1.

$$\frac{x}{4}=\frac{3}{8}$$

$$\frac{8x}{8}=\frac{12}{8}$$

$$x=12/8$$

2.

$$\frac{12}{x}=\frac{3}{5}$$

$$3x=60$$

$$x=20$$

3.

$$\frac{x}{9}=\frac{1}{x}$$

$$\sqrt{x^2}=\sqrt{9}$$

$$x=\pm 3$$

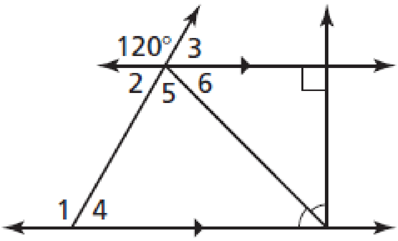
4. $\frac{x+3}{2}=\frac{3}{5}$

5. $\frac{4-x}{12}=\frac{3}{-7}$

6.

$$\frac{1}{2x+1}=\frac{x-3}{9}$$

Use the diagram to find the measure of the angle.



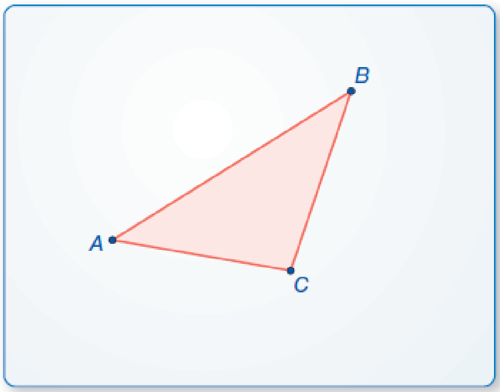
1. ∠1 **2.** ∠2 **3.** ∠3

4. ∠4 **5.** ∠5 **6.** ∠6

Essential Question

How are similar polygons related?

Work with a partner. Use dynamic geometry software to draw any $\triangle ABC$. Dilate $\triangle ABC$ to form a similar $\triangle A'B'C'$ using any scale factor k and any center of dilation.

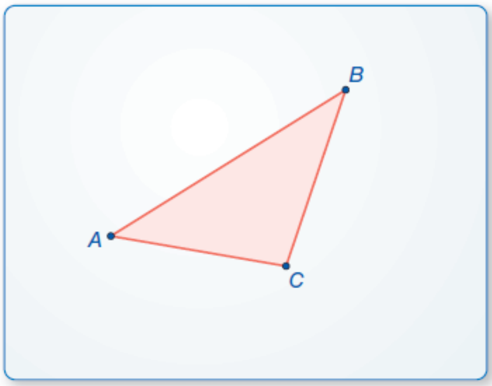


a. Compare the corresponding angles of $\triangle A'B'C'$ and $\triangle ABC$.

b. Find the ratios of the lengths of the sides of $\triangle A'B'C'$ to the lengths of the corresponding sides of $\triangle ABC$. What do you observe?

c. Repeat parts (a) and (b) for several other triangles, scale factors, and centers of dilation. Do you obtain similar results?

Work with a partner. Use dynamic geometry software to draw any $\triangle ABC$. Dilate $\triangle ABC$ to form a similar $\triangle A'B'C'$ using any scale factor k and any center of dilation.



a. Compare the perimeters of $\triangle A'B'C'$ and $\triangle ABC$. What do you observe?

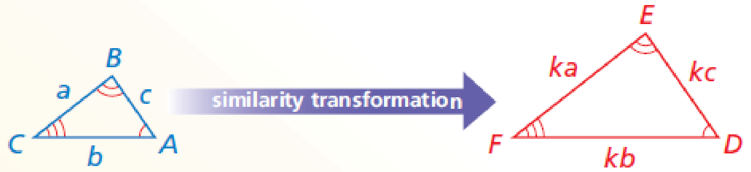
b. Compare the areas of $\triangle A'B'C'$ and $\triangle ABC$. What do you observe?

c. Repeat parts (a) and (b) for several other triangles, scale factors, and centers of dilation. Do you obtain similar results?

Core Concept

Corresponding Parts of Similar Polygons

In the diagram below, $\triangle ABC$ is similar to $\triangle DEF$. You can write "$\triangle ABC$ is similar to $\triangle DEF$" as $\triangle ABC \sim \triangle DEF$. A similarity transformation preserves angle measure. So, corresponding angles are congruent. A similarity transformation also enlarges or reduces side lengths by a scale factor k. So, corresponding side lengths are proportional.



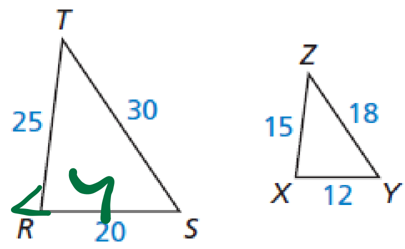
Corresponding angles

$\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle C \cong \angle F$

Ratios of corresponding side lengths

$$\frac{DE}{AB} = \frac{EF}{BC} = \frac{FD}{CA} = k$$

In the diagram, $\triangle RST \sim \triangle XYZ$.



a. Find the scale factor from $\triangle RST$ to $\triangle XYZ$.

b. List all pairs of congruent angles.

$\angle T \cong \angle Z$ $\angle R \cong \angle X$ $\angle S \cong \angle Y$

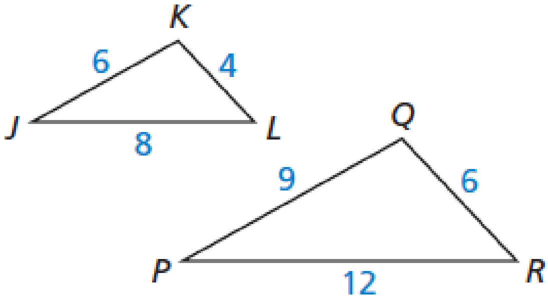
c. Write the ratios of the corresponding side lengths in a *statement of proportionality.*

$\frac{15}{25}$, $\frac{18}{30}$, $\frac{12}{20}$ } $k = 0.6$

$\cong$ $\sim$

1. In the diagram, △*JKL* ~ △*PQR*. Find the scale factor from △*JKL* to △*PQR*. Then list all pairs of congruent angles and write the ratios of the corresponding side lengths in a statement of proportionality.

△JKL



$\frac{6}{4}$

$\frac{9}{6}$ $\frac{12}{8} = 1.\overline{6}$

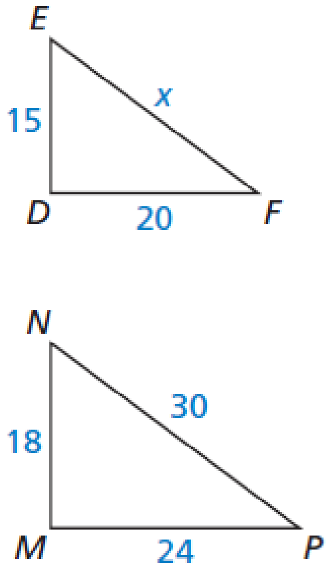
Core Concept

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 scale factor of the similar polygons.

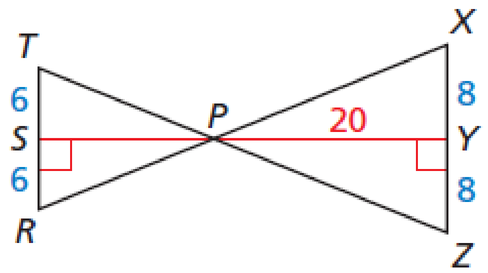
In the diagram, $\triangle DEF \sim \triangle MNP$.

Find the value of x.

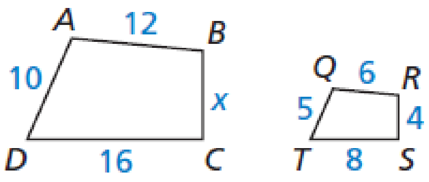


In the diagram, $\triangle TPR \sim \triangle XPZ$.

Find the length of the altitude $\overline{PS}$.

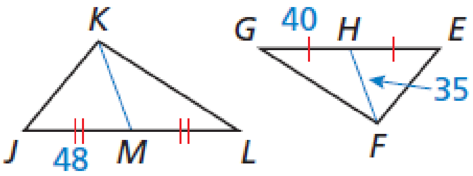


2. Find the value of *x*.



ABCD ~ *QRST*

3. Find *KM*.

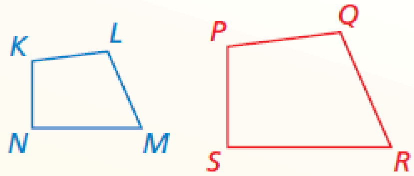


$\triangle JKL \sim \triangle EFG$

Theorem

Theorem 8.1 Perimeters of Similar Polygons

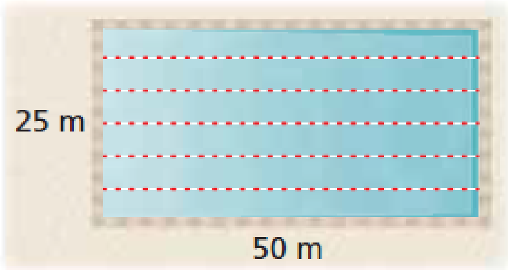
If two polygons are similar, then the ratio of their perimeters is equal to the ratios of their corresponding side lengths.



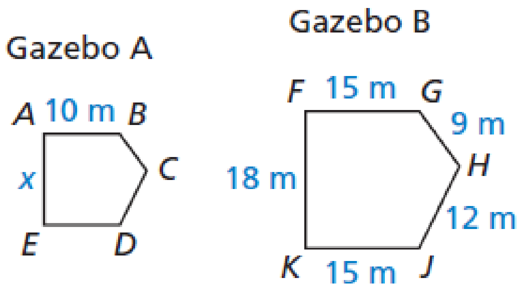
If $KLMN \sim PQRS$, then $\dfrac{PQ + QR + RS + SP}{KL + LM + MN + NK} = \dfrac{PQ}{KL} = \dfrac{QR}{LM} = \dfrac{RS}{MN} = \dfrac{SP}{NK}$.

Proof Ex. 52, p. 426; *BigIdeasMath.com*

A town plans to build a new swimming pool. An Olympic pool is rectangular with a length of 50 meters and a width of 25 meters. The new pool will be similar in shape to an Olympic pool but will have a length of 40 meters. Find the perimeters of an Olympic pool and the new pool.



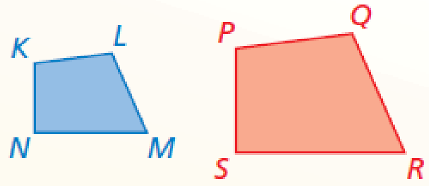
4. The two gazebos shown are similar pentagons. Find the perimeter of Gazebo A.



Theorem

Theorem 8.2 Areas of Similar Polygons

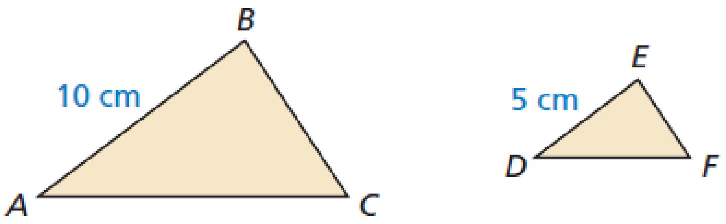
If two polygons are similar, then the ratio of their areas is equal to the squares of the ratios of their corresponding side lengths.



If $KLMN \sim PQRS$, then $\dfrac{\text{Area of } PQRS}{\text{Area of } KLMN} = \left(\dfrac{PQ}{KL}\right)^2 = \left(\dfrac{QR}{LM}\right)^2 = \left(\dfrac{RS}{MN}\right)^2 = \left(\dfrac{SP}{NK}\right)^2.$

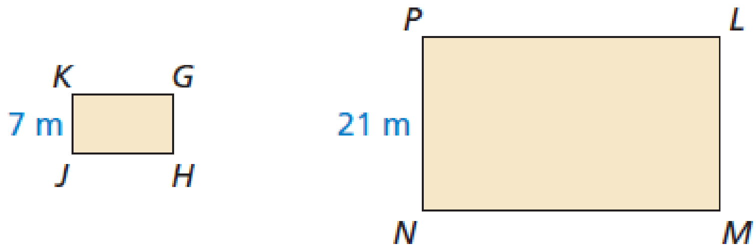
Proof Ex. 53, p. 426; *BigIdeasMath.com*

In the diagram, $\triangle ABC \sim \triangle DEF$. Find the area of $\triangle DEF$.



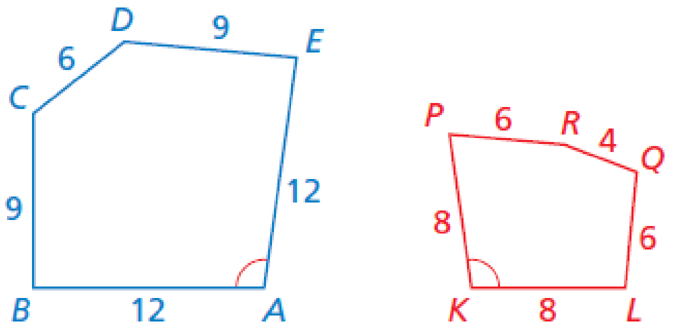
Area of $\triangle ABC = 36\ \text{cm}^2$

5. In the diagram, *GHJK* ~ *LMNP*. Find the area of *LMNP*.

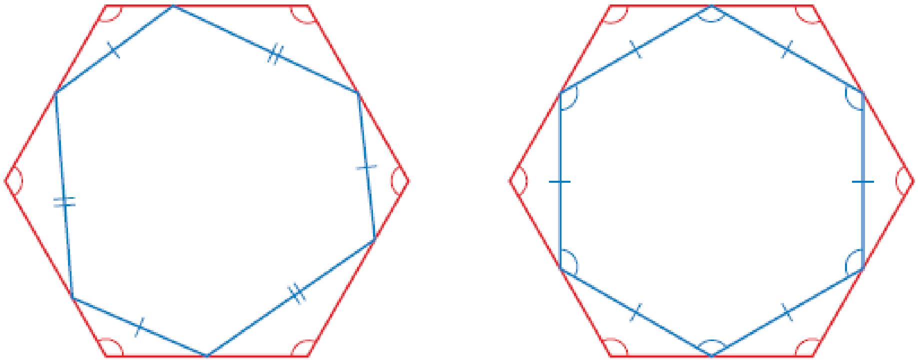


Area of *GHJK* = 84 m^2

Decide whether *ABCDE* and *KLQRP* are similar. Explain your reasoning.



Refer to the floor tile designs below. In each design, the red shape is a regular hexagon.



Tile Design 1 Tile Design 2

6. Decide whether the hexagons in Tile Design 1 are similar. Explain.

7. Decide whether the hexagons in Tile Design 2 are similar. Explain.

Writing Prompt: If two polygons are similar, then …