

Geometry: 8.1-8.4 Notes

NAME _____

8.1 Similar Triangles

Date: _____

Define Vocabulary:

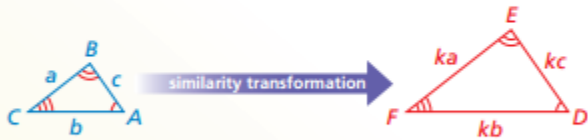
similar figures –

similarity transformation –

corresponding parts –

Corresponding Parts of Similar Polygons

In the diagram below, $\triangle ABC$ is similar to $\triangle DEF$. You can write “ $\triangle ABC$ is similar to $\triangle DEF$ ” as $\triangle ABC \sim \triangle DEF$. A similarity transformation preserves angle measure. So, corresponding angles are congruent. A similarity transformation also enlarges or reduces side lengths by a scale factor k . So, corresponding side lengths are proportional.



Corresponding angles

$$\angle A \cong \angle D, \angle B \cong \angle E, \angle C \cong \angle F$$

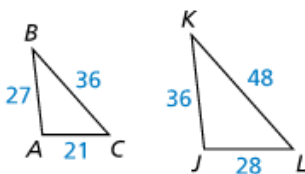
Ratios of corresponding side lengths

$$\frac{DE}{AB} = \frac{EF}{BC} = \frac{FD}{CA} = k$$

Examples: Using similarity statements.

WE DO

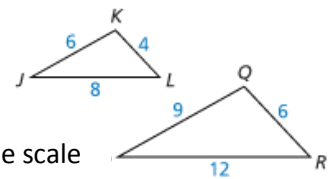
In the diagram, $\triangle ABC \sim \triangle JKL$.



- Find the scale factor from $\triangle ABC$ to $\triangle JKL$.
- List all pairs of congruent angles.
- Write the ratios of the corresponding side lengths in a *statement of proportionality*.

YOU DO

In the diagram, $\triangle JKL \sim \triangle PQR$. Find the scale factor from $\triangle JKL$ to $\triangle PQR$. Then list all pairs of congruent angles and write the ratios of the corresponding side lengths in a statement of proportionality.



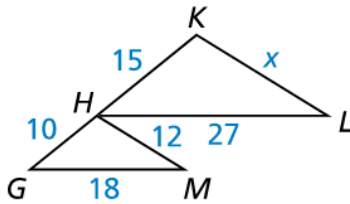
Corresponding Lengths in Similar Polygons

If two polygons are similar, then the ratio of any two corresponding lengths in the polygons is equal to the scale factor of the similar polygons.

Examples: Finding a corresponding length.

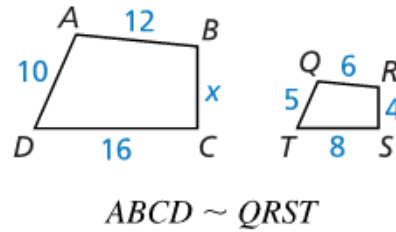
WE DO

In the diagram, $\triangle GHM \sim \triangle HKL$. Find the value of x .



YOU DO

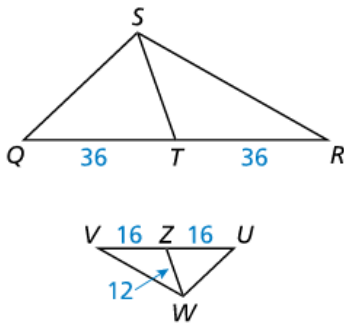
Find the value of x .



Examples: Finding a corresponding length.

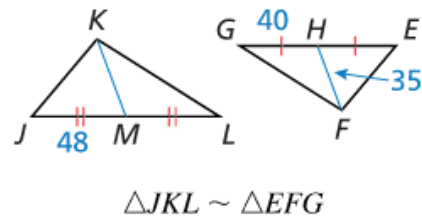
WE DO

In the diagram, $\triangle UVW \sim \triangle QRS$. Find the length of the median \overline{ST} .



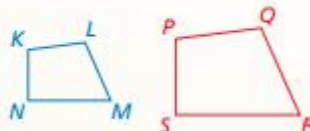
YOU DO

Find KM .



Theorem 8.1 Perimeters of Similar Polygons

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



$$\text{If } KLMN \sim PQRS, \text{ then } \frac{PQ + QR + RS + SP}{KL + LM + MN + NK} = \frac{PQ}{KL} = \frac{QR}{LM} = \frac{RS}{MN} = \frac{SP}{NK}$$

Proof Ex. 52, p. 426; BigIdeasMath.com

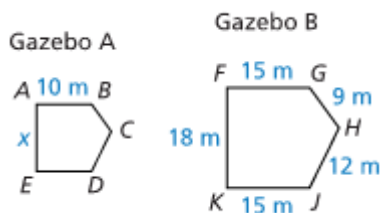
Examples: Modeling with mathematics

WE DO

Your neighbor has decided to enlarge his garden. The garden is rectangular with width 6 feet and length 15 feet. The new garden will be similar to the original one, but will have a length of 35 feet. Find the perimeter of the original garden and the enlarged garden.

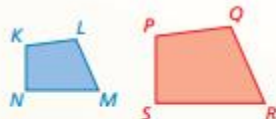
YOU DO

The two gazebos shown are similar pentagons. Find the perimeter of Gazebo A.



Theorem 8.2 Areas of Similar Polygons

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



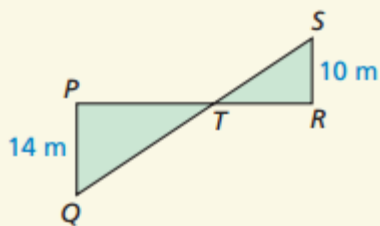
$$\text{If } KLMN \sim PQRS, \text{ then } \frac{\text{Area of } PQRS}{\text{Area of } KLMN} = \left(\frac{PQ}{KL}\right)^2 = \left(\frac{QR}{LM}\right)^2 = \left(\frac{RS}{MN}\right)^2 = \left(\frac{SP}{NK}\right)^2.$$

Proof Ex. 53, p. 426; BigIdeasMath.com

Examples: Finding areas of similar polygons.

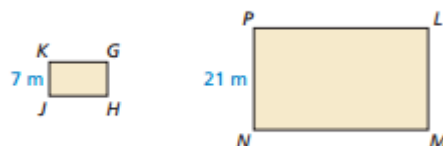
WE DO

In the diagram, $\triangle PQT \sim \triangle RST$, and the area of $\triangle RST$ is 75 square meters. Find the area of $\triangle PQT$.



YOU DO

In the diagram, $GHJK \sim LMNP$. Find the area of $LMNP$.



Area of $GHJK = 84 \text{ m}^2$

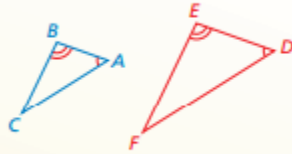
Assignment	
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Theorem 8.3 Angle-Angle (AA) Similarity Theorem

If two angles of one triangle are congruent to two angles of another triangle, then the two triangles are similar.

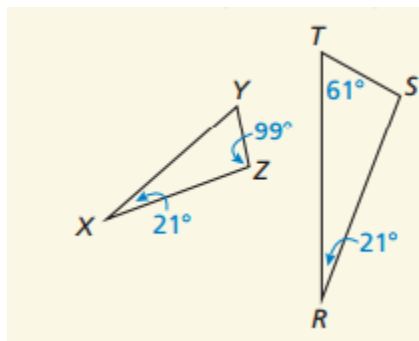
If $\angle A \cong \angle D$ and $\angle B \cong \angle E$, then $\triangle ABC \sim \triangle DEF$.

Proof p. 428

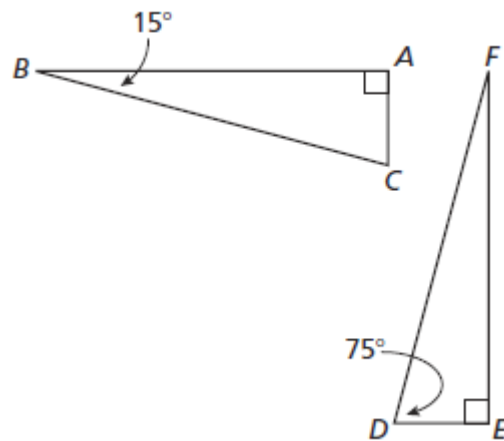


Examples: Determine whether the triangles are similar. If they are, write a similarity statement. Explain your reasoning.

WE DO



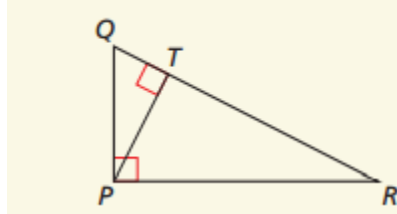
YOU DO



Examples: Show that the triangles are similar. Write a similarity statement.

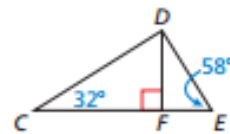
WE DO

Show that $\triangle QPR \sim \triangle QTP$.



YOU DO

$\triangle CDF$ and $\triangle DEF$



Examples: Modeling with mathematics

WE DO

A school flagpole casts a shadow that is 45 feet long. At the same time, a boy who is five feet eight inches tall casts a shadow that is 51 inches long. How tall is the flagpole to the nearest foot?

YOU DO

You are standing outside, and you measure the lengths of the shadows cast by both you and a tree. Write a proportion showing how you could find the height of the tree.

Assignment	
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Define Vocabulary:

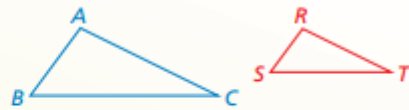
slope

parallel lines

perpendicular lines

Theorem 8.4 Side-Side-Side (SSS) Similarity Theorem

If the corresponding side lengths of two triangles are proportional, then the triangles are similar.



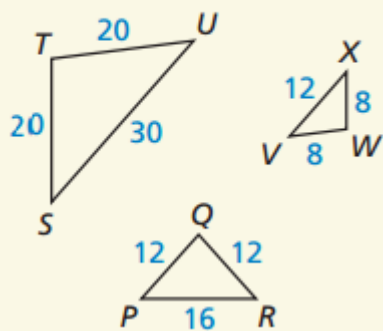
If $\frac{AB}{RS} = \frac{BC}{ST} = \frac{CA}{TR}$, then $\triangle ABC \sim \triangle RST$.

Proof p. 437

Examples: Using the SSS Similarity Theorem.

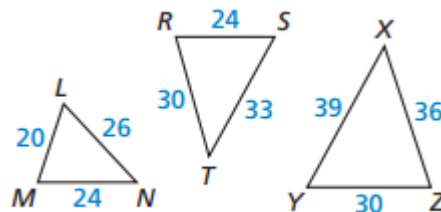
WE DO

Is either $\triangle PQR$ or $\triangle STU$ similar to $\triangle VWX$?



YOU DO

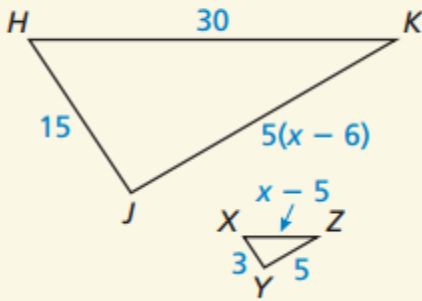
Which of the three triangles are similar?
Write a similarity statement.



Examples: Using the SSS Similarity Theorem.

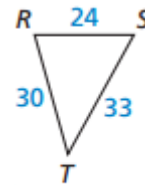
WE DO

Find the value of x that makes $\triangle XYZ \sim \triangle HJK$.



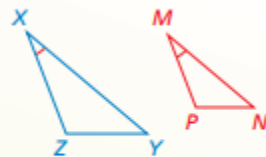
YOU DO

The shortest side of a triangle similar to $\triangle RST$ is 12 units long. Find the other side lengths of the triangle.



Theorem 8.5 Side-Angle-Side (SAS) Similarity Theorem

If an angle of one triangle is congruent to an angle of a second triangle and the lengths of the sides including these angles are proportional, then the triangles are similar.



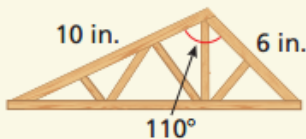
If $\angle X \cong \angle M$ and $\frac{ZX}{PM} = \frac{XY}{MN}$, then $\triangle XYZ \sim \triangle MNP$.

Proof Ex. 33, p. 443

Examples: Using the SAS Similarity Theorem.

WE DO

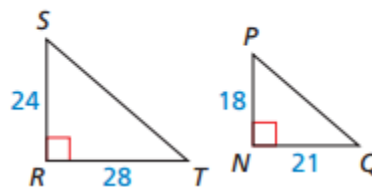
The diagram is a scale drawing of a triangular roof truss. The lengths of the two upper sides of the actual truss are 18 feet and 40 feet. The actual truss and the scale drawing both have an included angle of 110° . Is the scale drawing of the truss similar to the actual truss? Explain.



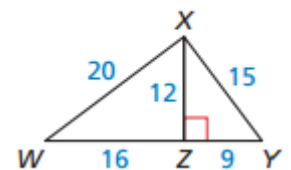
YOU DO

Explain how to show that the indicated triangles are similar.

$\triangle SRT \sim \triangle PNQ$



$\triangle XZW \sim \triangle YZX$



Assignment	
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Define Vocabulary:

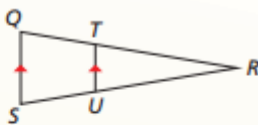
corresponding angles

ratio

proportion

Theorem 8.6 Triangle Proportionality Theorem

If a line parallel to one side of a triangle intersects the other two sides, then it divides the two sides proportionally.

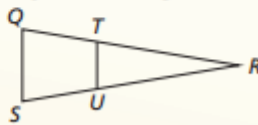


If $\overline{TU} \parallel \overline{QS}$, then $\frac{RT}{TQ} = \frac{RU}{US}$.

Proof Ex. 27, p. 451

Theorem 8.7 Converse of the Triangle Proportionality Theorem

If a line divides two sides of a triangle proportionally, then it is parallel to the third side.



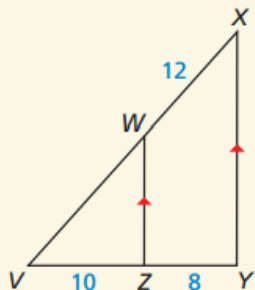
If $\frac{RT}{TQ} = \frac{RU}{US}$, then $\overline{TU} \parallel \overline{QS}$.

Proof Ex. 28, p. 451

Examples: Finding the length of a segment.

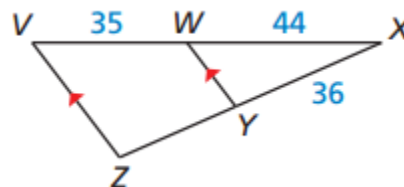
WE DO

In the diagram, $\overline{WZ} \parallel \overline{XY}$, $WX = 12$, $VZ = 10$, and $ZY = 8$. What is the length of \overline{VW} ?



YOU DO

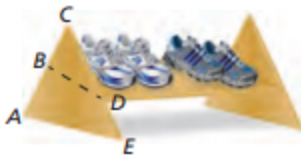
Find the length of \overline{YZ} .



Examples: Determining whether segments are parallel.

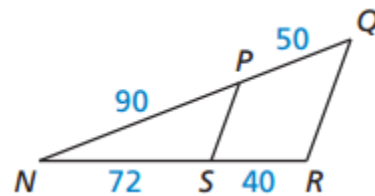
WE DO

$BA = 35$ centimeters,
 $CB = 25$ centimeters,
 $CD = 20$ centimeters, and
 $DE = 28$ centimeters. Explain why the shelf is parallel to the floor.



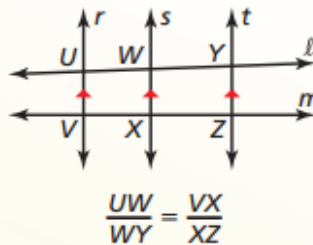
YOU DO

Determine whether $\overline{PS} \parallel \overline{QR}$.



Theorem 8.8 Three Parallel Lines Theorem

If three parallel lines intersect two transversals, then they divide the transversals proportionally.

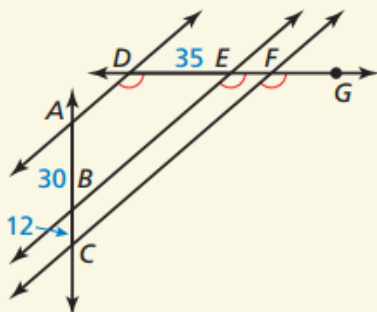


Proof Ex. 32, p. 451

Examples: Using the Three Parallel Lines Theorem.

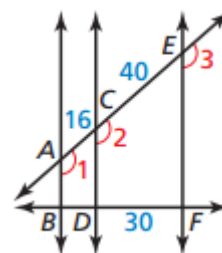
WE DO

In the diagram, $\angle ADE$, $\angle BEF$, and $\angle CFG$ are all congruent. $AB = 30$, $BC = 12$, and $DE = 35$. Find DF .



YOU DO

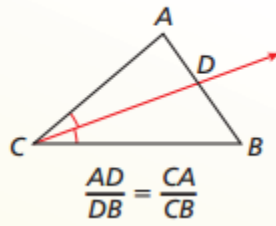
Find \overline{BD} .



Theorem 8.9 Triangle Angle Bisector Theorem

If a ray bisects an angle of a triangle, then it divides the opposite side into segments whose lengths are proportional to the lengths of the other two sides.

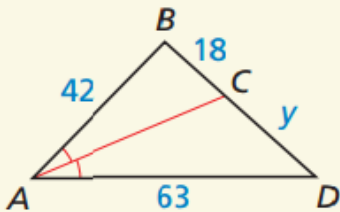
Proof Ex. 35, p. 452



Examples: Using the Three Parallel Lines Theorem.

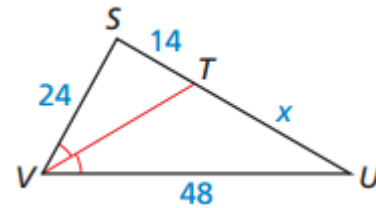
WE DO

In the diagram, $\angle BAC \cong \angle CAD$. Use the given lengths to find the length of \overline{CD} .



YOU DO

Find the value of the variable.



Assignment	
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