Lesson #2: Multiplying and Dividing Fractions

Much of Mathematics is learning the rules. These next few lessons have rules. Follow them and you will succeed.

Multiplying Fractions:

The process to multiplying fractions is straight-forward:
1. Multiply the numerators together
2. Multiply the denominators together
3. Reduce to lowest terms.

Examples:

a) $\dfrac{2}{3} \times \dfrac{4}{5}$

$= \dfrac{8}{15}$

b) $\dfrac{-8}{5} \times \dfrac{15}{4}$

$= \dfrac{-120 \div 20}{20 \div 20}$

$= -6$

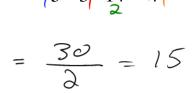c) $\dfrac{-4}{3} \times \dfrac{2}{7} \times \dfrac{-5}{3}$

$= \dfrac{40}{63}$

Typically, the hardest part is reducing. There is another way to approach multiplying fractions. First reduce ANY numerator with ANY denominator (this is sometimes called cross reducing). Let's look at example two again, but this time reduce first.

$\dfrac{\overset{-2}{\cancel{-8}}}{\underset{1}{\cancel{5}}} \times \dfrac{\overset{3}{\cancel{15}}}{\underset{1}{\cancel{4}}}$

$= -6$

Another! $\dfrac{\overset{1}{\cancel{6}}}{\underset{1}{\cancel{7}}} \times \dfrac{\overset{3}{\cancel{21}}}{\underset{2}{\cancel{12}}}$

$= \dfrac{3}{2}$

An big one! $\dfrac{\overset{1}{\cancel{7}}}{\underset{1}{\cancel{5}}} \times \dfrac{\overset{2}{\cancel{8}}}{\underset{1}{\cancel{3}}} \times \dfrac{\overset{3}{\cancel{9}}}{\underset{2}{\cancel{14}}} \times \dfrac{\overset{5}{\cancel{25}}}{\underset{1}{\cancel{4}}}$

$= \dfrac{30}{2} = 15$

NOTE: You may reduce first or last, it does not matter, but you must always reduce

Dividing Fractions:

The process to dividing has one extra step done BEFORE the multiplying steps. We need to change the division to a multiplication, so instead of dividing by a fraction, we multiply by the __reciprocal__. This means to __flip__ the fraction to the __right__ of the division sign. Once this is done, you now have a multiplication question and can follow the steps from above.

Examples:

only reduce when you are multiplying. ✓

a) $\dfrac{4}{5} \div \dfrac{3}{7}$

$= \dfrac{4}{5} \overset{\times}{\longrightarrow} \dfrac{7}{3}$

$= \dfrac{28}{15}$

b) $\dfrac{9}{4} \div \dfrac{8}{3}$ (note: you may be tempted to reduce, but not yet!)

$= \dfrac{9}{4} \overset{\times}{\longrightarrow} \dfrac{3}{8}$

$= \dfrac{27}{32}$

c) $\dfrac{6}{11} \div \dfrac{-3}{2}$

$= \dfrac{\overset{2}{\cancel{6}}}{11} \times \dfrac{-2}{\cancel{3}_1}$

$= \dfrac{-4}{11}$

$\left| \dfrac{6}{11} \times \dfrac{-2}{3} \right.$

$= \dfrac{-12 \div 3}{33 \div 3}$

$= \dfrac{-4}{11}$

d) $\dfrac{5}{9} \div \dfrac{6}{7} \div \dfrac{12}{14}$

$= \dfrac{5}{9} \times \dfrac{7}{\cancel{6}_3} \times \dfrac{\cancel{14}^7}{12}$

$= \dfrac{245}{324}$

Application: A chemist is measuring the acid needed for an experiment. If she has $2\dfrac{1}{5}$ cylinders (or $\dfrac{11}{5}$) and she needs $\dfrac{1}{10}$ of a cylinder for each experiment, how many experiments can she do?

$\dfrac{11}{5} \div \dfrac{1}{10}$

$= \dfrac{11}{\cancel{5}_1} \times \dfrac{\cancel{10}^2}{1}$

$= 22$

$\therefore$ she can do 22 experiments.

"there fore"