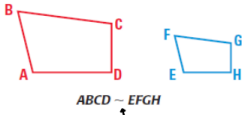


Geometry
11.3 Use Similar Polygons

Similar Polygons: two polygons that have corresponding angles congruent and corresponding side lengths are **proportional**.



$ABCD \sim EFGH$

Similarity Statement:
Notation for 2 similar polygons

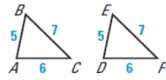
Corresponding angles
 $\angle A \cong \angle E, \angle B \cong \angle F, \angle C \cong \angle G,$
and $\angle D \cong \angle H$

Ratios of corresponding sides
 $\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE}$

Statement of Proportionality:
Notation for 2 similar polygons

Scale Factor: the ratio of the lengths of 2 corresponding sides of 2 similar polygons.

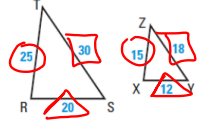
SIMILARITY AND CONGRUENCE Notice that any two congruent figures are also similar. Their scale factor is 1 : 1. In $\triangle ABC$ and $\triangle DEF$, the scale factor is $\frac{5}{5} = 1$. You can write $\triangle ABC \sim \triangle DEF$ and $\triangle ABC \cong \triangle DEF$.



EXAMPLE 1 Use similarity statements

In the diagram, $\triangle RST \sim \triangle XYZ$.

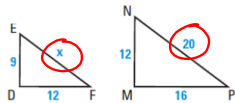
- List all pairs of congruent angles.
- Check that the ratios of corresponding side lengths are equal. (**scale factor**)
- Write the ratios of the corresponding side lengths in a **statement of proportionality**.



- a) $\angle R \cong \angle X, \angle T \cong \angle Z, \angle S \cong \angle Y$
- b) $\frac{15}{25} = \frac{3}{5} \checkmark \quad \frac{18}{30} = \frac{3}{5} \checkmark \quad \frac{12}{20} = \frac{3}{5} \checkmark$
- c) $\frac{ZX}{TR} = \frac{ZY}{TS} = \frac{XY}{SR}$

EXAMPLE 3 Use similar polygons

ALGEBRA In the diagram, $\triangle DEF \sim \triangle MNP$. Find the value of x .



$$\frac{x}{20} = \frac{9}{12}$$

$$12x = 20 \cdot 9$$

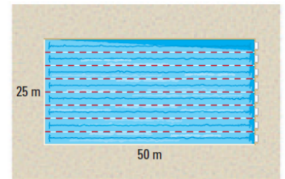
$$\frac{12x}{12} = \frac{180}{12}$$

$$x = 15$$

EXAMPLE 4

SWIMMING A town is building a new swimming pool. An Olympic pool is rectangular with length 50 meters and width 25 meters. The new pool will be similar in shape, but only 40 meters long.

- Find the **scale factor** of the new pool to an Olympic pool.



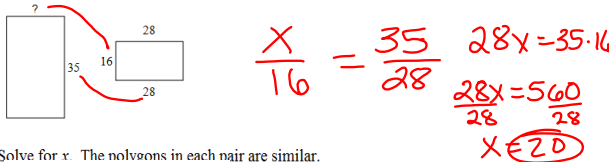
$$\frac{\text{Image}}{\text{Pre-image}} = \frac{40}{50} = \frac{4}{5}$$



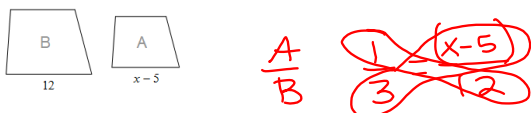
The polygons in each pair are similar. Find the scale factor of the smaller figure to the larger figure.



The polygons in each pair are similar. Find the missing side length.



Solve for x. The polygons in each pair are similar.



scale factor from A to B = 1 : 3

Explain 2 Applying Properties of Similar Figures

The properties of similar figures can be used to find the measures of corresponding parts.

Example 2 Given that the figures are similar, find the values of x and y.



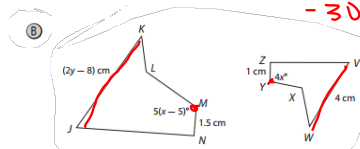
$$\frac{4y}{10} = \frac{(3y-5)}{5}$$

$$20y = 10(3y-5)$$

$$20y = 30y - 50$$

$$-30y = -50$$

$$y = 5$$



$$5(x-5) = 4x$$

$$5x - 25 = 4x$$

$$-25 = -1x$$

$$x = 25$$

$$\frac{(2y-8)}{4} = \frac{1.5}{1}$$

$$2y - 8 = 6$$

$$2y = 14$$

$$y = 7$$

Homework

Worksheet 11.3