DUE DATE:
B DAY: Feb 8th

Unit 8 Study Guide—Ratio & Proportion

*Name*_________________________ *Period*_______ *Score* _______

Section 8-1: Equivalent Ratios & Unit Rates

Ratio: A ratio is a ____.

Example: A classroom has 35 students in it. There are 15 boys and 20 girls.

The ratio of boys to girls is ______________________.

We can write this ____ different ways $15 \text{ to } 20$, $15:20$ or as a fraction $\frac{15}{20}$. When we write it as a fraction we want to have it in simplest form. $\frac{15}{20} = \frac{3}{4}$

If we wanted the ratio of girls to boys we would have $20 \text{ to } 15$, $20:15$ or $\frac{20}{15} = \frac{4}{3}$

Example: There are 21 ducks and 9 geese swimming in the pond. Write a ratio of ducks to geese as a fraction in simplest form.

Example: Write this ratio as a fraction in simplest form: 240 miles to 8 gallons of gas.

$$\frac{240 miles}{8 gallons} = \frac{30}{1} \text{ or } 30 \textit{ miles per one gallon of gas}$$

Unit Rate: a ratio that compares two quantities of different units like dollars and pounds.

If you have \$12 for 3 pounds, you can write the ratio $\frac{\$12}{3 lbs}$.

Unit rate is the ratio of two units ____________________________________. If you have to pay \$12 for 3 pounds of almonds then we need to find how much one pound of almonds would be.

$$\frac{\$12}{3\, pounds} = \frac{\$4}{1\, pound} = \$4 \textit{ per one pound of almonds}$$

If I read 180 words in 3 minutes, what is my unit rate? or How many words do I read in 1 minute?

$$\frac{180 words}{3 \min} =$$

Section 8-2: Solving Proportions & Customary Units

Proportion: ______________________________________; a proportion is an equation that can be solved.

For example, $\frac{1}{2}=\frac{5}{10}$ is a proportion. They are 2 fractions, or ratios that ______________________.

Example: Solve the proportion $\frac{2}{3}=\frac{x}{9}$

It may be obvious to some that the 2^{nd} ratio is just the 1^{st} multiplied by 3, so we would get $x=6$.

But if it is not obvious, we can cross multiply and solve the resulting one-step equation.

$$\frac{2}{3} \times \frac{x}{9} \Longrightarrow (2)(9)=(3)(x)$$

$$18 = 3x$$

$$\div 3 \quad \div 3$$

$$6 = x \text{ or } x=6$$

We will use proportions to convert between **customary units.**

Example: If $1\ foot = 12\ inches$, **3 feet = _________ inches?**

Set up the proportion:

$$\frac{1\ foot}{12\ inches}=\frac{3\ feet}{x\ inches}$$

**Notice that matching units are used in the numerator and denominator.

Then, cross-multiply and solve.

$$\frac{1\ foot}{12\ inches} \times \frac{3\ feet}{x\ inches} \Longrightarrow (1)(x)=(12)(3)$$

$$1x=36$$

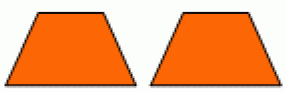
$$x=36 \text{ so, } \textbf{3 feet = 36 inches}$$

This is the table of basic customary conversions.

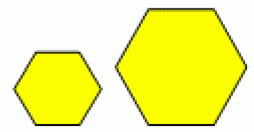
Customary Conversions
8 fluid ounces = 1 cup
2 cups = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon
8 pints = 1 gallon
3 teaspoons = 1 tablespoon
16 tablespoons = 1 cup
16 fluid ounces = 1 pint
16 ounces = 1 pound
5,280 feet = 1 mile
12 inches = 1 foot
3 feet = 1 yard

Section 8-3: Similar Figures

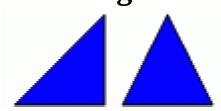
Congruent Shapes are the **SAME SIZE** and the **SAME SHAPE**---they are ***exact copies***.



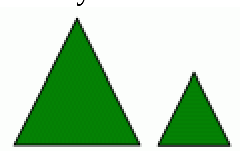
Similar Shapes have the **SAME ANGLES** (***same shape***) but the **SIDES** are **PROPORTIONAL**. They can be copies that have been REDUCED in size (50% of the original). Or they can be copies that have been INCREASED in size (200% of the original).
Because the two images below have the **same angles**, ***their shape has to be*** **_____________________**.



If the angles are different, then the two images ***will not have the same shape*** and are not similar.

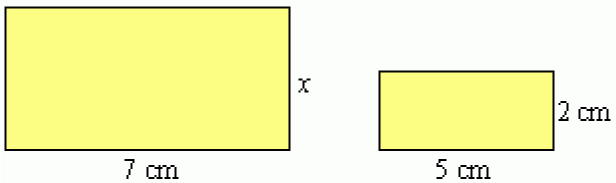


In order to be similar, ***the*** **_________________________________**. In other words, there must be some SCALE FACTOR that each side is multiplied by. The second triangle below was produced by multiplying each side by 0.5



You can find and compare ***the ratio*** between the ***same two sides*** of two different, but similar figures.

In the two similar figures below we can find the ratio of the height of the right side of each square and the length of the bottom of each square.



Setting these two ratios equal to each other produces a proportion. Solving the proportion for the missing information allows us to find the height of the first rectangle.

$$\frac{x}{7} = \frac{2}{5}$$

The height of the first rectangle is 2.8 cm.

Section 8-4: Scale Factor

- A **Scale** is a ratio that tells you how ______________________. In this case we may use different units.

  Ex: If a model of a car is 6 inches long and the actual car is 10 feet long then the scale of the model would be

$$\text{Scale} = \frac{\text{Model Length}}{\text{Actual Length}} = \frac{6\text{ in}}{10\text{ ft}} = \frac{3\text{ in}}{5\text{ ft}} \quad \text{or } 3\text{ in} : 5\text{ ft}$$

- A **Scale Factor** is the ____________________ to the lengths of a given figure in order to __________ or ___________ the size of the figure while maintaining ____________________. **A scale factor does not include the units**. The way to accomplish this is by making the units the same and then cancelling them out.

  Ex: To find the scale factor of the model car we take the scale and convert feet to inches:

$$\frac{3\text{ in}}{5\text{ ft}} = \frac{3\ \cancel{\text{in}}}{60\ \cancel{\text{in}}} = \frac{3}{60} = \frac{1}{20}$$

$$\text{So the Scale Factor is } \frac{1}{20} \quad \text{or } 1 : 20$$

- The scale factor can be written as a fraction $\frac{A}{B}$ or as a ratio in the form **A : B**. It can also be written as a decimal.

Example:

A model of the Empire State Building is 15 inches tall. The scale of the model : actual is 3 inch : 250 feet. How tall is the actual Empire State Building in New York City?

First, we need the scale factor. $\frac{3\text{ inches}}{250\text{ feet}} = \frac{3\ \cancel{\text{inches}}}{3000\ \cancel{\text{inches}}} = \frac{1}{1000}$

We can use the scale factor to solve the following proportion:

$$\frac{1}{1000} = \frac{15\text{ inches}}{x}$$

$$0.001 = \frac{15\text{ inches}}{x} \qquad \text{Multiply both sides by x}$$

$$0.001x = 15\text{ inches} \qquad \text{Divide both sides by 0.001}$$

$$x = 15000\text{ inches} \qquad \text{Convert inches to feet}$$

$$x = 1250\text{ feet}$$

So the actual Empire State Building is 1250 feet tall, making it the 14^{th} tallest building in the world.