Proportions

A _____ is an equation that relates two equivalent ratios. Ratios are said to be in proportion if they can both be reduced to the same ratio.

$\frac{1}{2} = \frac{5}{10}$ This **is** a proportion.

$\frac{1}{2} = \frac{5}{8}$ This is **NOT** a proportion

You can check to see if two ratios are in proportion by cross-multiplying. The cross-products must be equal.

Proportion ✓ 72 72 $\frac{6}{9} = \frac{8}{12}$

Proportion ✗ 55 56 $\frac{5}{8} = \frac{7}{11}$

Example:

State whether the ratios are proportional. If they aren't proportional, change one of the numbers to make them proportional. Circle = or ≠.

1) $\frac{6}{10} = \neq \frac{3}{5}$ $\frac{6}{10}$ (=) $\neq \frac{3}{5}$ They are in proportion.

You Try:

1) $\frac{4}{5} = \neq \frac{12}{15}$

2) $\frac{8}{12} = \neq \frac{2}{3}$

3) $\frac{7}{8} = \neq \frac{8}{9}$

4) $\frac{4}{5} = \neq \frac{7}{8}$

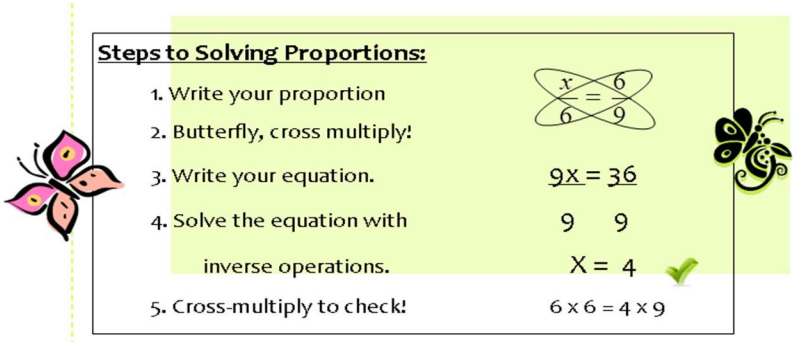
5) $\frac{4}{12} = \neq \frac{5}{15}$

6) $\frac{1}{3} = \neq \frac{1}{6}$

Solving Proportions

One way to solve proportions is to cross multiply and see what factor you need to make the cross-products equal.

Example:



Another way that you can solve a proportion is to find the factor that is shared across the numerator or denominator and use that same relationship to complete the proportion.

Example:

1) $\frac{4}{36} = \frac{u}{9}$ $\div 4$ $\frac{4}{36} = \frac{u}{9}$ $\div 4$ $u = 1$

2) $\frac{u}{36} = \frac{1}{9}$ $\times 4$ $\frac{u}{36} = \frac{1}{9}$ $\times 4$ $u = 4$

You Try:

Finding the missing number in the proportion:

1) $\frac{r}{15} = \frac{4}{20}$ **r = 3**

2) $\frac{8}{10} = \frac{20}{y}$ **y = 25**

3) $\frac{x}{30} = \frac{3}{4}$ **x = 22.5**

4) $\frac{2,5}{5} = \frac{j}{4}$ **j = 2**

5) $\frac{12}{a} = \frac{21}{7}$ **a = 4**

6) $\frac{k}{3} = \frac{14}{21}$ **k = 2**

You can set up proportions to solve word problems as well.

Example:

1) Jazmine won a pie-eating contest, eating 6 pies in 10 minutes. At that rate, how many pies can she eat in two hours?

   There are 120 minutes in two hours. So, $\frac{6}{10} = \frac{p}{120}$. Since 10 times 12 equals 120, 6 times 12 is 72. She would eat 72 pies in two hours.

You Try:

1) Matthew hiked 10 miles in 4 hours. At that rate, how far can he hike in 18 hours? **45 miles**

2) A recipe calls for 2.5 cups of sugar to make 12 cookies. How much sugar is needed to make 36 cookies? **7.5 cups**

3) If 16 necklaces can be bought for $40, how much will 12 necklaces cost? **$30**

4) Sebastian can correctly solve 120 multiplication problems in 2 minutes. At this rate, how long would it take him to solve 300 problems? **5 minutes**

5) Alexandra types at a speed of 45 words per minute. How many words can she type in 10 minutes? **450 words**

6) Daisy needs 1.5 cups of sugar to make 12 cupcakes. How much sugar does she need to make 48 cupcakes? **6 cups**