

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 

$$\frac{6}{9} = \frac{8}{12}$$

Proportion 

$$\frac{5}{8} = \frac{7}{11}$$

Example:

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

1) $\frac{6}{10} = \neq \frac{3}{5}$ $\frac{6}{10} \ominus \neq \frac{3}{5}$ 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.

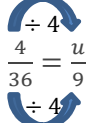
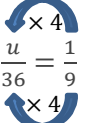
Example:

Steps to Solving Proportions:

1. Write your proportion  $\frac{x}{6} = \frac{6}{9}$
2. Butterfly, cross multiply! $9x = 36$
3. Write your equation. $9x = 36$
4. Solve the equation with inverse operations. $9 \quad 9$
 $x = 4$ 
5. Cross-multiply to check! $6 \times 6 = 4 \times 9$ 

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

You Try:

Finding the missing number in the proportion:

1) $\frac{r}{15} = \frac{4}{20}$ 2) $\frac{8}{10} = \frac{20}{y}$ 3) $\frac{x}{30} = \frac{3}{4}$

4) $\frac{2,5}{5} = \frac{j}{4}$ 5) $\frac{12}{a} = \frac{21}{7}$ 6) $\frac{k}{3} = \frac{14}{21}$

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?

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

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

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

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