Mastering Fractions - Multiplication and Division

Multiplication: When multiplying fractions, simply multiply numerator times numerator, and denominator times denominator. (Top times top, bottom times bottom)

Example:

$\frac{1}{5} \times \frac{2}{3} = \frac{\mathbf{2}}{\mathbf{15}}$

1 times 2 is 2

5 times 3 is 15

When multiplying fractions by whole numbers, place the whole number over 1, so that you can multiply numerator times numerator and denominator times denominator.

Example:

$\frac{3}{7} \times 2$ → Place 2 over 1 → $\frac{3}{7} \times \frac{2}{1} = \frac{\mathbf{6}}{\mathbf{7}}$

Sometimes you may have to reduce:

Example:

$\frac{3}{4} \times \frac{5}{9} = \frac{15}{36}$ → Reduce → $\frac{\cancel{15}^{5}}{\cancel{36}_{12}} = \frac{\mathbf{5}}{\mathbf{12}}$

3 goes into 15 five times

3 goes into 36 twelve times

You may also cross-cancel. This is another method of reducing:

Example:

3 goes into 3 one time

$\frac{\cancel{3}^{1}}{4} \times \frac{2}{\cancel{3}_{1}}$

3 goes into 3 one time

Now reduce the 2 and the 4

$\frac{\cancel{3}^{1}}{\cancel{4}_{2}} \times \frac{\cancel{2}^{1}}{\cancel{3}_{1}} = \frac{\mathbf{1}}{\mathbf{2}}$

2 goes into 2 one time

2 goes into 4 two times

1 times 1 is 1

2 times 1 is 2

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Division: When dividing with a fraction, invert the number after the division symbol, and turn the division into a multiplication problem. The inverted number is called the *reciprocal* of the original number.

Example:

$$\frac{7}{8} \div \frac{3}{5} \xrightarrow{\text{Invert the 3/5 then multiply}} \frac{7}{8} \times \frac{5}{3} = \frac{35}{24}$$

Notice we ended up with an improper fraction, 35/24. You may change it into a mixed number if you wish, though in Algebra, improper fractions are often easier to work with.

The next example involves a division problem in the form of a complex fraction (a fraction dividing a fraction). Take the reciprocal of the denominator, and multiply.

Example:

$$\frac{\frac{3}{4}}{\frac{1}{5}} \xrightarrow{\text{Invert the 1/5 then multiply}} \frac{3}{4} \times \frac{5}{1} = \frac{15}{4}$$

Notice when we inverted 1/5, it became 5/1, which is the same as 5 (a whole number). Conversely, when we invert a whole number, we get a fraction with 1 as the numerator.

Example:

$$\frac{2}{5} \div 9 \longrightarrow \frac{2}{5} \div \frac{9}{1} \longrightarrow \frac{2}{5} \times \frac{1}{9} = \frac{2}{45}$$

Here are some practice problems to try:

a) $\frac{1}{10} \times 3$ **b)** $\frac{5}{12} \div \frac{4}{9}$ **c)** $\frac{3}{2} \times \frac{8}{3}$ **d)** $\frac{7}{8} \div \frac{1}{4}$ **e)** $\frac{\frac{2}{5}}{\frac{2}{5}}$

Answers to Practice Problems: a) 3/10 b) 45/48 c) 4 d) 7/2 e) 1