Geometry **Notes 7.1: Ratio and Proportion** Name:_____

Students will be able to write and reduce ratios and solve proportions.

The Michigan State Spartans have won 10 games and lost 3 games so far this season. Compare the following: (use any way you know)

(a) Wins to losses

10 : 3 $\frac{10}{3}$ 10 to 3

(b) Wins to number of games played

10 : 13 $\frac{10}{13}$ 10 to 13

- A Ratio / division is a comparison of a number a and a nonzero number b using _____.

A ratio can be written 3 ways:

1. a : b
2. a to b
3. $\frac{a}{b}$

Example 1: A football team has won 9 games and lost 5. Find the ratio.

a. wins to losses $\frac{9}{5}$ NEVER $1\frac{4}{5}$

b. losses to wins 5 : 9

c. losses to number of games played $\frac{5}{14}$

Example 2: Simplify the ratios.

a. $\frac{20\ yards}{25\ yards}$ $\frac{4}{5}$

b. 60 cm : 200 cm $\frac{60}{200} = \frac{6}{20} = \frac{3}{10}$

c. $\frac{3\ ft}{18\ in}$ ×12 12 in : 1 ft $\frac{36\ in}{18\ in} = \frac{2}{1}$

d. 8 ft : 8 yards 3 ft to 1 yd $\frac{3\ ft}{8\ yd \times 3} = \frac{8\ ft}{24\ ft}$ $\frac{1}{3}$

- So, simplifying ratios is almost identical to reducing fractions!

Common conversions:

12 inches = 1 foot 3 feet = 1 yard	10 mm = 1cm 100 cm = 1 m 1000 m = 1 km	7 days = 1 week 12 months = 1 year 2 4 hours = 1 day	16 ounces = 1 lb (pound) 4 quarts = 1 gallon 100 mL = 1 L

Try: Simplify the ratios.

12 months : 1 yd 3ft : 1yd 100 cm : 1m

1. $\frac{12\ m}{10\ m}$ → $\frac{6}{5}$

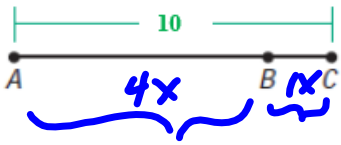
2. 2 years: 8 months

$\frac{2\ yr \times 12}{8\ months}$ → $\frac{24}{8} = \frac{3}{1}$

3. $\frac{2\ yards \times 3}{16\ feet}$ → $\frac{6}{16} = \frac{3}{8}$

4. $\frac{1\ m \times 100}{150\ cm}$ → $\frac{100\ cm}{150\ cm} = \frac{2}{3}$

Example 3: In the diagram, AB : BC is 4 : 1 and AC = 10. Find AB and BC.



$4x + 1x = 10$

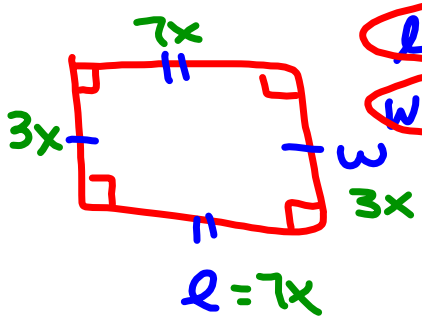
$\frac{5x}{5} = \frac{10}{5}$

$x = 2$

$AB = 4(2) = 8$

$BC = 1(2) = 2$

Example 4: The perimeter of a rectangle is 80 feet. The ratio of the length to the width is 7 : 3. Find the length and the width of the rectangle.



l = length = $7x = 7(4) = 28$ ft

w = width = $3x = 3(4) = 12$ ft

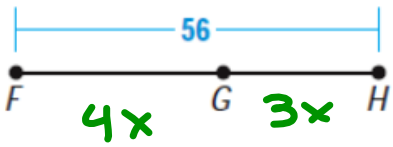
$7x + 7x + 3x + 3x = 80$

$\frac{20x}{20} = \frac{80}{20}$

$x = 4$

Try:

1. In the diagram, FG : GH = 4 : 3 and FH = 56. Find FG and GH.



$4x + 3x = 56$

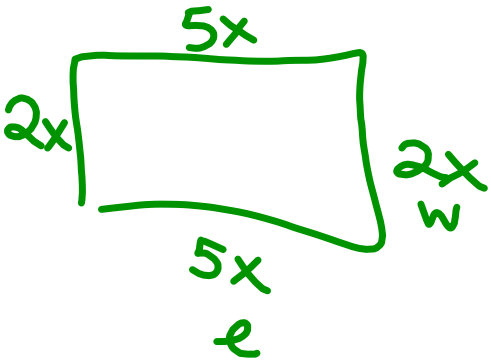
$\frac{7x}{7} = \frac{56}{7}$

$x = 8$

FG = 32

GH = 24

2. The perimeter of a rectangle is 84 feet. The ratio of the width to the length is 2 : 5. Find the length and the width of the rectangle.



$5x + 5x + 2x + 2x = 84$

$14x = 8x$

$x = 6$

width : 12 ft

length : 30 ft

Solving proportions

☆ **Proportion:** An equation that states two Ratios are equal.

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

Cross Product Property
In a proportion, the product of the extremes is equal to the product of the means.

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

CROSS MULTIPLY!

Example 5: Solve the following proportions.

a. $\frac{4}{5} = \frac{x}{15}$

$4 \cdot 15 = 5x$

$60 = 5x$

$\frac{60}{5} = \frac{5x}{5}$

$12 = x$

b. $\frac{5}{3} = \frac{y+2}{6}$

$5 \cdot 6 = 3(y+2)$

$30 = 3y + 6$

$-6 \quad -6$

$24 = 3y$

$\frac{24}{3} = \frac{3y}{3}$

$8 = y$

c. $\frac{2}{x-1} = \frac{5}{3x-4}$

$2(3x-4) = 5(x-1)$

$6x - 8 = 5x - 5$

$-5x \quad -5x$

$x - 8 = -5$

$+8 \quad +8$

$x = 3$