KEY TO WHITE'S NEW COMPLETE ARITHMETIC: FOR TEACHERS

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WHITE'S NEW

COMPLETE ARITHMETIC

FOR TEACHERS

By E. E. WHITE, A. M., LL.D.

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E-P 17

PREFACE.

THIS Key contains solutions to all the problems, oral and written, in

WHITE'S NEW COMPLETE ARITHMETIC,

Excepting the inductive oral problems, and those purely drill problems which present no difficulty to those who are familiar with the processes involved.

Most of the solutions of the written problems are given in the equation form, since this not only requires less space than any other, but it also permits the giving of all needed explanations in connection with the solutions. It is assumed that all teachers can perform the numerical operations indicated.

CINCINNATI, O., April 5, 1884.

N. B.—Any one who may discover an error in this edition, will confer a favor on the author by calling his attention to it.

KEY TO WHITE'S

NEW COMPLETE ARITHMETIC.

SOLUTIONS OF PROBLEMS.

Page 45.

Prob. 38. L. C. M. of 10, 12, and 15 = 60, no. of min. each will walk;

60 min. ÷ 10 min. = 6, no. of miles A will walk;
60 min. ÷ 12 min. = 5, no. of miles B will walk;
60 min. ÷ 15 min. = 4, no. of miles C will walk.

FRACTIONS.

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48. $\frac{2+3}{12+3} = \frac{3}{4}$. Since $\frac{1}{4}$ is $\frac{3}{12}$, $\frac{3}{4}$ is 3 times $\frac{3}{12}$, which is $\frac{9}{12}$, and hence the resulting fraction $\frac{3}{4}$ equals $\frac{9}{12}$.

49. If, for example, both terms of $\frac{12}{15}$ be divided by 3, the resulting fraction is $\frac{4}{5}$. The size or value of the fractional part in $\frac{4}{5}$ is 3 times as great as in $\frac{12}{15}$, while the number of parts taken in $\frac{4}{5}$ is only one third of the number of parts taken in $\frac{12}{15}$; and hence $\frac{4}{5} = \frac{12}{15}$.

In like manner, it may be shown that the division of both terms of any fraction by the same integer divides the number of parts taken by the integer, and, at the same time, increases the size or value of each part taken as many times as there are units in the integer; and hence the value of the resulting fraction equals the value of the given fraction.

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94. $\frac{2\times4}{8\times4} = \frac{8}{12}$. Since $\frac{1}{3}$ equals $\frac{4}{12}$, $\frac{2}{3}$ equals 2 times $\frac{4}{12}$, which is $\frac{8}{12}$, and since the resulting fraction $\frac{8}{12}$ equals $\frac{2}{3}$, the value of the fraction is not changed.

95. If both terms of the fraction $\frac{3}{4}$ be multiplied by 3, the resulting fraction will be $\frac{9}{12}$. The number of parts taken in $\frac{9}{12}$ is 3 times as many as the number of parts taken in $\frac{3}{4}$, but the size or value of the part taken in $\frac{9}{12}$ is only one third of the size or value of the part in $\frac{3}{4}$, and hence $\frac{9}{12} = \frac{3}{4}$.

In like manner, it may be shown that the multiplying of both terms of any fraction by an integer multiplies the number of parts taken by the integer and divides the size of the parts taken by the same number, and hence the value of the resulting fraction equals the value of the given fraction.

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10. Take, for example, $\frac{2}{9}$, $\frac{5}{9}$, and $\frac{1}{9}$. The fractional unit in each of these fractions is *one ninth*, and, since $\frac{2}{9}$, $\frac{5}{9}$, and $\frac{1}{9}$ are composed of the same fractional unit, they are like numbers, and hence may be added. The sum of the numerators (9) is the number of this common unit (ninth) in all of the fractions taken together.

In like manner, it may be shown that all fractions which have a common denominator, are composed of the same fractional unit, and hence are like numbers and can be added.

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11. The fraction $\frac{3}{8}$ can not be subtracted from $\frac{3}{4}$ without first reducing them to equivalent fractions with a common denominator, because the fractions $\frac{3}{8}$ and $\frac{3}{4}$ are not composed of a common unit, and hence are not like numbers.

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50. $16\frac{3}{4}$ gal. $+ 21\frac{3}{8}$ gal. $= 38\frac{1}{8}$ gal., quantity sold;
$45\frac{1}{2}$ gal. $- 38\frac{1}{8}$ gal. $= 7\frac{3}{8}$ gal., quantity unsold.

51. $\frac{3}{10} + \frac{5}{12} = \frac{18}{60} + \frac{25}{60} = \frac{43}{60}$, part to wife and children;
$\frac{60}{60} - \frac{43}{60} = \frac{17}{60}$, part to college.

52. $\frac{2}{5}$ of $\frac{3}{8} = \frac{6}{40}$, part of factory sold;
$\frac{3}{8} - \frac{6}{40} = \frac{9}{40}$, part still owned.

53. $\frac{2}{9} + \frac{3}{7} = \frac{41}{63}$, part in mud and water;
$\frac{63}{63} - \frac{41}{63} = \frac{22}{63}$, part in air.

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9. The multiplying of the numerator of $\frac{4}{15}$ by 3 multiplies the number of parts taken by 3, while the size or value of the parts is not changed, and hence the value of the fraction is multiplied by 3. $\frac{4 \times 3}{15} = \frac{4}{15} \times 3$.

10. The dividing of the denominator of $\frac{4}{15}$ by 3 increases the size or value of each part taken 3 times, while the number of parts taken is not changed, and hence the value of the fraction is multiplied by 3. $\frac{4}{15 \div 3} = \frac{4}{15} \times 3$.

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36. $5 \times \frac{3}{4} = \frac{15}{4}$, and $\frac{3}{4}$ of $5 = \frac{15}{4}$; hence $5 \times \frac{3}{4} = \frac{3}{4}$ of 5.

In like manner, it may be shown that the product of an integer by any fraction equals the fraction of the integer.