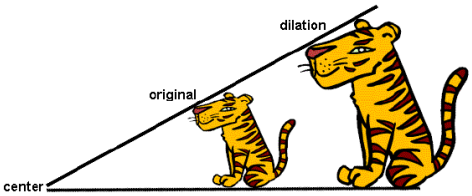
7.1 Dilations

Targets

- I can determine whether a dilation is an enlargement, a reduction, or a congruence transformation.
- I can determine the scale factor for a given dilation.

Instruction (Vocabulary)

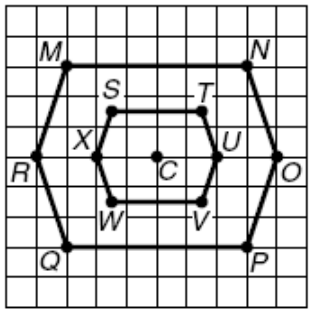
Term/Concept	Definition/Example	Picture
Dilation	○ A **dilation** is a transformation that may change the _____ of a figure.	
Center Point & Scale Factor	○ A dilation requires a **center point** and a **scale factor**. ○ **Scale factor (*r*)** = _____ _____	

- if $r > 1$ → _____
- If $0 < r < 1$ → _____
- If $r = 1$ → _____

Instruction

Example 1:
Determine whether the dilation shown is an enlargement, a reduction, or a congruence transformation. Then determine the scale factor for each dilation.

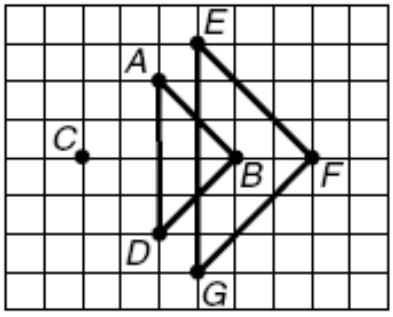
a. *STUVWX* is a dilation image of *MNOPQR*.



Type of Dilation: _____

Scale Factor: _____

b. ΔEFG is a dilation image of ΔABC.

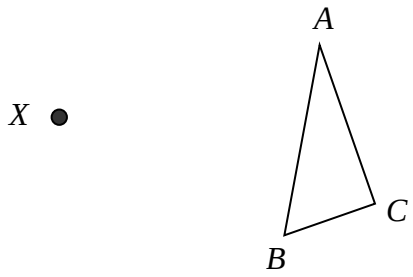


Type of Dilation: _____

Scale Factor: _____

Example 2:

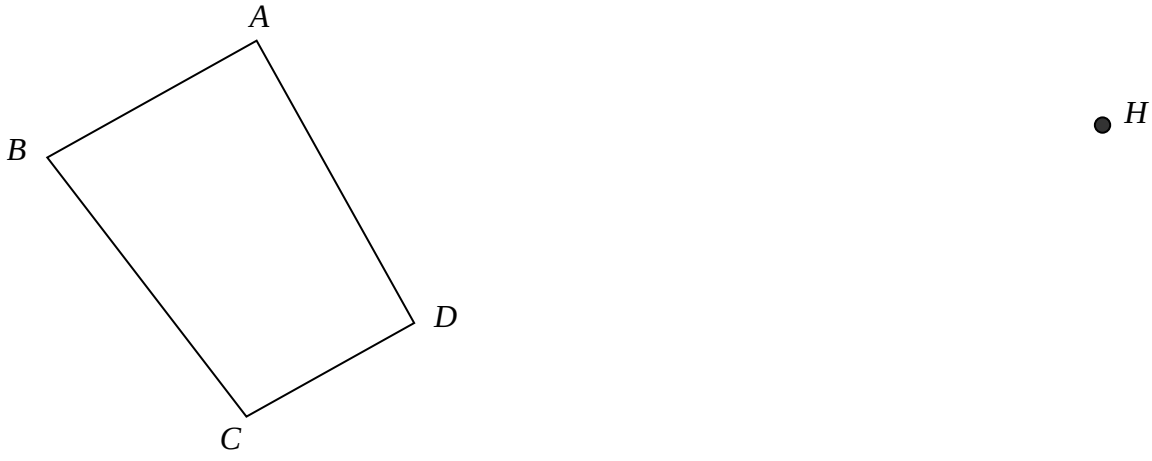
Draw the image of ΔABC under a dilation with center X and a scale factor of 3. Then determine whether the transformation is an enlargement, a reduction, or a congruence transformation.



Instruction

Your turn:

Draw the image of *ABCD* under a dilation with center *H* and a scale factor of $\frac{1}{3}$. Then determine whether the transformation is an enlargement, a reduction, or a congruence transformation.



Instruction

Term/Concept	Definition/Example
Dilations on the Coordinate Plane	○ If $P(x, y)$ is the preimage of a dilation centered at the origin with a scale factor of r, then the image is _____

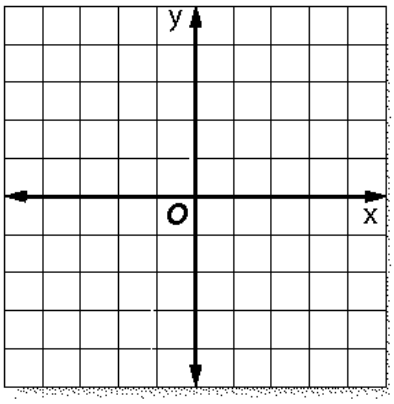
Example 3:

Graph the polygon that has the following vertices. Then find and graph the image of the polygon after a dilation centered at the origin with a scale factor of 2.

$A(-2, 2) \rightarrow A'$

$B(-1, -3) \rightarrow B'$

$C(3, 3) \rightarrow C'$



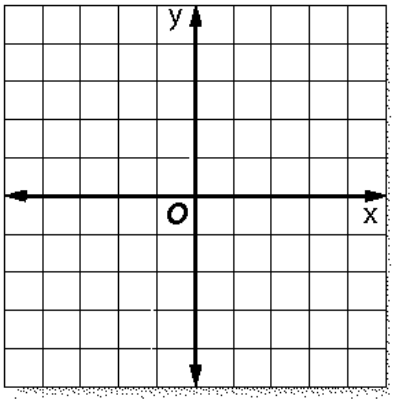
Your turn:

Graph the polygon that has the following vertices. Then find and graph the image of the polygon after a dilation centered at the origin with a scale factor of $\frac{1}{2}$.

$A(-4, 3) \rightarrow A'$

$B(-2, -4) \rightarrow B'$

$C(5, -2) \rightarrow C'$



Example 4:

Find the length of $\overline{CD}$ under a dilation with a scale factor of 4 if $C'D' = 6$.

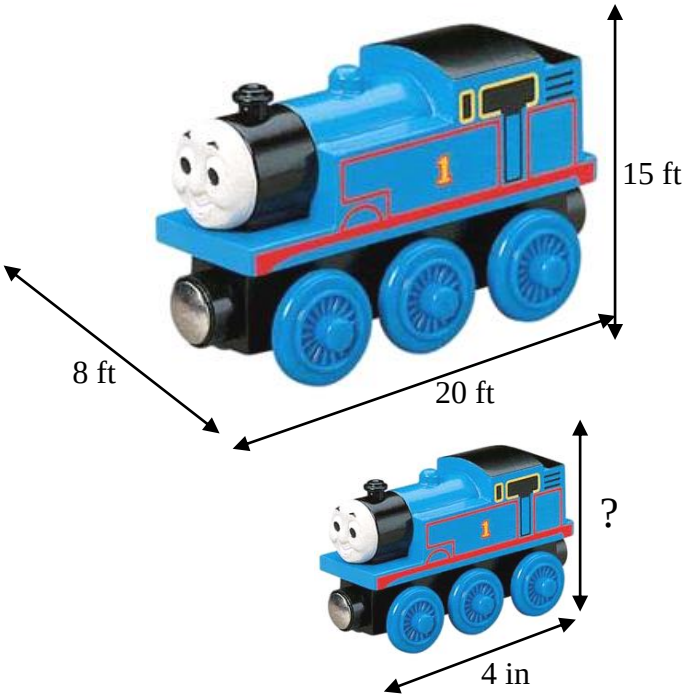
Your Turn

Find the length of $\overline{E'F'}$ under a dilation with a scale factor of $\frac{2}{3}$ if $EF = 5$.

Instruction

Example 5:
A train and a model of the train are shown at the right.

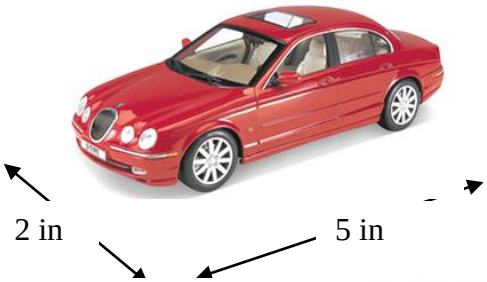
a. What is the scale factor needed to build the model from the actual train?



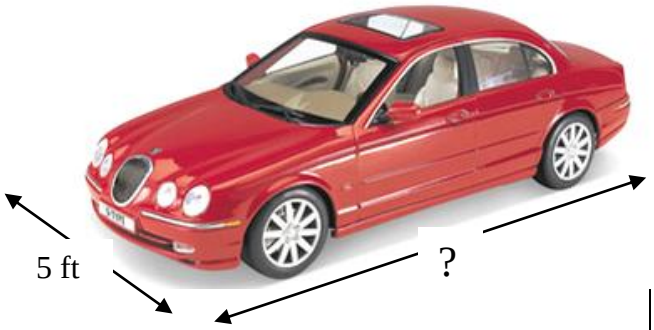
b. What is the height of the model?

Your turn:
A model car and the actual car are shown at the right.

a. What is the scale factor needed to build the actual car from the model?



b. What is the length of the actual car?



7.2 Ratios and Proportions

Targets	• I can write ratios. • I can use properties of proportions.

Vocab	**Ratio**	○ a _____ of 2 amounts	ratio of *a* to *b* notation:

Instruction	***Example 1:*** State the ratio of the number of females in this class to the number of males.	***Your turn:*** In a schedule of 5 classes, Jordan has 2 elective classes. What is the ratio of elective to non-elective classes in Jordan's schedule?

Vocabulary	**Extended Ratio**	○ can be used to compare 3 or more amounts	ratio of *a* to *b* to *c* notation:

Instruction	***Example 2:*** The ratio of the measures of the sides of a triangle is 5:7:8. The perimeter of the triangle is 240 ft. Find the measures of all the sides of the triangle.
	Example 3: The ratio of the measures of the angles of a triangle is 2:10:3. Find the measures of all the angles of the triangle.

	Your turn: The perimeter of a rectangle is 140 in. The ratio of the length to the width is 7:3. Find the length of the rectangle.

Vocabulary	**Proportion**	○ an equation stating that 2 _____ are _____	*Example:* $\frac{4}{10}=\frac{2}{5}$
	Cross Products	○ the **product** of the _____ in a proportion are equal	$\frac{4}{10}=\frac{2}{5}$

Solving Proportions:

Instruction

Example 4:
Solve each of the following proportions.

a. $\frac{3}{8}=\frac{y}{24}$

b. $\frac{6}{18.2}=\frac{9}{x}$

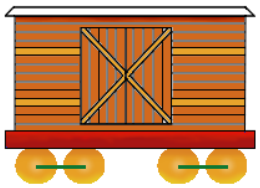
c. $\frac{2x+3}{8}=\frac{5}{4}$

d. $\frac{x+1}{x-1}=\frac{3}{4}$

Instruction

Example 5:

A boxcar on a train has a length of 40 feet and a width of 9 feet. A scale model is made with a length of 16 inches. Find the width of the model.



Example 6:

The scale on a map indicates that 1 inch = 4 miles. If 2 towns are 3.5 inches apart on the map, what is the actual distance between the towns?

Your turn:

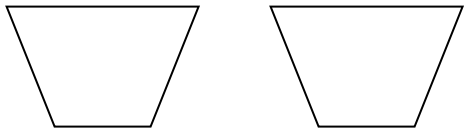
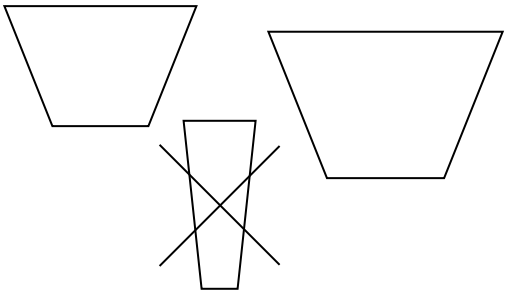
The Lehman's minivan requires 5 gallons of gasoline to travel 120 miles. How much gasoline will they need for a 350-mile trip?

Your turn:

A 3.5 in. x 5 in. photo set horizontally is enlarged to make a photo 18 inches tall. Find the width of the enlarged photo.

7.3 Similar Polygons

Targets	• I can identify similar figures. • I can find missing side lengths in similar figures.

Vocabulary	**Congruent Polygons** $\cong$	○ polygons that have the ***same*** _____ and the ***same*** _____.	
	Similar Polygons $\sim$	○ polygons that have the ***same*** _____ but ***may have different*** _____.	

Vocabulary

Similar Polygons

Two polygons are similar if:

1. All their corresponding angles are _____.

AND

2. The measures of their corresponding sides are _____ (all the ratios of the corresponding sides are equal).

Instruction

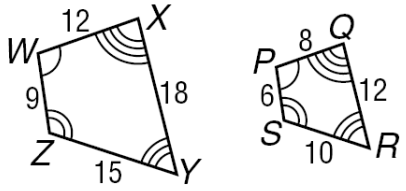
Notation:

$\cong$ means "is _____ to" (same shape and same size)

$\sim$ means "is _____ to" (same shape, may have different sizes)

Example 1:

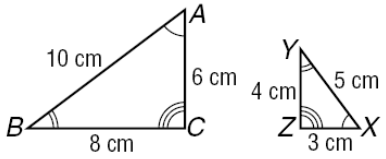
Determine whether polygon *WXYZ* ~ polygon *PQRS*. Justify your answer.



Instruction

Your turn:

Determine whether $\Delta ABC \sim \Delta XYZ$. Justify your answer.

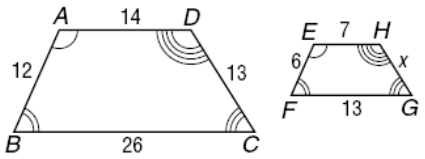


- **Finding missing side lengths in similar figures:**

Instruction

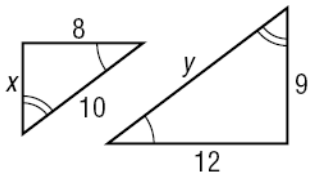
Example 2:

The following pair of polygons is similar. Find the value of *x*.



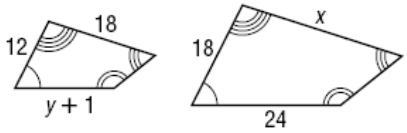
Your turn:

The following pair of polygons is similar. Find the values of *x* and *y*.



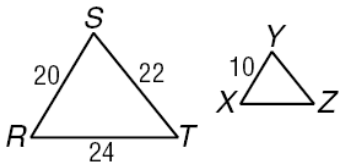
Example 3:

The following pair of polygons is similar. Find the values of *x* and *y*.



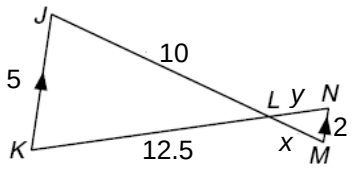
Your turn:

The following triangles are similar. Find the perimeter of ΔXYZ.



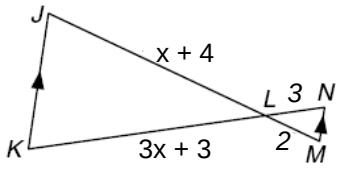
Example 4:

$\Delta JKL \sim \Delta MNL$. Find the values of *x* and *y*.



Your turn:

Find the value of *x*. $\Delta JKL \sim \Delta MNL$



7.4 Proving Triangles Similar

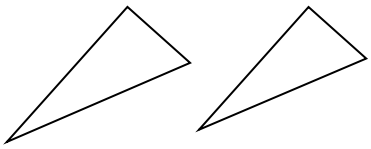
Targets

- I can identify similar triangles.
- I can use similar triangles to solve problems.

Congruent triangles:

*all 3 pairs of *corresponding angles* are **congruent**

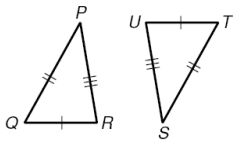
*all 3 pairs of *corresponding sides* are **congruent**



REVIEW: Triangle Congruence Theorems

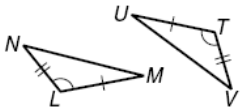
(ways of proving 2 triangles are congruent)

1.



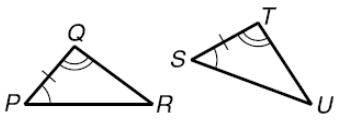
_____

2.



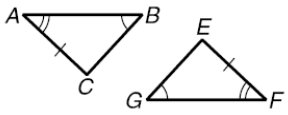
_____

3.



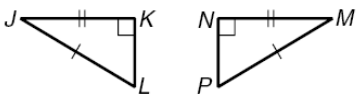
_____

4.



_____

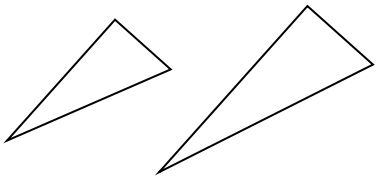
5.



_____

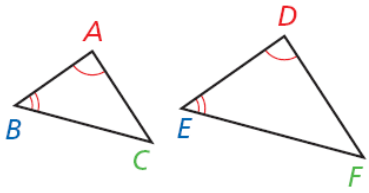
Similar Triangles:

- all 3 pairs of *corresponding angles* are **congruent**
- all 3 pairs of *corresponding sides* are **proportional**



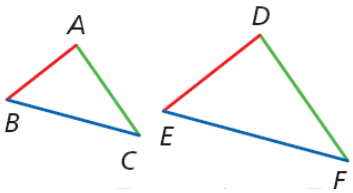
Triangle Similarity Theorems

Angle-Angle (AA~) Similarity



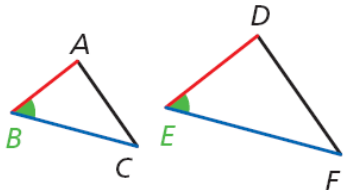
If $\angle A \cong \angle D$ and $\angle B \cong \angle F$, then $\Delta ABC \sim \Delta DEF$

Side-Side-Side (SSS~) Similarity



If $\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$, then $\Delta ABC \sim \Delta DEF$

Side-Angle-Side (SAS~) Similarity



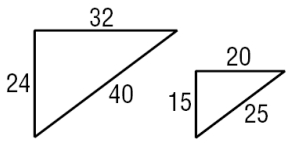
If $\frac{AB}{DE} = \frac{BC}{EF}$ and $\angle B \cong \angle E$, then $\Delta ABC \sim \Delta DEF$

Instruction

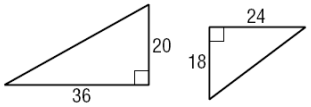
Example 1:

Determine whether each pair of triangles is similar. Justify your answer.

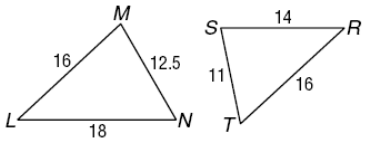
a.



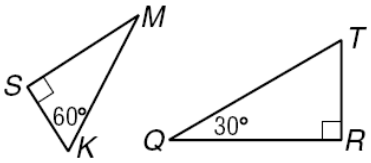
b.



c.



d.



7.5 Proportional Parts of Triangles

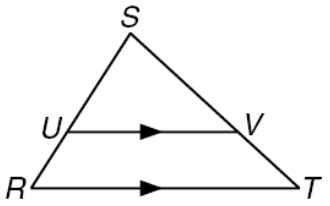
Targets

- I can use the Triangle Proportionality Theorem to find parts of triangles.
- I can use the Triangle Midsegment Theorem to find parts of triangles.
- I can recognize and use proportions to find relationships between altitudes, angle bisectors and medians of similar triangles.

Theorem

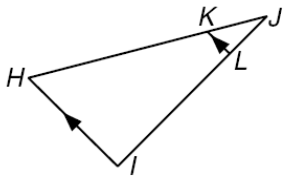
Triangle Proportionality Theorem:

- If a line is _____ to one side of a triangle and intersects the other 2 sides, then it separates those 2 sides into segments whose lengths are _____.

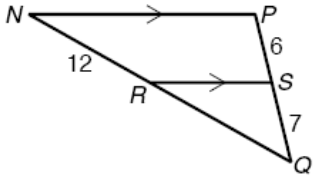


Instruction

Example 1:
If $JK = 7$, $KH = 21$, and $JL = 6$, find LI.

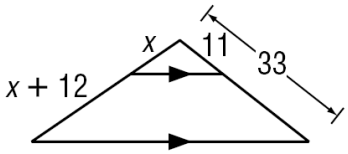


Your turn:
Find NQ.

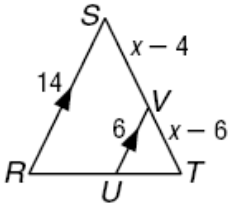


Instruction

Example 2:
Find the value of x.



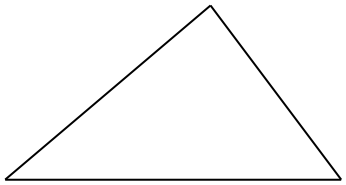
Your turn:
Find the value of x.



Vocabulary

Midsegment

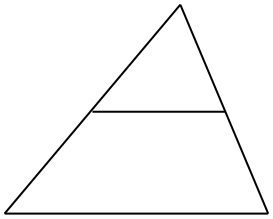
segment whose _____ are the _____ of _____ of a triangle.



Theorem

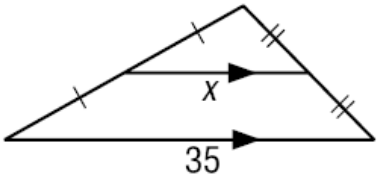
Triangle Midsegment Theorem:

A midsegment of a triangle is _____ to one side of the triangle, and its length is _____ the length of that side



Instruction

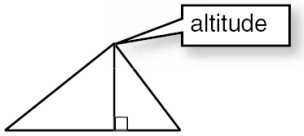
Example 3:
Find the value of *x*.



Your turn:
In ΔRST , X is the midpoint of $\overline{RT}$ and Y is the midpoint of $\overline{ST}$. If $XY = 12$, find RS. Draw and label a figure.

Vocabulary

Altitude:
a perpendicular segment from a vertex to the line containing the opposite side

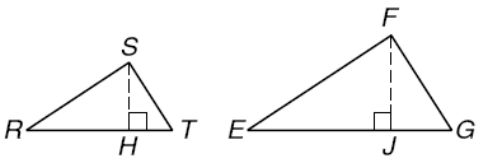


Theorem:
If two triangles are similar, then the measures of the corresponding altitudes are _____ to the measures of the corresponding sides.

Instruction

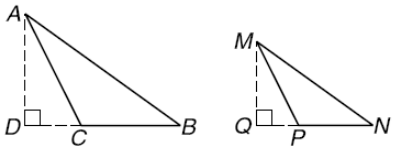
Example 4:

Find FG if $\Delta RST \sim \Delta EFG$, $\overline{SH}$ is an altitude of ΔRST, $\overline{FJ}$ is an altitude of ΔEFG, $ST = 6$, $SH = 5$, and $FJ = 7$.



Your turn:

$\Delta ABC \sim \Delta MNP$, $\overline{AD}$ and $\overline{MQ}$ are altitudes, $AB = 24$, $AD = 14$, and $MQ = 10.5$. Find MN.



Theorem

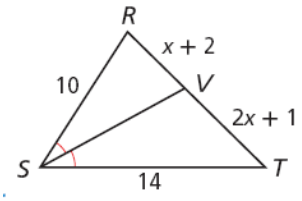
Angle bisectors theorem:

An angle bisector in a triangle separates the opposite side into segments that have the same ratio as the other two sides.

Instruction

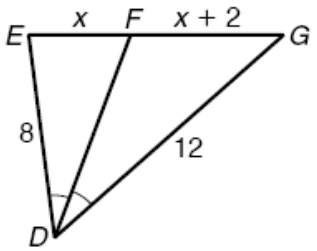
Example 5:

Find the value of x.



Your turn:

Find the value of x.

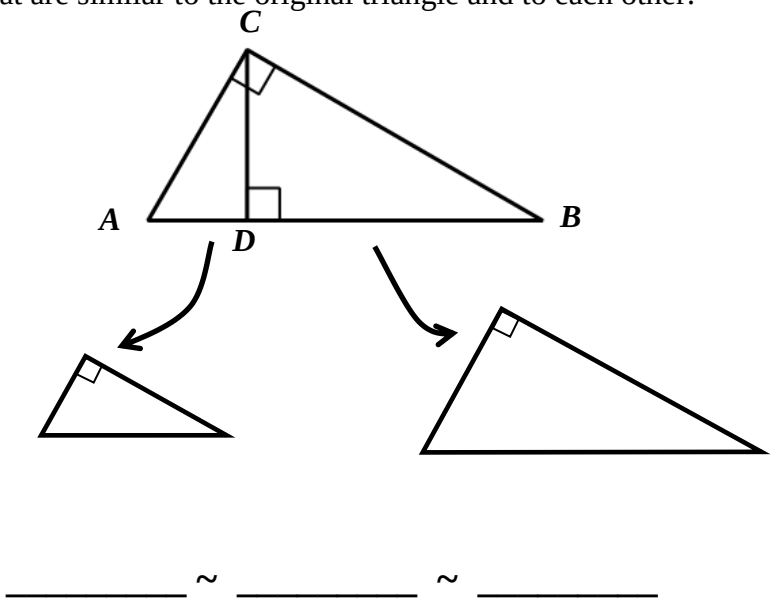


7.6 Similarity in Right Triangles

Targets

- I can solve problems involving relationships between parts of a right triangle and the altitude (height) to its hypotenuse (longest side).

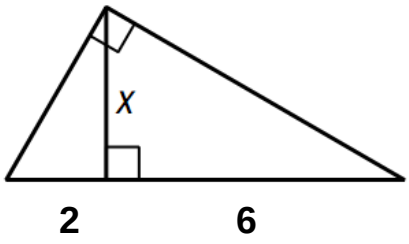
Term/ Concept	Definition/Example	Picture
Triangle Relationship	The altitude to the hypotenuse of a right triangle divides the triangle into two triangles that are similar to the original triangle and to each other.	



_____ ~ _____ ~ _____

Instruction

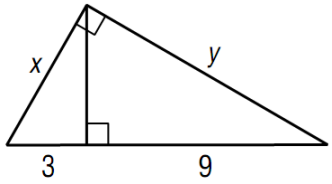
Example 1:
Find the value of *x*. Round your answer to 2 decimal places.



Instruction

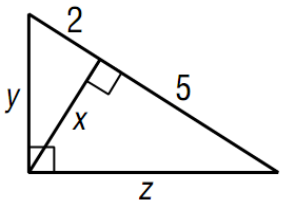
Example 2:

Find the values of *x* and *y*. Round your answers to 2 decimal places.



Example 3:

Find the values of *x*, *y*, and *z*. Round your answers to 2 decimal places.



Your turn:

Find the values of *x*, *y*, and *z*. Round your answers to 2 decimal places.