# Geometry Lesson 44

Objective: TSW apply symmetry.

Recall from Lesson 41 that proportions can be used to find unknown measures in similar polygons. Any two regular polygons with the same number of sides are similar. Therefore, all regular polygons with the same number of sides are similar to each other.

Example 1 Using Similarity to Find Unknown Measures
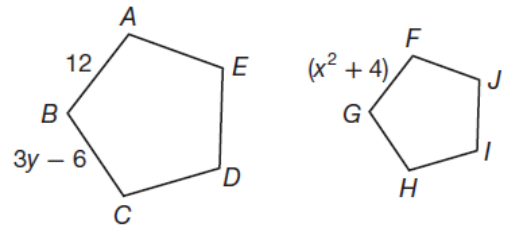The hexagons in the diagram are similar. Find the values of x and y.
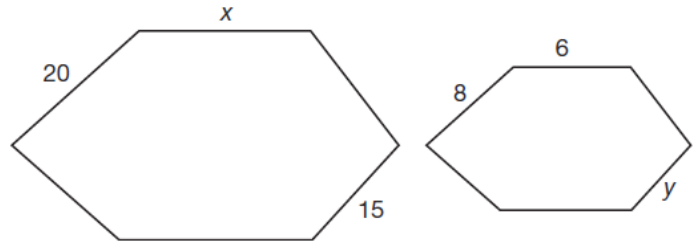
SOLUTION

Example 2 Applying Similarity to Solve for Unknowns
a. Pentagons $ABCDE$ and $FGHIJ$ are regular pentagons, and are similar to each other. The similarity ratio of $ABCDE$ to $FGHIJ$ is 3:2. Find the values of x and y.

SOLUTION

Hint

Often, the negative answer to a root is disregarded in geometry, because a figure cannot have a negative measurement. In this case though, using the value $x = -2$ still results in a positive side length, so both answers are valid.

b. What is the ratio of the perimeter of $ABCDE$ to $FGHIJ$?

SOLUTION

As you can see from Example 2, the perimeters of two similar figures share the same similarity ratio as their sides.

Theorem 44-1 - If two polygons are similar, then the ratio of their perimeters is equal to the ratio of their corresponding sides.

Example 3 Proving the Relationship Between Perimeters of Similar Figures

Given $\Delta PQR \sim \Delta STU$, prove that the ratio of their perimeters is 1:2 if the ratio of their corresponding sides is 1:2.

    SOLUTION   Use a 2-column proof.

      Statements   Reasons

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Example 4 Applying Similarity to Solve a Perimeter Problem

Figures *HIJK* and *LMNO* are similar polygons. Their corresponding sides have a ratio of 2:5. If the perimeter of figure *HIJK* is 27 inches, what is the perimeter of figure *LMNO* ?

    SOLUTION

Math Reasoning

Formulate Would Theorem 44-1 also apply to the circumference of a circle? Why or why not?

Example 5 Application: Map Scales

Foxx plans to jog 5000 meters a day in training for a race. The park where Foxx jogs is in the shape of a regular pentagon. The side length of the park is 5 centimeters long on a map with the scale $\frac{1\ cm}{50\ m}$. How many times does Foxx need to jog along the perimeter of the park to complete his daily training ?

    SOLUTION

You Try!!!!!

b. In ΔABC , $AB = x^2 - 7$, $BC = y + 4$, and $CA = 5$. In ΔDEF, $DE = 6$, $EF = 12$, $and\ FD = 15$. $\Delta ABC \sim \Delta DEF$. Find the values of *x* and *y*. Then find the ratio of the perimeters of the two triangles.

c. Figures *ABCD* and *EFGH* are similar. The ratio of their corresponding sides is 3:5. If the perimeter of *EFGH* is 45 inches, what is the perimeter of figure *ABCD* ?

d. Pentagons *ABCDE* and *FGHIJ* are similar figures. The perimeter of *ABCDE* is 32 centimeters. The similarity ratio of *ABCDE* to *FGHIJ* is 2:9. What is the perimeter of *FGHIJ* ?

e. Jana and her brother Jacob are designing their own tree house with two separate doors, one that is proportional to Jana's height and one that is proportional to Jacob's height. Jacob is 3 feet tall and Jana is 4 feet tall, so Jana decides that her door should be 5 feet tall by 2 feet wide. How tall should Jacob's door be, and what will its perimeter be?