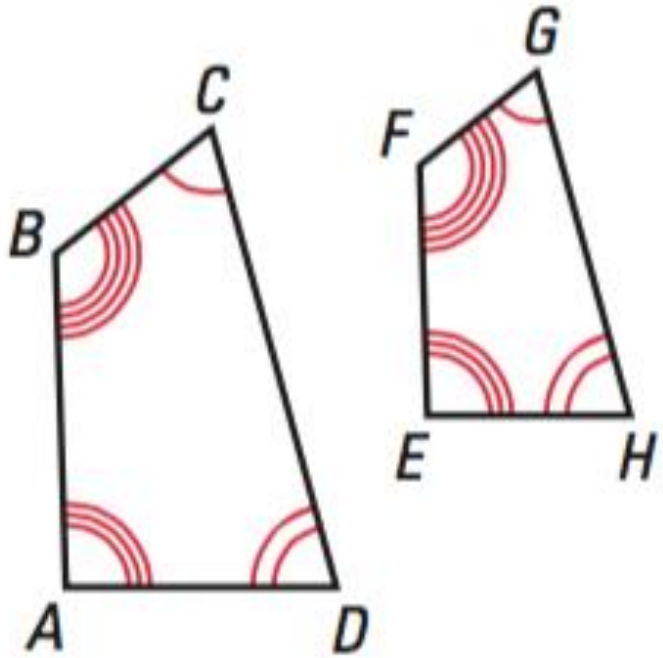
Chapter 8
Similarity

Section 3
Similar Polygons

GOAL 1: Identifying Similar Polygons

When there is a correspondence between two polygons such that their corresponding angles are congruent and the lengths of corresponding sides are proportional the two polygons are called **similar polygons.**

In the diagram, *ABCD* is similar to *EFGH*. The symbol ~ is used to indicate similarity. So, *ABCD* ~ *EFGH*.



$$\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE}$$

Statement of proportionality

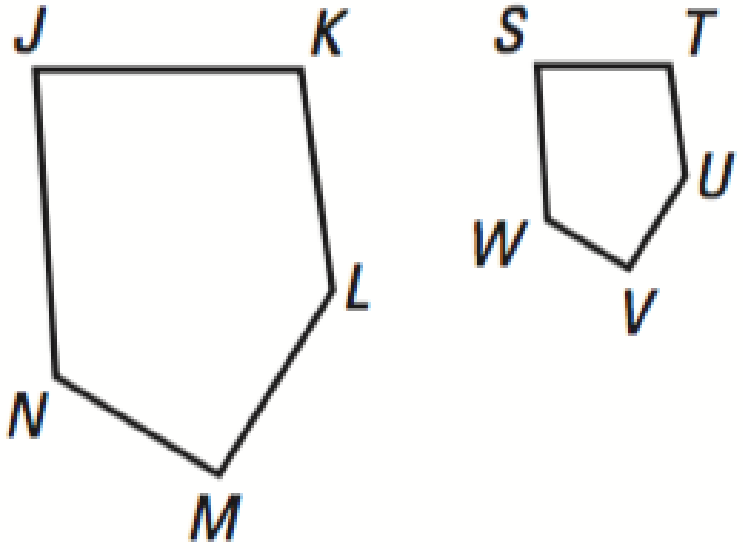
Example 1: Writing Similarity Statements

Pentagons JKLMN and STUVW are similar. List all the pairs of congruent angles. Write the ratios of the corresponding sides in a statement of proportionality.

$\angle J \cong \angle S \quad \angle K \cong \angle T$

$\angle L \cong \angle U \quad \angle M \cong \angle V$

$\angle N \cong \angle W$

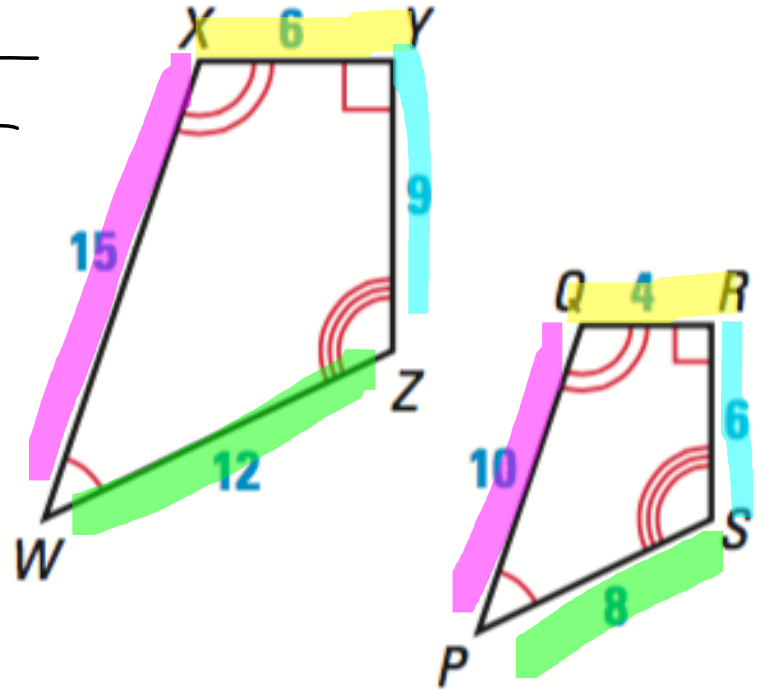


$$\frac{JK}{ST} = \frac{KL}{TU} = \frac{LM}{UV} = \frac{MN}{VW} = \frac{NJ}{WS}$$

Example 2: Comparing Similar Polygons

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

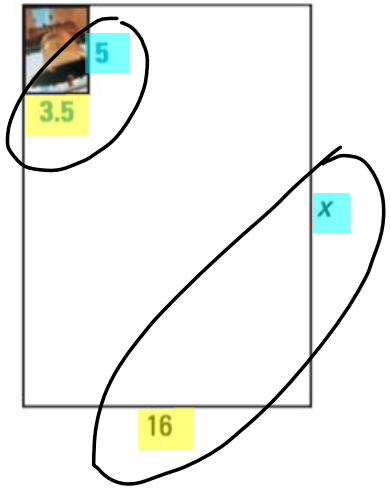
$\frac{6}{4} \rightarrow \frac{3}{2}$ $\frac{9}{6} \rightarrow \frac{3}{2}$ $\frac{12}{8} \rightarrow \frac{3}{2}$ $\frac{15}{10} \rightarrow \frac{3}{2}$



WXYZ ~ PQRS

GOAL 2: Using Similar Polygons in Real Life

Example 3: Comparing Photographic Enlargements



POSTER DESIGN You have been asked to create a poster to advertise a field trip to see the Liberty Bell. You have a 3.5 inch by 5 inch photo that you want to enlarge. You want the enlargement to be 16 inches wide. How long will it be?

$$\frac{3.5}{16} = \frac{5}{x}$$

$$\frac{3.5x}{3.5} = \frac{80}{3.5}$$

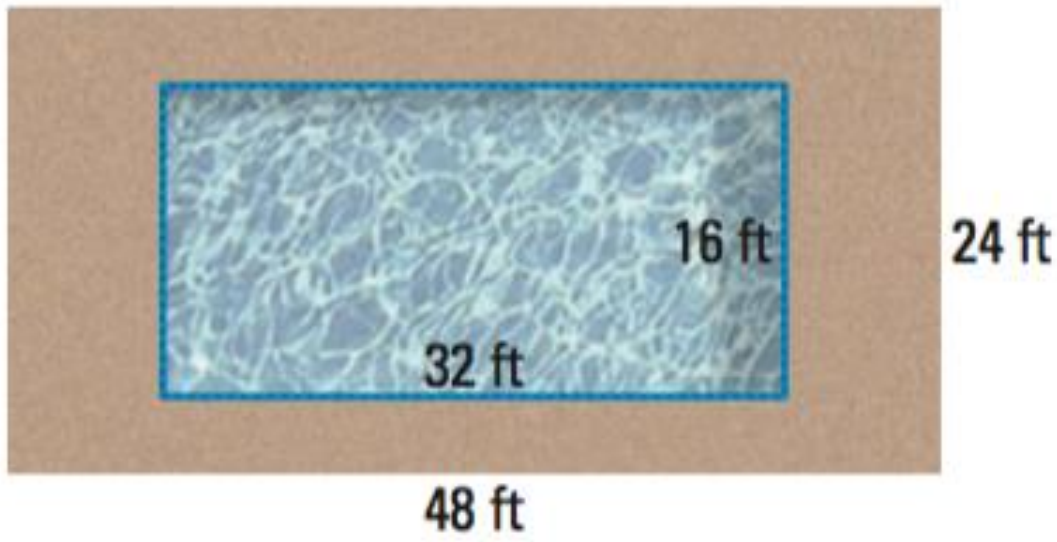
$$x = 22.86 \text{ in.}$$

If two polygons are similar, then the ratio of the lengths of two corresponding sides is called the **scale factor**. In Example 2 on slide 5, the ratio of 3/2 is the scale factor of WXYZ to PQRS.

Example 4: Using Similar Polygons

The rectangular patio around a pool is similar to the pool as shown. Calculate the scale factor of the patio to the pool, and find the ratio of their perimeters.

SF patio to pool: $\frac{48}{32} \rightarrow \frac{3}{2}$



Ratio of perimeters:

patio: 2(48) + 2(24) = 144

pool: 2(32) + 2(16) = 96

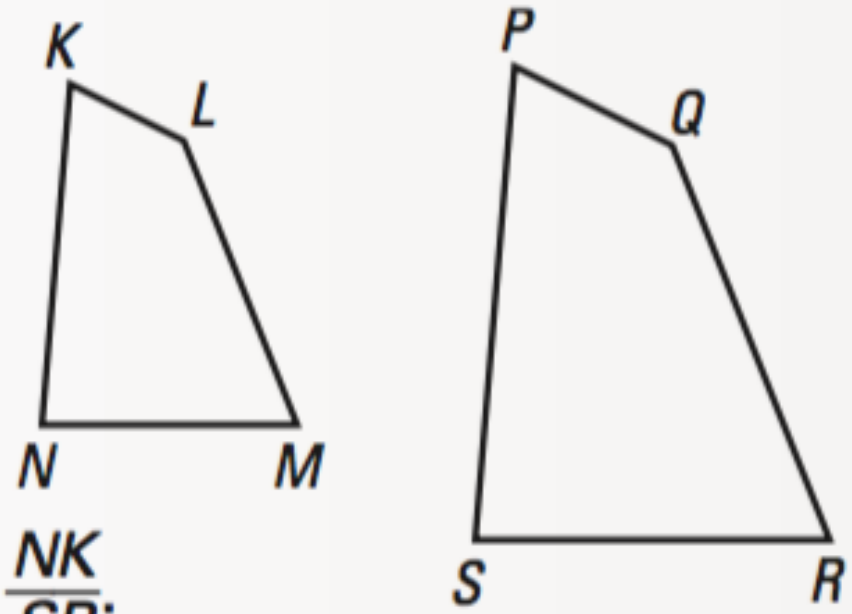
$\frac{144}{96} \rightarrow \frac{12}{8} \rightarrow \frac{3}{2}$

Notice in Example 4 that the ratio of the perimeters is the same as the scale factor of the rectangles. This observation is generalized in the following theorem. You are asked to prove Theorem 8.1 for two similar rectangles in Exercise 45.

THEOREM

THEOREM 8.1

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

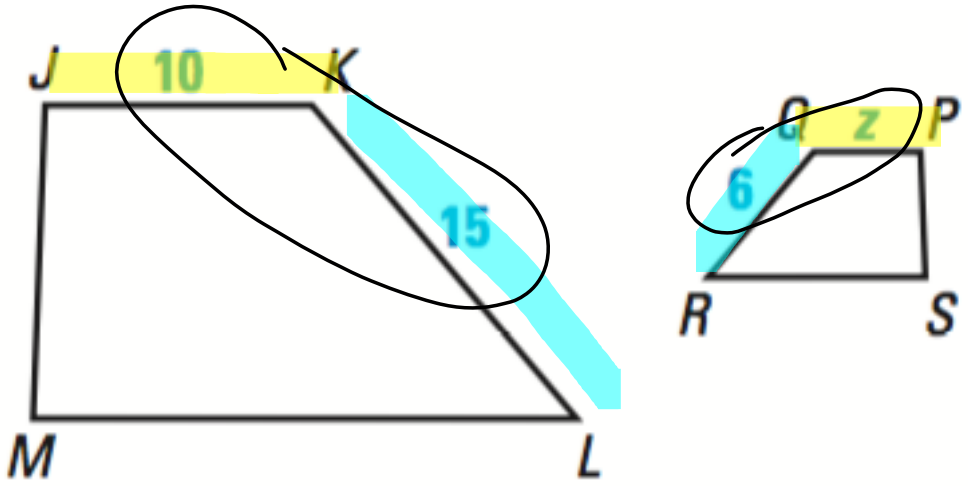


If $KLMN \sim PQRS$, then

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

Example 5: Using Similar Polygons

Quadrilateral JKLM is similar to quadrilateral PQRS. Find the value of z.



$$\frac{10}{2} = \frac{15}{6}$$

$$\frac{15z}{15} = \frac{60}{15} \rightarrow z = 4$$

EXIT SLIP