# 6.2 Use Proportions to Solve Geometry Problems

**Goal** • Use proportions to solve geometry problems.

*Your Notes*

**VOCABULARY**

Scale drawing A scale drawing is a drawing that is the same shape as the object it represents.

Scale The scale is a ratio that describes how the dimensions in the drawing are related to the actual dimensions of the object.

**ADDITIONAL PROPERTIES OF PROPERTIES**

2. **Reciprocal Property** If two ratios are equal, then their reciprocals are also equal.

   If $\frac{a}{b} = \frac{c}{d}$, then $\frac{b}{a} = \frac{d}{c}$.

3. If you interchange the means of a proportion, then you form another true proportion.

   If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a}{c} = \frac{b}{d}$.

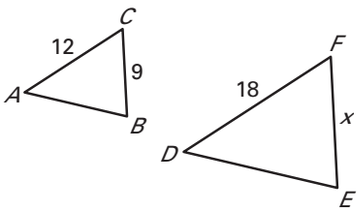
4. In a proportion, if you add the value of each ratio's denominator to its numerator, then you form another true proportion.

   If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a + b}{b} = \frac{c + d}{d}$.

**Your Notes**

## Example 1 *Use properties of proportions*

**In the diagram, $\frac{AC}{DF} = \frac{BC}{EF}$. Write four true proportions.**




Because $\frac{AC}{DF} = \frac{BC}{EF}$, then $\frac{12}{18} = \frac{9}{x}$.

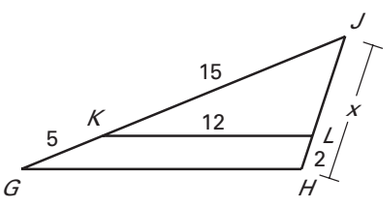
**Reciprocal Property:** The reciprocals are equal, so $\frac{18}{12} = \frac{x}{9}$.

**Property 3:** You can interchange the means, so $\frac{12}{9} = \frac{18}{x}$.

**Property 4:** You can add the denominators to the numerators, so $\frac{30}{18} = \frac{9 + x}{x}$.

## Example 2 *Use proportions with geometric figures*

**In the diagram, $\frac{JL}{LH} = \frac{JK}{KG}$. Find *JH* and *JL*.**




| | |
|---|---|
| $\frac{JL}{LH} = \frac{JK}{KG}$ | **Given** |
| $\frac{JL + LH}{LH} = \frac{JK + KG}{KG}$ | **Property of Proportions (Property 4)** |
| $\frac{x}{2} = \frac{15 + 5}{5}$ | **Substitution Property of Equality** |
| $5x = 2(15 + 5)$ | **Cross Products Property** |
| $x = 8$ | **Solve for *x*.** |

So $JH = 8$ and $JL = 8 - 2 = 6$.

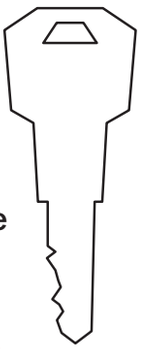
**Checkpoint** **Complete the following exercises.**

| | |
|---|---|
| **1.** In Example 1, find the value of *x*. $x = 13.5$ | **2.** In Example 2, $\frac{KL}{GH} = \frac{JK}{JG}$. Find *GH*. $GH = 16$ |

***Your Notes***

**Example 3** ***Find the scale of a drawing***

**Keys** The length of the key in the scale drawing is 7 centimeters. The length of the actual key is 4 centimeters. What is the scale of the drawing?



**Solution**

To find the scale, write the ratio of a length in the drawing to an actual length, then rewrite the ratio so that the denominator is 1.

$$\frac{\text{length in drawing}}{\text{length of key}} = \frac{7 \text{ cm}}{4 \text{ cm}} = \frac{7 \div 4}{4 \div 4} = \frac{1.75}{1}$$

The scale of the drawing is 1.75 cm : 1 cm.

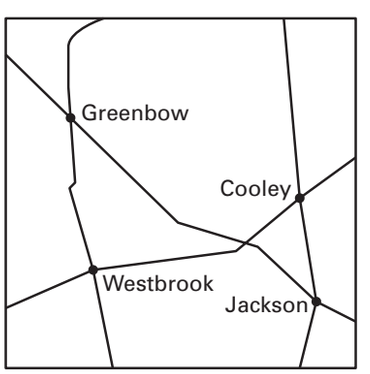
✔ ***Checkpoint*** **Complete the following exercise.**

**3.** In Example 3, suppose the length of the key in the scale drawing is 6 centimeters. Find the new scale of the drawing.

1.5 cm : 1 cm

**Example 4** ***Use a scale drawing***

**Maps** The scale of the map at the right is 1 inch : 8 miles. Find the actual distance from Westbrook to Cooley.




**Solution**

Use a ruler. The distance from Westbrook to Cooley on the map is about 1.25 inches. Let $x$ be the actual distance in miles.

$$\frac{1.25 \text{ in.}}{x \text{ mi}} = \frac{1 \text{ in.}}{8 \text{ mi}} \quad \begin{matrix} \leftarrow \text{distance on map} \\ \leftarrow \text{actual distance} \end{matrix}$$

$x =$ 1.25(8) **Cross Products Property**

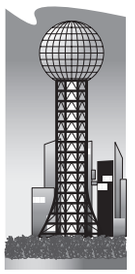
$x =$ 10 **Simplify.**

The actual distance from Westbrook to Cooley is about 10 miles.

***Your Notes***

**Example 5** ***Solve a multi-step problem***

**Scale Model** You buy a 3-D scale model of the Sunsphere in Knoxville, TN. The actual building is 266 feet tall. Your model is 20 inches tall, and the diameter of the dome on your scale model is about 5.6 inches.



**a.** What is the diameter of the actual dome?

**b.** How many times as tall as your model is the actual building?

**Solution**

**a.** $\frac{20 \text{ in.}}{266 \text{ ft}} = \frac{5.6 \text{ in.}}{x \text{ ft}}$ ← measurement on model ← measurement on actual building

$20x = 1489.6$ **Cross Products Property**

$x \approx 74.5$ **Divide each side by** 20 **.**

The diameter of the actual dome is about 74.5 feet.

**b.** To simplify a ratio with unlike units, multiply by a conversion factor.

$\frac{266 \text{ ft}}{20 \text{ in.}} = \frac{266 \text{ ft}}{20 \text{ in.}} \cdot \frac{12 \text{ in.}}{1 \text{ ft}} =$ 159.6

The actual building is 159.6 times as tall as the model.

✔ ***Checkpoint*** **Complete the following exercises.**

**4.** Two landmarks are 130 miles from each other. The landmarks are 6.5 inches apart on a map. Find the scale of the map.

1 inch : 20 miles

**5.** Your friend has a model of the Sunsphere that is 5 inches tall. What is the approximate diameter of the dome on your friend's model?

about 1.4 inches

***Homework***