Name_____ Date _____

8.1 Similar Polygons

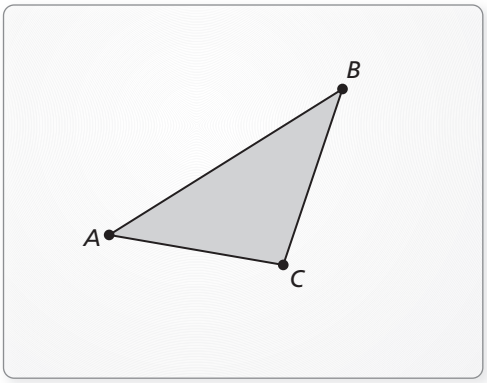
For use with Exploration 8.1

Essential Question How are similar polygons related?

1 EXPLORATION: Comparing Triangles after a Dilation

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

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?

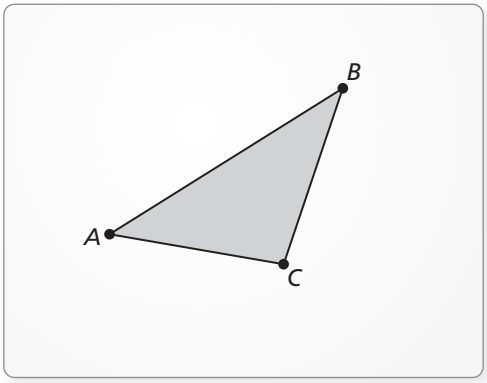
c. Repeat parts (a) and (b) for several other triangles, scale factors, and centers of dilation. Do you obtain similar results?

2 EXPLORATION: Comparing Triangles after a Dilation

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

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?

Communicate Your Answer

3. How are similar polygons related?

4. A $\triangle RST$ is dilated by a scale factor of 3 to form $\triangle R'S'T'$. The area of $\triangle RST$ is 1 square inch. What is the area of $\triangle R'S'T'$?

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8.1 Notetaking with Vocabulary

For use after Lesson 8.1

In your own words, write the meaning of each vocabulary term.

similar figures

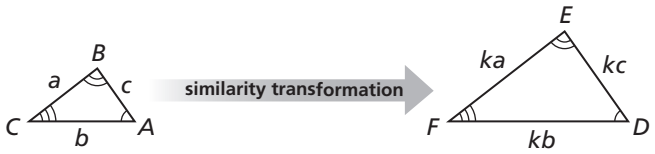
similarity transformation

corresponding parts

Core Concepts

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

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

Notes:

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8.1 Notetaking with Vocabulary (continued)

Corresponding Lengths in Similar Polygons

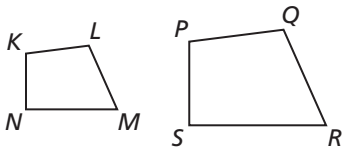
If two polygons are similar, then the ratio of any two corresponding lengths in the polygons is equal to the scale factor of the similar polygons.

Notes:

Theorems

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.



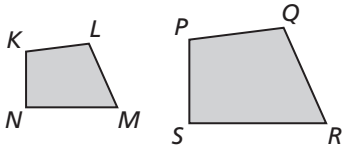
If $KLMN \sim PQRS$, then

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

Notes:

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

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

Notes:

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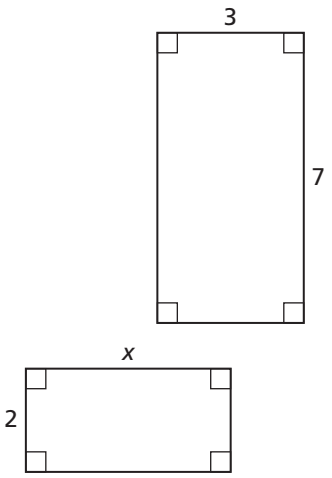
8.1 Notetaking with Vocabulary (continued)

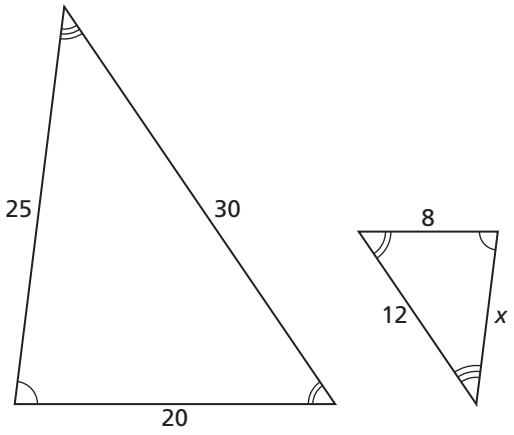
Extra Practice

In Exercises 1 and 2, the polygons are similar. Find the value of *x*.

1.



2.

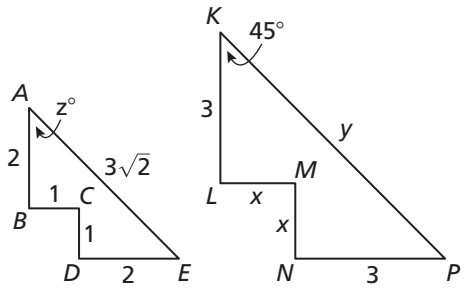


In Exercises 3–8, *ABCDE ~ KLMNP*.

3. Find the scale factor from *ABCDE* to *KLMNP*.

4. Find the scale factor from *KLMNP* to *ABCDE*.

5. Find the values of x, y, and z.



6. Find the perimeter of each polygon.

7. Find the ratio of the perimeters of *ABCDE* to *KLMNP*.

8. Find the ratio of the areas of *ABCDE* to *KLMNP*.