8.3 Similar Polygons

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

VOCABULARY

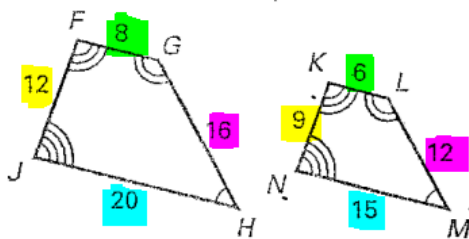Similar polygons

corresponding angles are congruent
corresponding sides are proportional

Scale factor

ratio of the lengths of two corresponding sides

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.
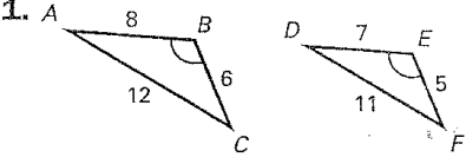
$$\frac{FG}{KL} = \frac{8}{6} = \frac{4}{3} \qquad \frac{GH}{LM} = \frac{16}{12} = \frac{4}{3} \qquad 4:3$$

$$\frac{HJ}{MN} = \frac{20}{15} = \frac{4}{3} \qquad \frac{FJ}{KN} = \frac{12}{9} = \frac{4}{3}$$

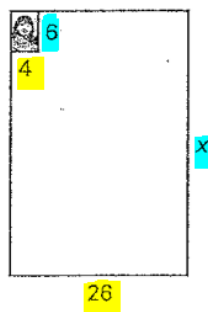Answer So, the two figures are similar and you can write
$FGHJ \sim KLMN.$

1.

$$\frac{12}{11} \neq \frac{8}{7}$$

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.

$$\frac{26 \text{ in.}}{4 \text{ in.}} = \frac{x \text{ in.}}{6 \text{ in.}}$$
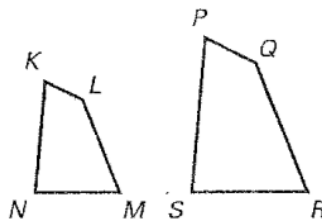
$$4x = 156$$

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

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 ~ PQRS, then

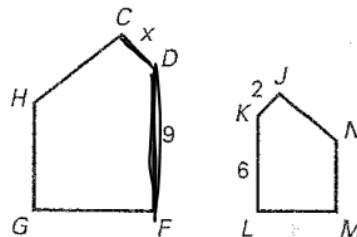$$\frac{KL + LM + MN + NK}{PQ + QR + RS + SP} = \frac{KL}{PQ} = \frac{LM}{QR} = \frac{MN}{RS} = \frac{NK}{SP}.$$

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.

Write proportion.
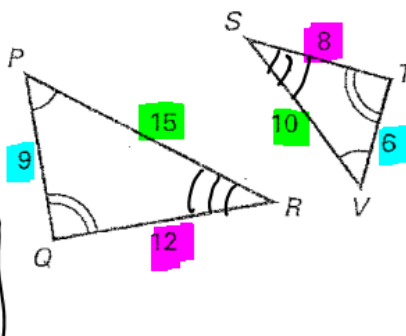
Substitute.

$$\frac{CD}{JK} = \frac{DF}{KL}$$

Cross multiply and divide by 6.

$$X = 3$$

---

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

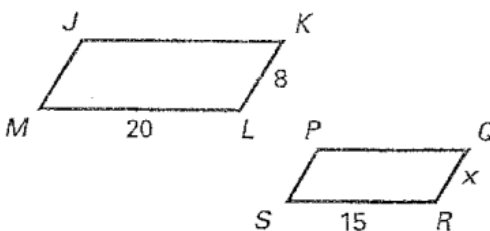$$\frac{9}{6} = \boxed{\frac{3}{2}} \qquad \frac{15}{10} = \boxed{\frac{3}{2}} \qquad \frac{12}{8} = \boxed{\frac{3}{2}}$$

$$\frac{9+15+12}{6+8+10} = \frac{36}{24} = \boxed{\frac{3}{2}}$$

$$\triangle PQR \sim \triangle VTS$$

---

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

$$\frac{x}{8} = \frac{15}{20} \longrightarrow 20x = 120$$

$$\boxed{x = 6}$$