6.3 Use Similar Polygons

Goal • Use proportions to identify similar polygons.

Your Notes

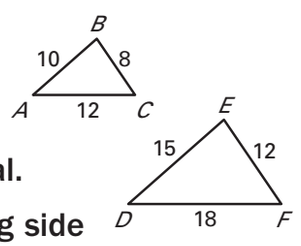
VOCABULARY

Similar polygons

Scale factor of two similar polygons

Example 1 ***Use similarity statements***

In the diagram, $\triangle ABC \sim \triangle DEF$.



a. List all pairs of congruent angles.

b. Check that the ratios of corresponding side lengths are equal.

c. Write the ratios of the corresponding side lengths in a *statement of proportionality*.

In a *statement of proportionality*, any pair of ratios forms a true proportion.

Solution

a. $\angle A \cong \angle$___, $\angle B \cong \angle$___, $\angle C \cong \angle$___

b. $\frac{AB}{DE} =$ ____ $=$ ___ $\frac{BC}{EF} =$ ____ $=$ ___

$\frac{CA}{FD} =$ ____ $=$ ___

c. The ratios in part (b) are equal, so

____ $=$ ____ $=$ ____.

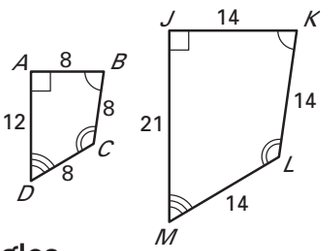
✔ ***Checkpoint*** **Complete the following exercise.**

1. Given $\triangle PQR \sim \triangle XYZ$, list all pairs of congruent angles. Write the ratios of the corresponding side lengths in a statement of proportionality.

Your Notes

Example 2 *Find the scale factor*

Determine whether the polygons are similar. If they are, write a similarity statement and find the scale factor of *ABCD* to *JKLM*.



Solution

Step 1 **Identify** pairs of congruent angles.

From the diagram, you can see that $\angle B \cong \angle$___, $\angle C \cong \angle$___, and $\angle D \cong \angle$____. Angles ___ and ___ are right angles, so $\angle$____ $\cong \angle$___. So, the corresponding angles are _____.

Step 2 **Show** that corresponding side lengths are proportional.

$\frac{AB}{JK} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$ $\qquad$ $\frac{BC}{KL} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$

$\frac{CD}{LM} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$ $\qquad$ $\frac{AD}{JM} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$

The ratios are equal, so the corresponding side lengths are _____.

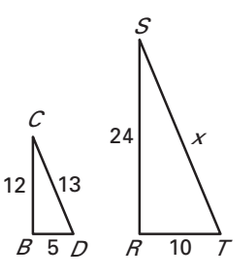
So *ABCD* $\sim$ _____. The scale factor of *ABCD* to *JKLM* is ___.

Example 3 *Use similar polygons*

In the diagram, $\triangle BCD \sim \triangle RST$. Find the value of *x*.

Solution

The triangles are similar, so the corresponding side lengths are _____.



There are several ways to write the proportion. For example, you could write $\frac{BD}{RT} = \frac{CD}{ST}$.

$\frac{BC}{\square} = \frac{\square}{ST}$ **Write proportion.**

$\frac{12}{\square} = \frac{\square}{x}$ **Substitute.**

$12x =$ ____ **Cross Products Property**

$x =$ ____ **Solve for *x*.**

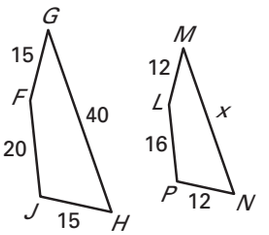
Your Notes

✔ ***Checkpoint*** **In the diagram, *FGHJ* ~ *LMNP*.**

2. What is the scale factor of *LMNP* to *FGHJ*?

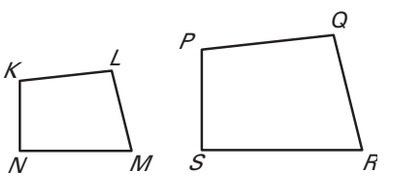
_____

3. Find the value of *x*.



THEOREM 6.1: PERIMETERS OF SIMILAR POLYGONS

If two polygons are similar, then the ratio of their perimeters is equal to the ratios of their corresponding side lengths.



If *KLMN* ~ *PQRS*, then

$$\frac{KL + LM + MN + NK}{PQ + QR + RS + SP} = \_\_\_\_ = \_\_\_\_ = \_\_\_\_ = \_\_\_\_.$$

Example 4 ***Find perimeters of similar figures***

Basketball A larger cement court is being poured for a basketball hoop in place of a smaller one. The court will be 20 feet wide and 25 feet long. The old court was similar in shape, but only 16 feet wide.

a. Find the scale factor of the new court to the old court.

b. Find the perimeters of the new court and the old court.

Solution

a. Because the new court will be similar to the old court, the scale factor is the ratio of the widths, ____ = ____.

b. The new court's perimeter is _____ = ____ feet. Use Theorem 6.1 to find the perimeter *x* of the old court.

$\frac{90}{x} =$ ____ **Use Theorem 6.1 to write a proportion.**

$x =$ ____ **Simplify.**

The perimeter of the old court was ____ feet.

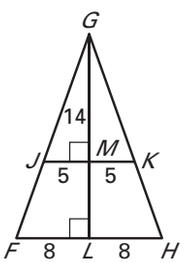
Your Notes

CORRESPONDING LENGTHS IN SIMILAR POLYGONS

If two polygons are similar, then the ratio of any two corresponding lengths in the polygons is equal to the _____ of the similar polygons.

Example 5 ***Use a scale factor***

In the diagram, $\triangle FGH \sim \triangle JGK$. Find the length of the altitude $\overline{GL}$.



Solution

First, find the scale factor of $\triangle FGH$ to $\triangle JGK$.

$\frac{FH}{\square} =$ _____ $=$ ____ $=$ ___

Because the ratio of the lengths of the altitudes in similar triangles is equal to the scale factor, you can write the following proportion.

$\frac{GL}{GM} =$ ___ **Write proportion.**

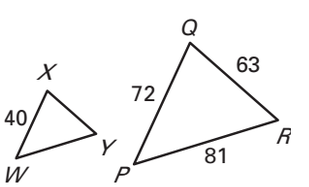
$\frac{GL}{\square} =$ ___ **Substitute _____ for GM.**

$GL =$ _____ **Multiply each side by _____ and simplify.**

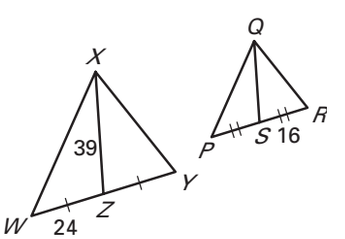
The length of altitude $\overline{GL}$ is _____.

Checkpoint **In the diagrams, $\triangle PQR \sim \triangle WXY$.**

4. Find the perimeter of $\triangle WXY$.



5. Find the length of median $\overline{QS}$.



Homework