

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

$$1 \text{ times } 2 \text{ is } 2$$

$$5 \text{ times } 3 \text{ is } 15$$

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

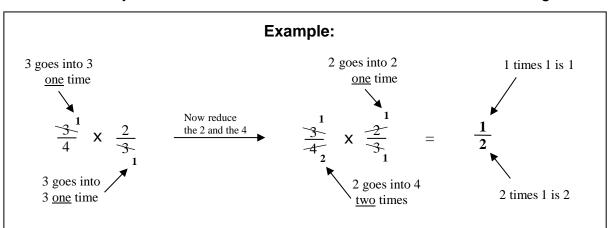
Example:
$$\frac{3}{7} \times 2 \xrightarrow{\text{Place 2 over 1}} \frac{3}{7} \times \frac{2}{1} = \frac{6}{7}$$

Sometimes you may have to reduce:

Example: 3 goes into 15 five times

$$\frac{3}{4} \times \frac{5}{9} = \frac{15}{36}$$
Reduce
$$\frac{15^{5}}{36} = \frac{5}{12}$$
3 goes into 36 twelve times

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





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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:

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

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) $\frac{\frac{2}{5}}{\frac{2}{5}}$

b)
$$\frac{5}{12} \div \frac{4}{9}$$

c)
$$\frac{3}{2} \times \frac{8}{3}$$

d)
$$\frac{7}{8} \div \frac{1}{4}$$

d) 7/2

e)
$$\frac{\frac{2}{5}}{\frac{2}{5}}$$

Answers to Practice Problems: a) 3/10 b) 45/48 c) 4

e) 1