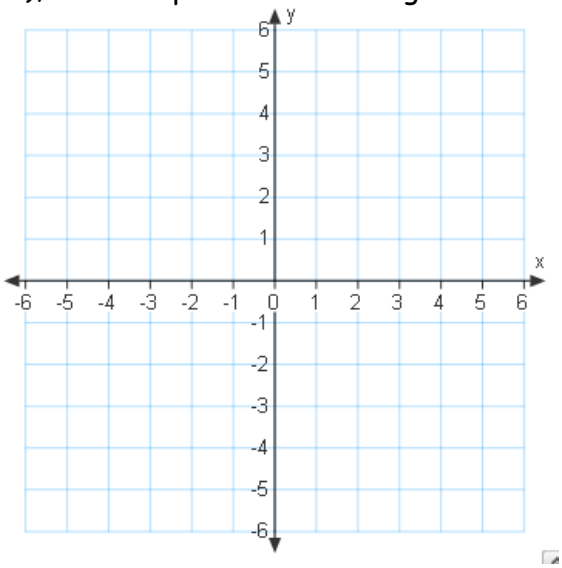
## Day 5: Compositions

**Warm-Up**: Given triangle GHI with G(-2, 1), H(3, 4), and I(1, 5), find the points of the image under the following transformations and write the Algebraic Rule.




1) Translate right 2, down 3

2) Reflect over the x-axis

3) Rotate 90 degrees, counter-clockwise

4) Dilate with a scale factor of 3

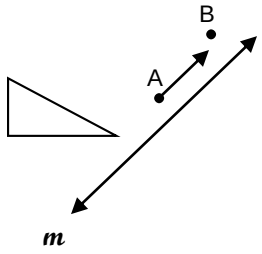
## Compositions

A **glide reflection** is the composition of a _____ and a _____

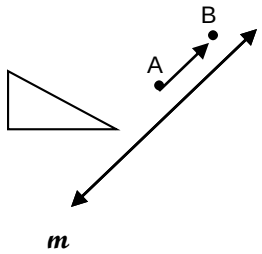
where the _____ motion is _____ to the _____.

**Discovery Activity:** Use patty paper to complete the transformations below:

1. Translate A→B, then reflect over line m



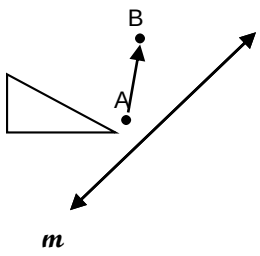

2. Reflect over line m, then translate A→B.



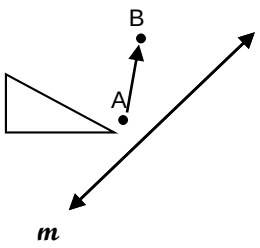

3. Does it matter which transformation is done first in a glide reflection?

Use patty paper to complete the transformations below:

4. Translate A→B, then reflect over line m




5. Reflect over line m, then translate A→B.




6. Is this a glide reflection? Why or why not?

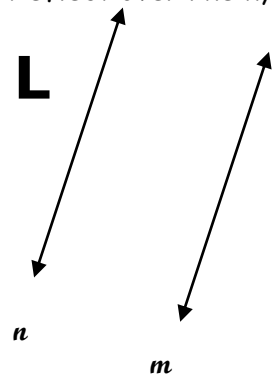
7. The translation $T(x, y) \rightarrow (x+2, y+4)$ is followed by the translation $T(x, y) \rightarrow (x-8, y-5)$. Write this as a single translation.

8. A 90° rotation followed by a 90° rotation clockwise. Write this as a single rotation.

9. The reflection over the x-axis is followed by the reflection over the y-axis. Can this be written as a single reflection?
   Can this be written as a single transformation? Draw a sketch to support your answer.

Use patty paper to complete the transformations below:

10. Reflect over line n, then reflect over line m.

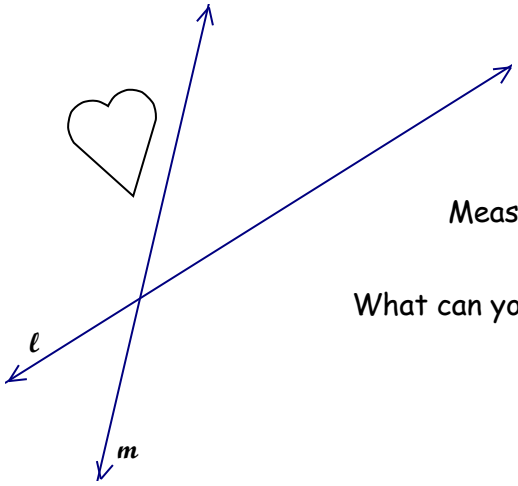



Measure the distance from the preimage to the final image.

Measure the distance from line n to line m.

What can you conclude about consecutive reflections over parallel lines?

11. Reflect over line m, then reflect over line l.




Measure the acute angle formed by line l and line m.

Measure the angle of rotation (from the preimage to the final image)

What can you conclude about consecutive reflections over intersecting lines?

12. Two lines intersect at a 50° angle. Write the composition of two reflections over the lines as a single transformation.

13. Two parallel lines are 3 cm apart. Describe the composition of two reflections over the lines as a single transformation.

14. A figure is reflected over the y-axis and then reflected over the line y = x. Write as a single transformation.

## Summary

A _____ is a sequence of _____.

Two reflections across _____ lines is the same as a _____.

A _____ is the same as a double reflection around _____ lines.

The point of rotation is the _____ of the _____ _____ _____.

**Same Orientation**: Facing the _____ _____.

TIP to check: If vertices are labeled alphabetically with ABC and A'B'C', read them in alphabetical order. They should read both _____ or both _____.

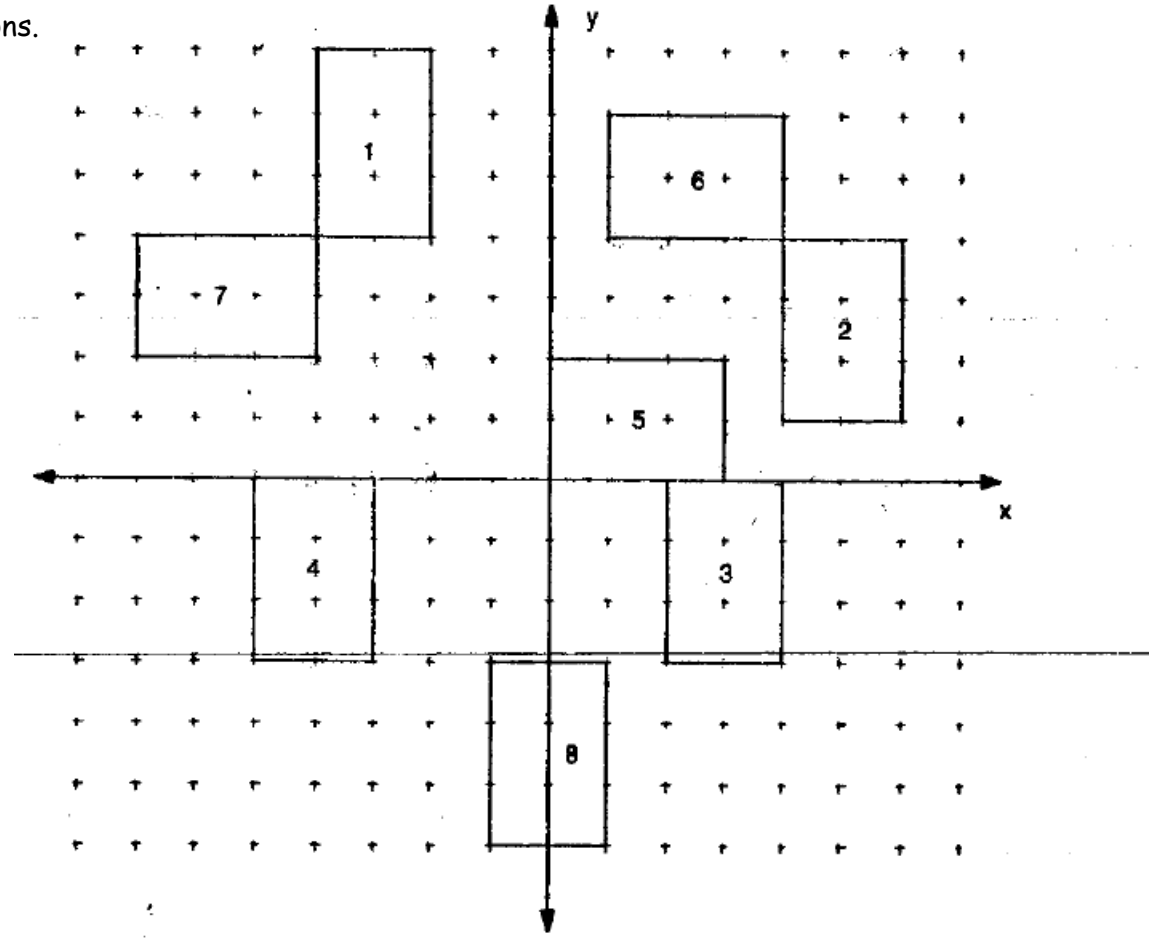
**Opposite Orientation**: Facing the _____ _____.

TIP to check: If vertices are labeled alphabetically with ABC and A'B'C', read them in alphabetical order. They should read one _____ and one _____.

Orientation can be helpful in describing and _____ transformations.

**Practice 1: Compositions of Transformations with Coordinates**

All of the rectangles are congruent. For each problem, start with the rectangle indicated. Then perform compositions of transformations specified. Perform the transformations in the order specified, one after the other. Determine which rectangle you land on after performing the transformations.




1. Reflect figure 1 over the y-axis. Translate it three units down then rotate it 90° counter-clockwise around (3,1). Which figure does figure 1 now match? **Answer: figure 5**
2. Translate figure 2 one unit down. Reflect it over the x-axis then reflect it over the line x = 4. Which figure does figure 2 now match?
3. Reflect figure 3 over the y-axis. Rotate 90° clockwise around (-2, 0) then glide 5 units to the right. Which figure does figure 3 now match?
4. Rotate figure 4 90° clockwise around (-3,0). Then reflect over the line y =2 then translate one unit to the left. Which figure does figure 4 now match?
5. Translate figure 5 five units to the left. Then rotate 90° clockwise around (-2,2). Then translate up two spaces. Which figure does figure 5 now match?
6. Rotate figure 6 90° clockwise around (4,4) then translate three units down. Which figure does figure 6 now match?
7. Rotate figure 7 90° clockwise around (-4,4) then reflect over the line x = -4. Which figure does figure 7 now match?
8. Reflect figure 8 over the x-axis. Then translate four units to the left. Then reflect over the line y = 1.5 Which figure does figure 8 now match?

**Practice 2: Composition of Motions with Algebraic Rules**

For each problem, there is a composition of motions listed. Write algebraic rules for each of the transformations. Then, determine a **single** algebraic rule that would accomplish the same motion with a **single** transformation.

1) Translate the triangle 4 units right and 2 units up, and then reflect the triangle over the line y=x.

2) Rotate the triangle 90 degrees counter clockwise, and then dilate the figure by a scale factor of 3.

3) Translate the triangle 4 units left and 2 units down, and then reflect the triangle over the y-axis.

4) Rotate the triangle 90 degrees clockwise, and then dilate the figure by a scale factor of 1/3.

5) Translate the triangle 4 units right and 2 units down, and then reflect the triangle over the x-axis.

6) Rotate the triangle 180 degrees counter clockwise, and then dilate the figure by a scale factor of 2.

7) Translate the triangle 4 units left and 2 units up, and then reflect the triangle over the line y=x.

8) Rotate the triangle 180 degrees clockwise, and then dilate the figure by a scale factor of 1/2.

## Day 6: Review of Transformations; Review of Ratios and Proportions

**Warm-Up/Some Review for the quiz**:

Given the points C (3, 2), A (-5, 4), and T (-1, 6), name the new points after the following transformations. Then, describe the transformation.

1.) $(x, y) \rightarrow (-x, -y)$

2.) $(x, y) \rightarrow (y, x)$

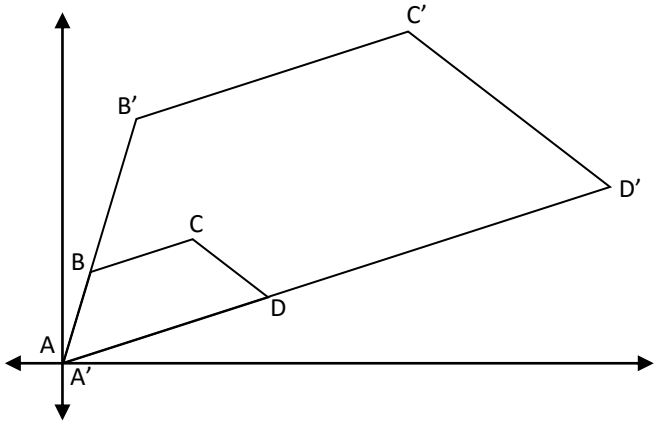
3.) $(x, y) \rightarrow (x-3, y+1)$

4.) $(x, y) \rightarrow (\frac{1}{2}x, \frac{1}{2}y)$

## Similarity

**Discovery:** Let's find out how Similarity works!!

Quadrilateral ABCD has been dilated about the origin by a magnitude of $\frac{5}{2}$ to obtain Quadrilateral A'B'C'D'.




Use the information provided to answer each of the questions below.

1. If the measures of ∠**ABC** and ∠**C** are **120°**, and the measures of ∠**A** and ∠**ADC** are 60°, what is the measure of ∠**C'**? What is the measure of ∠**A'**?

2. What is the ratio of CD : C'D'? What is the ratio of A'B' : AB?

3. If AD is 8 in, what is the length of A'D'?

4. If B'C' is 15 in, what is the length of BC?

5. Name the segments that are parallel to each other. How can you be sure?

6. If the slope of segment AB is 1/3, what is the slope of segment A'B'? How do you know this?

**Summary:**

Two figures are similar (~) if they have the same _____ but not necessarily the same _____.

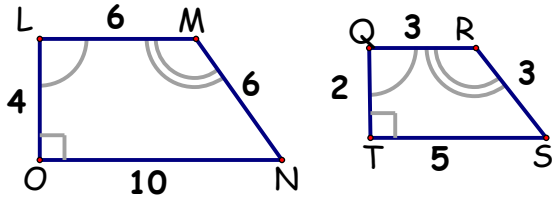
The _____ _____ is the ratio of the lengths of the corresponding sides.

(a.k.a. the _____ _____)

Two figures are congruent $(\cong)$ if they are similar and _____.

Two polygons are similar if:

1) Corresponding _____ are _____ AND 2) Corresponding _____ are _____




**Similarity Statement:** LMNO ~ **QRST**

When writing a **similarity statement,** be sure to line up corresponding angles and sides in the statement!!

In a similarity statement, be sure to:

1.) Line up corresponding angles that are congruent.

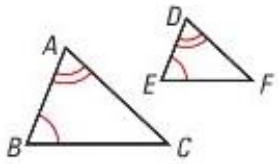
$\angle$ **L** $\cong \angle$ ___ , $\angle$ **M** $\cong \angle$ ___ ,
$\angle$ __ $\cong \angle$ **S** , $\angle$ __ $\cong \angle$ **O**,

2.) Line up corresponding sides that are proportional.

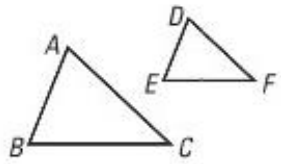
$$\frac{LM}{\quad} = \frac{MN}{\quad} = \frac{\quad}{ST} = \frac{\quad}{QT}$$

Two TRIANGLES are similar by ~

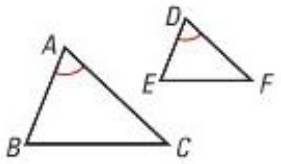
1. _____ 2. _____ 3. _____




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




If $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$, then $\triangle ABC \sim \triangle DEF$.




If $\angle A \cong \angle D$ and $\frac{AB}{DE} = \frac{AC}{DF}$ then $\triangle ABC \sim \triangle DEF$.

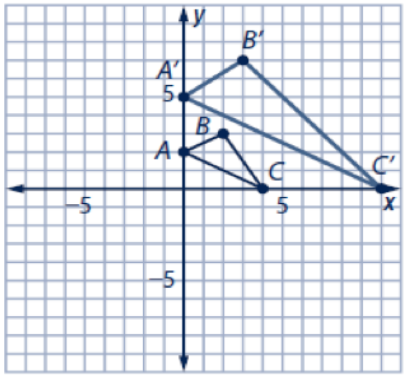
## Day 7: Similarity

**Warm-Up:** Given triangle CDE with C(2, 2), D(-6, 4) and E(-2, -6),
write the points of the image under the following transformations. For #1 and 2, write the description and the vertices. For #3 and 4, give the algebraic rule and the coordinate pairs.

1) $(x, y) \rightarrow (3x, 3y)$
2) $(x, y) \rightarrow (\frac{1}{4}x, \frac{1}{4}y)$
3) Dilation with scale factor 2
4) Horizontal stretch with scale factor 1/3, vertical shrink with scale factor 1/3
5) 21st Century Skill Check :

Triangle ABC and Triangle A'B'C' are shown on the right.
The scale on each axis is 1.

Since Triangle A'B'C' is bigger than triangle ABC, Logan thinks that triangle A'B'C' can be obtained by applying a size transformation centered at the origin to triangle ABC. Do you agree or disagree with Logan? Explain your reasoning.




## Similar Figures

**Definition**

**Characteristics**

**Similar Figures**

**Examples**

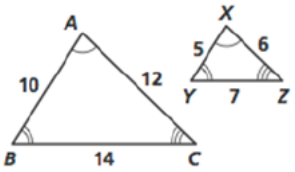
**Non-Examples**

**Venn Diagram**

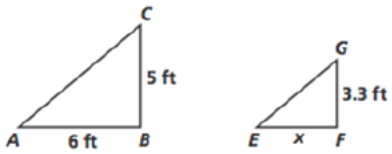
**Foundational Practice:**

Are these polygons similar? Why or why not? Write a similarity statement. Then, solve for the variable, where appropriate.

1)



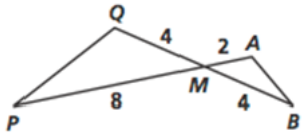

2) Given: $\angle A \cong \angle E,\ \angle C \cong \angle G$



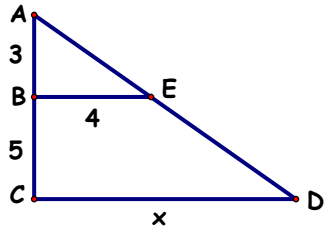

Explain why the triangles are similar and write a similarity statement. Then, solve for the variable, where appropriate.

3)


4)




5) $\overline{BE} \parallel \overline{CD}$




**Application Practice:**

1) A 6 ft tall tent standing next to a cardboard box casts a 9 ft shadow. If the cardboard box casts a shadow that is 6 ft long then how tall is it?

2) A telephone booth that is 8 ft tall casts a shadow that is 4 ft long. Find the height of a lawn ornament that casts a 2 ft shadow.

## You Try!!

3) A map has a scale of 3 cm : 18 km. If Riverside and Smithville are 54 km apart then they are how far apart on the map?

4) Find the distance between Riverside and Milton if they are 12 cm apart on a map with a scale of 4 cm : 21 km.

7) A map has a scale of 2 in : 6 mi. If Clayton and Centerville are 10 in apart on the map then how far apart are the real cities?

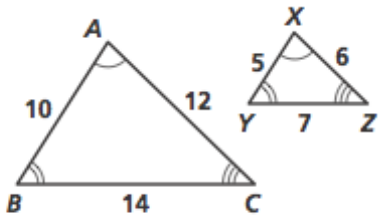
8) A statue that is 12 ft tall casts a shadow that is 15 ft long. Find the length of the shadow that a 8 ft cardboard box casts.

# Practice 8-2

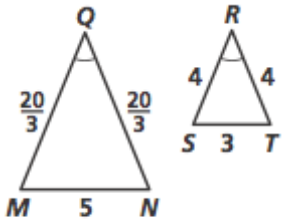
Similar Polygons

**Are the polygons similar? If they are, write a similarity statement, and give the similarity ratio. If they are not, explain.**

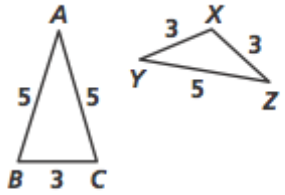
**1.**



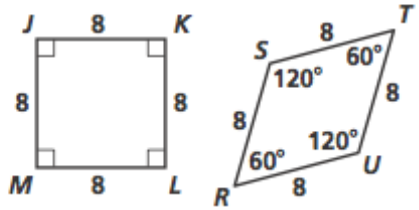

**2.**



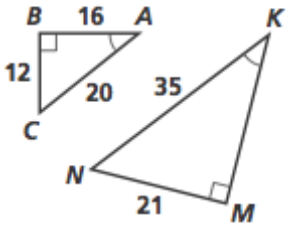

**3.**



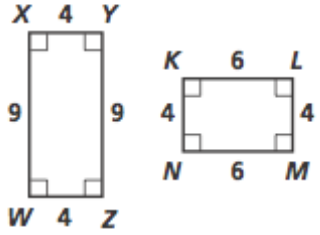

**4.**




**5.**



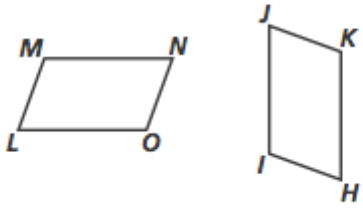

**6.**




***LMNO* ~ *HIJK*. Complete the proportions and congruence statements.**

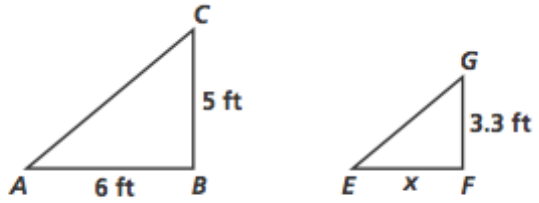
**7.** $\angle M \cong ?$ **8.** $\angle K \cong ?$ **9.** $\angle N \cong ?$

**10.** $\frac{MN}{IJ} = \frac{?}{JK}$ **11.** $\frac{HK}{?} = \frac{HI}{LM}$ **12.** $\frac{IJ}{MN} = \frac{HK}{?}$

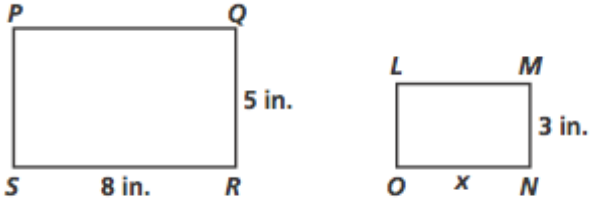



***Algebra* The polygons are similar. Find the values of the variables.**

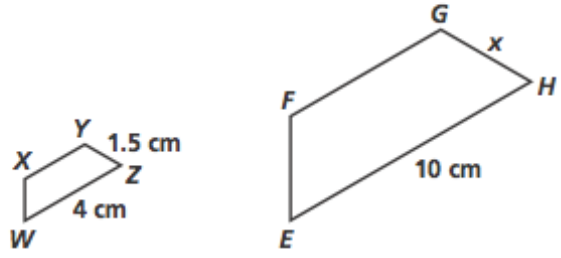
**13.**



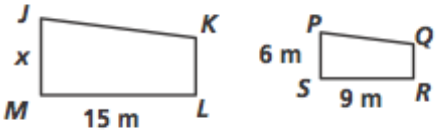

**14.**




**15.**




**16.**

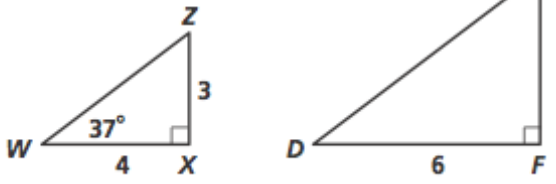



**$\triangle WXZ \sim \triangle DFG$. Use the diagram to find the following.**

**17.** the similarity ratio of $\triangle WXZ$ and $\triangle DFG$

**18.** $m\angle Z$ **19.** $DG$ **20.** $GF$

**21.** $m\angle G$ **22.** $m\angle D$ **23.** $WZ$

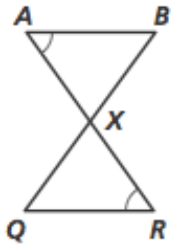


# Practice 8-3

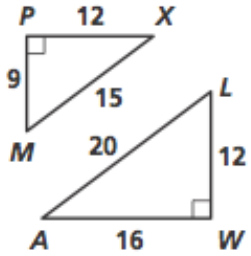
**Proving Triangles Similar**

**Explain why the triangles are similar. Write a similarity statement for each pair.**

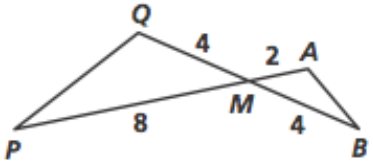
**1.**



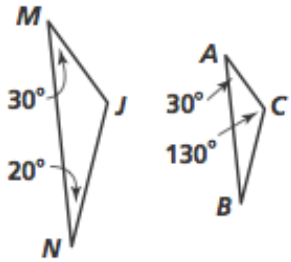

**2.**



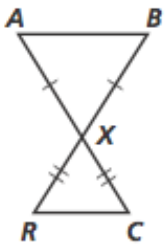

**3.**



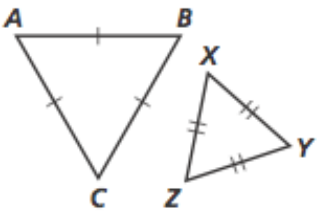

**4.**




**5.**

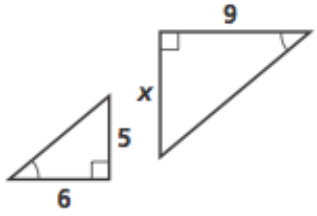



**6.**

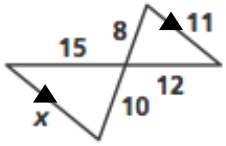



***Algebra* Find the value of *x*.**

**7.**




**8.**

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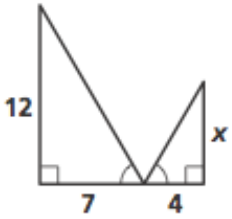


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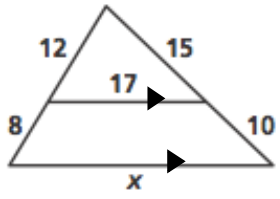


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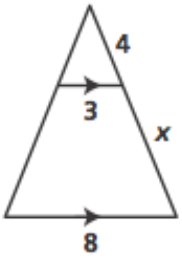


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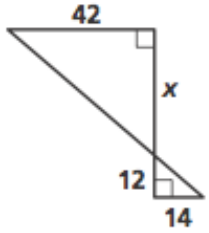


**13.** Natasha places a mirror on the ground 24 ft from the base of an oak tree. She walks backward until she can see the top of the tree in the middle of the mirror. At that point, Natasha's eyes are 5.5 ft above the ground, and her feet are 4 ft from the image in the mirror. Find the height of the oak tree.