ECLECTIC EDUCATIONAL SERIES.

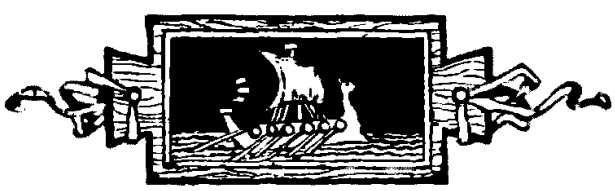
KEY

TO

RAY'S NEW

ARITHMETICS,

INTELLECTUAL AND PRACTICAL.



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RAY'S MATHEMATICAL SERIES.

Regular Series.

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PREFACE.

This KEY TO RAY'S NEW ARITHMETICS is presented to the public in the hope that teachers may be assisted thereby in their arduous labors.

It may be supposed that every teacher is able to solve every example in the series; but it should not therefore be required that the work shall actually be done by the teacher. The examination to which every teacher in the Public Schools submits, is the only test that can be required of the possession of knowledge. In the actual work of the school-room, the teacher is clearly entitled to use all appliances that will save him from drudgery, and enable him to devote his full time and energies to the task of imparting instruction and guiding the labors of his pupils.

In most schools, the methods of instruction have so changed that twice as much labor is now expected from the teacher as was required twenty years ago. Much work is now written on slates or paper; and this must be carefully examined, criticized, and marked. This increased labor leaves the teacher little time to work out the examples, and test their correctness.

In the Key to the Intellectual Arithmetic, all the problems which might be supposed to present the least difficulty, have been briefly solved. The form of solution is usually the briefest that is consistent with accuracy and clearness: no formal method is pursued.

The Key to the Practical Arithmetic is believed to be complete. It was not thought best to omit any thing that might assist any teacher. Here, too, the solutions are as brief as possible. Figures and signs are used wherever they serve the purpose. Lengthy explanations are avoided,—the work only being given.

With the hope that this Key will be found to be full and accurate, and so arranged as to prove helpful on all occasions, it is respectfully submitted to the teachers of Ray's Arithmetics.

Cincinnati, June, 1879.

SOLUTIONS

OF THE

MORE DIFFICULT EXAMPLES

IN

RAY'S NEW INTELLECTUAL ARITHMETIC.

LESSON I.

18. All together have the sum of 5 dollars, 3 dollars, and 1 dollar, which is 9 dollars.

25. As many as the sum of 4, 4, and 2, which is 10.

LESSON II.

25. I have the sum of 10 cents, 5 cents, 3 cents, and 3 cents, which is 21 cents.

LESSON V.

37. William's age is the sum of 8 years and 5 years, which is 13 years; and the sum of all their ages is 13 years, plus 5 years, plus 8 years, which is 26 years.

LESSON VI.

24. I received in money as many dollars as the difference between 17 dollars and 6 dollars, which is 11 dollars.

LESSON VIII.

19. I spent the sum of 20 cents and 10 cents, which is 30 cents; I had left the difference between 65 cents and 30 cents, which is 35 cents.

LESSON IX.

8. Both had the sum of 18 marbles and 18 marbles, which is 36 marbles; if when they quit one had 25 marbles, the other had the difference between 36 marbles and 25 marbles, which is 11 marbles.

14. He is worth the sum of 20 dollars and 10 dollars, which is 30 dollars. He owes the sum of 5 dollars, 6 dollars, and 10 dollars, which is 21 dollars. Should he pay his debts, he would be worth the difference between 30 dollars and 21 dollars, which is 9 dollars.

LESSON XI.

4. The sum of 19 and 10 is 29; the difference between 17 and 10 is 7; if I take 7, the difference, from 29, the sum, 22 will be left.

21. There are as many peach-trees in the orchard as the sum of 15 peach-trees, 9 peach-trees, and 10 peach-trees, which is 34 peach-trees. There are as many apple-trees as the sum of 5 apple-trees, 11 apple-trees, and 10 apple-trees, which is 26 apple-trees. Then there are as many more peach-trees than apple-trees as the difference between 34 trees and 26 trees, which is 8 trees.

LESSON XII.

22. If 1 yard of muslin cost 11 cents, 3 yards will cost 3 times 11 cents, which is 33 cents.

LESSON XIV.

11. If a man travel 7 miles in 1 hour, in 8 hours he will travel 8 times 7 miles, which is 56 miles.

17. In one hour they would be as far apart as the sum of 2 miles and 4 miles, which is 6 miles; in 3 hours they would be 3 times 6 miles apart, which is 18 miles.

LESSON XVI.

22. Each one would receive one sixth of 36 dollars, which is 6 dollars.

23. Since there are 4 quarts in 1 gallon, in 36 quarts there are as many gallons as 4 quarts are contained times in 36 quarts, which are 9.

LESSON XVIII.

24. One man will earn in 3 days one ninth of $108, which is $12. In one day he would earn one third of $12, which is $4.

25. In 1 day the former travels one third of 15 miles, which is 5 miles. In 1 day the latter travels one half of 20 miles, which is 10 miles; and if the latter travels 10 miles in 1 day, and the former, 5 miles, the latter travels as much farther in 1 day than the former as the difference between 10 miles and 5 miles, which is 5 miles.

LESSON XIX.

7. The sum of 1, 2, and 3 is 6, and 6 is contained in 60 ten times. If I have as many marbles as 3 times the number of times 6 is contained in 60, I have 3 times 10 marbles, which is 30 marbles.

8. Six hats will cost 6 times $5, which is $30; 4 yards of cloth will cost 4 times $3, which is $12. Both will cost the sum of $30 and $12, which is $42; and if he gave in exchange flour at $6 a barrel, it took as many barrels as $6 are contained times in $42, which are 7.

9. If a man gain 6 miles in 5 hours, it will take as many times 5 hours to gain 24 miles as 6 miles are contained times in 24 miles, which are 4; and 4 times 5 hours are 20 hours.

34. It will take 1 man 3 times 10 days, which is 30 days. It will take as many men to do it in 5 days as 5 days are contained times in 30 days, which are 6.

LESSON XXII.

2. One third of an apple is worth $\frac{1}{3}$ of three cents, which is 1 cent.

5. One fourth of a melon is worth $\frac{1}{4}$ of 8 cents, which is 2 cents; and if $\frac{1}{4}$ of a melon is worth 2 cents, $\frac{3}{4}$ of a melon are worth 3 times 2 cents, which is 6 cents.

23. One calf cost $\frac{1}{12}$ of \$120, which is \$10; and if 1 calf cost \$10, he sold the 7 calves for 7 times \$10, which is \$70.

LESSON XXIII.

9. For \$1 you can buy $\frac{1}{8}$ of a bushel, and for \$5 you can buy 5 times $\frac{1}{8}$ of a bushel, which is $\frac{5}{8}$ of a bushel.

16. One fifth of 30 is 6; then $\frac{3}{5}$ of 30 are 3 times 6, which is 18; and 18 is $\frac{18}{23}$ of 23.

LESSON XXIV.

7. One sixth of a gallon will cost $\frac{1}{5}$ of 35 cents, which is 7 cents; and if $\frac{1}{6}$ of a gallon cost 7 cents, $\frac{6}{6}$, or 1 gallon, will cost 6 times 7 cents, which is 42 cents.

17. One fourth of 8 cents is 2 cents, and $\frac{3}{4}$ are 3 times 2 cents, which is 6 cents; and if 6 cents are $\frac{2}{3}$ of mine, $\frac{1}{3}$ of mine is $\frac{1}{2}$ of 6 cents, which is 3 cents; and if 3 cents are $\frac{1}{3}$, then $\frac{3}{3}$ will be 3 times 3 cents, which is 9 cents.

LESSON XXV.

4. One yard will cost $\frac{1}{3}$ of 5 dollars, which is $1\frac{2}{3}$ dollars.

LESSON XXVI.

4. Since there are $\frac{4}{4}$ in 1, in 3 there are 3 times $\frac{4}{4}$, which is $\frac{12}{4}$; and $\frac{12}{4} + \frac{1}{4} = \frac{13}{4}$. Other answers, $\frac{19}{4}$, $\frac{21}{4}$, $\frac{27}{4}$.

LESSON XXVII.

13. To reduce a fraction to its lowest terms, divide both terms by their greatest common divisor. Of 27 and 36, the G. C. D. is 9; 9 in 27 is contained 3 times, and 9 in 36 is contained 4 times.

Therefore, $\frac{27}{36}$ changed to its lowest terms $= \frac{3}{4}$.

LESSON XXVIII.

10. Since there are $\frac{8}{8}$ in 1, in $\frac{1}{4}$ there is $\frac{1}{4}$ of $\frac{8}{8}$, which is $\frac{2}{8}$; and if $\frac{2}{8} = \frac{1}{4}$, then $\frac{8}{4}$ will be 3 times $\frac{2}{8}$, which is $\frac{6}{8}$.

LESSON XXIX.

4. The common denominator is 15. $1 = \frac{15}{15}$; $\frac{1}{3} = \frac{5}{15}$, and $\frac{2}{3} = \frac{10}{15}$; $\frac{1}{5} = \frac{3}{15}$, and $\frac{2}{5} = \frac{6}{15}$.

LESSON XXX.

2. Three fourths $= \frac{6}{8}$, and $\frac{1}{2} = \frac{4}{8}$. He gave for both $\$\frac{6}{8} + \$\frac{4}{8} = \$\frac{10}{8} = \$1\frac{1}{4}$.

LESSON XXXI.

3. One half of the first $= \frac{3}{6}$ of a melon; $\frac{2}{3}$ of the second $= \frac{4}{6}$ of a melon. $\frac{4}{6} - \frac{3}{6} = \frac{1}{6}$.

LESSON XXXII.

14. Find how much is in both air and water: as much as the sum of $\frac{1}{2}$ and $\frac{1}{3}$. $\frac{1}{2} = \frac{3}{6}$, and $\frac{1}{3} = \frac{2}{6}$; their sum is $\frac{5}{6}$. Since there are $\frac{6}{6}$ in the pole, there would be as much in the earth as the difference between $\frac{6}{6}$ and $\frac{5}{6}$, which is $\frac{1}{6}$.

LESSON XXXIII.

2. To 5 horses he would give 5 times $\frac{1}{2}$ peck, which is $\frac{5}{2}$ pecks; and $\frac{5}{2}$ pecks $= 2\frac{1}{2}$ pecks.

LESSON XXXIV.

8. One pound of cheese will sell for $\frac{1}{4}$ of 30 cents, which is $7\frac{1}{2}$ cents. Then 3 pounds will sell for 3 times $7\frac{1}{2}$ cents, which is $22\frac{1}{2}$ cents.

28. One seventh of 18 is $2\frac{4}{7}$; then $\frac{2}{7} = 2$ times $2\frac{4}{7}$ feet, which is $5\frac{1}{7}$ feet; and $\frac{5}{7} = 5$ times $2\frac{4}{7}$ feet, which is $12\frac{6}{7}$ feet.

29. One ninth of \$15 is $\$1\frac{2}{3}$; then $\frac{2}{9} = 2$ times $\$1\frac{2}{3}$, which is $\$3\frac{1}{3}$; $\frac{1}{3}$ of \$15 is \$5; $\$5 + \$3\frac{1}{3} = \$8\frac{1}{3}$, $\$15 - \$8\frac{1}{3} = \$6\frac{2}{3}$.

31. $\frac{5}{5} - \frac{2}{5} = \frac{3}{5}$. $\$18 = \frac{3}{5}$ of the number, then $\frac{1}{5}$ would be $\frac{1}{3}$ of \$18, which is \$6; and $\frac{2}{5}$ would be 2 times \$6, which is \$12.

32. $\$45 = \frac{7}{7} + \frac{2}{7}$, which is $\frac{9}{7}$ of the cost. $\frac{1}{7}$ is $\frac{1}{9}$ of $\$45 = \$5$; and $\frac{7}{7}$ would be 7 times $\$5 = \$35$.

LESSON XXXVI.

22. Five and three sevenths pounds of sugar cost $5\frac{3}{7}$ times 7 cents, which is 38 cents. It would take as many pounds of raisins to pay for it as 6 cents are contained times in 38 cents, which are $6\frac{1}{3}$.

LESSON XXXVIII.

9. One pound will cost $\frac{1}{4}$ of $\$\frac{5}{4} = \$\frac{5}{16}$; then 7 pounds will cost 7 times $\$\frac{5}{16} = \$\frac{35}{16} = \$2\frac{3}{16}$.

LESSON XXXIX.

16. The sum of $\frac{1}{5}$ and $\frac{2}{5} = \frac{3}{5}$; $\frac{5}{5} - \frac{3}{5} = \frac{2}{5}$; then 14 ft. $= \frac{2}{5}$ of the pole; $\frac{1}{5} = 7$ ft.; $\frac{5}{5} = 35$ ft.

23. $\$12 = \frac{4}{3}$ of the cost; $\frac{1}{3}$ of the cost is $\frac{1}{4}$ of $\$12 = \$3$; $\frac{3}{3} = \$9$. One yard cost $\frac{1}{5}$ of $\$9 = \$1\frac{4}{5}$.

28. One eighth of the cost was $\frac{1}{5}$ of \$50, which is \$10; then $\frac{8}{8}$ are 8 times \$10, which is \$80. It would take as many yards as \$4 are contained times in \$80, which are 20.

LESSON XL.

11. One third of the number is $\frac{1}{8}$ of 56, which is 7; then $\frac{3}{3}$ are 3 times 7, which is 21; 21 is 3 times 7.

LESSON XLI.

9. One fourth of a bu. of wheat is worth $\frac{1}{3}$ of a bu. of rye; then $\frac{4}{4}$ of a bu. of wheat are worth $\frac{4}{3}$ of a bu. of rye; and $\frac{1}{5}$ of a bu. of wheat is worth $\frac{1}{5}$ of $\frac{4}{3}$ of a bu. of rye, which is $\frac{4}{15}$ of a bu. of rye; and $\frac{4}{5}$ of a bu. of wheat are worth 4 times $\frac{4}{15}$ of a bu. of rye, which is $\frac{16}{15}$, or $1\frac{1}{15}$ bu. of rye.

LESSON XLIII

22. As many bu. of rye as $\frac{3}{4}$ are contained times in $4\frac{1}{2}$. $4\frac{1}{2} = \frac{18}{4}$; $\frac{18}{4} \div \frac{3}{4} = 6$.

LESSON XLIV.

11. $\$3\frac{1}{10} = \$\frac{31}{10}$; $7\frac{3}{4} = \frac{31}{4}$; $\frac{1}{4}$ of a doz. cost $\frac{1}{31}$ of $\$\frac{31}{10}$, which is $\$\frac{1}{10}$; then 1 pair cost $\frac{1}{3}$ of $\$\frac{1}{10}$, or $\$\frac{1}{30}$. He gained the difference between $\$\frac{1}{10}$ and $\$\frac{1}{30}$, which is $\$\frac{1}{15}$.

12. $2\frac{1}{2} = \frac{5}{2}$. $\frac{1}{2}$ doz. cost $\frac{1}{5}$ of \$15, which is \$3; then each one cost $\frac{1}{6}$ of \$3, which is $\$\frac{1}{2}$. He gained on each one the difference between $\$\frac{3}{5}$ and $\$\frac{1}{2}$, which is $\$\frac{1}{10}$.

On $\frac{1}{2}$ doz. he gained $\$\frac{6}{10}$; and on $\frac{5}{2}$ doz. $\$\frac{30}{10}$, or \$3.

LESSON XLV.

22. A walks 5 miles 7 times in walking 35 miles; B walks 3 miles 7 times in the same time. Therefore, B walks 7 times 3 miles, which is 21 miles.

25. One horse will eat $\frac{1}{6}$ of 12 bu. in a week, which is 2 bu. a week; then 10 horses will eat 10 times 2 bu. in a week, which is 20 bushels.

26. Five horses will eat in 1 week $\frac{1}{2}$ of 16 bu., which is 8 bu; to eat 56 bu., it will take them as many weeks as 8 is contained times in 56, which are 7.

28. It will take 6 times 12 horses, which is 72 horses, to eat it in 1 day; and to eat it in 9 days it will take $\frac{1}{9}$ of 72 horses, which is 8 horses.

LESSON XLVI.

6. Nine times $9 = 81$. $81 \div 12 = 6\frac{9}{12}$, or $6\frac{3}{4}$.

8. $\frac{48}{120} = \frac{2}{5}$. $\frac{54}{189} = \frac{2}{7}$. $\frac{240}{288} = \frac{5}{6}$.

9. One ninth $= \frac{16}{144}$, $\frac{3}{9} = \frac{48}{144}$; $\frac{1}{16} = \frac{9}{144}$, $\frac{4}{16} = \frac{36}{144}$; $\frac{1}{72} = \frac{2}{144}$, $\frac{17}{72} = \frac{34}{144}$.

12. If he traveled $\frac{1}{4}$, or $\frac{3}{12}$, the first day, and $\frac{1}{3}$, or $\frac{4}{12}$, the second day, then the third day he must have traveled $\frac{12}{12}$ less $\frac{7}{12}$, which is $\frac{5}{12}$; $\frac{5}{12}$ of 84 miles $= 35$ miles.

21. $\$99 = \frac{8}{8} + \frac{3}{8}$, or $\frac{11}{8}$, of the cost; then $\frac{1}{8} = \$9$, and $\frac{8}{8}$, the cost, $= \$72$.

22. One eighth of $\$96 = \$12$, or $\frac{1}{5}$ of the cost; then the cost was 5 times $\$12 = \$60$. It took as many barrels of flour to pay for the horse as \$6 are contained times in \$60, which are 10.

23. Eighty-four is $\frac{7}{6}$ of 72, and 72 is 8 times 9.

25. Eight ninths of $81 = 72$, and $72 = \frac{9}{8}$ of 64.

26. Four sevenths of 35 are 20, and 20 is $\frac{5}{6}$ of 24. Three eighths of 16 are 6, and 24 is 4 times 6.

27. $\$17\frac{1}{2} = \$\frac{35}{2}$. $4\frac{3}{8}$ yd. $= \frac{35}{8}$ yd. $\frac{1}{8}$ of a yd. would cost $\frac{1}{35}$ of $\$\frac{35}{2}$, which is $\$\frac{1}{2}$; then $\frac{8}{8}$ of a yd. would cost $\$\frac{8}{2}$, or \$4.

33. In one week he would earn $\frac{1}{8}$ of \$72, which is \$9; in one day he would earn $\frac{1}{6}$ of \$9, which is $\$1\frac{1}{2}$.

37. One half of 20 years = 10 years, or $\frac{1}{5}$ of the father's age; then 5 times 10 years = 50 years, the father's age. $\frac{1}{10}$ of 50 years = 5 years, or the age of the youngest son.

38. \$21 = $\frac{7}{5}$ of the cost. $\frac{1}{5} = \frac{1}{7}$ of \$21, which is \$3. $\frac{5}{5} = \$15$, or the cost. At \$1 a bushel, it would take 15 bushels of corn to pay for it; at $\$\frac{1}{3}$, it would take 3 times 15 bushels, which is 45 bushels.

39. Three yards = $\frac{15}{5}$ yards. $\frac{15}{5}$ are 5 times $\frac{3}{5}$, and will cost 5 times $\$\frac{2}{3}$, which is $\$3\frac{1}{3}$.

41. One half of 12 = 6. 6 + 2 = 8. 8 is $\frac{1}{3}$ of 24.

44. Three fourths of 24 = 18. 18 — 6 = 12. 12 is $\frac{2}{3}$ of 18. 18 is 6 more than $\frac{2}{3}$ of itself.

50. Two fifths of 30 yards = 12 yards. He sold one yard for $\frac{1}{12}$ of \$48, which is \$4.

60. Three fifths of \$20 are \$12. Fourteen is $\frac{7}{9}$ of 18, and 2 times 18 are 36. Twelve is $\frac{1}{3}$ of 36.

79. Two fifths of 10 yards are 4 yards, and they cost $\frac{2}{5}$ of \$90, which is \$36. \$40 — \$36 = \$4, the gain on 4 yards, and on 1 yard the gain is \$1.

80. B gains in one day 23 miles less 18 miles, which are 5 miles. It will take as many days to gain 40 miles as 5 miles are contained times in 40 miles, which are 8.

81. The hound gains in one second 10 feet less 7 feet = 3 ft., or 1 yd.; then to gain 90 yards it will take 90 seconds, or $1\frac{1}{2}$ min. The hound runs 90 times 10 feet, which are 900 ft. = 300 yd. The hare runs 90 times 7 ft. = 630 feet, or 210 yd.

85. In one hour the cistern would lose 9 gallons less 6 gallons, which are 3 gallons; and it would take as many hours to empty the cistern as 3 gallons are contained times in 36 gallons, which are 12.

89. Such part of the journey as $2\frac{1}{4}$ days are of $3\frac{3}{8}$ days. $3\frac{3}{8} = \frac{27}{8}$. $2\frac{1}{4} = \frac{18}{8}$. $\frac{18}{8} = \frac{18}{27}$, or $\frac{2}{3}$, of $\frac{27}{8}$. He can therefore perform $\frac{2}{3}$ of the journey in $2\frac{1}{4}$ days.

90. In one day A can do $\frac{1}{2}$, B $\frac{1}{4}$, and C $\frac{1}{6}$; then all do the sum of $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{6}$, which is $\frac{11}{12}$, in one day. To do $\frac{12}{12}$, it will take as many days as $\frac{11}{12}$ are contained times in $\frac{12}{12}$, which are $1\frac{1}{11}$.

91. Twenty yards at \$4 per yard = \$80. 15 yards at \$3 per yard = \$45. \$80 + \$45 = \$125, or what I paid for 35 yards. I received for $\frac{6}{7}$, or 30 yards, \$3 per yard = \$90, and for $\frac{1}{7}$, or 5 yards, \$4 per yard = \$20. For all I received \$90 + \$20 = \$110. My loss on 35 yards was \$125 — \$110 = \$15, or $\$\frac{15}{35} = \$\frac{3}{7}$ per yard.

93. Three fourths of 6 miles are $4\frac{1}{2}$ miles. 6 miles less $4\frac{1}{2}$ miles = $1\frac{1}{2}$ miles, the distance B gains in one hour. To gain 36 miles, it will take as many hours as $1\frac{1}{2}$ miles are contained times in 36 miles, which are 24.

LESSON LIII.

1. Five bu. will cost 5 times 60 cents, which is \$3; 3 pk. will cost $\frac{3}{4}$ of 60 cents, which is 45 cents; then 5 bu. and 3 pk. will cost \$3.45.

2. Four gal. 2 qt. 1 pt. = 37 pt.; at 5 cents a pint, the milk will cost 37 times 5 cents, which is \$1.85.

4. One rod contains 198 in.; 2 yd. 2 ft. 3 in. = 99 in., or $\frac{1}{2}$ a rod; then $5\frac{1}{2}$ rods will cost $5\frac{1}{2}$ times \$12, which is \$66.

5. Twenty-six min. and 40 sec. = $\frac{4}{9}$ of an hour; 9 hours + $\frac{4}{9}$ hours = $9\frac{4}{9}$ hours. If it traveled 9 miles an hour, the distance is $9\frac{4}{9}$ times 9 miles = 85 miles.

8. Three tenths da. = $\frac{3}{10}$ of 24 hr., which is $7\frac{1}{5}$ hr.; $7\frac{1}{5}$ hr. + $\frac{2}{5}$ hr. = $7\frac{3}{5}$ hours.

9. One third rd. = $5\frac{1}{2}$ ft., or $5\frac{2}{4}$ ft.; $\frac{1}{2}$ yd. = $1\frac{1}{2}$ ft., or $1\frac{2}{4}$; then $5\frac{2}{4}$ ft. + $1\frac{2}{4}$ + $\frac{3}{4}$ ft. = $7\frac{3}{4}$ ft.

11. One bu. 3 pk. = 7 pk; 1 pk. is worth $\frac{1}{7}$ of 70 cents, which is 10 cents; 2 bu. 1 pk. = 9 pk.; and 4 qt. = $\frac{1}{2}$ pk.; then $9\frac{1}{2}$ pk. are worth $9\frac{1}{2}$ times 10 cents, which is 95 cents.

13. One third of a T. cost $\frac{1}{2}$ of \$8, which is \$4; 1 T. cost \$12; 1 cwt. cost $\frac{1}{20}$ of \$12, which is 60 ct.; 3 cwt. 75 lb. = $3\frac{3}{4}$ cwt.; then $3\frac{3}{4}$ cwt. cost $3\frac{3}{4}$ times 60 ct., which is \$2.25.

14. In 2 hr. 24 min. there are 144 min.; the rate per min. is $\frac{1}{144}$ of 60 miles = $\frac{60}{144}$ mi., or $\frac{5}{12}$ mi.; the rate per hr. is 60 times $\frac{5}{12}$ mi., which is $\frac{300}{12}$ mi. = 25 mi.

15. In 3 yd. 1 ft. 6 in. there are $3\frac{1}{2}$ yd.; in 1 rd. 5 yd. there are $10\frac{1}{2}$ yd.; the wheel would make as many revolutions in going $10\frac{1}{2}$ yd. as $3\frac{1}{2}$ yd. are contained times in $10\frac{1}{2}$ yd., which are 3.

17. I bought as many pounds as 40 ct. are contained times in 235 ct., which are $5\frac{7}{8}$; $\frac{7}{8}$ lb. = 14 oz. I bought 5 lb. 14 oz.

20. In 150 bu. are 6 T.; 6 T. will cost 6 times \$3.75, which is \$22.50; 1 bu. will cost $\frac{1}{25}$ of \$3.75, which is 15 ct.

21. The distance around the lot is 50 ft. + 100 ft. × 2 = 300 ft.; 300 ft. = 100 yd.; 100 yd. = $18\frac{2}{11}$ rd. If 1 rd. cost \$5, then $18\frac{2}{11}$ rd. cost $18\frac{2}{11}$ times \$5, which is $\$90\frac{10}{11}$.

LESSON LIV.

15. The entire cost was \$90 plus \$3 × 6 = \$108; the sum received for him was \$42 + \$99 = \$141; all gained \$141 — \$108 = \$33; each man received $\frac{1}{3}$ of \$33, which is \$11.

LESSON LV.

12. In 6 da. of 8 hr. each there are 48 hr.; in 7 da. of 9 hr. each there are 63 hr.; $\$9\frac{3}{5} = \$\frac{48}{5}$. In 1 hr. he would earn $\frac{1}{48}$ of $\$\frac{48}{5}$, which is $\$\frac{1}{5}$; in 63 hr., $\$\frac{63}{5} = \$12\frac{3}{5}$.

15. In $3\frac{1}{2}$ are $\frac{7}{2}$; $2\frac{1}{3} = \frac{7}{3}$. $\frac{1}{3}$ of the number is $\frac{1}{7}$ of $\frac{7}{2} = \frac{1}{2}$; then $\frac{3}{3} = \frac{3}{2}$, or $1\frac{1}{2}$. $1\frac{1}{2} \times 2\frac{1}{2} = \frac{3}{2} \times \frac{5}{2} = \frac{15}{4} = 3\frac{3}{4}$.

18. Two thirds of $\frac{6}{5} = \frac{4}{5}$. If $\frac{4}{5}$ are $\frac{2}{7}$, then $\frac{1}{7}$ is $\frac{1}{2}$ of $\frac{4}{5}$, which is $\frac{2}{5}$; and $\frac{7}{7}$ would be 7 times $\frac{2}{5}$, which is $\frac{14}{5} = 2\frac{4}{5}$.

22. Two thirds of $\frac{12}{5}$ are $\frac{8}{5}$. If $\frac{8}{5}$ are $\frac{1}{2}$, then $\frac{2}{2}$ are $\frac{16}{5}$; and 2 is contained in $\frac{16}{5}$, $\frac{8}{5}$ or $1\frac{3}{5}$ times.

25. Four fifths of 10 marbles are 8 marbles. If 8 is $\frac{8}{11}$, then $\frac{1}{11}$ is 1, and $\frac{11}{11}$ are 11.

26. Three fifths of 60 plums are 36 plums; $\frac{3}{4}$ of 36 are 27; $\frac{4}{9}$ of 27 are 12, or what she gave away. She had left $36 - 12 = 24$.

27. Five sevenths of the distance is 35 mi.; then $\frac{1}{7}$ is 7 mi., and $\frac{2}{7}$ are 14 mi.; $\frac{3}{7}$ of 14 mi. $= 6$ mi.; 14 mi. $- 6$ mi. $= 8$ mi.

30. Seven sevenths less $\frac{2}{7} = \frac{5}{7}$; $\frac{2}{5}$ of $\frac{5}{7} = \frac{2}{7}$; $\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$, the part she had left. $\frac{3}{7} = 6$, $\frac{1}{7} = 2$, $\frac{7}{7} = 14$.

31. Two thirds of 12 ct. are 8 ct If 8 is $\frac{1}{2}$, then $\frac{2}{2}$ are 16; if 16 ct. are $\frac{4}{5}$ of William's money, then William has 20 ct.

32. If $\frac{1}{2}$ of B's money equals $\frac{2}{7}$ of A's, then all of B's money $= \frac{4}{7}$ of A's; $\frac{7}{7} - \frac{4}{7} = \frac{3}{7}$, the difference between A's and B's money; $\frac{3}{7} = 12$ ct., $\frac{1}{7} = 4$ ct., $\frac{7}{7} = 28$ ct., A's money; 28 ct. $- 12$ ct. $= 16$ ct., B's.

33. One third $= \frac{4}{12}$, $\frac{1}{4} = \frac{3}{12}$; $\frac{4}{12} + \frac{3}{12} + \frac{1}{12} = \frac{8}{12} = \frac{2}{3}$; then $32 = \frac{1}{3}$; $\frac{3}{3} = 96$, the number of trees in the orchard. $\frac{1}{3}$ of $96 = 32$; $\frac{1}{4}$ of $96 = 24$; $\frac{1}{12}$ of $96 = 8$.

34. If $\frac{2}{9}$ are pear-trees, $\frac{7}{9}$ must be apple-trees. The excess of apple-trees is therefore $\frac{5}{9}$ of the whole; 25 is then $\frac{5}{9}$ of the whole; $\frac{2}{9}$, or the pear-trees, $= 10$, and $\frac{7}{9}$, or the apple-trees, $= 35$.

LESSON LVI.

3. If the second is three times the first, then the whole number is four times the first. Therefore, the first is $\frac{1}{4}$ of $16 = 4$, and the second $4 \times 3 = 12$.

5. The whole number will be six times the first part; then the first part $= \frac{1}{6}$, the second $\frac{2}{6}$, the third $\frac{3}{6}$, or 4, 8, and 12, respectively.

10. The difference of the two numbers is $6 + 2 = 8$; the sum of 8, the difference, and 4, one of the numbers, $= 12$, the other number.

11. The sum of 19 and 6 is 25; $25 - 10 = 15$, the difference between the numbers; then $19 - 15 = 4$, the smaller number.

12. The sum of the numbers is $10 + 8 = 18$; $18 - 5 = 13$, the other number.

18. They had at first 32 ct. $-$ 8 ct. $=$ 24 ct.; each had $\frac{1}{2}$ of 24 ct. $=$ 12 ct. If Thomas found 8 more, he had 12 ct. $+$ 8 ct. $=$ 20 ct.

19. They bought 4 peaches $+$ 6 peaches $+$ 20 peaches $=$ 30 peaches; each one bought $\frac{1}{2}$ of 30 peaches, which is 15 peaches. Thomas had left $15 - 4 = 11$; William had left $15 - 6 = 9$.

20. Both bought 24 cherries $+$ 7 cherries $+$ 5 cherries $=$ 36 cherries. Since Mary bought twice as many as Sarah, both bought three times as many as Sarah; there-

fore Sarah bought $\frac{1}{3}$ of 36 cherries = 12 cherries, and Mary bought 2 times 12 cherries = 24 cherries; 24 — 7 = 17, the number of cherries Mary had left; 12 — 5 = 7, the number Sarah had left.

21. Three times the number is 50 — 5 = 45; $\frac{1}{3}$ of 45 is 15, the number.

22. Three fourths of the number would be 31 — 10 = 21; $\frac{1}{4}$ would be $\frac{1}{3}$ of 21 = 7; $\frac{4}{4}$, or the number, would be 28.

23. Four fifths of the number would be 21 + 7 = 28; then $\frac{1}{5}$ is $\frac{1}{4}$ of 28 = 7, and $\frac{5}{5}$ = 35.

25. Since Sarah has 3 cents less than Mary, she has only 5 cents more than Jane. Three times Jane's money is 43 ct. — 8 ct. — 5 ct. = 30 ct.; then Jane's money is $\frac{1}{3}$ of 30 ct. = 10 ct.; Mary's is 10 ct. + 8 ct. = 18 ct.; Sarah's is 10 ct. + 5 ct. = 15 ct.

26. Three times Frank's age = 42 yr. + 3 yr., which is 45 yr.; then Frank's age is $\frac{1}{3}$ of 45 yr. = 15 yr. Mary's age is 2 times 15 yr. less 3 yr. = 27 yr.

27. The ring cost \$5 and the watch \$12 more than the chain; then \$62 — \$12 — \$5 = \$45, which is 3 times the cost of the chain; $\frac{1}{3}$ of \$45 = \$15, the cost of the chain; \$15 + \$5 = \$20, cost of the ring; and \$15 + \$12 = \$27, cost of the watch.

28. One half of $\frac{4}{7}$ is $\frac{2}{7}$. If 30 + 6, or 36, is $\frac{2}{7}$, then $\frac{1}{7}$ is 18, and $\frac{7}{7}$ are 7 times 18 = 126.

29. James has one part; John has two parts + \$3; Frank has three parts + \$3 + \$7; \$55 — \$3 — \$3 — \$7 = \$42, which is 6 times James's money. $\frac{1}{6}$ of \$42 is \$7, James's money; 2 times \$7, + \$3 = \$17, John's money; and 3 times \$7, + \$3, + \$7 = \$31, Frank's.

30. Thomas has 1 part; Joseph has 3 parts less \$2; Paul has 8 parts less \$4 less \$20; then \$20 + \$4 + \$2 + \$22 equal \$48, which is 12 times Thomas's money. $\frac{1}{12}$ of \$48 is \$4, Thomas's money; 3 times \$4, — \$2 = \$10; Joseph's money; 8 times \$4, — \$24 = \$8, Paul's money.

31. The harness cost 1 part; the horse, 1 part + \$50; the buggy, 2 parts + \$50 + \$25; then \$225 — \$50 — \$50 — \$25 = \$100, which is 4 times the cost of the harness. $\frac{1}{4}$ of \$100 is \$25, cost of harness; \$25 + \$50 = \$75, cost of horse; 2 times \$25 + \$75 = \$125, cost of buggy.

LESSON LVII.

2. Both have to pay $\frac{3}{7} + \frac{7}{7} = \frac{10}{7}$; $\frac{1}{7}$ is $\frac{1}{10}$ of \$60 = \$6. John pays 3 times \$6 = \$18; Thomas pays 7 times \$6 = \$42.

3. Four fourths + $\frac{3}{4} = \frac{7}{4}$; $\frac{1}{4}$ is $\frac{1}{7}$ of 56 mi. = 8 mi.; $\frac{4}{4}$ are 32 mi., and $\frac{3}{4}$ are 24 mi., the distance traveled each day, respectively.

4. Since the first, plus $\frac{5}{7}$ of the first, less 8 (that is $\frac{12}{7}$ of the first less 8), = 100, then $\frac{12}{7}$ of the first = 108; $\frac{1}{7}$ is $\frac{1}{12}$ of 108 = 9; $\frac{7}{7} = 63$, the first; $\frac{5}{7} = 45$, and 45 less 8 = 37, the second.

5. Four fourths $+ \frac{2}{4} + \frac{3}{4} = \frac{9}{4}$, or 45; $\frac{1}{4}$ is $\frac{1}{9}$ of $45 = 5$. $\frac{4}{4} = 20$, the first part; $\frac{2}{4} = 10$, the second part; $\frac{3}{4} = 15$, the third part.

10. If $\frac{1}{2}$ of the cows $= \frac{2}{7}$ of the sheep, then all of the cows $= \frac{4}{7}$ of the sheep, and $1 + \frac{4}{7} = \frac{11}{7}$ of the sheep; $\frac{1}{7}$ of the sheep is $\frac{1}{11}$ of $55 = 5$; $\frac{7}{7} = 35$, the number of sheep; $\frac{4}{7} = 20$, the number of cows.

11. If $\frac{1}{3}$ of the less $= \frac{2}{9}$ of the greater, $\frac{3}{3}$, or the whole of the less, $= 3$ times $\frac{2}{9}$, which is $\frac{6}{9} = \frac{2}{3}$; then $\frac{3}{3} + \frac{2}{3} = 60$; $\frac{1}{3}$ is $\frac{1}{5}$ of $60 = 12$; $\frac{3}{3} = 36$, the greater number; $\frac{2}{3} = 24$, the smaller number.

12. If $\frac{1}{4}$ of Mary's age $= \frac{1}{3}$ of Sarah's, $\frac{4}{4}$ of Mary's age $= \frac{4}{3}$ of Sarah's; $\frac{4}{3} + \frac{3}{3} = \frac{7}{3}$; $\frac{1}{3}$ of Sarah's age is $\frac{1}{7}$ of $14 = 2$; $\frac{3}{3} = 6$, Sarah's age; $\frac{4}{3} = 8$, Mary's age.

13. If $\frac{2}{3}$ of the first $= \frac{3}{4}$ of the second, $\frac{1}{3}$ is $\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8}$, and $\frac{3}{3}$, or the whole of the first, $= \frac{9}{8}$ of the second. If the first is $\frac{9}{8}$ of the second, and the second $\frac{8}{8}$, both $= \frac{17}{8}$ of the second. $\frac{1}{8}$ is $\frac{1}{17}$ of $51 = 3$; $\frac{9}{8} = 27$, the first part; $\frac{8}{8} = 24$, the second.

14. If $\frac{2}{3}$ of the apple-trees $= \frac{4}{7}$ of the peach-trees, $\frac{1}{3} = \frac{2}{7}$, and $\frac{3}{3} = \frac{6}{7}$; $\frac{3}{3} = \frac{7}{7}$; then $\frac{7}{7}$ of the peach-trees $+ \frac{6}{7}$ of the peach-trees $= \frac{13}{7}$ of the peach-trees, and $\frac{1}{7}$ is $\frac{1}{13}$ of 65 trees $= 5$ trees. $\frac{7}{7} = 35$, the number of peach-trees; $\frac{6}{7} = 30$, the number of apple-trees.

15. If $\frac{2}{3}$ of A's distance $= \frac{5}{9}$ of B's, then $\frac{1}{3} = \frac{5}{18}$, and $\frac{3}{3} = \frac{15}{18}$, or $\frac{5}{6}$; then A travels $\frac{5}{6}$ as far as B, and both traveled $\frac{5}{6} + \frac{6}{6} = \frac{11}{6}$, or 66 miles. $\frac{1}{6}$ is $\frac{1}{11}$ of 66 mi. $= 6$ mi.; $\frac{6}{6} = 36$ mi., B's distance; $\frac{5}{6} = 30$ mi., A's distance; and 36 mi. $- 30$ mi. $= 6$ mi., the number of miles B traveled more than A.

16. Let $\frac{12}{12}$ = the apple-trees; $\frac{4}{12}$ = the plum-trees; $\frac{1}{2}$ of $\frac{12}{12} + \frac{1}{4}$ of $\frac{4}{12} = \frac{7}{12}$, the cherry-trees; then $\frac{12}{12} + \frac{4}{12} + \frac{7}{12} = \frac{23}{12}$, or 69 trees. $\frac{1}{12}$ is $\frac{1}{23}$ of $69 = 3$; $\frac{12}{12} = 36$, the number of apple-trees; $\frac{4}{12} = 12$, the plum-trees; and $\frac{7}{12} = 21$, the cherry-trees.

17. Five thirds of 12 yr. are 20 yr. If 20 yr. are $\frac{4}{9}$ of both Jane's and Sarah's age, $\frac{1}{9}$ is 5 yr., and $\frac{9}{9}$ are 45 yr. If Jane's age is $\frac{7}{8}$ of Sarah's, then $\frac{8}{8} + \frac{7}{8} = \frac{15}{8}$, and $\frac{15}{8} =$ 45 yr.; $\frac{1}{8} = 3$ yr., and $\frac{8}{8} = 24$ yr., Sarah's age; $\frac{7}{8} = 21$ yr., Jane's age.

18. Three elevenths of 44 are 12; $\frac{4}{5}$ of 30 is 24; 24 is $\frac{4}{9}$ of 54; twice 54 are 108; 12 is contained in 108 nine times.

19. John's money is $\frac{3}{5}$, and Charles's $\frac{5}{5}$, or $\frac{20}{20}$; $\frac{3}{4}$ of $\frac{3}{5}$ $= \frac{9}{20}$, and $\frac{9}{20} + \$33 = \frac{20}{20}$, Charles's money; then $\frac{11}{20} =$ \$33. $\frac{1}{20} = \$3$, and $\frac{20}{20} = \$60$, Charles's money; $\frac{3}{5}$ of \$60 $=$ \$36, John's money.

20. Let $\frac{12}{12}$ = the hogs; then $\frac{8}{12}$ = the sheep, and $\frac{6}{12}$ the cows; $\frac{12}{12} + \frac{8}{12} + \frac{6}{12} = \frac{26}{12}$, and $\frac{26}{12} = 104$; $\frac{1}{12} = 4$. $\frac{12}{12} = 48$, the hogs; $\frac{8}{12} = 32$, the sheep; and $\frac{6}{12} = 24$, the cows.

22. From noon to midnight is 12 hr. If the time elapsed since noon is $\frac{3}{5}$ of the time to midnight, then it is still $\frac{5}{5}$ to midnight; $\frac{3}{5} + \frac{5}{5} = \frac{8}{5}$, and $\frac{8}{5} = 12$ hr; $\frac{1}{5}$ is $\frac{1}{8}$ of 12 hr. $= 1\frac{1}{2}$ hr.; $\frac{3}{5} = 4\frac{1}{2}$ hr. Therefore it is half-past four o'clock, P. M.

23. Since once the time past noon + 3 hr. is $\frac{1}{2}$ the time to midnight, twice the time past noon + 6 hr. = the whole time to midnight; but the time past noon +

the time to midnight is 12 hr.; hence the time past noon, with twice the time past noon + 6 hr. = 12 hr.; hence 3 times the time past noon is 6 hr., and the time past noon is $\frac{1}{3}$ of 6 hr. = 2 hr.

24. Let $\frac{5}{5}$ = the whole time; the time past noon is $\frac{1}{5}$; from midnight to noon is $\frac{4}{5}$; then $\frac{4}{5}$ = 12 hr; $\frac{1}{5}$ = 3 hr. It is 3 o'clock in the afternoon.

25. Let $\frac{4}{4}$ = the whole time; from midnight to noon is $\frac{3}{4}$; the time past noon = $\frac{1}{4}$; $\frac{3}{4}$ = 12 hr.; $\frac{1}{4}$ = 4 hr. It is 4 o'clock in the afternoon.

26. If $\frac{1}{2}$ the time past noon = $\frac{1}{20}$ of the time past midnight, the whole time past noon = $\frac{1}{10}$ the time past midnight; $\frac{10}{10}$ = the whole time; $\frac{1}{10}$ = the time past noon; $\frac{9}{10}$ = the time from midnight to noon, or 12 hr.; $\frac{1}{10}$ = $1\frac{1}{3}$ hr. It is 20 min. past one o'clock P. M.

LESSON LVIII.

2. One + $\frac{2}{3}$ = $\frac{5}{3}$; $\frac{1}{3}$ is $\frac{1}{5}$ of 20 = 4; $\frac{3}{3}$ = 12, the number.

4. Twice the number is $\frac{10}{5}$, and $\frac{10}{5} + \frac{3}{5} = \frac{13}{5}$. If $\frac{13}{5}$ = 52, then $\frac{1}{5}$ is $\frac{1}{13}$ of 52 = 4, and $\frac{5}{5}$ = 20, the number.

5. Twice the number is $\frac{14}{7}$, and $\frac{14}{7}$ less $\frac{4}{7} = \frac{10}{7}$. If $\frac{10}{7}$ = 40, then $\frac{1}{7}$ is $\frac{1}{10}$ of 40, which is 4, and $\frac{7}{7}$ = 28.

6. Let $\frac{5}{5}$ = the number; 3 times $\frac{5}{5}$ less $\frac{3}{5} = \frac{12}{5}$. If $\frac{12}{5}$ = 48, then $\frac{1}{5}$ is $\frac{1}{12}$ of 48 = 4, and $\frac{5}{5}$ = 20.

7. Let $\frac{6}{6}$ = his age; then $\frac{6}{6} + \frac{3}{6} + \frac{4}{6} = \frac{13}{6}$. If 26 = $\frac{13}{6}$, then $\frac{1}{6}$ = 2, and $\frac{6}{6}$ = 12.

8. Her age $= \frac{12}{12}$, and $\frac{12}{12} + \frac{4}{12} + \frac{3}{12} = \frac{19}{12}$; twice her age is $\frac{24}{12}$, and $\frac{24}{12} - \frac{19}{12} = \frac{5}{12}$; ten years $= \frac{5}{12}$, and $\frac{1}{12} =$ 2 years; then $\frac{12}{12}$, her age, is 24 years.

9. Five fifths less $\frac{2}{5} = \frac{3}{5}$; $\frac{3}{5}$ are 30 cents, then $\frac{5}{5}$ are 50 cents.

10. Let $\frac{10}{10}$ = the number; $\frac{10}{10} + \frac{5}{10} + \frac{6}{10} = \frac{21}{10}$; three times the number is $\frac{30}{10}$; $\frac{30}{10} - \frac{21}{10} = \frac{9}{10}$; $27 = \frac{9}{10}$; $\frac{1}{10} =$ 3; $\frac{10}{10} = 30$.

11. Let $\frac{11}{11}$ = the father's age; $\frac{11}{11} - \frac{3}{11} = \frac{8}{11}$; $\frac{8}{11} = 40$ yr.; $\frac{1}{11} = 5$ yr.; $\frac{11}{11} = 55$ yr.

12. Let $\frac{5}{5}$ = her age; $\frac{5}{5} + \frac{4}{5} = \frac{9}{5}$; three times her age is $\frac{15}{5}$; $\frac{15}{5} - \frac{9}{5} = \frac{6}{5}$; 18 yr. $= \frac{6}{5}$; $\frac{1}{5} = 3$ yr.; $\frac{5}{5} = 15$ yr.

13. Let $\frac{9}{9}$ = the whole length; then $\frac{9}{9} - \frac{2}{9} = \frac{7}{9}$; $\frac{7}{9} =$ 28 yd.; $\frac{1}{9} = 4$ yd.; $\frac{9}{9} = 36$ yd.

14. Let $\frac{3}{6}$ = the distance from A to B, and $\frac{6}{6}$ the distance from C to D; $\frac{2}{3}$ of $\frac{3}{6}$ are $\frac{6}{18} = \frac{2}{6}$. $\frac{2}{6} + 20 = \frac{6}{6}$; then $20 = \frac{4}{6}$; $\frac{1}{6} = 5$; $\frac{6}{6} = 30$, the distance from C to D; $\frac{3}{6} =$ 15, the distance from A to B.

15. Let $\frac{15}{15}$ = my age; $\frac{15}{15} + \frac{5}{15} + \frac{3}{15} = \frac{23}{15}$; $\frac{2}{3}$ of 69 years = 46 years; $\frac{23}{15} = 46$ years; $\frac{1}{15} = 2$ years; $\frac{15}{15} = 30$ years.

LESSON LIX.

4. As many lots as $\frac{3}{8}$ are contained times in $\frac{8}{8}$, which are $2\frac{2}{3}$.

5. In $2\frac{1}{2}$ days are $\frac{5}{2}$ days; in $\frac{1}{2}$ day he would do $\frac{1}{5}$ of the work; in 1 day he would do $\frac{2}{5}$ of the work.

7. In $3\frac{1}{3}$ days are $\frac{10}{3}$ days. In $\frac{1}{3}$ of a day he would walk $\frac{1}{10}$; in 1 day, $\frac{3}{10}$; in 2 days, $\frac{6}{10} = \frac{3}{5}$.

8. Both do $\frac{1}{2} + \frac{1}{4}$, which are $\frac{3}{4}$.

9. All do the sum of $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{5}$, which is $\frac{19}{20}$.

11. A digs $\frac{1}{6}$ in 1 day; B digs $\frac{1}{12}$ in 1 day; both dig $\frac{3}{12} = \frac{1}{4}$ in 1 day. If they dig $\frac{1}{4}$ in 1 day, it will take 4 days to dig the whole trench.

12. C does $\frac{1}{5}$ in 1 day; B does $\frac{1}{7}$ in 1 day; both do $\frac{12}{35}$ in 1 day. It will take as many days to do it all as $\frac{12}{35}$ are contained times in $\frac{35}{35}$, which are $2\frac{11}{12}$

13. A can do $\frac{1}{2}$ in 1 day, B $\frac{1}{3}$, and C $\frac{1}{6}$; all do in 1 day the sum of $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{6}$, which is $\frac{6}{6}$. Therefore, all three do it in 1 day.

15. Both drink $\frac{1}{12}$ in 1 day; the woman drinks $\frac{1}{30}$ in 1 day; the man drinks $\frac{1}{12} - \frac{1}{30} = \frac{1}{20}$ in 1 day. If he drink $\frac{1}{20}$ in 1 day, he would drink it all in 20 days.

16. All do $\frac{1}{4}$ in 1 day; A and B do $\frac{1}{8} + \frac{1}{12} = \frac{5}{24}$ in 1 day; C does in 1 day $\frac{1}{4} - \frac{5}{24} = \frac{1}{24}$. Therefore, C can reap it all in 24 days.

17. Both do in 1 day $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$. If they do $\frac{5}{6}$ in 1 day, they would do it all in $1\frac{1}{5}$ days.

18. A digs $\frac{2}{5}$ in 1 day, and B digs $\frac{3}{10}$ in 1 day; both dig $\frac{2}{5} + \frac{3}{10} = \frac{7}{10}$ in 1 day. Therefore, if they dig $\frac{7}{10}$ in 1 day, they would dig it all in $1\frac{3}{7}$ days.

19. C reaps $\frac{1}{5}$ in 1 day; D reaps $\frac{3}{10}$ in 1 day; both reap in 1 day $\frac{1}{5} + \frac{3}{10} = \frac{5}{10} = \frac{1}{2}$. If they reap $\frac{1}{2}$ in 1 day, they would reap the whole in 2 days.

LESSON LX.

8. The ratio of 21 to 7 is 3; $36 \div 3 = 12$, the number.

9. The ratio of 20 to 2 is 10; $10 - 5 = 5$, 5 is $\frac{1}{4}$ of 20, and 20 is the ratio of 40 to 2.

10. The ratio of 18 to 2 is $9, +3 = 12, +7 = 19$; and 19 is the ratio of 38 to 2.

11. The ratio of 27 to 9 is $3, +5 = 8$; and 8 is the ratio of 20 to $2\frac{1}{2}$.

13. Five $+ 7 = 12$; $\frac{5}{12}$ of $48 = 20$, the first part; $\frac{7}{12}$ of $48 = 28$, the second part.

18. Once the number $+ 3$ times the number $= 4$ times the number, or 48; and $\frac{1}{4}$ of 48 is 12, the number.

19. One $+ 4 = 5$; the first is $\frac{1}{5}$ of 25 yd. $= 5$ yd.; the second is $\frac{4}{5} = 20$ yd.

22. The first has $\frac{2}{3}$ of $7\frac{1}{2}$ doz. $= 5$ doz.; the second has $\frac{1}{3}$ of $7\frac{1}{2}$ doz. $= 2\frac{1}{2}$ doz.

23. A paid $\frac{25}{40} = \frac{5}{8}$ of the cost, and B paid $\frac{15}{40} = \frac{3}{8}$ of the cost. A should receive $\frac{5}{8}$ of $\$56 = \$35$, and B should receive $\frac{3}{8}$ of $\$56 = \$21$.

24. Three $+ 2 = 5$. C's loss was $\frac{3}{5}$ of $\$30 = \$18$; D's loss was $\frac{2}{5}$ of $\$30 = \$12$.

LESSON LXI.

3. Three thirds $+ \frac{4}{3} = \frac{7}{3}$. A has $\frac{3}{7}$ of 14 ct. $= 6$ ct.; B has $\frac{4}{7}$ of 14 ct. $= 8$ ct.

5. In $2\frac{1}{2}$ are $\frac{5}{2}$, and $4\frac{1}{2} = \frac{9}{2}$; $\frac{5}{2} + \frac{9}{2} = \frac{14}{2}$. The first would receive $\frac{5}{14}$ of \$28 $=$ \$10; the second would receive $\frac{9}{14}$ of \$28 $=$ \$18.

6. Three thirds $+ \frac{5}{3} = \frac{8}{3}$. William's age is $\frac{5}{8}$ of 32 yr. $= 20$ yr.; Frank's age is $\frac{3}{8}$ of 32 yr. $= 12$ yr.

7. Three thirds $+ \frac{7}{3} = \frac{10}{3}$. $\frac{7}{10}$ of 30 apples $= 21$ apples, the number of sound ones; $\frac{3}{10}$ of 30 apples $= 9$ apples, the number not sound.

8. Four fifths $+ \frac{5}{5} = \frac{9}{5}$. One built $\frac{4}{9}$ of 27 ft. $= 12$ ft.; the other, $\frac{5}{9} = 15$ ft.

10. One $+ 2 + 3 + 4 = 10$. The first part is $\frac{1}{10}$ of 70 $= 7$; the second, $\frac{2}{10}$ of $70 = 14$; the third, $\frac{3}{10}$ of $70 = 21$; the fourth, $\frac{4}{10}$ of $70 = 28$.

11. One half $= \frac{6}{12}$; $\frac{1}{3} = \frac{4}{12}$; $\frac{1}{4} = \frac{3}{12}$; and $\frac{6}{12} + \frac{4}{12} + \frac{3}{12} = \frac{13}{12}$. The first is $\frac{6}{13}$ of $39 = 18$; the second, $\frac{4}{13} = 12$; the third is $\frac{3}{13} = 9$.

12. All had 3 ct. $+ 4$ ct. $+ 5$ ct. $= 12$ ct. William's share, $\frac{3}{12}$ of 36, $= 9$; Thomas's, $\frac{4}{12}$ of 36, $= 12$; John's, $\frac{5}{12}$ of 36, $= 15$.

13. The whole loss was \$864 — \$500 $=$ \$364; $\frac{1}{8}$ of \$364 is $\$45\frac{1}{2}$, A's loss; $\frac{1}{4}$ of \$364 is \$91, B's loss; $\frac{5}{8}$ of \$364 are $\$227\frac{1}{2}$, C's loss.

14. A has $\frac{4}{4}$, B $\frac{2}{4}$, and C $\frac{1}{4}$; all have $\frac{4}{4} + \frac{2}{4} + \frac{1}{4} = \frac{7}{4}$. A has $\frac{4}{7}$ of \$42 = \$24; B has $\frac{2}{4}$ of \$24 = \$12; and C has $\frac{1}{4}$ of \$24 = \$6.

15. Four + 3 + 2 = 9. A has $\frac{4}{9}$, B $\frac{3}{9}$, and C $\frac{2}{9}$, or 20, 15, and 10, respectively.

16. One + 3 + 6 = 10. $\frac{1}{10}$ of 60 = 6, the horses; $\frac{3}{10}$ of 60 = 18, the cows; $\frac{6}{10}$ of 60 = 36, the sheep.

17. One + 2 + 3 = 6. A has $\frac{1}{6}$ of 42 = 7; B, $\frac{2}{6}$ = 14; C, $\frac{3}{6}$ = 21.

18. One + 2 + 4 = 7. Emma has $\frac{1}{7}$ of 35 = 5; Agnes has $\frac{2}{7}$ of 35 = 10; Sarah has $\frac{4}{7}$, = 20.

LESSON LXII.

2. It will take 15 times 8 men = 120 men to do the work in 1 day; to do it in 12 days it will take $\frac{1}{12}$ of 120 men = 10 men.

4. One will fill it in 9 times $2\frac{1}{2}$ hr. = $22\frac{1}{2}$ hr.; then 5 pipes will fill it in $\frac{1}{5}$ of $22\frac{1}{2}$ hr. = $4\frac{1}{2}$ hr

6. Fifteen ct. = $\$\frac{3}{20}$; 80 times $\$\frac{3}{20} = \$\frac{240}{20} = \$12$.

7. Sixty ct. = $\$\frac{3}{5}$; 80 times $\$\frac{3}{5} = \$\frac{240}{5} = \$48$.

10. It will make 3 times 20 = 60 one cent loaves. $\frac{1}{4}$ of 60 = 15 four cent loaves; $\frac{1}{5}$ of 60 = 12 five cent loaves.

11. A loaf will weigh 3 times 8 oz. = 24 oz., when flour is \$1 a barrel; it will weigh $\frac{1}{4}$ of 24 oz. = 6 oz., when flour is \$4 a barrel.

12. Six times 10 oz. = 60 oz.; $\frac{1}{5}$ of 60 oz. = 12 oz.

13. In $\$5\frac{1}{3}$ are $\$\frac{16}{3}$; $\frac{16}{3}$ times 7 oz. = $\frac{112}{3}$ oz.; $\$4\frac{2}{3} = \$\frac{14}{3}$. When flour is worth $\$4\frac{2}{3}$ a barrel, a loaf will weigh as many oz. as $\frac{14}{3}$ are contained times in $\frac{112}{3} = 8$.

14. It will take 5 times 5 men = 25 men to do the same work in $\frac{1}{5}$ of the time; to do twice as much will take 2 times 25 men = 50 men.

15. Six men will do $\frac{1}{2}$ of it in $\frac{1}{2}$ of 5 days = $2\frac{1}{2}$ days; one man will do the other $\frac{1}{2}$ in 6 times $2\frac{1}{2}$ days = 15 days. 6 + 3 = 9; 9 men will do it in $\frac{1}{9}$ of 15 days = $1\frac{2}{3}$ days. Therefore, the whole time is $2\frac{1}{2}$ days + $1\frac{2}{3}$ days = $4\frac{1}{6}$ days.

16. Seven men will do $\frac{1}{2}$ of the work in 2 days; one man will do the other half in 7 times 2 days = 14 days. 7 — 3 = 4; 4 men will do it in $\frac{1}{4}$ of 14 days = $3\frac{1}{2}$ days. Therefore, it will take 2 days + $3\frac{1}{2}$ days = $5\frac{1}{2}$ days to do the whole work.

18. One man would spend $\frac{1}{6}$ of \$36 = \$6 in 8 days; in 1 day he would spend $\frac{1}{8}$ of \$6 = $\$\frac{6}{8}$. 5 persons would spend 5 times $\$\frac{6}{8} = \$\frac{30}{8}$ in 1 day; in 12 days, 12 times $\$\frac{30}{8} = \$\frac{360}{8} = \$45$.

19. One third of 12 rd. is 4 rd; $\frac{1}{8}$ of 4 rd. is $\frac{4}{8}$ rd. = $\frac{1}{2}$ rd; 5 times $\frac{1}{2}$ rd. = $\frac{5}{2}$ rd.; 3 times $\frac{5}{2}$ rd. = $\frac{15}{2}$ rd. = $7\frac{1}{2}$ rd.

20. One sixth of 36 bu. = 6 bu.; $\frac{1}{10}$ of 6 bu. = $\frac{3}{5}$ bu.; 5 times $\frac{3}{5}$ bu. = $\frac{15}{5}$ bu.; 9 times $\frac{15}{5}$ bu. = $\frac{135}{5}$ bu. = 27 bu.

21. One ox will eat 2 A. in 5 times 6 days = 30 days; one ox will eat 8 A. in 4 times 30 days = 120 days; 12 oxen will eat 8 A. in $\frac{1}{12}$ of 120 days = 10 days.

22. One person would spend $\frac{1}{8}$ of \$400 = \$50 in 5 months; in 1 month he would spend $\frac{1}{5}$ of \$50 = \$10; in 8 mo. 1 person would spend 8 times \$10 = \$80, and 11 persons would spend 11 times \$80 = \$880.

23. One ox can be kept on $\frac{1}{10}$ of 5 A. = $\frac{1}{2}$ A. for 3 mo.; one ox can be kept 1 mo. on $\frac{1}{3}$ of $\frac{1}{2}$ A. = $\frac{1}{6}$ A.; for 5 mo. on 5 time $\frac{1}{6}$ A. = $\frac{5}{6}$ A. 15 A. = $\frac{90}{6}$ A., and $\frac{90}{6}$ A. will keep as many oxen as $\frac{5}{6}$ are contained times in $\frac{90}{6}$ = 18. If 7 sheep eat as much as an ox, it will keep 18 times 7 sheep = 126 sheep.

LESSON LXIII.

2. One horse eats as much as $1\frac{1}{2}$ cows, and 14 horses eat as much as 21 cows; 15 cows + 21 cows = 36 cows. A pays $\frac{21}{36} = \frac{7}{12}$ of \$60 = \$35; B pays $\frac{15}{36} = \frac{5}{12}$ of \$60 = \$25.

3. B's 120 sheep = 6 horses; his 15 oxen = 10 horses; then B has the same as 6 horses + 10 horses = 16 horses. Both have 16 horses + 8 horses = 24 horses. A pays $\frac{8}{24}$, or $\frac{1}{3}$, of \$72 = \$24; B pays $\frac{2}{3}$ of \$72 = \$48.

5. C's \$50 for 4 mo. = \$200 for 1 mo.; D's \$60 for 5 mo. = \$300 for 1 mo.; \$200 + \$300 = \$500. C has $\frac{2}{5}$ of \$45 = \$18; D has $\frac{3}{5}$ of \$45 = \$27.

6. Three men for 4 days = 12 men 1 day; 5 men 3 days = 15 men 1 day; 12 men + 15 men = 27 men. A receives $\frac{4}{9}$ of \$81 = \$36; B receives $\frac{5}{9}$ of \$81 = \$45.

7. A's \$2 for 5 mo. = \$10 for 1 mo.; B's \$3 for 4 mo. = \$12 for 1 mo.; \$10 + \$12 = \$22. A receives $\frac{5}{11}$ of \$55 = \$25; B, $\frac{6}{11}$ = \$30.

8. E's 4 horses = 6 cows; 6 cows for 5 mo. = 30 cows 1 mo.; F's 10 cows for 6 mo. = 60 cows 1 mo.; 30 cows + 60 cows = 90 cows. E pays $\frac{1}{3}$ of \$27 = \$9; F pays $\frac{2}{3}$ of \$27 = \$18.

9. The net gain is \$300 — \$150 = \$150; \$600 + \$900 = \$1500. M has $\frac{2}{5}$ of \$150 = \$60; N has $\frac{3}{5}$ of \$150 = \$90.

10. C's capital = \$600 for 12 mo., or \$7200 for 1 mo.; D's = \$600 for 8 mo., or \$4800 for 1 mo.; \$7200 + \$4800 = \$12000. C has $\frac{72}{120} = \frac{3}{5}$ of \$250 = \$150; D has $\frac{48}{120} = \frac{2}{5}$ of \$250 = \$100.

11. E had \$1000 for 12 mo. = \$12000 for 1 mo.; F had \$3000 for 12 mo. = \$36000 for 1 mo., less \$1000 for 4 mo. = \$4000 for 1 mo., and \$36000 — \$4000 = \$32000; \$32000 + \$12000 = \$44000. E has $\frac{3}{11}$ of \$770 = \$210; F has $\frac{8}{11}$ of \$770 = \$560.

12. \$240 — \$20 = \$220; B's share is $\frac{1}{2}$ of \$220 = \$110; A's share is \$110 + \$20 = \$130. B has $\frac{110}{240} = \frac{11}{24}$ of the gain, and also $\frac{11}{24}$ of the capital, \$2400, = \$1100; A has $\frac{13}{24}$ of the gain, and also $\frac{13}{24}$ of \$2400, = \$1300.

13. Since D's time was only $\frac{3}{4}$ of C's, he must have had $\frac{1}{4}$ more capital than C; then $\frac{4}{4}$ = D's capital, and $\frac{3}{4}$ = C's capital; $\frac{4}{4} + \frac{3}{4} = \frac{7}{4}$, and $\frac{7}{4}$ = \$980. $\frac{1}{4} = \frac{1}{7}$ of \$980 = \$140; $\frac{4}{4}$ = \$560, D's capital; $\frac{3}{4}$ = \$420, C's capital.

14. A's gain per mo. was $\frac{1}{10}$ of \$70 = \$7; B's gain per mo. was $\frac{1}{8}$ of \$80 = \$10. Both gained \$7 + \$10 = \$17 per mo. If A has $\frac{7}{17}$ of the gain, his capital is $\frac{7}{17}$ of \$1700 = \$700; B's capital is $\frac{10}{17}$ of \$1700 = \$1000.

15. The ratio of their stock was as 2 to 3, and of the time as 10 to 12; $2 \times 10 = 20$; $3 \times 12 = 36$; $20 + 36 = 56$. E's gain was $\frac{5}{14}$ of \$840 = \$300; F's gain was $\frac{9}{14}$ of \$840 = \$540.

LESSON LXVII.

8. $\frac{30}{45} = \frac{2}{3} = 66\frac{2}{3}$ per cent.

9. He gains $\frac{5}{25} = \frac{1}{5}$, and $\frac{1}{5} = 20$ per cent.

14. He gains \$24 — \$15 = \$9; \$9 = $\frac{3}{5}$ of the cost, or 60 per cent.

15. In 5 gal. are 20 qt. He lost $\frac{6}{20} = \frac{3}{10} = 30$ per cent.

16. Six cents = $\frac{6}{5}$ of the cost; $\frac{5}{5} = 5$ cents, the cost; 8 ct. — 5 ct. = 3 ct.; $\frac{3}{5} = 60$ per cent.

17. He paid $\frac{1}{6}$ of \$3 = 50 cents for 1 yd.; he sold 1 yd. for $\frac{1}{5}$ of \$4 = 80 ct.; 80 ct. — 50 ct. = 30 ct.; $\frac{30}{50} = \frac{3}{5}$ = 60 per cent.

18. Eight ct. = $\frac{4}{5}$ of the cost; $\frac{5}{5} = 10$ ct., the cost. $\frac{1}{3}$ of 25 ct. = $8\frac{1}{3}$ ct.; $10 - 8\frac{1}{3} = 1\frac{2}{3} = \frac{1\frac{2}{3}}{10} = \frac{5}{30} = \frac{1}{6} = 16\frac{2}{3}$ per cent loss. $\frac{1}{2}$ of 25 ct. = $12\frac{1}{2} - 10 = 2\frac{1}{2}$; $\frac{2\frac{1}{2}}{10} = \frac{5}{20} = \frac{1}{4}$; $\frac{1}{4} = 25$ per cent gain.

19. One lemon cost $\frac{1}{2}$ of 3 ct. = $1\frac{1}{2}$ ct. He sold 1 lemon for $\frac{1}{3}$ of 2 ct. = $\frac{2}{3}$ ct. $1\frac{1}{2} = \frac{9}{6}$; $\frac{2}{3} = \frac{4}{6}$; $\frac{9}{6} - \frac{4}{6} = \frac{5}{6}$; $\frac{5}{6}$ are $\frac{5}{9}$ of $\frac{9}{6}$, and $\frac{5}{9} = 55\frac{5}{9}$ per cent.

LESSON LXVIII.

2. \$26 = 130 per cent of the cost, or $\frac{130}{10}$; $\frac{1}{10} = \frac{1}{13}$ of \$26 = \$2; $\frac{10}{10}$ = \$20, the cost.

3. Fourteen cents = $\frac{14}{10}$ of the cost; $\frac{1}{10}$ is $\frac{1}{14}$ of 14 ct. = 1 ct.; $\frac{10}{10}$ = 10 ct., the cost.

4. \$81 = $\frac{9}{8}$ of the cost; $\frac{1}{8}$ = \$9; $\frac{8}{8}$ = \$72.

5. \$63 = $\frac{9}{10}$ of the cost; $\frac{1}{10}$ = \$7; $\frac{10}{10}$ = \$70.

6. \$21 = $\frac{7}{4}$ of the cost; $\frac{1}{4}$ = \$3; $\frac{4}{4}$ = \$12.

7. Forty ct. = $\frac{4}{3}$ of the cost; $\frac{1}{3}$ = 10 ct.; $\frac{3}{3}$ = 30 ct. Each orange cost $\frac{1}{10}$ of 30 ct. = 3 ct.

8. \$10 = $\frac{5}{4}$ of the cost; $\frac{1}{4}$ = \$2; $\frac{4}{4}$ = \$8, the cost; \$12 — \$8 = \$4. He would gain $\frac{4}{8}$ = 50 per cent.

9. Seven ct. = $\frac{7}{8}$ of the cost; $\frac{1}{8}$ = 1 ct.; $\frac{8}{8}$ = 8 ct., the cost. 8 ct. — 6 ct. = 2 ct.; and 2 ct. are $\frac{1}{4}$ of the cost = 25 per cent loss.

10. \$35 = $\frac{5}{6}$ of the cost; $\frac{1}{6}$ = \$7; $\frac{6}{6}$ = \$42, the cost. \$63 — \$42 = 21; \$21 is $\frac{1}{2}$ of the cost = 50 per cent gain.

11. \$18 = $\frac{6}{5}$ of its value; $\frac{5}{5}$ = \$15, its value; 10 per cent of \$15 is $\frac{1}{10}$ of \$15 = \$1.50; \$18 — \$15 = \$3. He lost \$3 + \$1$\frac{1}{2}$ = \$4$\frac{1}{2}$.

12. \$60 = $\frac{6}{5}$ of the cost; $\frac{5}{5}$ = \$50, the cost. A gained \$60 — \$50 = \$10; B lost 20 per cent, or $\frac{1}{5}$ of \$60 = \$12. B lost \$12 — \$10 = \$2 more than A gained.

13. \$30 $= \frac{5}{4}$ of the cost of the first; $\frac{4}{4} =$ \$24, the cost. The gain was \$30 — \$24 = \$6. \$30 $= \frac{3}{4}$ of the cost of the second; $\frac{4}{4} =$ \$40, the cost. The loss on the watch was \$40 — \$30 = \$10; loss by sale \$10 — \$6 = \$4.

14. One apple sold for $\frac{1}{4}$ of 3 ct. $= \frac{3}{4}$ ct.; $\frac{3}{4}$ ct. = 150%, or $\frac{3}{2}$% of the cost. $\frac{1}{2} = \frac{1}{4}$ ct.; $\frac{2}{2} = \frac{2}{4}$ ct. $= \frac{1}{2}$ ct., the cost. 5 apples for 4 ct. $= \frac{4}{5}$ ct. for 1 apple. Gain $\frac{4}{5} - \frac{1}{2} = \frac{3}{10}$, and $\frac{3}{10} = \frac{3}{5}$ of $\frac{5}{10}$, or 30 per cent.

15. One lemon sold for $\frac{4}{5}$ ct.; $\frac{4}{5}$ ct. $= \frac{4}{5}$ per cent of the cost; 1 ct. = the cost; 6 for 5 ct. $= \frac{5}{6}$ ct. for 1; 1 ct. — $\frac{5}{6}$ ct. $= \frac{1}{6}$ ct.; $\frac{1}{6}$ of 1 ct. $= 16\frac{2}{3}$ per cent.

16. Ten per cent of 60 = 6; $\frac{2}{3}$ of 6 = 4; 4 is $\frac{1}{2}$ of 8; 8 $= \frac{1}{5}$, or 20 per cent, of 40.

17. Fifty per cent of 120 = 60; $\frac{3}{5}$ of 60 = 36; $\frac{1}{2}$ of 36 = 18; 18 is 10 less than 28, and 28 is 20 per cent, or $\frac{1}{5}$, of 140.

18. Sixty per cent of 10 is 6; $\frac{2}{3}$ of 6 = 4; $\frac{1}{4}$ of 4 = 1. 1 is 5 less than 6, and 6 is 50 per cent, or $\frac{1}{2}$, of 12.

19. Seventy-five per cent of 15 $= \frac{45}{4}$; $\frac{2}{5}$ of $\frac{45}{4} = \frac{18}{4}$; $\frac{3}{4}$ of $\frac{18}{4} = \frac{27}{8}$; $\frac{27}{8}$ are $1\frac{3}{5}$ more than $\frac{71}{40}$, and $\frac{71}{40}$ are 50 per cent, or $\frac{1}{2}$, of $\frac{142}{40} = 3\frac{11}{20}$.

20. Twenty-five per cent of 4 is 1; $\frac{2}{3}$ of 1 $= \frac{2}{3}$; $\frac{3}{2}$ times $\frac{2}{3} = \frac{3}{3} = 1$; 1 is 25 per cent, or $\frac{1}{4}$, of 4; and 4 is $\frac{1}{2}$ of 8.

LESSON LXIX.

1. One fifth of \$3 is 60 ct.; \$3 — 60 ct. = \$2.40.

2. One fifth of \$125 = \$25; \$125 — \$25 = \$100.

3. One sixth of \$840 = \$140; \$840 — \$140 = \$700.

4. Twenty% = $\frac{1}{5}$; $\frac{1}{5}$ of \$500 = \$100; \$500 — \$100 = \$400. 5% = $\frac{1}{20}$; $\frac{1}{20}$ of \$400 = \$20; \$400 — \$20 = \$380.

5. One sixth of \$1200 = \$200; \$1200 — \$200 = \$1000. 5% = $\frac{1}{20}$; $\frac{1}{20}$ of \$1000 = \$50; \$1000 — \$50 = \$950.

6. \$4.80 = $\frac{4}{5}$ of the retail price; $\frac{1}{5}$ = \$1.20; $\frac{5}{5}$ = \$6.

7. \$720 = $\frac{2}{3}$ of the retail price; $\frac{1}{3}$ = \$360; $\frac{3}{3}$ = \$1080.

8. One hundred per cent less 5 per cent = 95%, or $\frac{19}{20}$; $\frac{19}{20}$ = \$133; $\frac{1}{20}$ = \$7; $\frac{20}{20}$ = \$140. \$140 is $\frac{4}{5}$ of the list price; $\frac{1}{5}$ = \$35; $\frac{5}{5}$ = \$175.

9. \$399 = $\frac{19}{20}$ of the remainder after $\frac{1}{8}$ per cent discount; $\frac{1}{20}$ = \$21; $\frac{20}{20}$ = \$420. \$420 = $\frac{7}{8}$ of the list price; $\frac{1}{8}$ = \$60; $\frac{8}{8}$ = \$480.

10. \$50 less $\frac{1}{5}$ = \$40; \$40 less $\frac{1}{20}$ = \$38; \$20 less $\frac{1}{10}$ = \$18; \$18 less $\frac{1}{20}$ = \$17.10; \$38 + \$17.10 = \$55.10.

LESSON LXX.

1. His commission was $2\frac{1}{2}$ per cent, or $\frac{1}{40}$, of \$4000, = \$100.

2. One twentieth of \$560 = \$28.

3. The corn cost 1000 times 50 ct. = \$500; $\frac{1}{40}$ of \$500 = \$12.50.

4. Five times \$300 = \$1500; $\frac{1}{20}$ of \$1500 = \$75. The owner receives \$1500 — \$75 = \$1425

5. The wheat sells for 800 times \$1.25 = \$1000; $\frac{1}{50}$ of \$1000 = \$20, the commission; \$1000 — \$20 = \$980.

6. \$100 = $\frac{1}{20}$ of \$2000.

7. \$60 = $\frac{1}{10}$; $\frac{10}{10}$ = \$600.

8. The commission was $\frac{1}{20}$ of \$1000 = \$50; \$1000 — \$50 = \$950. He bought as many shares as \$50 are contained times in \$950 = 19.

LESSON LXXI.

1. One per cent of \$2000 = \$20; $\frac{1}{2}\%$ = $\frac{1}{2}$ of \$20 = \$10.

2. One half of \$3000 = \$1500; $\frac{1}{50}$ of \$1500 = \$30.

3. Two thirds of \$2400 = \$1600; 1% of \$1600 is \$16, and \$16 + \$1.50 = \$17.50.

4. \$2500 + \$1500 = \$4000; 1% of \$4000 is \$40; $\frac{3}{4}\%$ is $\frac{3}{4}$ of \$40 = \$30.

5. Two thirds of \$1800 are \$1200; $\frac{1}{100}$ of \$1200 is \$12; $\frac{2}{3}$ of \$1200 are \$800; 1% of \$800 is $\frac{1}{100}$ of \$800 = \$8; $\frac{1}{2}\%$ is $\frac{1}{2}$ of \$8 = \$4; and \$12 + \$4 + \$1 = \$17.

6. One half of \$2600 = \$1300; $\frac{1}{50}$ of \$1300 = \$26; $\frac{2}{3}$ of \$1500 are \$1000; $\frac{1}{100}$ of \$1000 is \$10; and \$26 + \$10 + \$1.50 = \$37.50.

LESSON LXXII.

4. The interest on \$1 for 1 year is 8 ct.; for 3 yr. 3 times 8 ct. = 24 ct.; for \$20 it is 20 times 24 ct. = \$4.80.

5. The interest on \$1 for 6 yr. at 4% is 24 ct.; and for \$25 it is 25 times 24 ct. = \$6.

6. The interest for \$1 is 20 ct.; for \$40 it is \$8.

7. \$9. (8.) \$8.40.

9. \$9. (10.) \$36.

LESSON LXXIII.

2. Four mo. = $\frac{1}{3}$ of a year. The interest on \$1 for 4 mo. is $\frac{1}{3}$ of 5 ct. = $1\frac{2}{3}$ ct.; on \$60 it is 60 times $1\frac{2}{3}$ ct. = \$1.

3. The interest on \$1 for 7 mo. at 6% is $3\frac{1}{2}$ ct.; on \$80 it is \$2.80.

4. On \$1 it is $\frac{3}{4}$ of 8 ct. = 6 ct.; on \$40 it is \$2.40.

5. Two thirds of 9 ct. = 6 ct.; 75 times 6 ct. = \$4.50.

7. The interest for 1 year is 180 times 4 ct. = \$7.20; for 1 mo. $\frac{1}{12}$ of \$7.20 = \$0.60; for 10 mo. 10 times 60 ct. = \$6; for 10 days $\frac{1}{3}$ of 60 ct. = 20 ct.; for 10 mo. 10 da., \$6.20.

9. One year's interest = \$12; 1 mo. interest = \$1; for 4 mo. \$4; for 24 days $\frac{4}{5}$ of \$1 = 80 ct.; for 4 mo. 24 da., \$4.80.

10. The int. for 1 yr. is \$24; for 1 mo. \$2; for 9 mo. \$18; for \$18 $\frac{3}{5}$ of \$2 = \$1.20; for 9 mo. 18 da. it is \$19.20.

11. \$8.45.

12. The int. for 1 yr. is \$5.76; for 1 mo. 48 ct.; for 8 mo. \$3.84; for 25 da. $\frac{5}{6}$ of 48 ct. = 40 ct.; for 8 mo. 25 da., \$3.84 + \$0.40 = \$4.24.

13. \$3.20. (14.) \$6.75. (15.) \$3.80.

16. The int. for 1 year is \$1; for 3 yr. \$3. The amount is \$25 + \$3 = \$28.

17. \$44. (18.) \$68.20. (19.) \$32.80.

20. \$56.80. (21.) \$99.12.

LESSON LXXIV.

2. The int. for \$1 for 3 yr. at 4% is 12 ct. It will take as many dollars to acquire \$6 int. as 12 ct. are contained times in 600 ct., which are 50. *Ans.* \$50.

3. \$60. (4.) \$75. (5.) \$140.

6. \$240. (7.) \$350.

8. As many dollars as 5 ct. are contained times in \$200, which are 4000. *Ans.* \$4000.

LESSON LXXV.

2. The amount of \$1 for 3 yr. at 6% is \$1.18. It will take as many dollars to amount to \$236 as \$1.18 is contained times in \$236, which are 200.

3. \$500. (4.) \$250.

5. \$300. (6.) \$25.

7. The amount of \$1 for 2 yr. 6 mo. at 8% is \$1.20. It will take as many dollars to amount to \$60 as \$1.20 is contained times in \$60, which are 50. If \$50 = $\frac{2}{5}$ of the principal, $\frac{5}{5}$, or the whole, = \$125.

LESSON LXXVI.

2. The int. on \$40 for 1 yr. at 5% is \$2. To gain \$8, it will take 4 yr.

3. 2 yr. 6 mo. (4.) 2 yr. 8 mo.

5. $3\frac{3}{7}$ years. (6.) $6\frac{2}{3}$ yr. = 6 yr. 8 mo.

9. Any principal to treble itself must gain 200%. At 5% it will take as many years as 5 is contained times in 200 = 40.

LESSON LXXVII.

2. At 1 per cent the int. on \$50 for 5 yr. is \$2.50. To amount to \$20, the rate will be as many times 1% as \$2.50 are contained times in \$20, which are 8. *Ans.* 8 per cent.

3. Int. at 1% = \$2.25; \$11.25 ÷ \$2.25 = 5. *Ans.* 5%.

4. 7%.

5. Int. at 1% = \$6.75; \$54.00 ÷ \$6.75 = 8. *Ans.* 8%.

6. Int. at 1% = \$8; \$56 ÷ \$8 = 7. *Ans.* 7%.

7. \$240 less \$200 = \$40, the interest; int. at 1% = \$8; \$40 ÷ \$8 = 5. *Ans.* 5%.

8. \$183 less \$150 = \$33, the int.; int. at 1% = \$5.50; \$33 ÷ \$5.50 = 6. *Ans.* 6%.

LESSON LXXVIII.

2. The amount of \$1, for the given time and rate, is \$1.30 = $\frac{13}{10}$. \$520 = $\frac{13}{10}$; $\frac{1}{10}$ = \$40; $\frac{3}{10}$ = \$120, the discount; $\frac{10}{10}$ = \$400, the present worth.

3. \$30 = $\frac{6}{5}$; $\frac{5}{5}$ = \$25, present worth; \$30 — \$25 = \$5, discount.

4. Present worth, \$500; discount, \$250.

5. \$345 = $\frac{23}{20}$; $\frac{1}{20}$ = \$15; $\frac{20}{20}$ = \$300. \$345 — \$300 = \$45, discount.

6. \$96. (7.) \$4. (8.) \$50. (9.) \$44.

10. Int. for 6 yr. 8 mo. = 40 ct.; amt. of \$1 = \$1.40 = $\frac{7}{5}$. \$77 = $\frac{7}{5}$; $\frac{1}{5}$ = \$11; $\frac{5}{5}$ = \$55, present worth.

11. Amt. of \$1 for 3 yr. 6 mo. at 7% is \$1.24$\frac{1}{2}$ = $\frac{1245}{1000}$ = $\frac{249}{200}$; $\frac{1}{200}$ is $\frac{1}{249}$ of \$1000 = \$4$\frac{4}{249}$; $\frac{200}{200}$ = \$803$\frac{53}{249}$; \$1000 — \$803$\frac{53}{249}$ = \$196$\frac{196}{249}$, discount.

12. Amt. of \$1 is \$1.22 = $\frac{61}{50}$; \$900 = $\frac{61}{50}$; $\frac{1}{50}$ is $\frac{1}{61}$ of \$900 = \$14$\frac{46}{61}$; $\frac{50}{50}$ = \$737$\frac{43}{61}$; \$900 — \$737$\frac{43}{61}$ = \$162$\frac{18}{61}$.

LESSON LXXIX.

1. For 4 yr. 2 mo. 25%; $\frac{25}{100}$ = $\frac{1}{4}$.

2. For 5 yr. 25% int.; 100% + 25% = 125%, amt.; $\frac{25}{125}$ = $\frac{1}{5}$.

3. For 1 yr. $\frac{1}{2}$ of $\frac{1}{5} = \frac{1}{10}$; $\frac{1}{10}$ of 100% is 10%.

4. Two yr. 6 mo. = 30 mo.; $\frac{1}{30}$ of $\frac{1}{4} = \frac{1}{120}$ for 1 mo.; 12 times $\frac{1}{120} = \frac{1}{10}$; $\frac{1}{10}$ of 100% = 10%.

5. The int. at 10% = $\frac{1}{10}$ of the principal in 1 yr.; to equal $\frac{3}{5}$, or $\frac{6}{10}$, it will take 6 yr.

6. The yearly interest is $\frac{1}{3}$ of $\frac{9}{25} = \frac{3}{25}$; $\frac{3}{25} = \frac{12}{100} = 12\%$.

7. The interest for 2 yr. is 5 times $\frac{4}{25} = \frac{20}{25} = \frac{4}{5}$; for 1 yr. $\frac{1}{2}$ of $\frac{4}{5} = \frac{2}{5}$; $\frac{2}{5} = \frac{40}{100} = 40\%$.

8. Five eighths of the interest for 1 yr. = $\frac{3}{80}$ of the principal. If $\frac{3}{80}$ are $\frac{5}{8}$, then $\frac{1}{8}$ is $\frac{1}{5}$ of $\frac{3}{80} = \frac{3}{400}$, and $\frac{8}{8} = \frac{24}{400} = \frac{6}{100} = 6\%$.

9. The int. for 4 mo. is $\frac{1}{50}$ of the principal; for 12 mo. 3 times $\frac{1}{50} = \frac{3}{50} = \frac{6}{100} = 6\%$. Int. for \$1 for 1 yr. 4 mo. = 8 ct.; for \$200 it is 200 times 8 ct. = \$16

10. One yr. 4 mo. = 16 mo., or 4 times 4 mo.; $\frac{1}{4}$ of $\frac{3}{25} = \frac{3}{100}$; $\frac{3}{4} = \frac{9}{100} = 9\%$. The interest of \$100 for 1 yr. 8 mo. 12 da., at 9%, is \$15.30.

11. In 2 times 4 yr. = 8 yr.

12. In $3\frac{1}{3}$ are $\frac{10}{3}$; $\frac{1}{3}$ is $\frac{1}{10}$ of \$40 = \$4; $\frac{3}{3} = \$12$; \$12, the int. for 1 yr. = 5%, or $\frac{1}{20}$ of the principal; the principal = $\frac{20}{20}$, or \$240. A has 2 parts; B, 1 part; both, 3 parts. A has $\frac{2}{3}$ of \$240 = \$160; B has $\frac{1}{3} = \$80$.

13. In $1\frac{2}{5}$ are $\frac{7}{5}$; $\frac{1}{5} = \frac{1}{7}$ of \$49 = \$7; $\frac{5}{5} = \$35$. \$35 = $\frac{7}{100}$ of the principal; $\frac{1}{100} = \$5$; $\frac{100}{100} = \$500$. If twice A's money = 3 times B's, then once A's money = $1\frac{1}{2}$ times B's; B's, $\frac{2}{2}$; A's, $\frac{3}{2}$; both, $\frac{5}{2}$; $\frac{2}{2} = \$200$, B's money; $\frac{3}{2} = \$300$, A's money.

14. Two yr. 3 mo. = 27 mo. The int. for 1 mo. is $\frac{1}{27}$ of \$18 = \$$\frac{18}{27}$ = \$$\frac{2}{3}$; for 1 yr. 12 times \$$\frac{2}{3}$ = \$8. \$8 is 4 per cent, or $\frac{4}{100}$, of $\frac{3}{4}$ of A's and $\frac{1}{2}$ of B's; $\frac{1}{100}$ is \$2; $\frac{100}{100}$ is is \$200. $\frac{3}{4}$ of A's + $\frac{1}{2}$ of B's = \$200; but $\frac{1}{2}$ of A's = $\frac{2}{3}$ of B's, or $\frac{1}{4}$ of A's = $\frac{1}{3}$ of B's, and B's = $\frac{3}{4}$ of A's. Then, $\frac{6}{4}$ of B's = \$200, and B's money = \$133.33$\frac{1}{3}$. Since B's = $\frac{3}{4}$ of A's = \$133.33$\frac{1}{3}$, $\frac{1}{4}$ of A's = \$44.44$\frac{4}{9}$, and $\frac{4}{4}$ or A's money = \$177.77$\frac{7}{9}$.

LESSON LXXX.

1. One apple is worth $\frac{1}{8}$ of 24 plums = 3 plums; and 84 apples are worth 84 times 3 plums = 252 plums. One peach is worth $\frac{1}{12}$ of 252 plums = 21 plums; and 5 peaches are worth 105 plums.

2. Mary has 5 more than James, and Lucy 3 more than James. 5 + 3 = 8, and 32 — 8 = 24; $\frac{1}{3}$ of 24 = 8, James's share; 8 + 3 = 11, Lucy's; 8 + 5 = 13, Mary's.

3. Sixteen is twice the number; the number is 8.

4. C has $\frac{6}{6}$; B has $\frac{2}{6}$; A has $\frac{1}{6}$; C has $\frac{5}{6}$ more than A; $\frac{5}{6}$ = \$15; $\frac{1}{6}$ = \$3, A's; $\frac{6}{6}$ = \$18, C's; $\frac{2}{6}$ = \$6, B's.

5. Four fourths = James's money; $\frac{4}{4}$ + $\frac{3}{4}$ = $\frac{7}{4}$; \$34 — \$6 = \$28; \$28 = $\frac{7}{4}$; $\frac{1}{4}$ = \$4; $\frac{4}{4}$ = \$16, James's money; $\frac{3}{4}$ + \$6 = \$18, Thomas's money.

6. Eight eighths less $\frac{3}{8}$ = $\frac{5}{8}$; $\frac{1}{9}$ of $\frac{5}{8}$ = $\frac{5}{72}$; $\frac{4}{9}$ = $\frac{20}{72}$; $\frac{5}{8}$ = $\frac{45}{72}$; and $\frac{45}{72}$ + $\frac{20}{72}$ = $\frac{65}{72}$; $\frac{1}{72}$ = $\frac{1}{65}$ of 65 sheep = 1 sheep; $\frac{72}{72}$ = 72 sheep.

7. One man will do the work in 12 da. of 10 hr., or in 120 da. of 1 hr. each; 8 men will do it in 15 da. of 1 hr., or in $2\frac{1}{2}$ da. of 6 hr.

8. At 2 for 3 ct., 1 dozen cost 6 times 3 ct. = 18 ct.; at 2 for 5 ct., 1 doz. cost 6 times 5 ct. = 30 ct., and 2 doz. cost 18 ct. + 30 ct. = 48 ct. At 3 for 7 ct., 1 doz. sold for 4 times 7 ct. = 28 ct.; 2 doz. cost 56 ct.; and 56 ct. — 48 ct. = 8 ct., the gain on 2 doz.; 4 ct., gain on 1 doz.

9. Four horses, 2 mo. = 8 horses 1 mo.; 9 cows, 3 mo. = 27 cows, 1 mo.; 20 sheep, 5 mo. = 100 sheep, 1 mo. If 10 sheep = 2 horses, 5 sheep = 1 horse, and 100 sheep = 20 horses; 1 cow = $\frac{2}{3}$ of a horse, and 27 cows = 18 horses. Then A has the same as 8 horses; B, 18; and C, 20; and all have 46. A pays $\frac{8}{46}$ of \$92 = \$16; B, $\frac{18}{46}$ = \$36; C, $\frac{20}{46}$ = \$40.

10. He gave to each pair \$5; and \$5 in \$20 are contained 4 times. He had 4 sons and 4 daughters.

12. Nine less 3 = 6; 4 — 2 = 2; 6 ÷ 2 = 3, number of children.

14. One of John's steps = $1\frac{1}{4}$ of Henry's; 5 of John's = $6\frac{1}{4}$ of Henry's. He gains in taking 5 steps, $6\frac{1}{4}$ steps — 6 steps = $\frac{1}{4}$ step. He will take 4 times 5 steps = 20 steps to gain 1 step, and 7 times 20 steps = 140 steps to gain 7.

15. If 1 ox is worth 8 sheep, 3 oxen are worth 24 sheep, or 2 horses are worth 24 sheep; and 24 sheep are worth 24 times \$5 = \$120; 1 horse is worth $\frac{1}{2}$ of \$120 = \$60.

16. Two ct. + 24 ct. = 26 ct., and $\frac{1}{2}$ of 26 ct. = 13 ct., A's money; 13 ct. — 2 ct. = 11 ct., B's money.

17. Let $\frac{6}{6}$ = C's; $\frac{2}{6}$ = B's; $\frac{1}{6}$ = A's; then $\frac{6}{6} - \frac{2}{6} = \frac{4}{6}$, and $\frac{4}{6}$ = 20 yr. $\frac{1}{6}$ = 5 yr., A's age; $\frac{2}{6}$ = 10 yr., B's age; $\frac{6}{6}$ = 30 yr., C's age.

18. If \$15 is $\frac{3}{4}$ of their difference, then \$20 = the whole of the difference. If $\frac{2}{3}$ of A's = $\frac{4}{5}$ of B's, $\frac{3}{3}$ of A's = $\frac{6}{5}$ of B's; $\frac{3}{3} = \frac{5}{5}$, and $\frac{6}{5} - \frac{5}{5} = \frac{1}{5}$, their difference; and $\frac{1}{5}$ = \$20; $\frac{5}{5}$ = 100, B's; $\frac{6}{5}$ = \$120, A's.

19. One half of 17 is $8\frac{1}{2}$; and 10 less $8\frac{1}{2} = 1\frac{1}{2}$; and $1\frac{1}{2}$ in 15 is contained 10 times.

20. If 1 egg cost 2 ct., and 2 cost 6 ct., 3 cost 8 ct, and the average cost is $2\frac{2}{3}$ ct. 1 egg sells for $\frac{1}{3}$ of 10 ct. = $3\frac{1}{3}$ ct. The gain on 1 is $3\frac{1}{3} - 2\frac{2}{3} = \frac{2}{3}$; $\frac{2}{3}$ is $\frac{1}{4}$ of $2\frac{2}{3}$, or 25 per cent.

21. Eight less 5 = 3; $21 \div 3 = 7$, number of playmates.

22. John gains 2 steps every time he takes 7; to gain 30 steps he must take 7 steps as many times as 2 is contained in 30, or 15 times; 15 times 7 steps = 105 steps.

23. Let $\frac{7}{7}$ = the watch, and $\frac{2}{7}$ = the chain; three times $\frac{2}{7}$ plus 2 times $\frac{7}{7} = \frac{20}{7}$, and $\frac{20}{7}$ = \$100; $\frac{1}{7}$ = \$5; $\frac{2}{7}$ = \$10, price of the chain; $\frac{7}{7}$ = \$35, price of the watch.

24. In $4\frac{1}{2}$ are $\frac{9}{2}$; $2\frac{4}{7} = \frac{18}{7}$; A does $\frac{2}{9}$ in 1 day; both do $\frac{7}{18}$ in 1 day; $\frac{7}{18}$ less $\frac{2}{9} = \frac{3}{18} = \frac{1}{6}$, what B does in 1 day. If B does $\frac{1}{6}$ in 1 day, he would do it all in 6 days.

25. He gave $\frac{1}{2}$ ct. each for the first lot, and $\frac{1}{4}$ ct. each for the second lot; for two he gave $\frac{1}{2}$ ct. + $\frac{1}{4}$ ct. = $\frac{3}{4}$ ct.; average price, $\frac{3}{8}$ ct. He sold them for $\frac{3}{5}$ ct. each; gain on each, $\frac{3}{5} - \frac{3}{8} = \frac{9}{40}$. If he gained $\frac{9}{40}$ ct. on one, to gain 18 ct. it took as many pears as $\frac{9}{40}$ ct. is contained times in 18 ct. = 80.

26. He discounts the interest on \$50 for 1 yr., which is \$3; \$3 is $\frac{3}{50}$, or 6%, of the principal.

27. She wished to buy as many yards as $\frac{1}{2}$ is contained times in $5 = 10$.

28. A's money $= \frac{5}{5}$; B's money $= \frac{2}{5} - \$5$; $\frac{5}{5} + \frac{2}{5} - \$5 = \$51$; $\frac{7}{5} = \$56$; $\frac{1}{5} = \$8$; $\frac{5}{5} = \$40$, A's money; $\$51 - \$40 = \$11$, B's.

29. One third of the gain $= \frac{2}{15}$ of the selling price, and $\frac{3}{3} = \frac{6}{15}$, or $\frac{2}{5}$; $3\frac{3}{4}$ times $\$4 = \$15$, the cost. If the gain is $\frac{2}{5}$ of the selling price, then $\frac{5}{5} - \frac{2}{5} = \frac{3}{5}$, or the cost; $\frac{3}{5} = \$15$; $\frac{5}{5} = \$25$, the selling price.

30. The hound gains 5 of the hare's leaps every time the hare takes 3; to gain 100, he must take 3 leaps as many times as 5 is contained in $100 = 20$, and 20 times $3 = 60$.

31. Thomas's age $= 3$ parts; James's $= 1$ part; 3 parts $- 1$ part $= 10$, the difference. If $10 = 2$ parts, then 5 yr. $=$ James's age, and 15 yr. $=$ Thomas's.

32. If $\frac{3}{7} = \frac{4}{5}$, then $\frac{7}{7} = \frac{28}{15}$; and $\frac{28}{15} + \frac{15}{15} = \frac{43}{15}$ of George's distance; $\frac{43}{15} = 86$ miles; $\frac{1}{15} = 2$ miles; $\frac{15}{15} =$ 30 miles, George's distance; $\frac{28}{15} = 56$ miles, John's distance.

34. The difference between selling the lot at 6 ct. a doz. and 10 ct. a doz. is 12 ct. $+$ 18 ct. $= 30$ ct. The difference on 1 doz. is 10 ct. $-$ 6 ct. $= 4$ ct. There were as many doz. as 4 ct. are contained times in 30 ct. $= 7\frac{1}{2}$ doz. The cost of the lot was $6 \times 7\frac{1}{2} + 12 = 57$ ct.; and the cost of 1 doz. was 57 ct. $\div 7\frac{1}{2} = 7\frac{3}{5}$ ct.

35. Let $\frac{10}{10}$ = A's age, and $\frac{5}{10}$ = B's; $\frac{3}{5}$ of $\frac{5}{10}$ are $\frac{3}{10}$, and $\frac{3}{10} + 44 = 2\frac{1}{2}$ times $\frac{10}{10} = \frac{25}{10}$. If $\frac{3}{10} + 44 = \frac{25}{10}$, then $\frac{22}{10}$ $= 44$, and $\frac{1}{10} = 2$, and $\frac{10}{10} = 20$ yr., A's age; $\frac{5}{10} = 10$ yr., B's age.

36. Seven eighths of 24 miles = 21 miles. If 21 mi. are $\frac{3}{7}$, then $\frac{1}{7}$ is 7 mi., and $\frac{7}{7}$ are 49 mi., the distance from B to C; 49 mi. + 24 mi. = 73 mi., distance from A to C.

37. A, B, and C together can do $\frac{1}{4}$ in 1 da.; A and B together can do $\frac{1}{8}$ in 1 da.; B and C together can do $\frac{1}{6}$ in 1 da.; C can do in 1 da. $\frac{1}{4} - \frac{1}{8} = \frac{1}{8}$, and the whole in 8 da.; A can do in 1 da. $\frac{1}{4} - \frac{1}{6} = \frac{1}{12}$, and the whole in 12 da.; B can do in 1 da. $\frac{1}{6} - \frac{1}{8} = \frac{1}{24}$, and the whole in 24 da.

38. One duck cost $\$\frac{1}{6}$; 1 chicken, $\$\frac{1}{8}$, and 2 chickens, $\$\frac{2}{8}$; $\frac{1}{6} + \frac{2}{8} = \frac{10}{24}$; $\frac{1}{3}$ of $\frac{10}{24} = \frac{10}{72} = \frac{5}{36}$, the average cost. One third of $\frac{1}{2} = \frac{1}{6}$, the average selling price; $\frac{1}{6} = \frac{6}{36}$ $- \frac{5}{36} = \frac{1}{36}$, the average gain; the whole gain was $\$2\frac{1}{2}$ $= \$\frac{5}{2}$; $\frac{5}{2} = \frac{90}{36}$; $\frac{90}{36} \div \frac{1}{36} = 90$, the whole number; $\frac{2}{3}$ of $90 = 60$, the chickens; $\frac{1}{3}$ of $90 = 30$, the ducks.

39. Eight ct. — 3 ct. = 5 ct.; 6 ct. + 29 ct. = 35 ct.; 35 ct. = $\frac{5}{8}$ of cost of oranges; $\frac{1}{8} = 7$ ct., and $\frac{8}{8} = 56$ ct.; 56 ct. — 6 ct. = 50 ct., James's money.

40. A rides $\frac{1}{5}$ of 10 miles in $\frac{1}{4}$ of an hour, and 8 miles in 1 hour; A will travel 18 miles in $18 \div 8 = 2\frac{1}{4}$ hr. B travels $\frac{1}{8}$ of a mile in $\frac{1}{5}$ hr., and 5 miles an hour; B will travel $2\frac{1}{4}$ times 5 mi. = $11\frac{1}{4}$ mi., while A travels 18 mi.

41. Three halves + $\$2\frac{1}{2} = \$40$; then $\frac{3}{2} = \$37\frac{1}{2}$; $\frac{1}{2} =$ $\$12\frac{1}{2}$; $\frac{2}{2} = \$25$, his money.

42. C received $\frac{21}{21} - \frac{6}{21} - \frac{7}{21} = \frac{8}{21}$; $\frac{8}{21} - \frac{6}{21} = \frac{2}{21}$; $\frac{2}{21}$ = \$160; $\frac{1}{21}$ = \$80; $\frac{6}{21}$ = \$480, A's legacy; $\frac{7}{21}$ = \$560, B's legacy; $\frac{8}{21}$ = \$640, C's legacy.

43. Both consume $\frac{6}{15}$ in 6 days, and $\frac{15}{15}$ less $\frac{6}{15} = \frac{9}{15}$ = $\frac{3}{5}$ remaining. The woman consumes $\frac{1}{24}$ of $\frac{3}{5}$ in one day = $\frac{3}{120} = \frac{1}{40}$, and all in 40 days. Both consume $\frac{1}{15}$ in one day; $\frac{1}{15} - \frac{1}{40} = \frac{5}{120} = \frac{1}{24}$, what the man consumes in one day. It would last him alone 24 days.

44. Three and one half ct. + $6\frac{1}{2}$ ct. = 10 ct., the price of 2 pounds of the mixture; $100 \div 10 = 10$; 10 times 2 pounds = 20, the number of pounds.

45. Let $\frac{1}{10}$ = C's age; $\frac{2}{10}$ = B's; and $\frac{10}{10}$ = C's. $\frac{10}{10} - \frac{1}{10} = \frac{9}{10}$; $\frac{9}{10}$ = 45 yr.; $\frac{1}{10} = \frac{1}{9}$ of 45 yr. = 5 yr., C's age; $\frac{2}{10}$ = 10 yr., B's age; $\frac{10}{10}$ = 50 yr. = A's age.

46. Three fifths = Mary's age, and $\frac{5}{5}$ = Ella's; their sum is $\frac{8}{5}$; twice Ella's is $\frac{10}{5}$; $\frac{10}{5} - \frac{8}{5} = \frac{2}{5}$, and $\frac{2}{5}$ = 6 yr.; $\frac{1}{5}$ = 3 yr.; $\frac{5}{5}$ = 15 yr., Ella's age; $\frac{3}{5}$ = 9 yr., Mary's age.

47. Both do $\frac{4}{16}$ in 4 days; and $\frac{16}{16} - \frac{4}{16} = \frac{3}{4}$, that B finishes in 36 days. In one day he does $\frac{1}{36}$ of $\frac{3}{4} = \frac{3}{144}$ = $\frac{1}{48}$, and he does all in 48 days; $\frac{1}{16} - \frac{1}{48} = \frac{1}{24}$, what A does in 1 day, and he would do all in 24 days.

48. Three doz. at 1 ct. each = 36 ct.; 2 doz. at 4 eggs for 3 ct. = 18 ct.; 2 doz., the remainder, at 4 eggs for 5 ct. = 30 ct.; 36 ct. + 18 ct. + 30 ct. = 84 ct.; 84 = 7 doz.; $\frac{1}{7}$ of 84 ct. = 12 ct. a doz.

50. If he had worked 30 days, he would have received 30 times 30 ct. = \$9. Each day he is idle he gives 20 ct. for board and forfeits 30 ct. for not working = 50 ct. \$9 — \$5 = \$4; \$4.00 ÷ 50 ct. = 8, number of days idle; 30 days — 8 days = 22, number of days he worked.

51. The difference per yard is $2\frac{1}{2}$ ct.; $40 \div 2\frac{1}{2} = 16$, the number of yards.

52. If 4 of Moses's steps = 7 of Noah's, then one of Moses's = $1\frac{3}{4}$ of Noah's, and 5 of Moses's = $8\frac{3}{4}$ of Noah's; Moses gains $8\frac{3}{4} - 7 = 1\frac{3}{4}$ of Noah's steps every time he takes 5 steps; to gain 35 he must take 5 steps as many times as $1\frac{3}{4}$ are contained in 35. $35 = \frac{140}{4}$; $1\frac{3}{4} = \frac{7}{4}$; $\frac{140}{4} \div \frac{7}{4} = 20$; 20 times 5 steps = 100 steps.

53. One man will do as much work as 6 boys; 2 men as much as 12 boys; then 2 men would do in a week as much as 12 boys, and to do it in 1 day it would take 6 times 2 men = 12 men.

54. Let $\frac{1}{12}$ = the number in the first field; $\frac{4}{12}$, in the second; and $\frac{12}{12}$, in the third; then $\frac{12}{12} - \frac{1}{12} - \frac{4}{12} = \frac{7}{12}$, and $\frac{7}{12} = 70$; $\frac{1}{12} = 10$, the number in the first field; $\frac{4}{12} = 40$, the number in the second; $\frac{12}{12} = 120$, the number in the third.

55. For 24 days he would have received \$48. He loses \$2 each day he is idle, and pays 50 ct. for board = $\$2\frac{1}{2}$; \$48 — \$38 = \$10; $\$10 \div \$2\frac{1}{2} = 4$, number of days idle; 24 — 4 = 20, number of days he worked.

56. Since $\$12 = \frac{2}{7}$ of B's and C's, $\frac{7}{7} = \$42$; and \$42 + \$12 = \$54, what all had. If $\frac{3}{8}$ of C's = $\frac{3}{10}$ of A's and B's,

then $\frac{1}{8} = \frac{1}{10}$, and the whole of C's $= \frac{8}{10}$ of A's and B's; hence, $\frac{18}{10}$ of A's and B's $= \$54$; $\frac{1}{10} = \$3$, and $\frac{10}{10} = \$30$; $\$30 - \$12 = \$18$, B's share; $\$54 - \$30 = \$24$, C's share.

57. Six and six sevenths pounds cost $6\frac{6}{7}$ times 8 ct. $= 54\frac{6}{7}$ ct.; $\frac{1}{6}$ of $54\frac{6}{7}$ ct. $= 9\frac{1}{7}$ ct.; $54\frac{6}{7}$ ct. $+ 9\frac{1}{7}$ ct. $= 64$ ct.

58. The first has \$1200 for 1 mo.; the second has \$2400 for 1 mo., or \$1200 more than the first; the first must put in for the remaining 6 mo. $\frac{1}{6}$ of $\$1200 = \$200$.

59. The difference between selling at 9 ct. and 12 ct. is \$1.50 on the whole; on one pound the difference is 3 ct.; there are as many pounds as $\$1.50 \div 3 = 50$.

60. One of B's steps $= 1\frac{1}{2}$ of A's, and 4 of B's $= 6$ of A's; B gains $6 - 5 = 1$ step every time he takes 4 steps; B takes 4 steps 9 times in taking 36 steps. If he gains 1 step every time he takes 4, then A is 9 steps in advance of B.

61. Both had 9 oranges; each ate $\frac{1}{3}$ of $9 = 3$. Thomas ate 2 of John's oranges, and should give him $\frac{2}{3}$ of 9 ct. $=$ 6 ct.; he ate one of James's, and should give him $\frac{1}{3}$ of 9 ct. $= 3$ ct.