Warm Up

1. If $\triangle QRS \cong \triangle ZYX$, identify the pairs of congruent angles and the pairs of congruent sides. $\angle Q \cong \angle Z; \ \angle R \cong \angle Y; \ \angle S \cong \angle X;$

 $\overline{QR} \cong \overline{ZY}; \ \overline{RS} \cong \overline{YX}; \ \overline{QS} \cong \overline{ZX}$

Solve each proportion.

2.
$$\frac{2}{x-3} = \frac{8}{3x-3}$$
 $\frac{x-6}{42} = \frac{2x-14}{77}$
 $x = 9$ $x = 18$

Objectives

Identify similar polygons.

Apply properties of similar polygons to solve problems.

Holt Geometry



Figures that are <u>similar</u> (\sim) have the same shape but not necessarily the same size.



 $\Delta 1$ is similar to $\Delta 2(\Delta 1 \sim \Delta 2)$.



Holt Geometry

| Similar Polygons | | |
|---|--|---|
| | | |
| DEFINITION | DIAGRAM | STATEMENTS |
| Two polygons are similar polygons if and only if their corresponding angles are congruent and their corresponding side lengths are proportional. | $A = 6 B \\ 5 J = 5.4 12 F \\ 10 I = 10 I = 10.8 $ | $\angle A \cong \angle E$ $\angle B \cong \angle F$ $\angle C \cong \angle G$ $\angle D \cong \angle H$ $\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE} = \frac{1}{2}$ |

Holt Geometry

Example 1: Describing Similar Polygons

Identify the pairs of congruent angles and corresponding sides.



 $\angle N \cong \angle Q$ and $\angle P \cong \angle R$. By the Third Angles Theorem, $\angle M \cong \angle T$.

$$\frac{MP}{TR} = \frac{2.2}{1.1} = 2 \qquad \frac{MN}{TQ} = \frac{2}{1} = 2 \qquad \frac{NP}{QR} = \frac{1}{0.5} = 2$$

Check It Out! Example 1

Identify the pairs of congruent angles and corresponding sides.



 $\angle B \cong \angle G$ and $\angle C \cong \angle H$. By the Third Angles Theorem, $\angle A \cong \angle J$.

$$\frac{AB}{JG} = \frac{10}{5} = 2 \qquad \frac{BC}{GH} = \frac{6}{3} = 2 \qquad \frac{AC}{JH} = \frac{11.6}{5.8} = 2$$

A **similarity ratio** is the ratio of the lengths of

the corresponding sides of two similar polygons.

The similarity ratio of $\triangle ABC$ to $\triangle DEF$ is $\frac{3}{6}$, or $\frac{1}{2}$. The similarity ratio of $\triangle DEF$ to $\triangle ABC$ is $\frac{6}{3}$, or 2.





Example 2A: Identifying Similar Polygons

Determine whether the polygons are similar. If so, write the similarity ratio and a similarity statement.



rectangles ABCD and EFGH



Example 2A Continued

Step 1 Identify pairs of congruent angles.

 $\angle A \cong \angle E, \angle B \cong \angle F,$ All $\angle s$ of a rect. are rt. $\angle s$ $\angle C \cong \angle G,$ and $\angle D \cong \angle H.$ and are \cong .

Step 2 Compare corresponding sides.

 $\frac{AB}{EF} = \frac{6}{4} = \frac{3}{2}, \frac{BC}{FG} = \frac{9}{6} = \frac{3}{2}, \frac{CD}{GH} = \frac{AB}{EF} = \frac{3}{2}, \text{ and } \frac{DA}{HE} = \frac{BC}{FG} = \frac{3}{2}.$

Thus the similarity ratio is $\frac{3}{2}$, and rect. *ABCD* ~ rect. *EFGH*.

Example 2B: Identifying Similar Polygons

Determine whether the polygons are similar. If so, write the similarity ratio and a similarity statement.

△**ABCD** and △**EFGH**





Example 2B Continued

Step 1 Identify pairs of congruent angles.

 $\angle P \cong \angle R \text{ and } \angle S \cong \angle W \text{ isos. } \Delta$

Step 2 Compare corresponding angles.

$$m \angle P = m \angle R = \frac{1}{2} (180^\circ - 36^\circ) = 72^\circ$$
$$m \angle W = m \angle S = 62^\circ$$

 $m \angle T = 180^{\circ} - 2(62^{\circ}) = 56^{\circ}$

Since no pairs of angles are congruent, the triangles are not similar.

Check It Out! Example 2



Step 1 Identify pairs of congruent angles.

 $\angle N \cong \angle M$, $\angle L \cong \angle P$, $\angle S \cong \angle J$



Check It Out! Example 2 Continued

Step 2 Compare corresponding sides.

$$\frac{LJ}{PS} = \frac{75}{30} = \frac{5}{2}, \frac{LM}{PN} = \frac{60}{24} = \frac{5}{2}, \frac{JM}{SN} = \frac{45}{18} = \frac{5}{2}$$

Thus the similarity ratio is $\frac{5}{2}$, and $\Delta LMJ \sim \Delta PNS$.

Lesson Quiz: Part I

1. Determine whether the polygons are similar. If so, write the similarity ratio and a similarity statement. F = 2.5 cm

2. The ratio of a model sailboat's dimensions to the actual boat's dimensions is $\frac{1}{30}$. If the length of the model is 10 inches, what is the length of the actual sailboat in feet?



Lesson Quiz: Part II

3. Tell whether the following statement is sometimes, always, or never true. Two equilateral triangles are similar.

Always



Homework

Worksheet 7.2

Holt Geometry