

Geometry CC - Unit 7  
 Lesson 1: Intro to Similarity  
 M2 LO

Name: \_\_\_\_\_  
 Date: \_\_\_\_\_

Homework: HW Handout 7.1

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Similar Polygons

**Similar** - a polygon in which the corresponding angles are congruent and the ratio of their corresponding sides is in proportion.

Symbol:  $\sim$

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Example 1:  
 Similarity Statement:  $ABCD \sim EFGH$

Angles Congruent:  
 $\angle A \cong \angle E$   
 $\angle B \cong \angle F$   
 $\angle C \cong \angle G$   
 $\angle D \cong \angle H$

Statement of Proportionality:  
 $\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{AD}{EH}$

What is the scale factor of ABCD to EFGH? (ratio)  
 $\frac{14}{4} \rightarrow \frac{7}{2} \quad 7:2$

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Example 2: Given:  $\triangle JKLM \sim \triangle WXYZ$

List the angle congruencies and then give the statement of proportionality. (Do you need a picture?)

Angle Congruency:  
 $\angle J \cong \angle W$   
 $\angle K \cong \angle X$   
 $\angle L \cong \angle Y$   
 $\angle M \cong \angle Z$

Statement of Proportionality:  
 $\frac{JK}{WX} = \frac{KL}{XY} = \frac{LM}{YZ} = \frac{JM}{WZ}$

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Example 3:  
 Are the following polygons similar? If so, write a similarity statement and state the scale factor.

Angles: Are the corresponding angles congruent?  
 yes all corresponding angles are  $\cong$ .

Sides: Are sides proportional (same ratio)?  
 $\frac{WX}{RS} = \frac{6}{10} = \frac{3}{5}$   
 $\frac{XY}{SP} = \frac{9}{4}$   
 $\frac{YZ}{PQ} = \frac{12}{6} = 2$   
 $\frac{XZ}{RQ} = \frac{6}{8} = \frac{3}{4}$

Similarity Statement:  $WXYZ \sim RSPQ$   
 Scale Factor:  $4:6 \rightarrow 2:3$

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Example 4:  
 Are the following polygons similar? If so, write a similarity statement and state the scale factor.

$\frac{AD}{LO} = \frac{14}{18} = \frac{7}{9}$   
 $\frac{AB}{LM} = \frac{8}{18} = \frac{4}{9}$

no, the corresponding sides are not in proportion

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Example 5: Given:  $\triangle XML \sim \triangle PRQ$   
 Find  $x$ ,  $y$ , and  $m$ ,  $Q$

$180 - 150 = 30$   
 $\angle Q = 30^\circ$

$\frac{LM}{QR} = \frac{10}{15} = \frac{2}{3}$   
 $\frac{KM}{PR} = \frac{x}{15} = \frac{2}{3}$   
 $\frac{KL}{PQ} = \frac{8}{x+1} = \frac{2}{3}$

$3y = 18$   
 $y = 6$

$2y = 2(x+1)$   
 $2y = 2x + 2$   
 $22 = 2x$   
 $x = 11$

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More Facts about Similar Polygons:  
 If two polygons are similar, the following are in the same ratio:

- Corresponding sides
- Perimeters
- Altitudes
- Medians
- Angle bisectors
- Diagonals

Example 6: The figure below shows two squares.

Ratio of Sides = Ratio of Perimeters

a) What is the ratio of their sides?  
 $\frac{9}{12} \rightarrow \frac{3}{4}$  Same

b) What is the ratio of their perimeters?  
 $\frac{36}{48} \rightarrow \frac{3}{4}$

c) What is the ratio of their areas?  
 $\frac{81}{144} \rightarrow \frac{9}{16}$

$(\frac{3}{4})^2 = \frac{9}{16}$

$(\text{Ratio of Sides})^2 = \text{Ratio of areas}$

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Example 7: Two polygons are similar. The ratio of their side lengths is  $a : b$ .

a) What is the ratio of the perimeters?  
 $a : b$

b) What is the ratio of the altitudes?  
 $a : b$

c) What is the ratio of the areas?  
 $a^2 : b^2$

d) What is the ratio of the volumes?  
 $a^3 : b^3$

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In the following problems, use the diagram below where  $PQRS \sim JKLM$ .

10. Find the scale factor of PQRS to JKLM.  
 $\frac{QR}{KL} \rightarrow \frac{12}{15} \rightarrow \frac{4}{5}$

11. Find the scale factor of JKLM to PQRS.  
 $\frac{KL}{QR} \rightarrow \frac{15}{12} \rightarrow \frac{5}{4}$

12. Find the values of  $w$ ,  $x$ , and  $y$ .

$\frac{4}{5} = \frac{w}{25}$   $100 = 5w$   
 $20 = w$

$\frac{4}{5} = \frac{16}{y}$   $4y = 80$   
 $y = 20$

$\frac{4}{5} = \frac{10}{x}$   $50 = 4x$   
 $x = 12.5$

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