Geometry A

Name: Key

6.1 Notes: Ratios and Proportions

LEARNING TARGETS

- ✓ I can simplify ratios.
- ✓ I can use ratios to solve geometric applications
- ✓ I can solve real world problems by writing and solving proportions.

Vocabulary:

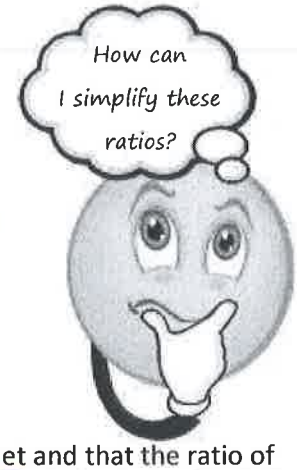
- A **ratio** is a comparison of two quantities using division. The ratio a to b, where b is not zero, can be written as $\frac{a}{b}$ or $a:b$.
- A **proportion** is an equation in which two ratios are equal. For example, $\frac{a}{b}=\frac{c}{d}$ is an example of a proportion. The numbers b and c are called the **means** and the numbers a and d are called the **extremes.**

➢ The truth of a proportion can be tested by using the **Cross Products Property**, which states:

If $\frac{a}{b}=\frac{c}{d}$, where $b\neq 0$ and $d\neq 0$, then $ad=bc$ (also known as product of means = product of extremes).

✓ I can simplify ratios.

In order to simplify ratios, the units must be the same. You may need to multiply the given ratio by a conversion factor to make the units cancel out!



Example1:

a) $42cm:6cm$

$\frac{42cm}{6cm}=\boxed{\frac{7}{1} \text{ or } 7:1}$

b) $\frac{4\ ft}{12\ in.}$ convert 12 in to 1 ft

$=\frac{4ft}{1ft}$

$=\boxed{\frac{4}{1} \text{ or } 4:1}$

c) 45min:1 hour convert 1 hour to 60 min.

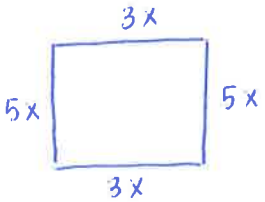
$\frac{45\ min}{1\ hr}=\frac{45min}{60min}=\boxed{\frac{3}{4} \text{ or } 3:4}$

✓ I can use a ratio to find a dimension.

You are painting some barn doors. You know that the perimeter of the doors is 64 feet and that the ratio of the length to height is 3:5. Find the area of the doors.

a) Step 1: Write equivalent ratio

Length : height = $3x:5x$



b) Step 2: Set up and solve equation to find x.

$3x+5x+3x+5x=64$ ← add up the 4 sides and set equal to given perimeter

$16x=64 \Rightarrow \boxed{x=4}$

c) Step 3: Evaluate the equivalent expressions for length and width.

length = $3(4)=12$ ft

height = $5(4)=20$ ft

d) Step 4: Answer the question – find area!

Area = $l \times h$

$=(12)(20)$

$\boxed{A=240 ft^2}$

✓ I can use extended ratios to solve problems.

An extended ratio compares more than 2 items.

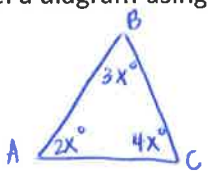
Example 3:

a) The measures of the angles in ΔABC are in the extended ratio of 2:3:4. Find the measures of the angles.

Step 1: Write an equivalent ratio for the given ratio.

angles : $2x : 3x : 4x$

Step 2: Draw and label a diagram using the given information.



Step 3: Set up and solve an equation to find x.

$2x + 3x + 4x = 180$

$9x = 180$

$\boxed{x = 20}$

Step 4: Answer the question!

$m\angle A = 2(20) = 40°$

$m\angle B = 3(20) = 60°$

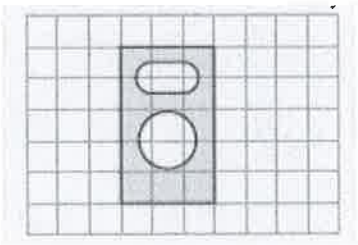
$m\angle C = 4(20) = 80°$

✓ I can use ratios and proportions to solve real-world problems

A **scale** is a ratio that describes how the dimensions in a drawing are related to the actual dimensions of the object. $scale = \frac{\text{dimension in drawing}}{\text{actual dimension}}$

Example 4:

a) The blueprint below shows a scale drawing of an MP3 music player. The diameter of the round speaker on the blueprint is 0.4 inch. The actual length is 1.6 inches. What is the scale of the blueprint?



$\frac{\text{drawing}}{\text{actual}}$: $\frac{0.4\text{ in}}{1.6\text{ in}} = 0.25 = \frac{1}{4}$

$\boxed{\text{Scale is } \frac{1}{4} \text{ or } 1:4}$

b) The scale of a map is 1in : 1440 ft. Find the actual length of the street if the distance on the map is 3 inches.

$\frac{\text{drawing}}{\text{actual}}$: $\frac{1\text{in}}{1440\text{ ft}} = \frac{3\text{in}}{x}$ ← cross multiply to solve

$x = (1440)(3)$

$x = 4{,}320$ ⇒ $\boxed{\text{The actual distance is } 4{,}320\text{ ft}}$