 4% per an., comp. yearly.
5. $1,154.37 for 4 years at 5% per an., comp yearly.
6. $250 for 2 years at 6% per an., comp. half-yearly.
7. $200 for 3 years at 6% per an,, comp. half-yearly.
8. $675.75 for $3\frac{1}{2}$ years @ 6% per an., comp. yearly.
9. $750 for $1\frac{1}{2}$ years @ 8% per an., comp. quarterly.
10. $2,000 for 2 years @ $6\frac{1}{2}$% per an., comp. yearly.
11. $120 for 3 years 3 mos. @ 4% per an., comp. yearly
12. $840 for 2 years 9 mos. @ 7% per an., comp. yearly
13. $500 for 2 years @ 7% per an., comp. half-yearly.
14. $400 for 15 months @ 10% per an., comp. quarterly
15. A man deposits $100 in a Savings' Bank at the beginning of each year, making his first deposit on Jan. 2nd., 1893. How much will there be to his credit on Jan. 2nd, 1899, the bank paying 4% per annum, calculated yearly?

B.

Find the amount accumulated at the end of 4 years by a man who invests $175 now, and the same sum at the beginning of each succeeding year, at 5%, compounded yearly.

A broker borrowed $1,000 for 2 years at 6% per annum, compounded yearly, and loaned it out at 6% per annum, compounded half-yearly. Find his gain.

A money dealer borrowed $2,500 for 2 years 6 mos., at 4% per annum, comp. yearly, and loaned it out at 5% per annum, comp. half-yearly. Find his gain.

A farmer mortgaged his farm for $1,750 on Feb. 1st, 1894, at 5% per annum, payable half-yearly. What amount of money was required to discharge the mortgage on Aug. 1st, 1896, no interest having been paid in the meantime?

A man borrowed $4,000 at 6% per annum, payable yearly. In two years the rate was reduced to 5%. What did this amount to in 4 years, no interest having been paid?

A man borrowed $2,400, and agreed to pay the principal and interest in three equal annual payments. What was each payment, interest at 6% per annum?

Find approximately in how many years a sum of money will double itself at 15% per annum.

A man puts $350 in a Savings' Bank each year, making his first deposit Dec. 31st, 1890. How much will there be to his credit Jan. 1st, 1895, the bank adding 4% per annum?

A teacher's salary of $1 000 is paid in four payments at the end of each quarter. What sum at the beginning of the year is equivalent to these payments, reckoning comp. int. at 2% per quarter?

What sum of money deposited in a bank at the end of each year for the next 3 years will amount to the same sum as $5,000 deposited now, banks paying 4% per annum, interest added yearly?

11. A lent a sum of money for 2 years at 10% p annum, compounded yearly. B lent an equal su for the same time at 10% per annum, comp. ha yearly. B gained 220.25 more than A. Find t sum each lent.

XXIII.—PRESENT WORTH AND TRUE DISCOUNT.

Find the true present worth of :

1. $840 due 2 years hence, money worth 6%.
2. $3,025 due 3 years hence, money worth 7%.
3. $1,375 due $2\frac{1}{2}$ years hence, money worth 4%
4. $918 due 4 years hence, money worth 5%.
5. $1,120 due 16 mos. hence, money worth 5%.

Find the true discount on :—

6. $572.50 due in 2 years, 5 mos., money worth 6%.
7. $960.60 due in 3 yrs., 4 mos., money worth 6%.
8. $1,820 due in 6 yrs., money worth 5%.
9. $416.30 due in $3\frac{1}{2}$ years, money worth $3\frac{3}{4}$%.
10. $636 due in 9 months, money worth 8%.
11. Find the P.W. of a note for $962, payable in year, money being worth 4%.
12. What sum will discharge a debt of $1,003.50 to paid in 8 mos., if money is worth 6% ?
13. What is the T.D allowed on a note for $2,070. payable 19 mos. hence, money worth 5% ?
14. A merchant bought goods amounting to $618 o credit of 4 mos. ; the discount off is 4% for cash. money is worth 9%, how much cheaper can he get goods by paying cash ?
15. A man rents a farm for 2 years, at $441 per ann the rent to be paid at the end of each year. Mo being worth 5% per annum, comp. int.; find w sum would now pay the 2 years' rent.

. A owes B $400 due in 1 year, $300 due in 2 years, and $200 due in 3 years. What sum paid now would cancel the debt, money worth 5% per an., comp interest?

. A gentleman has two sons aged 18 and 19 respectively What sums must be deposited in a bank to their credit now, so that each will receive $2,500 when 21 years of age; money worth 4% per an., comp. interest?

XXIV.—PARTNERSHIP.

A.

A and B form a partnership to carry on a dry goods business. A invests $2.000 and B invests $3,000; divide a gain of $1,875 between them.

Two men jointly purchase a house, the one paying $864 of the purchase money, and the other $1,728. They rent the house for $132.75 a year. What part of this ought each to have?

A, B and C gain $12,771 in a speculation. A invested $1,200, B $1,500, C $1,600. How much of the gain should C get?

B and C agreed to do a piece of work for $520. C worked 28 days of 5 hours each, and B worked 20 days of 6 hours each. How much was C paid?

Kent and Brown engaged in the lumber trade with a joint capital of $10,000. At the end of the year Kent's gain amounted to $1,710, and Brown's to $1.890. How much capital did Brown put into the business?

A, B and C form a partnership; their respective shares of one year's gain are $2,160, $2,430 and $2,565. A invested $250 less than B. How much did C invest?

A and B engage in trade. A puts into the business $400 for 6 mos., and B puts in $300 for 7 mos. How should a gain of $900 be divided?

8. Three cattle buyers rent a field for which they are to pay $320; the first had in 56 head for 12 days, the second 64 head for 15 days and the third 80 head for 18 days. What should each pay?

9. Ross rented a house for one year for $360; at the end of three months he took in Farmer as a co-tenant; after two months more they admit Patterson. Farmer moves out two months before the year is up. How much of the rent did each pay?

10. A vessel worth $2,700 is entirely lost; $\frac{2}{5}$ of it belonged to B, $\frac{1}{3}$ to C. and the rest to D. What did each lose, $1,620 being received as insurance?

11. A, B and C entered into partnership, their money being in the business for $4\frac{1}{2}$ mos., 4 mos., and $3\frac{1}{2}$ mos. respectively. Their gains were $450, $500, and $525 respectively. B's investment was $2,500; find A's and C's.

12. K and M made a joint stock of $1,575, by which they gained $887.50. K had for his share of the gain $62.50 more than M; what did M contribute to the stock?

B.

1. A begins business with a capital of $3,200; after 3 mos B is admitted as partner with $2 400; after 3 mos more C is admitted with $1,600. What fraction of the year's gain should each have?

2. A, B and C rent a pasture for $92. A puts in 6 horses for 8 weeks, B 12 oxen for 10 weeks, C 50 cows for 12 weeks. If 5 cows are reckoned as 3 oxen, and 4 oxen as 3 horses, what should each pay?

3. A and B were employed to do a piece of work for $60. They were to be paid in proportion to their ability to work, which was 4 to 5, and to the time each worked, which was 3 to 4. How much did each receive?

4. A and B entered into a partnership to carry on a mercantile business for one year. A put in $900 at first and at the end of 4 months withdrew $300. B put

in $600 at first and at the end of 4 months put in $300 more. They gained $3,000; 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 6 mos., B's for 8 mos., and C's for 10 mos. Each receives $600 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 $4,500. The gross receipts for the first year were $2,800, of which 5% was paid for insurance, and 14⅔% 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: ½ to John, ⅓ to James, and ¼ to Mary. If his property was valued at $7,488 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 $846, 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 $7,800; 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 60% of his capital, and B withdraws 40% of his. At the end of 2 years there is a gain of $3,383 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 $\frac{1}{4}\%$ premium.
2. St. Louis on St. Paul for $4,700 at $\frac{1}{4}\%$ discount.
3. Mobile on New York for $3,600 at $\frac{3}{8}\%$ premium.
4. Toronto on New York for $1,500 at $\frac{1}{4}\%$ premium.
5. Montreal on Chicago for $1,625 at $\frac{1}{2}\%$ discount.

Find the cost of a bill of exchange in

6. New York on London for £320 (£1 = 4.81\frac{3}{4}$).
7. Winnipeg on Liverpool for £420 10s. (£1 = 4.87\frac{1}{4}$).
8. New Orleans on Glasgow for £500 (£1 = 4.87\frac{1}{8}$).
9. How much must be paid for a sight draft on Vancouver for $3,240 at $\frac{7}{8}\%$ premium?
10. What amount of bill of exchange on London can be bought for $468.99 (£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 2.264.35 francs, when the course of exchange between Paris and London is at 25.3 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 $95\frac{1}{8}$ cents per 4 marks?
14. I purchase, through a New York broker, a bill of exchange on Manchester for £432 12s. 6d. at $4.84\frac{3}{8}$. What was the cost, brokerage $\frac{1}{8}\%$?
15. I sold, through a broker in Boston a bill of exchange on Hamburg for 1,260 marks, at $95\frac{1}{8}$c. for 4 marks. What did I receive, brokerage $\frac{1}{4}\%$?

B.

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

remium on the old par. When sterling exchange is uoted at 9, means that £1 = $\frac{102}{100}$ of $4.44\frac{4}{9}$.

. Formerly the legal par of exchange between this country and Great Britain was $4.44\frac{4}{9}$ for £1; the legal par at present is $4.86\frac{2}{3}$ for £1. Find what increase per cent. the present value is on the old value.

. Find the cost of a 70-day bill of exchange on Liverpool for £960, exchange being quoted at $9\frac{1}{2}$ (or par).

. Find the cost of a demand-bill on London for £720, exchange at $9\frac{1}{4}$.

. Find the cost of a bill of exchange on Dublin for £816, 15s., exchange at $10\frac{1}{2}$.

. What amount of demand-bill can be bought for $2,200 exchange at 10?

. What amount of bill of exchange can be bought for $4,807, exchange at $9\frac{1}{4}$?

. What is the value of a 70-day draft on Chicago for $5,000 at $\frac{1}{4}$% premium, interest 6%?

. I held a 70-day draft on Baltimore for $2,750. I sold the draft at $\frac{1}{4}$% premium, and with discount off of 8% per annum. What did I receive?

. A firm in Winnipeg bought a 60-day draft on Toronto for $7.300 at $\frac{5}{8}$% discount, rate of interest 5%. What was the cost of the draft?

0. What is the value of a 93-day draft on San Francisco for $5 475, at $\frac{1}{8}$% premium and interest 7%.

C.

. A merchant in Montreal drew on Hamburg for 10,000 guilders at $.415. How much more would he have received if he had ordered remittance through London to Montreal, exchange at Hamburg on London being $11\frac{1}{4}$ guilders for £1, and at London on Montreal $9\frac{1}{4}$%, brokerage being $1\frac{1}{4}$% for remittance from London?

. An American tourist goes to Paris with $5,000, which he changes for French money at the rate of $19\frac{1}{3}$ cents

for 1 franc. He spends 830 francs in France, and thence goes to Vienna where he exchanges what he has left at the rate of 135 florins for 300 francs. He spends 500 florins in Vienna, and then goes to England, where he exchanges his money, getting 1s. 8d. 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 ¾% 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 5 milrees; that of Lisbon on Hamburg was 5 milrees 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 4.96⅔, 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?

If the property of a city is valued at $16,000,000, and a man who owns property assessed at $6,400 pays $120 taxes, what is the total tax levied?

If a ton of coal occupies 40c. 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?

If $80.25 pay for $8\frac{1}{3}$ tons of coal, what will $\frac{7}{8}$ of a ton cost?

If $\frac{1}{2}$ of $\frac{3}{5}$ of $3\frac{1}{3}$ yds. of cloth cost $\frac{3}{11}$ of $\frac{2}{7}$ of $4\frac{2}{3}$, what fraction of a dollar will $\frac{3}{8}$ of $\frac{1}{2}$ of $\frac{55}{56}$ of a yard cost?

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?

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?

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.

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

9. Reduce to simplest form

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

10. If $16\frac{7}{18}$ cords of wood last as long as $11\frac{9}{26}$ tons of coal, how many tons of coal will last as long as $22\frac{4}{5}$ cords of wood?

Find the value of:

12. $\dfrac{\frac{6}{11}}{1\frac{3}{4}} \times \dfrac{\frac{3}{5}}{1\frac{5}{22}} \times \dfrac{25}{16} \times \dfrac{21}{35} \times \dfrac{\frac{6}{11}}{\frac{36}{77}}$

13. $\dfrac{27}{37\frac{1}{3}} \times \dfrac{87\frac{2}{9}}{98\frac{1}{8}} \times \dfrac{2\frac{5}{8}}{2\frac{1}{3}} \times \dfrac{81\frac{5}{11}}{128} \times \dfrac{7\frac{1}{3}}{15}$

14. $\dfrac{\frac{5}{6}\text{ of }2\frac{3}{4}}{\frac{11}{38}\text{ of }\frac{19}{57}} \times \dfrac{\frac{2}{3}\text{ of }\frac{3}{4}}{1\frac{1}{4}\text{ of }1\frac{1}{3}} \times \dfrac{\frac{15}{64}\text{ of }\frac{16}{27}}{\frac{15}{11}\text{ of }\frac{104}{81}} \times \dfrac{6\frac{2}{7}\text{ of }2\frac{1}{3}}{5\frac{1}{2}\text{ of }3\frac{3}{4}}$

15. $\dfrac{2\frac{1}{5}\text{ of }1\frac{5}{22}}{\frac{9}{16}\text{ of }6\frac{2}{3}} \div \dfrac{2\frac{7}{26}\text{ of }3\frac{9}{25}}{\frac{5}{8}\text{ of }1\frac{4}{15}} \div \dfrac{8\frac{8}{17}\text{ of }\frac{35}{54}}{4\frac{21}{26}\text{ of }\frac{10}{21}} \div \dfrac{\frac{17}{144}\text{ of }16}{8\frac{3}{7}\text{ of }3\frac{3}{8}}.$

XXVII.—RATIO AND PROPORTION.

1. Divide 35 in the proportion of 2 to 3.
2. Divide \$80 among A, B and C in the proportion of 4, 5 and 7.
3. A can run 8 yds. while B can run 7 How many yards start can A give B in a half-mile race, so that neither 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 $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{7}$.
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 \$1,500; what was B's gain?
7. A farm is divided into two parts, whose areas are as 9 to 13; the area of the larger part exceeds that of the smaller by $18\frac{2}{11}$ acres. Find the number of acres in the farm.
8. Gunpowder is composed of nitre, charcoal and sulphur, in the proportion of 33, 7, 5; how many lbs. of sulphur are in 135 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 reversed?
10. Divide \$171.50 into parts proportional to $\frac{1}{6}$, $\frac{1}{4}$, $\frac{2}{5}$.
11. A debt of \$88 is paid in \$5 bills, \$2 bills, and \$1 bills, the number of each denomination being proportional to 4, 7 and 10; how many were there of each?

XXVIII.—SHARING.

1. A bankrupt owes four creditors as follows : A $2,500, B $3,300, C $4,200, and D $4,000 ; his property is worth $10,500 ; what does each creditor receive ?
2. Divide $105 among three boys, A, B and C, so that B's share may be half as much again as A's, and C's a third as much again as A's and B's together.
3. Divide $825 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 $2\frac{1}{4}$ years at 5%.
4. A, B and C caught a certain number of fish ; when A's fish and B's are put together they make 110 ; B's and C's 130 ; A's and C's 120. If the fish be 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 $\frac{4}{9}$ of the whole, and to the second $\frac{3}{4}$ 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 15 men, 20 women and 30 children, in such a manner that a man and a child shall together receive as much as two women, and all the women together shall receive $480. Find the amount received by each man, woman and child respectively.
7. If 15 men, 19 women, and 25 boys earn $15,190.44 in a year (309 working days) ; and if a woman earns $\frac{3}{5}$ of what a man earns, and a boy $\frac{5}{7}$ 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 $73.50 for it. The money is divided according to their efficiency and the time each worked ; A's efficiency is to B's as 2 to 3, and B's to C's as 4 to 5 ; A worked 6 days, B 7 days, and C 8 days. How should the money be divided ?
9. What does each man, woman and child get when

$178.92 is divided among 6 men, 8 women and 10 children, so that 2 men may get as much as 3 women, and 2 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 $\frac{3}{4}$ 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 $7\frac{1}{4}$ 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, 16 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 $\frac{2}{3}$ of a piece of work in 16 days and then B joins him. They work together for 2 days, when B leaves and A finishes the work in $3\frac{3}{5}$ 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 $5\frac{5}{11}$ days. A and C together can do it in $6\frac{2}{7}$ days and B and C together in $7\frac{3}{11}$ 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 $3\frac{9}{17}$ days, A, B and D together in $3\frac{3}{7}$ days, A, C and D together in $3\frac{7}{11}$ 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

$2.40 and $3.20 per gal., in such a proportion tha by selling the mixture at $2.80 per gal. he made profit of 10%. Find the proportion in which th wines were mixed.

7. In what proportion must two kinds of coffee, whic cost 50c. and 65c. per lb., respectively, be mixed, s that when sold at 60c. per lb., there may be a gai of $11\frac{1}{9}\%$?

8. When wheat is worth 90c. per bus., 17 bushels of mixture of wheat and oats are worth $12.55; but i the proportions in the mixture were interchanged its value would be $8.70. Find the price of oat per bushel.

9. A cask contains 7 parts of brandy and 5 parts of water $\frac{1}{7}$ of the mixture is drawn off and the cash filled wit water; what is the strength of the mixture then?

10. A wine merchant mixes 8 gal. of wine worth $1.12 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 mix ture at $1 a gal. Find his gain per cent.

11. A mixture of 50 gal. of alcohol and water contain 80% alcohol. (a) How much water must be added t reduce the strength to $62\frac{1}{2}\%$? (b) How much alcohol must be added to increase its strength to $87\frac{1}{2}\%$?

XXXI.—INVOLVING SUM AND DIFFERENCE.

1. The sum of two numbers is 5046, and their difference 2332; find the numbers.

2. The sum of two numbers is 8048; their difference 7336; find the product of the numbers.

3. The sum of two numbers is 7621 and their difference 1267. Find the difference of their squares.

4. There are 809 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.

The total number of votes polled was 6146. A was elected by 772. How many voted for B?

The total number of votes in a municipality is 5149. At an election in which B and C were the candidates, B was elected by a majority of 632. It was found that the number who voted exceeded the number who didn't vote by 3423. How many votes did the defeated candidate receive?

Divide $8,746.35 between John and Thomas so that John may have $127.49 more than Thomas.

The sum of two numbers is $9\frac{3}{8}$, and their difference is $4\frac{3}{8}$. Four times the larger is how many times the smaller?

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?

Two men, by working together, can perform a piece of work in 18 days. If the job is worth $252, and one man works five days less than the other, how should the money be divided?

The sum of two numbers is 4675; their common factor is 17; the difference between the other two factors is 21. What are the numbers?

A man rows down stream a distance of 24 miles in 3 hours, and back again in $4\frac{1}{2}$ hours. Find his rate of rowing in still water.

A man rowed down stream $22\frac{1}{2}$ miles in 3 hours but it took him 9 hours to row up. Find the rate of the stream.

A man can row 6 miles an hour in still water. Compare his rate of rowing down with his rate of rowing up a stream which flows at the rate of $2\frac{1}{2}$ miles an hour.

A man can row a certain distance down a stream in 30 minutes, and up again in 40 minutes. If the stream's rate is $\frac{1}{2}$ mile an hour, find the distance.

16. Two trains respectively 155 yds. and 109 yds. lon going in opposite directions, pass each other in 9 se onds; when moving in the same direction the o passes the other in 45 seconds. Find their rates miles per hour.

17. Two trains, moving on parallel tracks, and bei respectively 132 yds. and 99 yds. long, pass ea other in $6\frac{3}{4}$ seconds. When moving in the sa direction the one passes the other in $47\frac{1}{4}$ second Find their rates per hour.

18. The duty on imported axes is \$1.80 per dozen, a $8\frac{1}{3}\%$ ad valorem. The whole duty paid on a lot axes was \$45, the specific duty being \$19.80 m than the ad valorem. Find the number of axes i ported.

XXXII.—SOLAR AND STANDARD TIME

1. How are solar and standard times reckoned?

2. Where is the zero zone? How wide is it? What m idian lines bound the east and west sides?

3. Name the centre meridians of the time zones betw $52\frac{1}{2}°$ W. and $142\frac{1}{2}°$ W. longitude. By what l names are some of these zones known?

4. When it is 2 p.m. at Greenwich, find standard ti at 75°W.; 90°W.; 104°W.; 106°W.; 113°W.

5. When it is 11.15 a m. at New York, $73\frac{1}{2}$°W., find standard times at Washington, 77°W.; Toronto, W.; San Francisco, $122\frac{1}{2}$°W.; Chicago, 88°W.; H ifax, $63\frac{1}{2}$°W.; Glasgow, $4\frac{1}{4}$°W.; Limerick, $8\frac{1}{2}$° Hamburg 10° E.

6. When it is 7.30 a.m. solar time at Winnipeg, 97 W., find the solar times at places: 44°W.; 120 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 42° find the longitude of places whose true times 5.30. a m.; 2.45 a m.; 6 a.m.; 10 a.m; 11.30 a 2.45 p.m.; 10.03 a.m.

What is the real time at Winnipeg 97°15′W. at 10.19 a.m.?

What is the true time at Boston 71°10′W. at 2.43 p.m.?

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

1. 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?

2. A vessel left Capetown 18°E. on Monday, July 6th, at 6.30 a.m., and arrived at Montreal 73°W. in 12 days, 8 hours. Find the time of arrival?

3. 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.

4. 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?

5. 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.

6. 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. John?

XXIII.—CLOCK PROBLEMS.

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

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

At what time are the hands directly opposite: Between 2 and 3? Between 4 and 5?

At what times are the hands 12 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 clock (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 $\frac{2}{3}$ of the time past noon is $\frac{8}{25}$ 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) of 512 and 488.

5. Find the continued product of (a) 9, 11, 101 and 10001; (b) 10031, 109, 13 and 7.

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

7. Simplify $\dfrac{(275)^3-(125)^3}{(275)^2+(275)(125)+(125)^2}$.

Simplify $\dfrac{(176)^3+(124)^3.}{(176)^2-(176)\ (124)+(124)^2.}$

Find the value of $(\frac{2}{3})^2+(\frac{3}{4})^2+(\frac{7}{12})^2+2(\frac{2}{3})(\frac{3}{4})+2(\frac{2}{3})(\frac{7}{12})$ $+2(\frac{3}{4})(\frac{7}{12})$.

Find the value of $\frac{25}{64}+\frac{121}{144}+\frac{529}{576}+\frac{55}{48}+\frac{115}{96}+\frac{253}{144}$.

Simplify $(\frac{7}{8})^3+3(\frac{7}{8})^2(\frac{5}{6})+3(\frac{7}{8})(\frac{5}{6})^2+(\frac{5}{6})^3$.

Simplify $(\frac{8}{9})^3-3(\frac{8}{9})^2(\frac{5}{6})+3(\frac{8}{9})(\frac{5}{6})_2-(\frac{5}{6})^3$.

Find the value of $\frac{1}{8}+\frac{9}{16}+\frac{27}{32}+\frac{27}{64}$; also of $\frac{64}{125}-\frac{32}{25}+$ $\frac{16}{15}-\frac{8}{27}$.

Simplify $\dfrac{(14)^5-(11)^5}{(\frac{14}{15})^4+(\frac{14}{15})^3(\frac{11}{12})+(\frac{14}{15})^2(\frac{11}{12})^2+(\frac{14}{15})(\frac{11}{12})^3+(\frac{11}{12})^4}$

Simplify $(\frac{3}{4}-\frac{2}{5})\times(\frac{81}{256}+\frac{54}{192}+\frac{36}{144}+\frac{24}{108}+\frac{16}{81})$.

Simplify $(\frac{3}{5}+\frac{1}{2})\times(\frac{81}{625}-\frac{27}{250}+\frac{9}{100}-\frac{3}{70}+\frac{1}{16})$.

Simplify $(\frac{11}{12})^3+(\frac{2}{3}+\frac{3}{4}+\frac{5}{6})(\frac{11}{12})^2+(\frac{2}{3}\cdot\frac{3}{4}+\frac{2}{3}\cdot\frac{5}{6}+\frac{3}{4}\cdot\frac{5}{6})\ \frac{11}{12}+$ $\frac{2}{3}\cdot\frac{3}{4}\cdot\frac{5}{6}$

Find the value of (a) $(\frac{11}{12}+\frac{3}{8})^2-(\frac{11}{12}-\frac{3}{8})^2$; (b) $(\frac{91}{114}+$ $\frac{171}{273})^2-(\frac{91}{144}-\frac{171}{273})^2$.

Reduce to their simplest forms:

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

$$\frac{3+6+18+72+432+3024+24192.}{4+8+24+96+576+4032+32256}$$

XXXV.—SQUARE ROOT

Find the square root of:

127449.

984064.

22420225.

.0676.

50.481729.

5 to five decimal places.

1.1 to three places of decimals.

8. .5 to six dec. places.
9. .$\dot{2}$ to four dec. places.
10. .097196881 to six dec. places.
11. $5\frac{1}{7}$ to five dec. places.
12. $13\frac{1}{3}$ to five places of decimals.
13. $\frac{217}{333}$ to five places.
14. .047619÷1.190476.
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 2,061. Find the larger.

XXXVI.—CUBE ROOT.

Find the cube root of:

1. 1953125.
2. 429172932007.
3. 627127283[illegible].
4. 1076890625.
5. 102503.232.
6. 179597.069288.
7. 483.736625.
8. .636056.
9. .697864103.

10. $32\frac{8}{11}$ to three decimals.

11. $\frac{2}{19}$ to four decimal places.

12. Simplify $\left(\sqrt[3]{.54} - 23\sqrt[3]{.0000390625}\right) \div \left(\sqrt[3]{.16} + \sqrt[3]{.02}\right)$.

MENSURATION.

XXXVII.—RECTANGLES.

A.

1. A rectangle measures 48 ft. by 30 ft.; find the area of a square which has the same perimeter.

2. A half-acre 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 24 in. wide at the other, and 16 ft. long?

4. If it cost \$11.20 for paper for a room 25′ 3″ long, 19′ 9″ wide, and 12′ high, when the paper is $\frac{3}{4}$ 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 $12\frac{1}{2}$c. 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. It costs \$96.25 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 road 100 miles long and $94\frac{1}{2}$ ft. wide. Find the whole amount paid.

10. Find the cost of plastering the walls of a room 30½ ft. long, 18½ ft. wide, 12 ft. high, at 18c. per square yard (no allowance for openings); find also the cost of carpeting such a room with carpet 27 in. wide, and costing $1.80 per yard.

B.

1. How many feet of lumber will be required to enclose a building 60½ ft. long, 40¼ ft. wide, 22 ft. high, and each side of the roof 24⅛ ft., allowing 523¼ ft. for the gables, and making no deductions for doors and windows?

2. Find the cost of the material required to fence 2½ miles of railway (both sides), posts placed 8 ft. apart, an 8-inch base 1 inch thick, a 2x4 rail at the top, and 6 strands of wire. The posts cost 12½ cents each, the lumber $14 a thousand, and the wire 4c. per pound. (A pound of wire stretches one rod).

3. A town lot containing ⅕ of an acre is 4 rods wide. Find the total cost of the material for a picket fence around it of inch pickets 2″ wide and 3′ long, placed 2″ apart, two stringers 2″x4″, and an inch base 14″ wide, the lumber being worth $16 per M; posts 8′ 3″ from centre to centre at 13c. each; nails $1.15.

4. The lengths of the sides of a rectangular piece of land are as 3 to 4, and its area is 120 acres. Find the length of the sides in chains.

5. A speculator bought a section of land, each side 1¼ miles long, at $37.25 an acre. Find the cost.

6. Find the entire cost of enclosing a square field containing 10 acres, by means of a wire fence, when the wire costs 60c. per rod, the posts, which are set 10 ft. apart, 8c. each, and the work 40c. per rod.

7. A farm, having a frontage of 80 rods, and a depth of 50 chains, is rented for $2.45 per acre. Find the rent.

8. The area of each of the larger walls of a room is 330 sq. ft.; the area of each of the other walls is 220 sq.

ft. ; the area of the floor is 384 sq. ft. Allowing $\frac{1}{25}$ of the area of walls for doors and windows, how many yards of paper, 18 inches wide, are required to cover the walls?

9. A rectangular court-yard, 180 ft. long and 135 ft. wide, has a path running around it of the uniform width of 10 ft. 6 in. ; the path is covered with gravel at a cost of 22½c. per sq. yard, and the remainder of the court-yard is covered with turf at a cost of 17½c. per 100 square ft. ; find the entire cost.

10. The expense of carpeting a room 15 ft. wide was $52.80; but if the length had been a yard less, the expense would have been $46.20. Find the length of the room.

11. The length of a rectangle is 78 ft. ; if the width were increased by 8 ft., the area of the rectangle would in such case, be 234 sq. yards. Find the width of the original rectangle.

12. A room whose height is 12 ft. and length $1\frac{1}{3}$ times its width, takes $178\frac{2}{7}$ yds. of paper 1 ft. 9 in. wide to cover its walls ; what will it cost to cover the floor with carpet 27 in. wide, and costing $1.75 per yard?

13. A rect. plot of ground is 60 ft. long and 50 ft. wide; one pathway is made surrounding the plot on the outside, and two others intersecting at right angles in the middle of the plot ; if these pathways are 5 ft. wide, and cost 62½c. per sq. yard, find their entire cost.

14. A piece of land whose length is 151 yds. 1¼ ft., and breadth 35 yds., is to be exchanged for part of a strip of land of the same quality, whose breadth is 15 yds. 2½ ft. Find the length of the equivalent strip.

XXXVIII.—TRIANGLES.

A.

Note :—Area = (1) Half the product of the base into the height. (2) (When a, b, c are the sides, and 2s their sum), $\sqrt{s\,(s-a)\,(s-b)\,(s-c)}$.

Find the areas of the following triangles :—

1. Base 20 ft., height 9 ft.
2. Base 45 ft., height 36 ft.
3. Base 7 yds. 1 ft., height 4 yds. 2 ft.
4. Base 9 yds. 2 ft. 6 in., height 7 yds. 1 ft. 5 in.

Find the areas of triangles whose sides are

5. 68 in., 77 in., 75 in.
6. 65 ft., 65 ft., 112 ft.
7. 26 in., 28 in., 30 in.
8. 24 yds., 25 yds., 26 yds.
9. 319, 444 and 455.
10. 17, 63 and 73.

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 15 yds., 396 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 390 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 $14' \times 5' \times 2'$.

4. Two ships sail away from the same port at the same time, one due north at 8 miles per hour, and the other due east at 6 miles per hour. How far apart are they in 14 hours?

5. A square field containing $27\frac{1}{2}$ acres has a diagonal path across it. What is the length of the path in yards?

6. The base of an isosceles triangle is 20 ft., and each of the two equal sides is $15\frac{1}{2}$ 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 $3\frac{1}{4}$ 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. farther 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 $\frac{32}{5}\sqrt{11}$.

XXXIX.—RIGHT PARALLELOPIPED AND PRISM.

A.

Find the number of cubic ft. and in. in a cube

1. Whose length is 2 ft. 10 in.

2. Whose length is 3 ft. 4 in.

3. Whose length is 1 yd., 2. ft., 8 in.

Find the number of cubic ft. and in. in a rectangular solid

4. Dimensions, 2 ft. 4 in., 3 ft. 6 in., 4 ft., 8 in.

5. Dimensions, 2 ft. 7 in., 4 ft. 6 in., 6 ft. 9 in.

6. Area of base, 4 ft. square, height 4 ft. 3 in.

7. Area of base, 12 sq. ft. 80 sq. in., height 31 in.

Find the no. of cubic ft. and in. in a prism.

8. Base 5 sq. ft., height 2 ft. 6 in.

9. Base 6 ft. by 9 ft., height 3 ft. 3 in.

10. Base $5'4'' \times 6''2''$; height $4'1''$.

11. Sides of the base 7, 15, 20 in. height 3 ft. 9 in.

12. Sides of the base 13, 40, 51 in. height 4 ft. 10 in.

13. Rain falling uniformly for 5 hours on a roof whose horizontal dimensions are 10 yards by 15 feet, fills a tank 6 ft. 3 in. by 2 ft 6 in., and 4 ft. deep. Find the depth of the rain-fall per hour.

14. An orchard is $24\frac{2}{3}$ rods long, and $15\frac{1}{4}$ rods wide. At $1\frac{3}{4}$ cents per cubic ft., what will it cost to dig a ditch around it 3 ft. 9 in. wide, and 4 ft. deep?

15. A reservoir is 25 ft. 6 in. long and 12 ft. 4 in. wide; find how many cubic feet of water must be drawn off to make the surface sink 1 foot.

16. Each edge of a cube is diminished by $\frac{1}{7}$ of itself. By what fraction of itself is the volume diminished

B.

1 Find the surface and volume of a rectangular solid, whose height is 25 ft., its base being 5 ft. long and 4 ft. wide.

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

3. A box with a lid is made of plank $1\frac{1}{2}$ in thick; the ex-

ternal dimensions of the box are $3'6'' \times 2'6'' \times 1'9''$, find exactly how many square feet of planking are used in the construction.

4. A bed of gravel $4\frac{1}{2}$ ft. in depth extends over the whole of a field of $3\frac{3}{4}$ acres; find the value of the gravel at 10 cents per cubic yard.

5. Find the weight of a stack of bricks 10 ft. high, 6 ft. wide, and 3 ft. thick, supposing a brick to be 9 in. long, $4\frac{1}{2}$ in. wide, and 3 in thick, and to weigh 5 pounds.

6. A cistern is 19 ft. 6 in. long and 6 ft 9 in. wide; find through how many inches the surface will sink if 520 gallons of water are drawn off.

7. Find to the nearest gallon the volume of a quod measuring 262.5 in. by 126 875 in. by 50 in.

8. A square plot of ground that contains $\frac{2}{10}$ of an acre is covered with cordwood (4 ft. long) to an average height of 12 ft. What is the wood worth at $4.12 a cord?

9. Find the number of cubic ft. in a hewn log, 12 in. square at one end, and $9\frac{3}{4}$ in. square at the other, the length being 27 ft.

10. If 1,008 men excavate a square basin whose side is 1,600 yds., and which is 30 yds deep, in 9 mos., how many men will be required to excavate a square basin whose side is 2,000 yds., and which is 40 yds. deep, in 12 months.

11. When the temperature of a cube of zinc is raised from 32°F. to 212°F. each dimension is thereby increased 3%. Find the percentage of increase in the bulk.

12. A rectangular solid $4\frac{1}{2}$ ft. long, $3\frac{1}{3}$ ft. broad and $1\frac{1}{3}$ in. thick, is increased 1 in. in thickness. By how much must the breadth be diminished, so that the solid may retain the same bulk as before?

13. How many bricks 9 in. long, $4\frac{1}{2}$ in. broad and 4 in. thick will be required to build a wall 45 ft. long, 17 ft. high, and 4 ft. thick, supposing the mortar to increase the volume of each brick $6\frac{1}{4}$%?

XL.—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 samples $\pi = 3\frac{1}{7}$.

14. Find the circumference, having given (1) Diameter = 6 ft. (2) Diameter = $6\frac{1}{2}$ yds. (3) Diameter = 8 yds. 2 ft. 4 in. (4) Radius = 10 ft. (5) Radius = $3\frac{3}{4}$ 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 = 8 ft. 9 in. (10) Diameter = $8\frac{3}{4}$ 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. 8 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 $1.25?

17. Find the length of the radius of a wheel which makes 6,400 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 substends an angle of 36° at the centre of a circle whose radius is 25 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 27 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

3. The diameter of a circle is 36 in. ; find the radius of another circle of one-fifth the area.
4. A road runs around a circular pond ; the outer circumference is 280 ft., and the inner 210 ft. Find the breadth and area of the road.
5. A road runs around a circular pond ; 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 512 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 645 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 8 in.. respectively, in diameter. How far will the carriage 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 12 in. and 16 in., respectively.
13. The diameter of a circular plate of lead is 13 inches. From this is cut out a circular plate of radius 6 inches, and the remainder of the lead is moulded into the form of a circular plate with one-fourth of the former thickness. Find the diameter of this plate.
14. Three equal circles of radius of 3 ft. each touch one another externally ; find the area of the space enclosed by the arcs between the touching points.
15. A circular shrubbery is surrounded by a road of uniform breadth, the inner side of the road measuring 66 rods in circumference, and the outer side 77. How much ground does the road cover ?

16. Find the cost of making a circular bicycle path 24 ft. wide, the inside distance to be a half-mile, at 35c. per square yd.

17. Find the area of a circular annulus contained between two circles, whose diameters are respectively 100 and 160.

XLI.—THE CYLINDER.

NOTE.—Surface = perim. of base × h. + twice area of 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. 5 in.
4. Height 30 ft., radius of base 8 in., $\pi = 3.1416$.

Find the area of the whole surface

5. Height 4 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. Radius 30 in., height 4 ft. 3 in.
10. Diameter 10 ft. 8 in., height 76½ in.
11. How many cub. ft. of earth must be dug out to make a well 30 feet deep and 3 ft. in diameter?
12. The diameter of a well is 3 ft. 6 in., and its depth 40 feet. What was the cost of excavating it at an average of $2.70 per cub. yard?
13. What is the cost of polishing a cylindrical marble pillar 2′ 6″ in diameter and 12 ft. long, at $1.25 a square foot?

B.

1. Find the volume of a cylindrical shell 2 in. thick, and 9 ft. in height, the radius of the outer surface being 10 in.

2. A circular cistern, 8 ft. in diameter and 9 ft. in depth, is filled with water to the height of 6 ft. How many gal. of water are in the cistern? (A cub. ft. of water weighs 1,000 oz., and a gallon 10 lbs.).
3. How many cords are there in a cylindrical log 20 ft. long and 3 ft. 6 in. in. diameter?
4. Water is flowing at the rate of 10 miles per hour, through a pipe 14 in. in diameter, into a rectangular reservoir 187 yds. by 96 yds. In what time will the surface be raised one inch?
5. A cubic ft. of water weighs 62.426 lbs., and a gal. of water weighs 10 lbs. How many gal. will a cylindrical cistern of 5 ft. diameter by 4 ft. deep hold?
6. A circular cistern is to contain 66 bbls., and to be 6 ft. deep. Find the diameter of the excavation, allowing for a brick lining 5 in. thick. (1 bbl. $=31\frac{1}{2}$ gal.; 1 cubic ft. $=24\frac{24}{25}$ quarts).
7. Two vessels, one in the form of a cube, and the other in the form of a cylinder, together hold $71\frac{52}{63}$ gal. of water. The diameter of the cylinder is 16 in., and the depth of the side 30 in. If a gal. weighs 10 lbs., and a c. ft. 1,000 oz., find the dimensions of the cube.
8. Ascertain the cost, at $35.10 per ton of 2,000 lbs., of 864 yards of iron piping 25 in. internal diameter and $\frac{1}{2}$ in. thick, assuming the specific gravity of iron to be 7.77, and a c. ft. of water to weigh $62\frac{1}{2}$ lbs., and $\pi = 3\frac{1}{7}$.

XLII.—THE CONE AND PYRAMID.

NOTE.—Surface $= \frac{1}{2}$ (per. of base $\times$ s.h.) + area of base. Volume $= \frac{1}{3}$ (area of base $\times$ p.h.)

A.

Find the area of a curved surface of a cone

1. Slant height 27 in., circumference of base 53 in.
2. Slant height 3 ft. 2 in., circumference 67 in

3. Slant height 24 in., radius of base 1 ft. 9 in.
4. Slant height 2 ft. 8 in., diameter of base 5 ft. 8 in.

Find the area of the whole surface

5. Slant height 4 ft., radius of base 24 in.
6. Slant height 5 ft. 3 in., diameter of base 6.4 ft.
7. Slant height 72 in., circumference of base 8 ft.

Find the volume of a cone

8. Height 4 ft., radius of base 2 ft.
9. Height 5 ft., radius of base 42 in.
10. Diameter of base 8.4 ft., height 5.3 ft.
11. Circumference of base 12 ft., height 5 ft.

Find the volume of the square pyramid

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

Find the volume of the triangular pyramids

15. Sides of base 3, 4, 5 ft., height 7 ft.
16. Sides of base 7, 9, 11 ft., height 4 ft.
17. Sides of base 6, 6, 6 ft., height 6 ft.
18. 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 18 in.; find its volume.
3. The base of a pyramid is a square, each side of which is 3 ft. 6 in., and its height is 3 ft. 9 in.; find its volume.
4. The height of a right circular cone, whose slant height is 41 feet, is 40 feet; find the volume.
5. How many yards of canvas 45 in. wide will be required to make a conical tent 15 ft. wide and 10 ft. high, 10% of the canvas being cut away or turned in, in the making?

6. Find the volume of a cone the radius of whose base is 16 in., and whose slant height is 5 ft. 5 in.
7. Find the volume of a cone whose altitude is 2 ft. 11 in., and slant height 3 ft. 1 in.
8. The faces of a pyramid on a square are equilateral triangles; the side of the base being 90 ft., find the volume.
9. The base of a pyramid is a rectangle which is 24 ft. by 26 ft.; find the volume, each of the edges which meet at the vertex being 30 ft.
10. The base of a pyramid is a square, each side of which is 24 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.

NOTE.—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. Radius $3\frac{1}{2}$ ft.
2. Radius $10\frac{1}{2}$ in.
3. Diameter 8 ft. 2 in.
4. Circumference 11 feet.

Find the volume of a sphere

5. Radius 4 inches.
6. Radius 7 inches.
7. Radius 7 in., and surface 616 sq. in.
8. Diameter 11 inches.
9. Diameter 31.5 feet.
10. Circumference 3 ft. 8 in.

B.

In the following $\pi = 3.1416$.

1. How much gunpowder will be required to fill a hollow

sphere of 7 inches diameter, if 30 c. in. of the powder weigh 1 pound?

2. Find the weight of a ball of gold 5 in. in diameter if a cub in. of gold weighs 11.194 ounces.

3. The surface of a sphere is equal to half that of a right circular cone; the radius of the base of the cone is 1 foot, and its height $\sqrt{3}$ feet. Find the volume of the sphere.

4. A spherical shell is 9 in. in diameter and its thickness is 1 inch; find the volume of the shell.

5. The inner radius of a spherical shell is 5 inches and the thickness of the shell is $1\frac{1}{2}$ inches; find its volume.

6. Find the weight of a shell $3\frac{1}{2}$ in. thick whose external diameter is $17\frac{1}{2}$ in., if a cubic foot of the metal weighs 480 lbs.

7. A spherical shell, internal diameter 14 inches, is filled with water. Its contents are poured into a cylindrical vessel whose internal radius is 14 in.; find the depth of the water in the cylinder.

8. The diameter of the base of a cone is 4 in., and its volume is equal to that of a spherical shell of one inch thickness, the external diameter of which is 4 in. Find the height of the cone.

9. If a sphere, whose diameter is 4 feet, is submerged in the water of a circular cistern of 8 feet diameter, the water being 9 feet in depth, how high will it cause the water to rise?

10. Find how long it will take to fill a hemispherical tank of 16 feet in diameter, from a cistern which supplies by a pipe 6.2832 gal. of water per minute (1 c. ft. = $6\frac{1}{4}$ gal.).

XLIV.—GENERAL PROBLEMS.

1. A number of men and women earned $93 a day, each man getting $2.25 and each woman $1.50. Had there been 6 more men and 7 more women the whole

number of women would have earned the same as the whole number of men. Find the actual number of each.

2. Prove that a number is divisible by 3 if the sum of its digits is divisible by 3; and by 9 if the sum of its digits is divisible by 9.

3. A compound of tin and lead weighs 10.43 times as much as an equal bulk of water, while tin weighs 7.44 times, and lead 11.35 times, as much as equal bulks of water. Find the number of pounds of each metal in 765 lbs. of the compound.

4. A house that cost $15,500 rents for $155 a month. It is insured at $10,850 at $\frac{4}{5}$% yearly; the taxes are 15 mills on an assessment of $12,450, and $346.45 is spent each year on repairs. What rate of interest does the investment pay?

5. A regiment of a thousand men, four abreast, and marching 3 ft. apart, passes over a bridge 3 mi. 44 yds. long in 56 min. 10 sec. If each man takes 96 steps per min., determine the length of each step.

6. Explain how to find the vulgar fraction which equals $.5\dot{7}\dot{2}$.

7. A starts to walk from P to Q at the rate of 4 mi. an hr., and one hour afterwards B starts from P and overtakes A in 4 hrs. Walking on, B arrives at Q 2 hrs. before A. Find the distance from P to Q.

8. A number of 2 digits is multiplied by 3, and the product placed to the left of the original number; show that the number so formed is always exactly divisible by 7.

9. A cub. foot of water weighs 1,000 ounces; how many tons will fall on $2\frac{1}{2}$ acres during a rainfall of $2\frac{1}{2}$ inches?

10. A has 8 bottles and B 2 bottles of wine. At odd times a common friend C joins them, and the three share equally. To recoup A and B, C hands over $10. How should A and B settle between them?

11. If the Avoir. pound is equal to 7,000 grs. Troy, and if 6,144 sovereigns weigh 133 lbs. 4 oz. Troy, how many sovereigns will weigh an ounce Avoir. ?

12. A man engages a sufficient number of men to do a piece of work in 84 days, if each man does an average day's work. It turns out that 3 of the men do respectively $\frac{1}{6}$, $\frac{1}{7}$ and $\frac{1}{9}$ less than an average day's work, and 2 others $\frac{1}{8}$ and $\frac{1}{10}$ more; and in order to complete the work in the 84 days, he procures the help of 17 additional men for the 84th day. How much less or more than an average day's work on the part of these 17 men is required ?

13. A had \$7 less than B had, and B had \$10 less than C had. A gave \$5 to B and \$12 to C. How many dollars had C more than A then ?

14. At what time between 4 and 5 p.m. is the minute hand exactly two minute spaces ahead of the hour hand of a watch marking correct time. ?

15. How much water must be added to a mixture of 15 gal. of vinegar costing 52c. per gal., and 13 gal. costing 40c. per gal., that \$5 may be gained by selling the whole at 15c per quart ?

16. A farmer sold two loads of wheat, in all 110 bus. for \$94.95. 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 89 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 $31\frac{9}{10}$ 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 $2\frac{3}{4}$ in. thick; another kind is 5 in. long and $3\frac{1}{4}$ in. thick. What is the size of the least piece of wall (height being the

same as length) that can be constructed with either kind of brick?

21. How many days are there in four hundred consecutive years?

22. When is a number exactly divisible by 2? by 4? by 5? by 6? by 8? by 10? by 11? by 13? by 25? by 125?

23. The quantity of saline matter in sea-water is .036 of the whole weight, and of this weight .061 is magnesia. Find the number of grains of magnesia in a cubic foot of sea water, supposing 32 cub. ft. of it to weigh 2,000 lbs?

24. Equal weights of gold and silver are in volume as 20 to 1; and equal volumes are in value as 1284 to 35. A certain volume is composed of equal weights of gold and silver; find how many times more valuable the same volume would be were it composed wholly of gold.

25. The square of 10129 is 102596641; find the square of 101293 without going through the operation of squaring.

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 2½% 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 89.9 to 11.1; what weight is there of each in a cub. yard of water (a cub. ft. of water weighs 1000 ounces)?

30. A man bought 400 sheep at a certain price per head. He sold $\frac{3}{8}$ of them at a gain of 20%, $\frac{3}{10}$ of them at a gain of 15%, and the remainder at a loss of 10%, gaining on the whole $217. How much did he pay for the sheep?

31. A farmer has 500 bus. of wheat; he can sell it at once for $1.20 a bus.; by storing it up for 6 mos. at a cost of $20 paid in advance, he can sell it for $1.30 a bus. He adopts the former course; money being worth 8% per annum, determine how much he has gained or lost by so doing.

32. A bankrupt who is paying 37½c. on the dollar divides among his creditors $6,300; what do his debts amount to?

33. If 3 men or 5 boys can do a piece of work in 17 days, in how many days will 5 men and 3 boys do a piece of work three times as great?

34. A lumber merchant bought 106,250 ft. of lumber at 14\frac{3}{8}$ per M., and retailed it at $1.75 per C. Find his gain.

35. A merchant bought 500 bbls. of flour at $6.25 per bbl.; on a credit of 8 mos. He sold it at $6.50 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 30 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 %.

41. A boy engages with a farmer for a year for $78 and a suit of clothes. He leaves at the end of 10 months and receives $62 and the suit. What was the suit worth?

42. Find how much a merchant cheats a customer who buys $126 worth of goods, when he gives only 34 inches per yard.

43. A speculator sold 2 horses for $143 each, gaining the same per cent. on one as he lost on the other. On the whole he lost $2; find the per cent.

44. A man sold 2 lots for $445, gaining 12½% on one and losing 12½% on the other. Find the cost of each, if he gained $5 on the whole transaction.

45. A person invested in 3% stock, and received 5¼% clear on his investment, after paying an income tax of 2%. What was the market price of the stock, brokerage ½%?

46. A debt is to be paid as follows: one-sixth now, and one-sixth every 3 mos. until the whole debt is paid. What is the equated time?

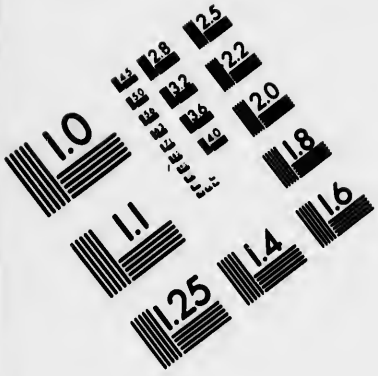
47. Find the equated time: one half of a debt is due in 4 months, ⅜ of it in 5 mos., and the balance in 6 mos.

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 $980 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?



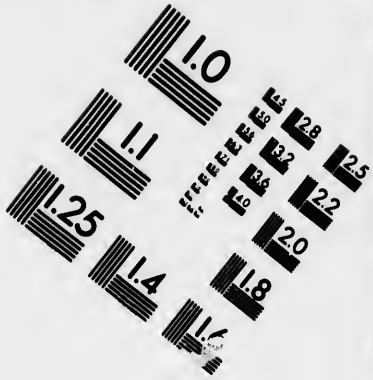
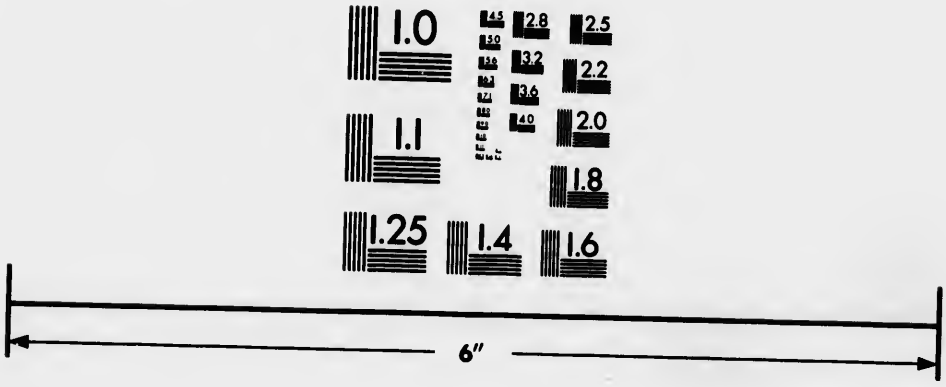
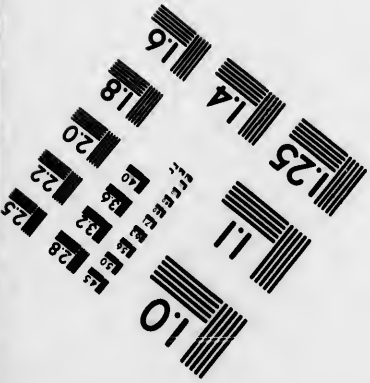


IMAGE EVALUATION TEST TARGET (MT-3)





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52. A map is drawn on a scale of 8 miles to an inch; on this map a township measures $1\frac{5}{16}$ in. by $1\frac{1}{8}$ in.; how many acres does it contain?

53. How many exact divisors has the number 6336?

54. A circular room has perpendicular walls 15 ft. high, the diameter of the room being 28 ft. The ceiling is a hemispherical dome; find the cost of plastering the whole surface at $17\frac{1}{2}$c. per sq. ft., $\pi = 3\frac{1}{7}$.

55. A spherical cannon ball, 9 in. diameter, is melted and cast into a conical mould, the base of which is 18 in. in diameter. Find the height of the cone.

56. A person buys a lot of land at $37.50 an acre, and by selling it in allotments finds the value increased three-fold, so that he clears $375, and retains 30 acres for himself. How many acres did he buy?

57. Divide $700 into two parts, such that the simple interest on one part for 3 years, at 5% per annum, may be equal to the simple interest on the other part for 6 years at $3\frac{1}{3}$ % per annum.

58. If 9% of the cost price of an article is equal to 7% of its selling price, what is the gain %?

59. A broker invests $6,136 in stock at $95\frac{3}{4}$ and charges $\frac{1}{8}$%; find his brokerage.

60. A merchant sells two kinds of flour, the superior at $5.50 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 28, 1397; find the exact 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 capital did each contribute

63. A grocer retailing sugar at the rate of 22 lbs. for $1 makes a profit of 11⅑%. If a bbl. of sugar costs $11.25, and contains 290 lbs., what per cent. of the weight is lost in retailing?

64. 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 being ⅛%.

65. Mr. John Heal bought goods as follows: Jan. 15, 1897, $500 worth at 30 days' credit. Feb. 25, 1897, $300 worth at 40 days' credit. Mar. 20, $800 worth at 15 days' credit. Find the time from which interest should be reckoned on the entire debt of $1,600.

66. A person sets out to walk from A to B at the rate of 5 miles an hour. When he had travelled 1⅞ miles he was overtaken by a coach from A, which was 10 minutes late at starting. At a distance of 11⅑ miles from B he met the coach returning from B, where it had stopped 30 minutes. What is the distance from A to B?

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 ¼ oz. too heavy, and in selling them a pound weight ¼ 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.

If his harrow be 90 inches wide, and the farm worth $55 per acre, find the value of the property harrowed in a day.

72. If it be worth 90c. per cord to cut a pile of cordwood, which is 6 ft. high and 24 ft. long, into three lengths, what would it be worth to cut the pile of wood into four lengths?

73. How many lbs. of tea at 45c., 60c. and 90c. per lb. must be taken to form a mixture of 500 lbs., worth 75c. a lb?

74. I bought a farm for $10,000, payable one-half cash the remainder in 1 year, with interest at 6%. I sell immediately for $12,000, payable in 3 mos., with interest at 4%. What is my present gain, money being worth 5%?

75. A man borrows $2,500, and agrees to pay the principal and interest in three equal yearly payments; interest being at 5% per annum. Find the amount of each payment.

76. A has $\frac{5}{8}$ as much money as B, and B has $\frac{5}{8}$ as ; 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 $18.89. 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 $62\frac{1}{2}\%$; but the merchant fails and pays $62\frac{1}{2}$c. 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 $33\frac{1}{3}\%$ on the cost; $\frac{1}{4}$ 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 trans-

actions, purchased tea on a commission of 2% on the price paid for it; his entire commission was $200. Find the amount paid for the tea.

82. If I owe $2,000 to be paid in 4 months' time, and I pay $500 now, what extension of time ought to be allowed me for the payment of the remainder, money being worth 6 per cent. per annum?

83. At 5 per cent. for two years the difference between the simple and compound interest is $1.95. Find the principal.

84. My house is valued at $3,000; furniture $1,800; books and pictures $800. I insure the whole through an agent for $\frac{3}{4}$ of their value at 80 cents per $100 for 3 years. What will I have to pay?

85. I sent $10,000 to my agent in Chicago, with instructions to buy grain at 90 cents per bushel. He charged $2\frac{1}{2}$% commission; how many bushels did he buy?

86. The difference in area between a square inscribed in a circle and one circumscribed about the same circle is 110 square yards. Find the area of the circle.

87. A's farm is $\frac{1}{2}$ mile square; B's contains $\frac{1}{2}$ of a square mile; C's is $\frac{1}{4}$ 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?

92. A person exchanged 180 shares of 6 per cent. stock at 80 per cent., for 10 per cent. stock at 125 per cent. How much was his yearly income increased?

93. A map 6 ft. long and 4 ft. wide represents 13,824 square miles of earth's surface. To what scale is it drawn?

94. A farmer owns a field in the form of an isosceles triangle, the equal sides being each 100 rods, and the other side 160 rods. How many acres are there in the field?

95. What sum must be invested at the beginning of each year for 3 years to pay off a debt of $600 due at the end of 5 years, interest reckoned at 5 per cent. per annum?

96. If 5 men can mow a square meadow in 4 days, find the time 9 men will take to mow a square meadow half as long again as the former?

97. Divide the difference of 100 and $\frac{1}{100}$ by the sum; and also the sum by the difference; and find the sum of the quotients.

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 £510 per annum, of dividends on shares paying 5% per annum, and of rents; if his dividends form $\frac{1}{6}$ of his total income and the rents $\frac{1}{8}$, find the amount of capital he has invested in shares.

100. The capital of a firm has been contributed by three partners as follows: A $1,200, B $1,800, C $3,000, and it is agreed that the active partners, A and B, shall receive 20% and $13\frac{1}{3}$% respectively of the profits for managing the business. The gross profits are $1,500; find the share of each partner.

101. Find the cost of a draft in Montreal for $1,000,

payable 30 days after sight, exchange being $\frac{1}{2}$ per cent. premium, and interest 6%.

102. A man buys stock at $90\frac{1}{4}$, and sells out at 90, thereby losing \$206; he then invests in stock which is at 3 per cent premium, and sells again when it has reached 5 per cent. premium. With the proceeds he invests in the 3 per cent. at 81. Find his yearly income from the last investment.

103. Copper is bought at \$76.50 per ton payable in 6 months; how should it be sold the same day (giving eight months' credit) so as to make the immediate gain 25% money being worth 4% per annum.

104. I buy two articles for \$150; if I sell both and lose 4% on what one cost me, but gain 6% on what the other cost me, I should gain on the whole $1\frac{1}{3}$%; what was the price of each?

105. A rectangular bin which contains 480 cub. ft. has its 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 bus. The agent deducted his commission, and also a 4% commission in advance on tea 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 $3\frac{1}{2}$% 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 \$3.75 per bbl. For what sum must he have the apples insured at $\frac{9}{16}$% prem. to guard against all loss in case of shipwreck, his other expenses being \$75?

109. A and B are partners, A's capital being $\frac{3}{5}$ of B's. At the end of five months A withdraws $\frac{1}{4}$ of his capital, and at the end of nine months B withdraws $\frac{1}{3}$ of his. How should they divide a gain of \$4,222.33 at the end of the year?

110. From a list price of a line of goods a purchaser is allowed a trade discount of 20%; a further discount of 12½% off the trade price for taking a quantity, and a still further discount of 10% off his bill for cash. Find the gain per cent. by selling at 10% less than the list price.

111. What is the value of a 70 day draft in Detroit for $2,545 at ¼% prem. and interest 6%?

112. I can buy flour at $3.19 a bbl and 4 months' credit; at $3.04 and 2 months' credit; or at $3.01 cash. What is the cost of 350 bbls. bought on the most advantageous of these terms, money being worth 8% per annum?

113. If a train 88 yds. long overtake a person walking at the rate of 4 miles an hour along the railway, and pass him in 8 seconds, what is the rate of the train in miles per hour?

114. If a cub. ft. of iron weighs 441 lbs., find the weight 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 $3 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 £640 costs $3,107.88, the broker's commission being ⅛%?

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

120. On what scale is a map drawn where 240,000 square miles of territory are represented on the map by a space of 6 inches long and 4 inches wide?

121. The sum of two numbers is 578; their common factor is 17; the difference between the other two factors is 8. What are the numbers?

122. The area of an equilateral triangle described on a side of a rectangle is equal to the area of the rectangle; one side of the rectangle is 16 feet; what is the length of the other side?

123. I sold through a broker a bill of exchange on Manchester for £240, and received $1,166.54 as the net proceeds. At what rate of exchange was the bill sold, allowing $\frac{1}{8}\%$ for brokerage?

124. The boundary lines of a field are the following: the first runs north 36 rods; the second, north-east 60 rods; the third, south 72 rods; and the fourth, west to the place of beginning, 48 rods; required the number of acres in the field.

125. 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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ANSWERS.

I. Page 9. A.—(1) 105815565. (2) 5688384. (3) 99. (4) 315; 330750. (5) 285. (6) 19372½. (7) 255. (8) $\frac{3}{280}$. (9) 576. (10) 1449. (11) 1683000. (12) 2178. B.—(1) 3322735731861. (2) 39350580192. (3) 625873-6471. (4) 117019573440. (5) 522356916976050 24. (6) 892411086. (7) 39277024272. (8) 132. (9) 68590142. (10) 713. (11) 297½ ft. (12) $440.

II. Page 10.—(1) 1. (2) 6. (3) 20. (4) $6\frac{69}{128}$. (5) $\frac{8}{33}$. (6) $21\frac{2120}{8400}$. (7) $\frac{25}{1056}$. (8) $\frac{1605}{3311}$. (9) $\frac{133}{544}$. (10) $3\frac{1}{2}$. (11) $\frac{16432}{22140}$. (12) $173\frac{2543}{4704}$.

III. Page 11. A.—(1) $60000. (2) 300. (3) $16700. (4) $\frac{101}{160}$. (5) $\frac{265}{378}$. (6) $65. (7) $2\frac{4}{29}$ hr. (8) $9\frac{3}{13}$. (9) $\frac{9}{11}$. (10) 33; 66; 99 days. B.—(1) $35. (2) $1732.50. (3) $13\frac{15}{16}$ miles. (4) 249 mi. (5) $1\frac{2}{23}$. (6) 21 hrs. (7) 40; 39. (8) $\frac{470}{1170}$. (9) 14 ac. (10) $\frac{69}{70}$. (11) 22050.

IV. Page 14.—(1) 1529.1173. (2) 221.013753. (3) 549.0721498. (4) 4806.5325. (5) 9.360001. (6) 9.989079. (7) 40.03822185. (8) 35.13422695. (9) 114.17229528358241. (10) 67.410542968711285. (11) 201.072800496265 84. (12) 846.372095763.

V. Page 15.—(1) 2600.08392. (2) 32.39787753. (3) 246.85164437. (4) 367.33277459. (5) 781.33455364. (6) 246.90943502458353. (7) 79.789966677748855. (8) 28.7248373204452765.

VI. Page 15.—(1) 111.55248. (2) 182.151828. (3) 73.64101944. (4) 365.4860576. (5) 11008.6628696. (6) 45674.271. (7) 686.955. (8) 12344.365. (9) 3529.163. (10) 150.8741. (11) 4.1581. (12) 2.3758. (13) 10.0831. (14) .2364. (15) 13.5169. (16) 6689.6527. (17) $126.68. (18) $136.86. (19) $122.93. (20) $130.23.

VII. Page 16.—(1) .054. (2) 33.080. (3) 1.732. (4) .47712. (5) .43241. (6) .3183. (7) .6931. (8) 30.105. (9) 29.956. (10) 7.9577. (11) 23.0258. (12) .03183. (13) .43429448. (14) 3.185. (15) 3.8235. (16) 8.0219. (17) .1013.

VIII. Page 17. A.—(1) $\frac{13}{16}$. (2) $\frac{31}{32}$. (3) $\frac{8}{11}$. (4) $\frac{5}{37}$. (5) $\frac{655}{909}$. (6) $\frac{9}{44}$. (7) $\frac{1}{12}$. (8) $\frac{892}{925}$. (9) $\frac{2911}{495}$. (10) $\frac{5}{7}$. (11) $\frac{1}{14}$. (12) $\frac{36908}{2475}$. B.—(6) .714285. (7) .846153. (8) .4210526315789473 68. (9) .6470588235294117.

IX. Page 18. A.—(1) 1.99999. (2) 1 49999. (3) 1.33333. (4) 1.24999. (5) 1.19999. (6) 2.7183. (7) 2.4107. (8) :2027. (9) 2.71805. (10) 4.063492. B.—(1) .0338235. (2) $\frac{8416}{436839}$. (3) $\frac{1}{6}$. (4) $\frac{1}{10}$. (5) $\frac{12}{80}$. (6) $\frac{109}{225}$. (7) 10.1873. (9) 9. (10) $12\frac{1}{6}$. (11) $\frac{1}{6}$. (12) 4.605.

X. Page 20. A.—(1) 18; 5.56; $14.58; $22.12; $67.05. (2) 76; 195; 648; 3025; 278. (3) $525. (4) $2228.70. (5) $5301. (6) $2500. (7) $5625. (8) 4608. (9) 150. (10) 861. (11) $5460. (12) 387. B.—(1) 628.15\frac{1}{2}$. (2) 67$\frac{57}{250}$c. (3) 4%. (4) 2 gal. (5) 88. (6) 11$\frac{1}{9}$%. (7) 10. (8) $160000. (9) 75%. (10) 22$\frac{2}{9}$%. (11) $3600. (12) $3125. C.—(1) 216. (2) 66$\frac{2}{3}$%. (3) $439.68; $293.12; $183.20. (4) 65c. (5) 84$\frac{1}{48}$%. (6) $1.76. (7) 800. (8) $50. (9) $2800. (10) $139.16. (11) 58$\frac{4}{17}$%. (12) 35c.

XI. Page 23. A.—(1) $227.50. (2) $448.04. (3) $676.60. (4) $376.96. (5) $505.40. (6) $596.16. (7) $855. (8) $1451.52. (9) $1692.62. (10) $596.03. (11) $844.596. (12) 368.15\frac{5}{8}$. B.—(1) $950. (2) 15%. (3) $16. (4) 79$\frac{18}{50}$c. (5) 1$\frac{4}{5}$c. (6) $6. (7) 51$\frac{5}{17}$%. (8) 2$\frac{226}{357}$%. (9) 11$\frac{1}{9}$%. (10) 100%. (11) 1$\frac{9}{40}$%. (12) 85$\frac{2}{11}$%. C.—

(1) $4.80. (2) $16\frac{2}{3}\%$. (3) $31\frac{11}{19}\%$. (4) $22\frac{3}{4}$c. (5) $4.60 (6) $437.64. (7) $6. (8) 25%. (9) $588; $15. (10) $420.

XII. Page 25. A.—(1) $10.84. (2) $140.50. (3) $6.35\frac{3}{4}$. (4) $226.92. (5) $102.96. (6) $17.523. (7) $109.12\frac{1}{2}$. (8) $174.82\frac{1}{2}$. (9) $94 50. (10) $8 77\frac{1}{2}$. (11) $1716.49. (12) $2\frac{1}{4}\%$. B.—(1) 125. (2) $1612. (3) $10648.36\frac{1}{2}$. (4) $226666\frac{2}{3}$ lbs. (5) $1\frac{2}{3}\%$. (6) $43.75. (7) $12.25. (8) $1600. (9) 60%. (10) $4315.79, nearly. (11) $311963\frac{11}{30\frac{1}{3}}$. (12) 6%. C.—(1) $2\frac{1}{2}\%$. (2) $842.30; $918.87; $1598.83. (3) $9\frac{3}{4}$c. (4) $4146\frac{14}{41}$ cwt; $1335.36\frac{34}{41}$. (5) 3%; 2%. (6) $7650. (7) 240 cwt. (8) $7744.21. (9) 4%. (10) $7.36. (11) $280.

XIII. Page 29. A.—(1) $758.25. (2) $832.30. (3) $1408.22. (4) $1187.50. (5) $1294.80. (6) $89 57. (7) $167.40. (8) $1026. (9) $79.20. (10) $8794.17. (11) $145.35. (12) $2075. (13) 42c. (14) $8.64. (15) 50%. B.—(1) 35%. (2) 50%. (3) $5\frac{5}{64}\%$ loss. (4) $2.76. (5) $360. (6) $96; $57.60. (7) $1040.60; $32\frac{1541}{2862}\%$. (8) $5\frac{5}{29}\%$. (9) $3045; $812. (10) $7.20. C.—(1) $5.76; $38\frac{8}{9}\%$. (2) $2\frac{1}{4}\%$ loss (3) 20 lbs. (4) $4.59\frac{116}{141}$. (5) 480. (6) $\frac{700}{727}\%$. (7) Gains $\frac{20}{51}\%$. (8) Gains $12\frac{1}{2}\%$. (9) $2.21\frac{1}{19}$. (10) $21\frac{19}{36}\%$; $17\frac{5}{7}\%$.

XIV. Page 32. A.—(1) $42.30. (2) $31.25. (3) $127.50. (4) $50.74. (5) $54.63. (6) $58.50. (7) $107.10. (8) $144.20. (9) $52.50. (10) $8125. (11) $129.46+. (12) $17.50. (13) $6500. (14) $8.40. (15) $916.60. B.—(1 $1.05. (2) $67.20. (3) $2501.52+. (4) $437500. (5) $560000. (6) 21 mills. (7) $750. (8) $85.07. (9) 4%. (10) $783.35.

XV. Page 34. A.—(1) $9. (2) $52.50. (3) $90. (4) $56.25. (5) $5.04. (6) $450. (7) $58.50. (8) $210. (9) $40.83\frac{3}{4}$. (10) $76.25. (11) $160. (12) $864. B.—(1) $90. (2) $110. (3) $1235. (4) $6256; $3104. (5) $9600. (6) $58.62\frac{1}{2}$. (7) $2500. (8) $420. (9) $1676.83\frac{1}{3}$. (10) 96c. (11) $831.234. (12) $\frac{35}{36}\%$. (13) $7.60. (14) $1\frac{1}{3}\%$. (15) $4000.

XVI. Page 36. A.—(1) $70.65. (2) $17.64. (3) $14.75. (4) $157.92. (5) $18.72. (6) $242.17\frac{3}{8}$. (7)

$297. (8) $115.41. (9) $1331.90. (10) $413.10. (11) $32.62½. (12) 69c. B.—(1) $2.80. (2) $3398.72. (3) $44.95. (4) $300. (5) $3906. (6) 2½ lbs. (7) $960. (8) 240 bags. (9) 80c. (10) $85.

XVII. Page 38. A.—(1) $5760. (2) $12600. (3) $19700. (4) $23856. (5) $36330. (6) $3384. (7) $3940. (8) $2394. (9) $7774.50. (10) $14190.75. (11) $28497. (12) $3008.75. (13) $7840. (14) $7262.75. (15) $9065.25. (16) £3542. (17) £2603¼. (18) $3275. (19) $2475. (20) $10468.75. (21) $91031.25. (22) $14022. (23) $36. (24) $61.25. (25) $159.60. (26) $111. (27) $228.80. (28) $385. (29) $276. (30) $5600. (31) $2550. (32) $1500. (33) £2400. (34) $4300. (35) $5200. (36) 6⅔%. (37) $5\frac{5}{19}$%. (38) 4⅔%. (39) $7\frac{21}{41}$%. (40) $7\frac{589}{773}$%. (41) $8\frac{76}{103}$%. (42) $700. (43) $750. (44) $925. (45) $2700. (46) $16000. (47) $4800. (48) $8500. (49) $45000. (50) $13080. B.—(1) $8.50. (2) None. (3) $992. (4) $56.25. (5) Former. (6) $79. (7) $5\frac{5}{24}$%. (8) 6%. (9) 130. (10) $133\frac{11}{24}$. (11) 25%. (12) 5%. C.—(1) $34.20. (2) 60 shares. (3) $17100. (4) $77000. (5) $25. (6) $118.08. (7) $12\frac{4}{13}$ years. (8) $16800. (9) 275 shares. (10) $13\frac{7}{11}$%. (11) 384 shares. (12) $102⅔.

XVIII. Page 42. A.—(1) $65.63. (2) $53.09. (3) $161.77. (4) $60.45. (5) $156.49. (6) $109.63. (7) $81.91. (8) 3%. (9) 8%. (10) $65. (11) 2 yrs. 7 mos. (12) $575.89. (13) Oct. 7th. (14) $11,000. (15) $373⅓. B.—(1) $7\frac{11}{37}$%. (2) $525.25; 4%. (3) 6¼%. (4) 10⅕%. (5) $1,822.50; $1,701; $1,417.50. (6) 10%; 265 days. (7) Dec. 26th, 1890. (8) Loss $108. (9) $21.58⅓. (10) 6 mos.

XIX. Page 44.—(1) $139.92. (2) $250. (3) $82.56. (4) $115.49. (5) $178.93. (6) $286.25. (7) $1,266.36. (8) $98.68. (9) $295.94. (10) $22.58.

XX. Page 45. A.—(1) $1,116.57. (2) $616.54. (3) $135.66. (4) $479.66. (5) $1,992.81. (6) $4,194.33. (7) $722.72. (8) $500.62. (9) $479.66. (10) $2,472.94. B.—(1) $119.30. (2) $67.60. (3) $247.46. (4) $883.116. (5) $495,127+. (6) June 11th. (7) $730. (8) 7%. (9) $6\frac{18}{247}$%. (10) 8.219%, nearly.

XXI. Page 47. A.—(1) $400. (2) $500. (3) $1,560. (4) $3,375. (5) $9,450. (6) 16. (7) 18. (8) 30. (9) 42. (10) 24. (11) 6. (12) 4. (13) $650. (14) $625. (15) 10 mos. B.—(1) 4 mos. (2) 20. (3) $4\frac{1}{4}$ mos. (4) 70 days, nearly. (5) Feb. 14th. (6) Dec. 30th, 1897. (7) Dec. 17th. (8) March 20th. (9) Sept. 2nd; $917.90. (10) Aug. 23rd. (11) $737.56.

XXII. Page 50. A.—(1) $126.10. (2) $247.20. (3) $44.93. (4) $28.81. (5) $248.77. (6) $31.28. (7) $38.81. (8) $153.22. (9) $94.62. (10) $268.[illegible] (11) $16.33. (12) $172.21. (13) $73.76. (14) $52.56. (15) $689.84. B.—(1) $791.57. (2) $1.91. (3) $70.45. (4) $1,979.97. (5) $4,955.08. (6) $897.86. (7) 5, nearly. (8) $1,895.71. (9) $951.93. (10) $1,801.74. (11) $3,997.277+.

XXIII. Page 52.—(1) $750. (2) $2,500. (3) $1,250. (4) $765. (5) $1,050. (6) $72.50. (7) $160.10. (8) $420. (9) $48.30. (10) $36. (11) $925. (12) $964.90. (13) $151.92. (14) $6.72. (15) $820. (16) $825.83. (17) $2,222.50; $2,311.39.

XXIV. Page 53. A.—(1) $750; $1,125. (2) $44.25; $88.50. (3) $4,752. (4) $280. (5) $5,250. (6) $2,375. (7) $480; $420. (8) $70; $100; $150. (9) $200; $80; $80. (10) $405; $360; $315. (11) $2,000; $3,000. (12) 732\frac{3}{11}$. B.—(1) $\frac{16}{29}$, $\frac{9}{29}$, $\frac{4}{29}$. (2) $10\frac{14}{17}$, $20\frac{5}{17}$, $60\frac{15}{17}$. (3) $22\frac{1}{2}$, $37\frac{1}{2}$. (4) $1,400. (5) $2,000, $1,500, $1,200. (6) $260. (7) $1,728. (8) A. $2,500.50; B. $3,549.50; C. $2,975.00. (9) $2,000. (10) $1,767.50; $1,616.

XXV. Page 56. A.—(1) $7,218. (2) $4,688.25. (3) $3,613.50. (4) $1,503.75. (5) $1,616.87$\frac{1}{2}$. (6) $1,541.60. (7) $2,048.88$\frac{5}{8}$. (8) $2,435.62$\frac{1}{2}$. (9) $3,268.35. (10) £96 10s. (11) $334,302. (12) £89 10s. (13) $1,[illegible]1.50. (14) $2,098.15. (15) $298.89. B.—(1) 9$\frac{1}{2}$%. (2) $4,672. (3) $3,496. (4) $4,011.15. (5) £450. (6) £990. (7) $4,952.35. (8) $2.712.76$\frac{1}{2}$. (9) $7,191.76$\frac{7}{8}$. (10) $5,380.92, nearly. C.—(1) 112.09\frac{71}{81}$. (2) $3,975.70. (3) $4,010; $4,009.85. (4) $45. (5) 4.86\frac{2}{3}$. (6) 7,258 francs, 6$\frac{985}{217}$ centimes

XXVI. Page 58.—(1) 1.014 lbs. (2) $300,000. (3) $17.25. (4) $7.49. (5) $\frac{15}{224}$. (6) 24. (7) 180. (8) $3\frac{31}{48}$ sov. (9) 47 tons, 17 cwt., 66 lbs. (10) $\frac{59049}{80104}$. (11) $15\frac{7}{13}$. (12) $\frac{1}{6}$. (13) $\frac{12}{55}$. (14) $\frac{4}{9}$. (15) $\frac{1125}{3136}$.

XXVII. Page 60.—(1) 14; 21. (2) $20; 25; 35. (3) 110. (4) 19 yds. (5) $140; 84; 60. (6) $2,160. (7) 100 sc. (8) 15 lbs. (9) $\frac{1}{3}$. (10) $35; $52.50; $84. (11) 8; 14; 20.

XXVIII. Page 61.—(1) $1,875; $2,475; $3,150; $3,000. (2) $18; $27; $60. (3) $450; $375. (4) 60. (5) 630 sc. (6) $33.60; $24; $14.40. (7) $1.40; 84c.; 60c. (8) $14; $24.50; $35. (9) $11.34; $7.56; $5.04. (10) $14,784; $16,362; $22,674.

XXIX. Page 62.—(1) 9 days. (2) $3.20. (3) $37\frac{1}{2}$; 25 days. (4) $13\frac{5}{7}$ days. (5) $2\frac{2}{3}$ days. (6) 16. (7) 20 days. (8) $8\frac{2}{5}$ days. (9) $4\frac{4}{50}$ days. (10) $2\frac{2}{3}$ days.

XXX. Page 63.—(1) 20 lbs. (2) 40c.; 31c. (3) 45c.; 65c. (4) 36; 24 lbs. (5) $80; $27. (6) 9 to 2. (7) 11 to 4. (8) 35c. (9) 50%. (10) $23\frac{97}{111}$%. (11) 14 gal.; 30 gal.

XXXI. Page 64.—(1) 3689; 1357. (2) 2738352. (3) 9655807. (4) 396; 413. (5) 2687. (6) 1827. (7) $4,309.43; $4,436.92. (8) 11. (9) 100 ac. (10) $143.50; $108.50. (11) 2516; 2159. (12) $6\frac{2}{3}$ miles. (13) $2\frac{1}{2}$ mi. an hr. (14) 17 to 7. (15) 2 miles. (16) 36; 24. (17) 30; 40. (18) 18 doz.

XXXII. Page 66.—(4) 9 a.m.; 8 a.m.; 7 a.m.; 7 a.m.; 6 a.m.; 6 a.m. (5) 11.15 a.m.; 11.15 a.m.; 8.15 a.m.; 10.15 a.m.; 12.15 p.m.; 4.15 p.m.; 3.15 p.m.; 5.15 p.m. (6) 11.03 a.m.; 5.57 a.m.; 10.16 a.m.; 3.59 p.m.; 2.17 p.m.; 2.48 p.m. (7) 68° 15′ W.; 109° 30′ W.; 53° 15′ W.; 45′ W.; 21° 45′ E.; 80° 30′ E.; 0°. (8) 9.40 a.m. (9) $2.58\frac{1}{3}$ p.m. (10) 26 min. 40 sec. (11) Sat. June, 6th, 11.55 a.m. (12) Sat. July 18th, 8.30 a.m. (13) 60° W. (14) 2.15 p.m. (15) 5′ 36″ to 8. (16) 9.45 a.m.

XXXIII. Page 67.—(1) $16\frac{4}{11}$ past 3; $32\frac{8}{11}$ past 6; $43\frac{7}{11}$ past 8. (2) $5\frac{5}{11}$ and $38\frac{2}{11}$ past 4; $21\frac{9}{11}$ and $54\frac{6}{11}$ past 7. (3) $43\frac{7}{11}$ past 2; $54\frac{6}{11}$ past 4. (4) $8\frac{8}{11}$ and

$3\frac{4}{11}$ past 4; $19\frac{7}{11}$ and $45\frac{9}{11}$ past 6. (5) $20\frac{20}{23}$ past 4, 5, 6, respectively. (6) $4.21\frac{9}{11}$; $4.19\frac{7}{11}$ and 4.24. (7) 13.50-$\frac{10}{13}$ and $16.21\frac{9}{11}$ past 3. (8) 7.54. (9) 5.20. (10) $12\frac{3}{16}$. (11) $\frac{540}{607}$ of a minute.

XXXIV. Page 68.—(1) 5508409. (2) 20820969. (3) 200000008. (4) 999991 and 90249856. (5) 99999999 and 99993439. (6) 4095 and 7777. (7) 150. (8) 300. (9) 4. (10) $6\frac{1}{4}$. (11) $4\frac{136225}{138924}$. (12) $\frac{1}{5832}$. (13) $1\frac{61}{64}$ and $\frac{8}{3375}$. (14) $\frac{1}{60}$. (15) $\frac{20281}{248832}$. (16) $\frac{10901}{100000}$. (17) $4\frac{89}{144}$. (18) $1\frac{3}{8}$ and 2. (19) $\frac{2}{3}$. (20) $\frac{3}{4}$.

XXXV. Page 69.—(1) 357. (2) 992. (3) 4735. (4) .26. (5) 7.777. (6) 2.23606. (7) 1.048. (8) .707-106. (9) .4472. (10) .311768. (11) 2.26778. (12) 3.63318. (13) .63509. (14) $\frac{1}{5}$, nearly. (15) 5600 in. (16) 4528. (17) 99.89+ yds. (18) 2057 and 833. (19) 72 rods. (20) 5628.

XXXVI. Page 70.—(1) 125. (2) 7543. (3) 3973. (4) 1025. (5) 46.8. (6) 56.42. (7) 7 85. (8) .86. (9) .887. (10) 3.198. (11) .4721. (12) .0416.

XXXVII. Page 71. A.—(1) 1521 sq. ft. (2) 297 lbs. (3) $28\frac{2}{3}$ sq. ft. (4) 7c. (5) $\$2.20\frac{2}{3}$. (6) $438 (7) 1.92 ac. (8) $16\frac{1}{2}$ ft. (9) $28350. (10) $23.52; 150.46\frac{2}{3}$. B.—(1) $7880\frac{5}{12}$ ft. (2) $1289.55. (3) $32.73\frac{2}{5}$ (4) 30 and 40 ch. (5) $37250. (6) $181.12. (7) $245 (8) $234\frac{3}{8}$ yds (9) $186.0705 (10) 8 yds. (11) 19 ft (12) $98. (13) 119.79\frac{1}{6}$. (14) 334 yd., 2 ft., $1\frac{11}{19}$ in.

XXXVIII. Page 73. A.—(1) 90 ft. (2) 810 ft (3) 154 ft. (4) 36 sq. yds., 6 ft., 9 in. (5) 2310 sq. in. (6) 1848 sq. ft. (7) 336 sq. in. (8) 269.766 sq. yds (9) 66990. (10) 463.757. (11) 10 ft. (12) 41 ft. (13) 113 ft. (14) 84 ft. (15) 8 yds. (16) 4.529 ft. (17) 420 ft. (18) $85 05. B.—(1) 240 yds. (2) 12 ft.; 30 and 54. (3) 15 ft. (4) 140 mi. (5) 515.94 yds. (6) 11.842 ft. (7) 3 miles. (8) 90 ft. (9) 37.997 ft. (10) 40 sq. in. (11) 26.925 ft.

XXXIX. Page 75. A.—(1) 22 ft. 1288 in. (2) 37 ft. 64 in. (3) 181 ft. 664 in. (4) 38 ft. 192 in. (5) 78 ft. 810 in. (6) 68 ft. (7) 32 ft. 752 in. (8) 15 ft. (9)

175 ft. 864 in. (10) 134 ft. 512 in. (11) 1 ft. 162 in. (12) 5 ft. 408 in. (13) $\frac{1}{3}$ in. (14) \$349.71$\frac{9}{16}$. (15) 314$\frac{1}{2}$. (16) $\frac{127}{343}$. B.—(1) 490 sq. ft.; 500 c. ft. (2) 253.876 sq. ft.; 138 56 c. ft. (3) 34$\frac{3}{4}$. (4) \$2,722 50. (5) 12,800 lbs. (6) 7.6 in. (7) 6,023 gal. (8) \$3,670.92. (9) 22$\frac{65}{256}$ c. ft. (10) 1575. (11) 9.2727%. (12) 37$\frac{17}{37}$ in. (13) 30720.

XL. Page 78. A.—(1) 18$\frac{6}{7}$ ft. (2) 20$\frac{3}{7}$ yds. (3) 27 yds. 1 ft. 9$\frac{1}{7}$ in. (4) 62$\frac{2}{7}$ ft. (5) 23$\frac{1}{4}$ yds. (6) 16 yds. 8$\frac{1}{2}$ in. (7) 154 sq. ft. (8) 100 sq. yds. 8$\frac{2}{3}$ sq. ft. (9) 240 sq. ft. 90 sq. in. (10) 60$\frac{5}{32}$ sq. in. (11) 32 sq. ft. 50$\frac{1}{2}$ sq. in. (12) 9 sq. yd. 7 ft. $\frac{11}{14}$ in. (13) 9$\frac{5}{8}$ sq. ft. (14) 447$\frac{32}{88}$ sq. ft. (15) 10 sq. ft. 119$\frac{1}{11}$ sq. in. (16) \$3.93. (17) 1 ft. 8$\frac{1}{2}$ in., nearly. (18) 672. (19) 15$\frac{5}{7}$ in. (20) $\frac{63}{220}$. B.—(1) 174.7 sq. ft. (2) 8.48 ft. (3) 8.05 in. (4) 11.1409; 2729.5 sq. ft. (5) 7543.36 sq. yds. (6) 1134.4 ft. (7) 141.8 ft. (8) 104.2 ft. (9) 6.129 sq. ft. (10) 625 sq. in. (11) 720 ft. (12) 20 in. (13) 10 in. (14) 1.45 sq. ft. (15) 125$\frac{1}{8}$ sq. rods. (16) \$2,534.37. (17) 12252.24.

XLI. Page 80. A.—(1) 8 sq. ft. (2) 15 sq. ft. (3) 1166 sq. in. (4) 125.664 sq. ft. (5) 75.398 sq. ft. (6) 186.925 sq. ft. (7) 173.662 sq. ft. (8) 87.9643 c. ft. (9) 83.448 c. ft. (10) 569.6768 c. ft. (11) 212.06 c. ft. (12) \$38 48. (13) \$117.81. B.—(1) 7.0686 c. ft. (2) 1885$\frac{5}{7}$ gal. (3) 1$\frac{1}{2}$ cords. (4) 14.306 min. (5) 490.29 gal. (6) 9$\frac{1}{3}$ ft. (7) side 2 ft. (8) \$6147.315.

XLII. Page 81. A.—(1) 715$\frac{1}{2}$ sq. in. (2) 1273 sq. in. (3) 1583.37 sq. in. (4) 3418.06 sq. in. (5) 37.699 sq. ft. (6) 84.948 sq. ft. (7) 29.093 sq. ft. (8) 16.755 c. ft. (9) 64.141 c. ft. (10) 97.905 c. ft. (11) 19.098 c. ft. (12) 12 c. ft. (13) 150 c. ft. (14) 18 c. ft. 576 c. in. (15) 14 c. ft. (16) 41.892 c. ft. (17) 31.176 c. ft. (18) 728 c. ft. B.—(1) 2827.44 c. ft. (2) 1884.96 c. in. (3) 15 c. ft. 540 c. in. (4) 3392.928 c. ft. (5) 29.1 yards. (6) 16889.24 c. in. (7) 5277.888 c. in. (8) 171825.3 c. ft. (9) 5039.44 c. ft. (10) 960 c. ft.

XLIII. Page 83. A.—(1) 154 sq. ft. (2) 1386 sq. in. (3) 209 ft. 88 in. (4) 38$\frac{1}{2}$ sq. ft. (5) 268.19 cub.

in. (6) $1437\frac{1}{3}$ cub. in. (7) $1437\frac{1}{3}$ cub. in. (8) 697.2 cub. in. (9) $16372\frac{1}{8}$ cub. ft. (10) 2 c. ft. 856 in. B.—(1) 5.986 lbs. (2) 732.647 oz. (3) .962 c. ft. (4) 202.-11 c. in. (5) 626.75 c. in. (6) 611.12 lbs. (7) $2\frac{1}{3}$ in. (8) 7 in. (9) 8 in. (10) 17 hrs. $46\frac{2}{3}$ min.

XLIV. Page 84.—(1) 20; 32. (3) tin = 128.398+ lbs. (4) 8%. (5) $3\frac{543}{5292}$ ft. (7) 60 miles. (9) 709, nearly. (10) B pays \$4. (11) $3\frac{1}{2}$. (12) $\frac{1}{30}$ less. (13) \$46. (14) 4.24. (15) 2 gals. (16) 63; 47. (17) $\frac{4000}{8323}$ oz. (18) $516\frac{1}{5}$ oz. (19) $2.21\frac{9}{11}$ min. (20) 3465 in. square. (21) 146097. (23) $962\frac{1}{2}$ grs. (24) $2\frac{514}{735}$ more. (25) 10260271849. (26) 2 hr. (27) 85 $\frac{15}{16}$. (28) 360. (29) 24003 oz.; 2997 oz. (30) \$2480. (31) \$5 loss. (32) 16800. (33) $22\frac{1}{2}$ days. (34) $\$332.03\frac{1}{8}$. (35) $\$231.48\frac{4}{27}$. (36) $\$1.21\frac{36}{205}$. (37) 60 to 79. (38) 24 miles. (39) 230. (40) 50%. (41) \$18. (42) \$7. (43) $8\frac{1}{3}$%. (44) \$240; \$200. (45) $55\frac{1}{2}$. (46) $7\frac{1}{2}$ mos. (47) $4\frac{5}{8}$ mos. (48) 3 days. (49) 37. (50) \$294; \$392; \$294. (51) 12. (52) 60480 (53) 42. (54) \$411.60. (55) $4\frac{1}{2}$ in. (56) 50. (57) \$400; \$300. (58) $28\frac{4}{7}$%. (59) \$8. (60) 80; 60. (61) $\$81.93\frac{51}{73}$. (62) \$1000; \$1500; \$1200. (63) $5\frac{5}{29}$%. (64) \$992. (65) 21st March. (66) 40 miles. (67) 39. (68) 26 days $11\frac{12}{31}$ hrs. (69) \$398.50. (70) 660 yds. (71) \$1250. (72) $\$6.07\frac{1}{2}$. (73) 100; 100; 300. (74) \$1922.75. (75) \$918.02+ (76) \$187.50. (77) $27\frac{1}{2}$; $14\frac{1}{2}$. (78) 15358.9 cub. yds. (79) gains $1\frac{9}{16}$%. (80) \$1080. (81) \$3880. (82) $1\frac{1}{3}$ mos. (83) \$780. (84) \$33.60. (85) $10840\frac{40}{369}$. (86) 172.788 sq. yds. (87) 600 ac. (88) \$4. (89) \$271.434. (90) 36 yds. (91) \$1078; \$588. (92) \$72. (93) $\frac{1}{2}$ inch to a mile. (94) 30 ac. (95) \$164.096. (96) 5 days. (97) $2\frac{4}{9999}$. (98) 85.84; 114.16 sq. in. (99) \$2400. (100) \$500. (101) \$999.55. (102) \$1400. (103) \$96.25. (104) \$80; \$70. (105) 748.88 c. ft. (106) $4\frac{2}{7}$%. (107) \$42750. (108) $\$832\frac{488}{997}$. (109) \$1514.13; \$2708.20. (110) $38\frac{8}{9}$%. (111) \$2520.75. (112) 1050. (113) 49 miles. (114) 196.164 lbs. (115) $\$12\frac{1}{2}$. (116) 12c. (117) \$280. (118) \$4.85. (119) 1.4367 c. ft. (120) 1 inch to 100 miles. (121) 357; 221. (122) $4\sqrt{3}$ ft. or $\frac{64}{\sqrt{3}}$ ft. (123) $9\frac{1}{2}$. (124) $16\frac{1}{8}$ acres. (125) 150.

Addition Tests. Page 5.—(1) 722931. (2) 729375. (3) 693816. (4) 638223. (5) 682287. (6) 836934. (7) 869415. (8) 894228. (9) 842361. (10) 823686. (11) 692937. (12) 729432. (13) 694386. (14) 643923. (15) 639288. (16) 651048. (17) 619068. (18) 696570. (19) 697992. (20) 744399. (21) 4348100. (22) 4383520. (23) 4124460. (24) 3981520. (25) 3943470. (26) 4850675. (27) 4960755. (28) 5069915. (29) 5249165. (30) 5119005. (31) 5465660. (32) 5789670. (33) 5108710. (34) 5083620. (35) 5168300. (36) 6481405. (37) 6387875. (38) 6216925. (39) 5770775. (40) 6445805.

Subtraction Tests. Page 7. (1) 3341890. (2) 3749300. (3) 4919760. (4) 3870320. (5) 2452900. (6) 3787685. (7) 2912795. (8) 4006885. (9) 5905895. (10) 4712815. (11) 3131800. (12) 4155040. (13) 4377290. (14) 3501660. (15) 5122740. (16) 3520175. (17) 3805985. (18) 4724155. (19) 4813895. 20. 4220105. (21) 490070. (22) 4987700. (23) 4099090. (24) 5097530. (25) 4480110. (26) 11232095. (27) 12180465. (28) 12532025. (29) 11389185. (30) 12378835. (31) 2198370. (32) 3116260. (33) 3985690. (34) 4855400. (35) 2578230. (36) 2999905. (37) 2219135. (38) 4411445. (39) 2819035. (40) 4573995.

Multiplication Tests. Page 7.—(1) 259559525-74464. (2) 45422967005312. (3) 51911905148928. (4) 58400893292544. (5) 77867857723392. (6) 3084583401-0624. (7) 103823810297856. (8) 116801786585088. (9) 136268751015936. (10) 155735715446784. (11) 17514-7648241454. (12) 204338922948363. (13) 26272147236-2181. (14) 350295296482908. (15) 408677845896726. (16) 525442944724362. (17) 613016768845089. (18) 700590592965816. (19) 788164417086543. (20) 817355-691793452. (21) 7347486452613l2. (22) 979664860348-416. (23) 1102122967891968. (24) 1653184451337952. (25) 2204245935783936. (26) 2571620258414592. (27) 2938994581045248. (28) 3306368903675904. (29) 391-8659441393664. (30) 5143240516829184 (31) 3700956-646047024. (32) 4163576226802902. (33) 5551434969-070536. (34) 6245364340204353. (35) 74019132920940-48. (36) 8327152453605804. (37) 11102869938141072.

(38) 12490728680408706. (39) 14803826584188096. (40) 16654304907211608. (41) 6492906. (42) 7575057. (43) 9739359. (44) 12985812. (45) 15150114. (46) 19478718. (47) 22725171. (48) 30300228. (49) 38957436. (50) 45450342. (51) 4852224. (52) 5458752. (53) 6469632. (54) 7278336. (55) 9704448. (56) 10917504. (57) 12939264. (58) 14556672. (59) 19408896. (60) 21835008. (61) 10077696. (62) 14348907. (63) 23887872. (64) 34012224. (65) 80621568. (66) 114791256. (67) 272097792. (68) 387420489. (69) 644972544. (70) 918330048.

Division Tests. Page 8.—(1) 43128. (2) 57504. (3) 75474. (4) 76672. (5) 86256. (6) 21654. (7) 28872. (8) 43308. (9) 64962. (10) 97443. (11) 23004. (12) 34506. (13) 51759. (14) 61344. (15) 69012. (16) 24192. (17) 36288. (18) 54432. (19) 72576. (20) 84672. (21) 118953. (22) 185038. (23) 237906. (24) 277557. (25) 356859. (26) 370076. (27) 475812. (28) 713718. (29) 832671. (30) 951624. (31) 12348. (32) 28812. (33) 134456. (34) 86436. (35) 74088. (36) 211464. (37) 317196. (38) 475794. (39) 555093. (40) 370062. (41) 214632. (42) 286176. (43) 190784. (44) 763136. (45) 476960. (46) 119240. (47) 953920. (48) 381568. (49) 572352. (50) 858528.

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