

## Lesson 5-4 Notes Proportions

Video: <https://www.brainpop.com/math/ratioproportionandpercent/proportions/> (user ID/password: sttim)

### What is a proportion?

A **proportion** is an equality of two ratios. For example  $\frac{6}{9} = \frac{8}{12}$ .

In a proportion, the cross-products are equal.

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

~~6~~ ~~8~~  
~~9~~ ~~12~~  
 $6 \cdot 12 = 9 \cdot 8$   
 $72 = 72 \checkmark$

For two ratios, the **cross products** are found by multiplying the denominator of one ratio by the numerator of the other.

Do these ratios form a proportion?

$$\frac{4}{5} = \frac{32}{40}$$

~~4~~ ~~32~~  
~~5~~ ~~40~~  
 $4 \cdot 40 = 5 \cdot 32$   
 $160 = 160 \checkmark$  **Yes**

$$\frac{7}{21} = \frac{28}{63}$$

~~7~~ ~~28~~  
~~21~~ ~~63~~  
 $7 \cdot 63 = 21 \cdot 28$   
 $441 = 588 \times$  **NO**

You Try!

Determine whether the ratios in each pair can form a proportion.

$$\frac{1}{2} = \frac{14}{28}$$

$28 \cdot 1 = 2 \cdot 14$   
 $28 = 28$  **Yes**

$$\frac{6}{8} = \frac{4}{3}$$

$6 \cdot 3 = 8 \cdot 4$   
 $18 = 32$  **NO**

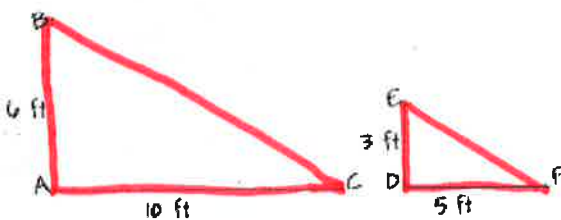
$$\frac{12}{15} = \frac{20}{25}$$

~~12~~ ~~20~~  
~~15~~ ~~25~~  
 $12 \cdot 25 = 15 \cdot 20$   
 $300 = 300 \checkmark$  **Yes**

$$\frac{6}{10} = \frac{24}{42}$$

~~6~~ ~~24~~  
~~10~~ ~~42~~  
 $6 \cdot 42 = 10 \cdot 24$   
 $252 = 240 \times$  **NO**

Are these triangles proportional?



$$\frac{3}{5} = \frac{6}{10}$$

**Yes**

## Lesson 5-5 Notes Solving Proportions

When solving for a "missing" piece of information, or a variable, there are two methods:

### 1) Solve Using Mental Math:

← Use the mental math method when...

The numerator/denominator is a multiple of the other numerator/denom.

$$\frac{x}{12} = \frac{21}{36}$$

$\xrightarrow{\times 3}$   
 $\xrightarrow{\times 3}$

$x = 7$

$$\frac{3}{8} = \frac{b}{24}$$

$\xrightarrow{\times 3}$   
 $\xrightarrow{\times 3}$

$b = 9$

$$\frac{15}{30} = \frac{5}{n}$$

$\xrightarrow{\div 3}$   
 $\xrightarrow{\div 3}$

$n = 10$

### 2) Solve Using Cross Products:

← Use the mental math method when...

Step 1: Write the cross products as an equation.

$$\frac{x}{9} = \frac{4}{6}$$

$$6x = 9 \cdot 4$$

Step 2: Simplify.

$$\frac{6x}{6} = \frac{36}{6}$$

Step 3: Solve the equation, simplify if needed.

$x = 6$

$$\frac{6}{9} = \frac{4}{6}$$

You Try! Solve each proportion.

$$\frac{4}{5} = \frac{x}{55}$$

$\xrightarrow{\times 11}$   
 $\xrightarrow{\times 11}$

$x = 44$

$$\frac{12}{15} = \frac{x}{20}$$

$$12 \cdot 20 = 15x$$

$$240 = 15x$$

$$15 \overline{) 240}$$

$$\underline{15} \phantom{0}$$

$$90$$

$x = 16$