Chapter 7: Similarity

Similar figures: Two figures that have the same shape but not neccessarily the same size.

Symbol for Similar: $\sim$

Ratio: A comparison of two quantities

Three ways to write a ratio:

a to b   a : b $\dfrac{a}{b}$

Proportion: A mathematical statement showing two ratios are equal

Two ways to write a ratio:

$$\frac{a}{b} = \frac{c}{d} \quad \text{or} \quad a : b = c : d$$
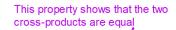

Solve.

$$\frac{36}{15} = \frac{w}{48}$$

$$w = 36 \cdot 48 \div 15$$
$$w = 115.2$$

In a simple proportion like this (3 #'s and a variable) all you need to do is multiply the two #'s that are diagonal from each other and divide by the third #.

Top-left quadrant

This property shows that the two cross-products are equal

This property shows that as long as you flip both sides of a proportion they are still equal.

Property	Properties of Proportions

$\frac{a}{b} = \frac{c}{d}$ is equivalent to

(1) $ad = bc$ (2) $\frac{b}{a} = \frac{d}{c}$

(3) $\frac{a}{c} = \frac{b}{d}$ (4) $\frac{a+b}{b} = \frac{c+d}{d}$

This property shows that you can interchange the denominator of one fraction with the numerator of the other fraction and they are still equal.

This property is as commonly used. What it shows is that if you add the denominator to the numerator for both fractions that they are still equal. It really comes from adding 1 to both sides of the original equation and then getting a common denominator so that you can write both sides as a single fraction:

$$\frac{a}{b} + 1 = \frac{c}{d} + 1$$

$$\frac{a}{b} + \frac{b}{b} = \frac{c}{d} + \frac{d}{d} \Rightarrow \frac{a+b}{b} = \frac{c+d}{d}$$

Top-right quadrant

Use this proportion to complete each st

$$\frac{22}{13} = \frac{33}{a}$$

1. $\dfrac{a}{13} = \square$

2. $\dfrac{a}{33} = \square$

3. $\dfrac{35}{13} = \square$

4. $429 = \square$

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1. $\dfrac{a}{13} = \dfrac{33}{22}$

property 3 from previous page

2. $\dfrac{a}{33} = \dfrac{13}{22}$

property 2 from previous page

3. $\dfrac{35}{13} = \dfrac{33+a}{a}$

property 4 from previous page

4. $429 = 22a$

property 1 from previous page

Bottom-left quadrant

Solve.

$$\frac{48}{x} = 72$$

You can turn this into $\dfrac{48}{x} = \dfrac{72}{1}$

then solve this simple proportion

$$x = 48 \cdot 1 \div 72$$

$$x = \frac{2}{3}$$

Bottom-right quadrant

Solve.

$$\frac{3}{m+7} = \frac{8}{m-2}$$

Use the 1st property of proportions to write down the equal cross products

$$3(m-2) = 8(m+7)$$

$$3m - 6 = 8m + 56$$
$$-3m \qquad\quad -3m$$

Now solve for m

$$-6 = 5m + 56$$
$$-56 \qquad\quad -56$$

$$\frac{-62}{5} = \frac{5m}{5}$$

$$\boxed{m = -\frac{62}{5}}$$

Extended Proportion:

When three or more ratios are equal.

Solve for x and y.

$$\frac{y}{42} = \frac{35}{16} = \frac{95}{x}$$

Use the last two to solve for x:

$$\frac{35}{16} = \frac{95}{x}$$

$X = 16 \cdot 95 \div 35$

$X = 43.43$

Use the first two to solve for y:

$$\frac{y}{42} = \frac{35}{16}$$

$y = 42 \cdot 35 \div 16$

$y = 91.88$

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Problems 1-5, 7, 9, 15, 18, 25, 44, 46