

# 8.3

## Similar Polygons

- Goals**
- Identify similar polygons.
  - Use similar polygons to solve real-life problems.

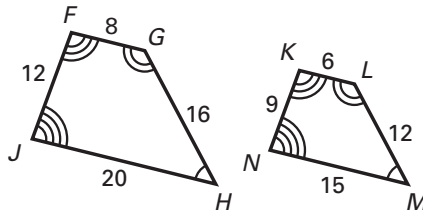
### VOCABULARY

**Similar polygons** Similar polygons are two polygons such that their corresponding angles are congruent and the lengths of corresponding sides are proportional.

**Scale factor** The scale factor is the ratio of the lengths of two corresponding sides of two similar polygons.

### Example 1 Comparing Similar Polygons

Decide whether the figures are similar. If they are similar, write a similarity statement.



### Solution

As shown, the corresponding angles of  $FGHJ$  and  $KLMN$  are congruent. Also, the corresponding side lengths are proportional.

$$\frac{FG}{KL} = \frac{8}{6} = \frac{4}{3}$$

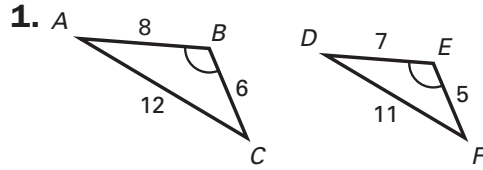
$$\frac{GH}{LM} = \frac{16}{12} = \frac{4}{3}$$

$$\frac{HJ}{MN} = \frac{20}{15} = \frac{4}{3}$$

$$\frac{FJ}{KN} = \frac{12}{9} = \frac{4}{3}$$

**Answer** So, the two figures are similar and you can write  $\underline{FGHJ} \sim \underline{KLMN}$ .

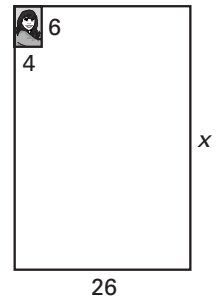
- ✓ **Checkpoint** Decide whether the figures are similar. If they are, write the similarity statement.



The triangles are not similar.

**Example 2** Comparing Photographic Enlargements

You have a 4-inch by 6-inch photo that you want to use for class election posters. You want the enlargement to be 26 inches wide. How long will it be?



**Solution**

Compare the enlargement to the original measurements of the photo.

$$\frac{26 \text{ in.}}{4 \text{ in.}} = \frac{x \text{ in.}}{6 \text{ in.}}$$

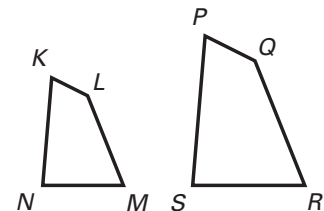
$$x = \frac{26}{4} \cdot 6$$

$$x = 39 \text{ inches}$$

**Answer** The length of the enlargement will be 39 inches.

**THEOREM 8.1**

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



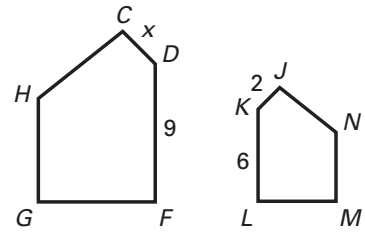
If  $KLMN \sim PQRS$ , then

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

**Example 3** Using Similar Polygons

Pentagon  $CDFGH$  is similar to pentagon  $JKLMN$ .

Find the value of  $x$ .



**Solution**

Set up a proportion that contains  $CD$ .

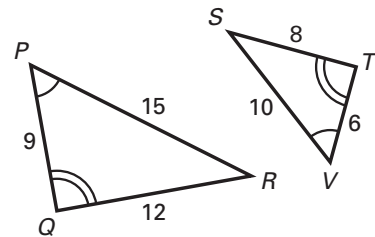
$$\frac{CD}{DF} = \frac{JK}{KL} \quad \text{Write proportion.}$$

$$\frac{x}{9} = \frac{2}{6} \quad \text{Substitute.}$$

$$x = 3 \quad \text{Cross multiply and divide by } 6.$$

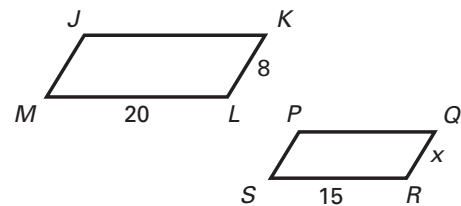
**Checkpoint** Complete the following exercises.

2. Verify that these two triangles are similar. Write the similarity statement. Then find the ratio of their perimeters.



These triangles are similar because the corresponding angles are congruent and the corresponding sides are in the ratio 3 : 2;  $PQR \sim VTS$ ; 3 : 2

3. Parallelogram  $JKLM$  is similar to parallelogram  $PQRS$ . Find the value of  $x$ .



6