Ratios and Proportions

A ***ratio*** is a comparison between two numbers (with the same units) by division***.*** The ratio of *x* and *y* can be expressed in the following ways (in simplest form): $\frac{x}{y}$ $x : y$ x to y

A ***proportion*** is an equation stating that two ratios are equal.

Means-Extremes Property of Proportion $a : b = c : d$

means

extremes

This property allows you to determine whether you have a proportion, or solve a proportion equation.

Words: product of means = product of extremes

Symbols: $\frac{a}{b} = \frac{c}{d}$ then $ad = bc$

Example 1: Determine Whether Ratios Form a Proportion

Determine whether the following ratios form a proportion.

a.) $\frac{7}{8}$ and $\frac{49}{56}$

$7(56) = 392$

$8(49) = 392$

✓

② or $\frac{49}{56} = \frac{7}{8}$

b.) $\frac{0.25}{0.6}$ and $\frac{1.25}{2}$.

$.5 = .75$

NOOO!!!...

c.) $\frac{4}{5}$ and $\frac{16}{20}$. $= \frac{4}{5}$

Yes

Example 2: Solve a Proportion

Solve the following proportions.

a.) $\frac{n}{12} = \frac{3}{8}$

$8n = 3(12)$

$8n = 36$

$n = \frac{36}{8} = \boxed{\frac{9}{2}}$

b.) $\frac{5}{3} = \frac{6}{(x+2)}$

$5(x+2) = 3(6)$

$5x + 10 = 18$

$5x = 8$

$\boxed{x = \frac{8}{5}}$

c.) $\frac{5}{12} = \frac{10}{x-1}$

$5x - 5 = 120$

$5x = 125$

$x = ...$

$\boxed{x = 25}$

Rates and Scales

A ***rate*** is a comparison between two numbers by division**.** In a rate, the two numbers compared must have the different units. The ratio of *x* and *y* can be expressed in the following ways (in simplest form):

$\frac{x}{y}$ $\quad$ x per y

A ***scale*** is used when making a model or drawing of something that is too large or too small to be conveniently drawn at actual size. A scale compares the model to the actual size using a proportion.

<u>Example 3: Use Rates</u>

a.) BICYCLING. Trent goes on a 30-mile bike ride every Saturday. He rides the distance in 4 hours. At this rate, how far can he ride in 6 hours?

$$\frac{30 \text{ miles}}{4 \text{ hrs}} = \frac{x \text{ miles}}{6 \text{ hrs}}$$

$$30(6) = 4x$$

$$180 = 4x$$

$$x = 45 \text{ miles}$$

b.) BICYCLING. The gear on a bicycle is 8:5. This means that for every 8 turns of the pedals, the wheel turns 5 times. Suppose the bicycle wheel turns about 2435 times during a trip. How many times would you have to crank the pedals during the trip?

$$\frac{8 \text{ pedals}}{5 \text{ wheels}} = \frac{x \text{ pedal}}{2435 \text{ wheels}}$$

$$x = 3896$$

Example 4: Use a Scale Drawing

MAP. In a road atlas, the scale for the map of Connecticut is 5 inches = 41 miles. The scale for the map of Texas is 5 inches = 144 miles. What are the distances in miles represented by $2\frac{1}{2}$ inches on each map?

Texas

$$\frac{5 \text{ in}}{144 \text{ mi}} = \frac{2.5 \text{ in}}{}$$

CT

$$\frac{5 \text{ in}}{41 \text{ mi}} = \frac{2.5 \text{ in}}{x}$$