

Name: _____

Date: _____

M8-U2/3: Notes #10 – Rotations₁

Class: _____

Rotation - _____

- If you rotate an object around a given point, what information will you need?

- After an object is rotated, will the image be congruent or similar to the original?

Example 1: Label the direction and degrees of rotation for each image of the original figure:

ORIGINAL

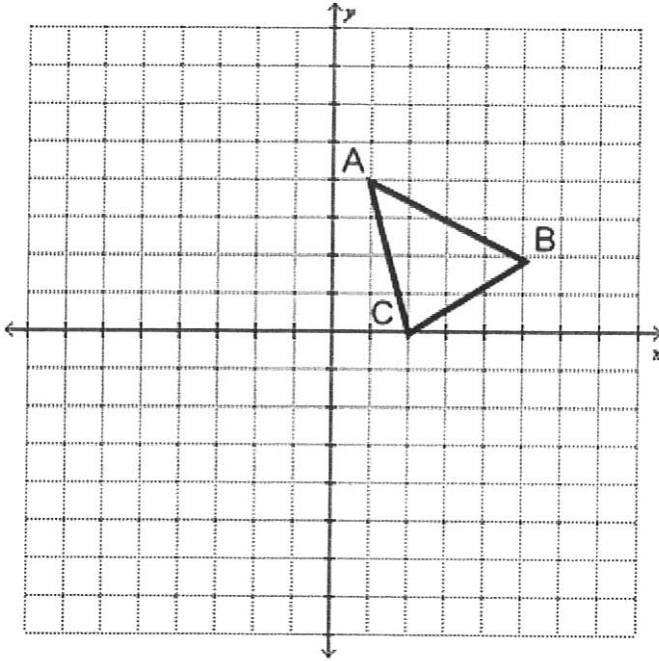
Or

Or

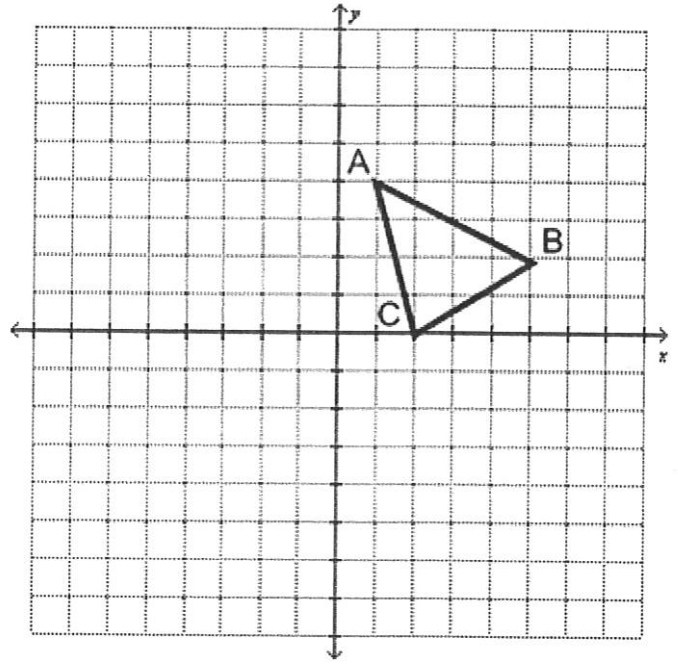
Or

Example 2. Triangle ABC is labeled on the graphs below.

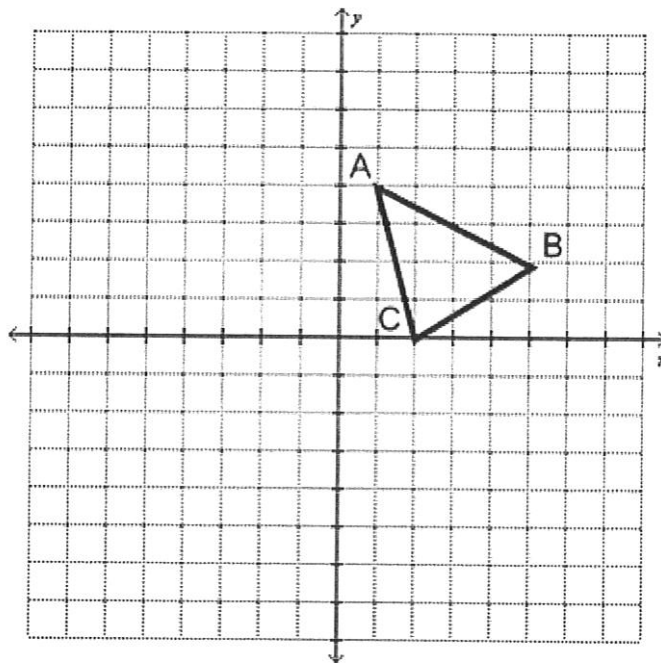
a) Rotate Triangle ABC , 90° counter-clockwise, Label the image $A' B' C'$.



b) Rotate Triangle ABC , 180° counter-clockwise. Label the image $A'' B'' C''$.



c) Rotate Triangle ABC , 270° counterclockwise. Label the triangle $A''' B''' C'''$.



Try It!

1. Graph Triangle ABC , $A(3, -2)$, $B(-5, 4)$, $C(3, 2)$.

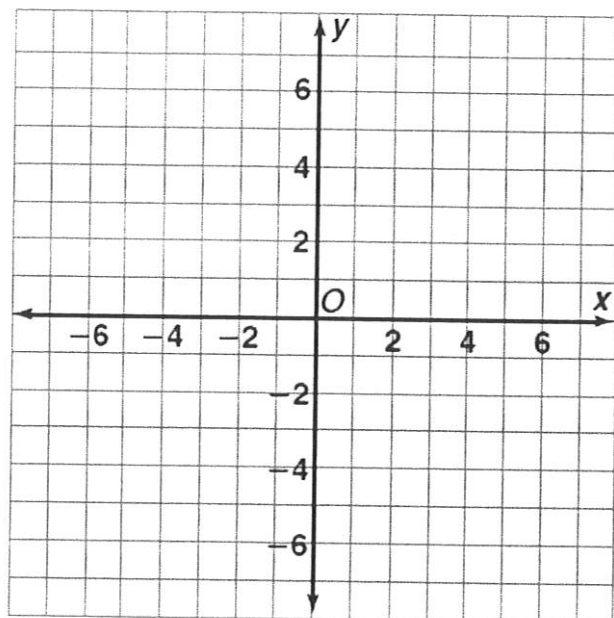
Graph and label the image of Triangle ABC after a 180° counterclockwise rotation about the origin.

What are the coordinates of the vertices of the image?

$$A (3, -2) \rightarrow A' \underline{\hspace{2cm}}$$

$$B (-5, 4) \rightarrow B' \underline{\hspace{2cm}}$$

$$C (3, 2) \rightarrow C' \underline{\hspace{2cm}}$$



2. Graph $ABCD$ with vertices $A(0, 4)$, $B(2, 2)$, $C(4, 2)$, and $D(4, 4)$.

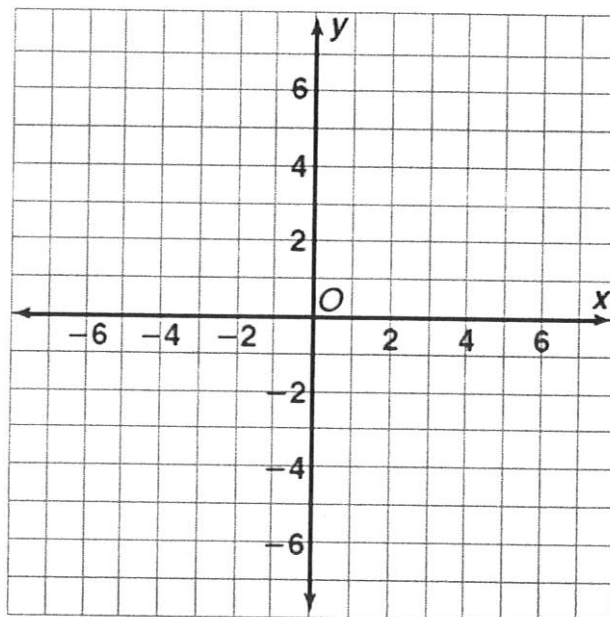
What are the coordinates of the image of quadrilateral $ABCD$ under a 90° **clockwise** rotation about the origin?

$$A (0, 4) \rightarrow A' \underline{\hspace{2cm}}$$

$$B (2, 2) \rightarrow B' \underline{\hspace{2cm}}$$

$$C (4, 2) \rightarrow C' \underline{\hspace{2cm}}$$

$$D (4, 4) \rightarrow D' \underline{\hspace{2cm}}$$

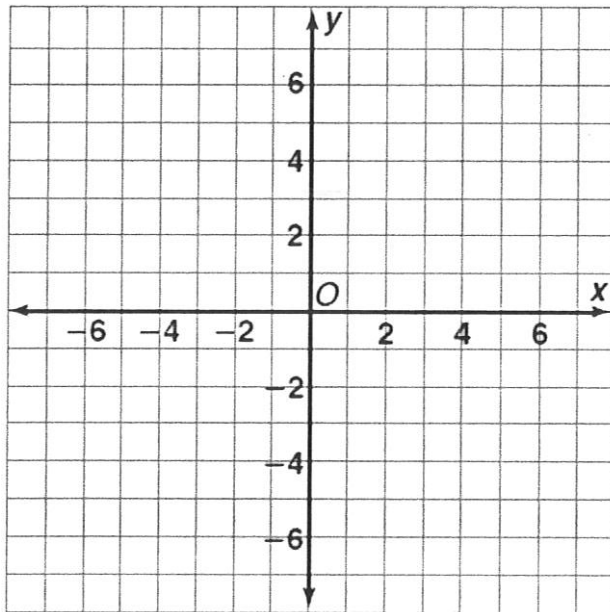


3.

a) Graph Triangle RST with vertices $R(-2, 3)$, $S(5, 4)$, and $T(4, 8)$.

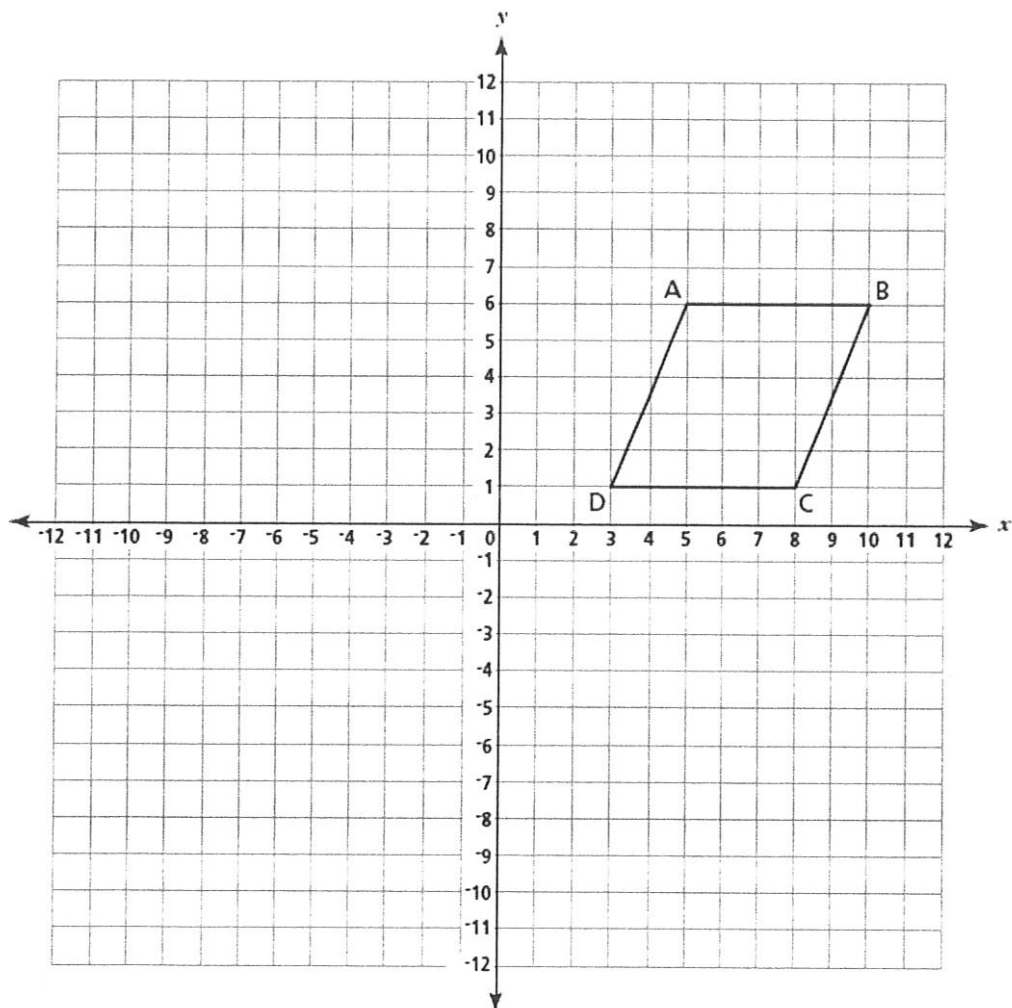
b) Rotate Triangle $R'S'T'$ 90° counterclockwise on the graph below.

Label the new coordinates of the vertices of Triangle $R'S'T'$. Graph the image.



Are $\triangle RST$ and $\triangle R'S'T'$ congruent to each other, similar to each other, or neither?
Explain how you determined your answer.

4. Quadrilateral $ABCD$ is plotted on the grid below.



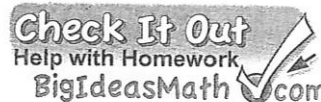
Part A

On the graph, draw the image of quadrilateral $ABCD$ after a **counterclockwise rotation of 180°** about the origin. Label the image $A'B'C'D'$.

Part B

On the lines below, explain how the coordinates of A changed to the coordinates of A' .

2.4 Exercises



Vocabulary and Concept Check

1. **VOCABULARY** What are the coordinates of the center of rotation in Example 2? Example 3?

MENTAL MATH A figure lies entirely in Quadrant II. In which quadrant will the figure lie after the given clockwise rotation about the origin?

2. 90° 3. 180° 4. 270° 5. 360°

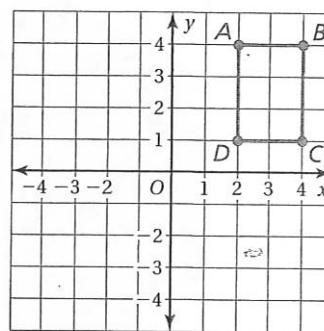
6. **DIFFERENT WORDS, SAME QUESTION** Which is different? Find “both” answers.

What are the coordinates of the figure after a 90° clockwise rotation about the origin?

What are the coordinates of the figure after a 270° clockwise rotation about the origin?

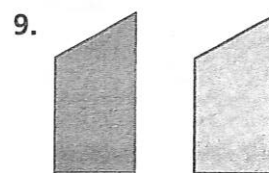
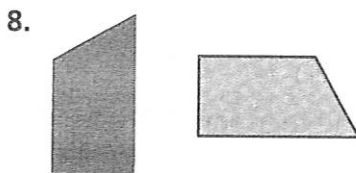
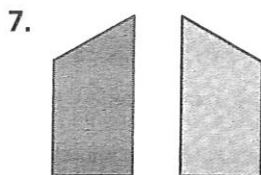
What are the coordinates of the figure after turning the figure 90° to the right about the origin?

What are the coordinates of the figure after a 270° counterclockwise rotation about the origin?

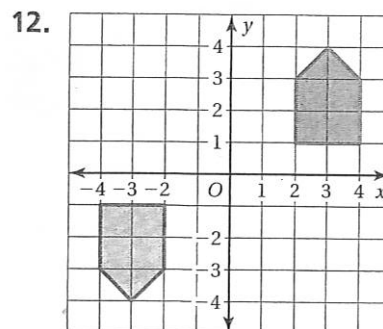
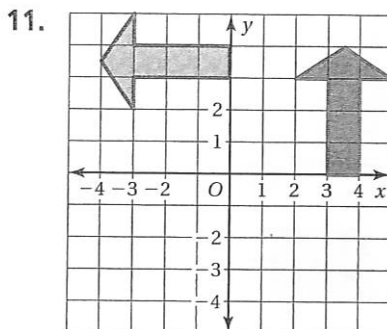
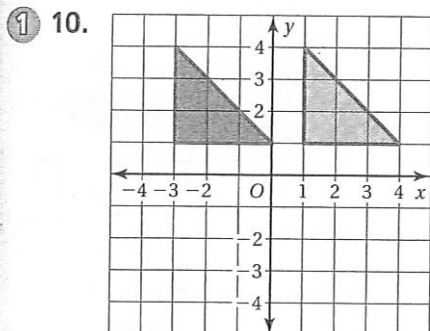


Practice and Problem Solving

Identify the transformation.



Tell whether the blue figure is a rotation of the red figure about the origin. If so, give the angle and direction of rotation.

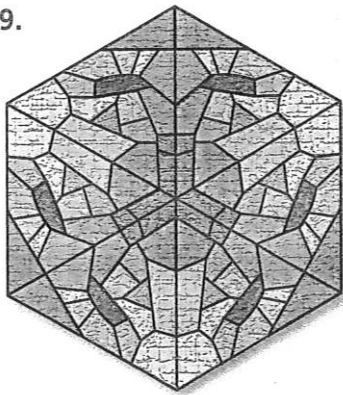


The vertices of a figure are given. Rotate the figure as described. Find the coordinates of the image.

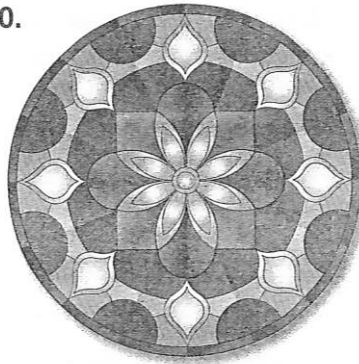
- ② ③ 13. $A(2, -2), B(4, -1), C(4, -3), D(2, -4)$
 90° counterclockwise about the origin
14. $F(1, 2), G(3, 5), H(3, 2)$
 180° about the origin
15. $J(-4, 1), K(-2, 1), L(-4, -3)$
 90° clockwise about vertex L
16. $P(-3, 4), Q(-1, 4), R(-2, 1), S(-4, 1)$
 180° about vertex R
17. $W(-6, -2), X(-2, -2), Y(-2, -6), Z(-5, -6)$
 270° counterclockwise about the origin
18. $A(1, -1), B(5, -6), C(1, -6)$
 90° counterclockwise about vertex A

A figure has *rotational symmetry* if a rotation of 180° or less produces an image that fits exactly on the original figure. Explain why the figure has rotational symmetry.

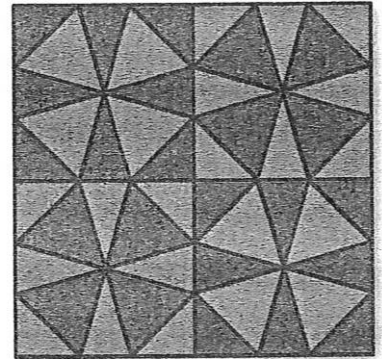
19.



20.



21.

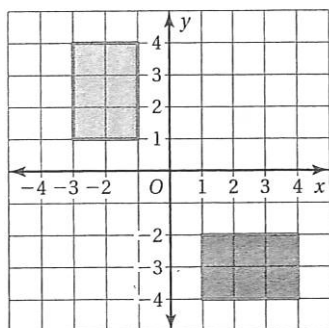


The vertices of a figure are given. Find the coordinates of the figure after the transformations given.

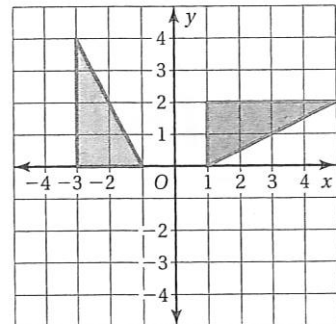
- ④ 22. $R(-7, -5), S(-1, -2), T(-1, -5)$
 Rotate 90° counterclockwise about the origin. Then translate 3 units left and 8 units up.
23. $J(-4, 4), K(-3, 4), L(-1, 1), M(-4, 1)$
 Reflect in the x -axis, and then rotate 180° about the origin.

The red figure is congruent to the blue figure. Describe two different sequences of transformations in which the blue figure is the image of the red figure.

⑤ 24.



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M8-U2/3: HW #10 – Rotations₁

Class: _____

1. Complete each of the following statements using one of the words below.

- rotation
- reflection
- translation
- dilation

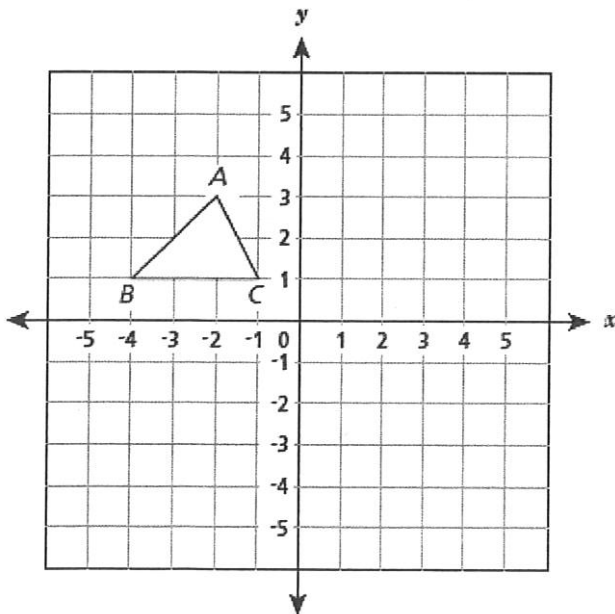
a. The transformation that slides a figure is a _____.

b. The transformation that turns a figure is a _____.

c. The transformation that produces a mirror image is a _____.

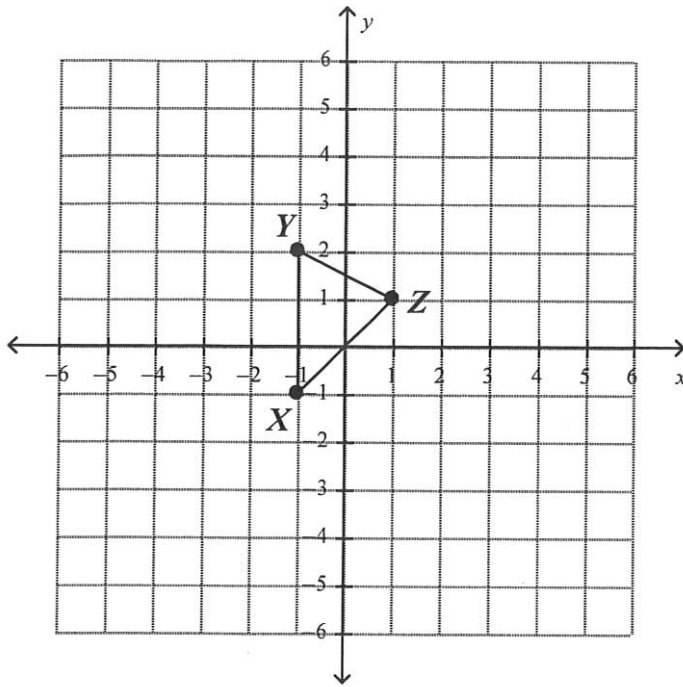
d. The transformation that reduces or enlarges a figure is a _____.

2. $\triangle ABC$ is rotated 90° clockwise about the origin. What will be the coordinates of the image of vertex B after the rotation has been performed?

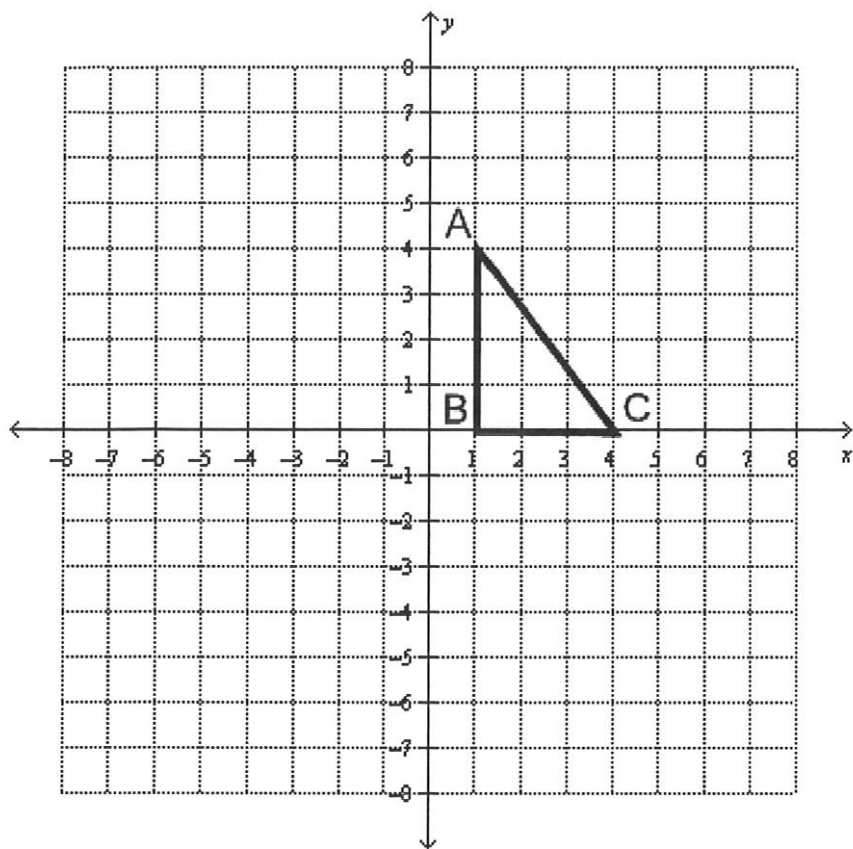


3. Triangle XYZ is plotted on the grid below.

On the graph, draw the image of Triangle XYZ after a 90° **counterclockwise** rotation. Label the image $X'Y'Z'$.



4. Draw and label the image of $\triangle ABC$ after a rotation of 180° about the origin.

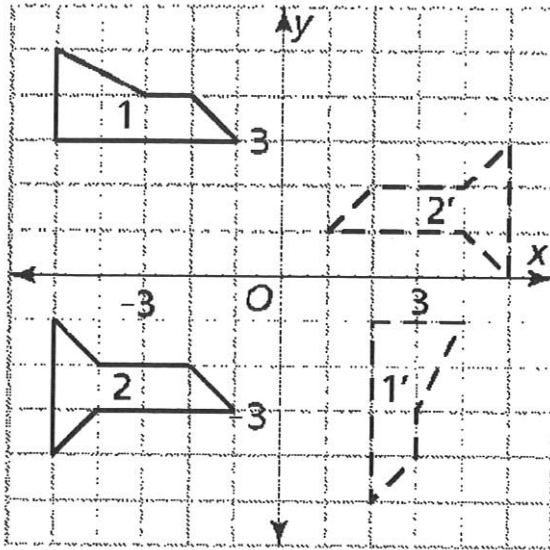


What are the coordinates of the vertices of $\triangle A'B'C'$? Explain how you determined them.

Are $\triangle ABC$ and $\triangle A'B'C'$ congruent to each other, similar to each other, or neither? Explain how you determined your answer.

Spiral:

5. Describe how you could move shape 2 to exactly match shape 2' by using series of transformations.



6. The image of $(2, -1)$ after a translation of $(x, y) \rightarrow (x - 1, y + 3)$ is _____.
7. A dilation of $(x, y) \rightarrow (2x, 2y)$ will make the coordinates of the image _____ times larger than the original.
8. The only transformation that changes the size of the original figure is a _____.

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M8-U2/3: Notes #11 – Rotations₂

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Warm-Up!

Last class we performed a series of rotations to Triangle ABC in example #2. Write the coordinates of the images in the tables below:

Compare the coordinates in each table.

Starting Point	90° Rotation CC
$A(1, 4)$	A'
$B(5, 2)$	B'
$C(2, 0)$	C'

Rule for 90° counterclockwise rotation about the origin:

$$(x, y) \rightarrow (\quad , \quad)$$

Starting Point	180° Rotation
$A(1, 4)$	A''
$B(5, 2)$	B''
$C(2, 0)$	C''

Rule for 180° rotation about the origin:

$$(x, y) \rightarrow (\quad , \quad)$$

Starting Point	270° Rotation CC
$A(1, 4)$	A'''
$B(5, 2)$	B'''
$C(2, 0)$	C'''

Rule for 270° counterclockwise rotation about the origin:

$$(x, y) \rightarrow (\quad , \quad)$$

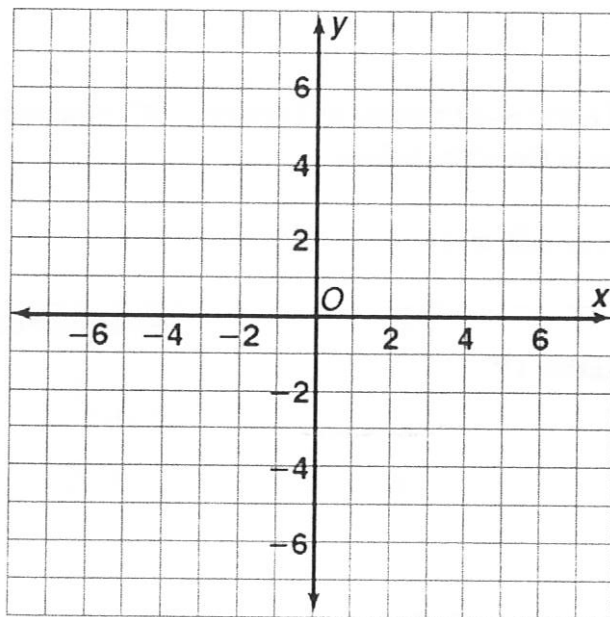
Starting Point	360° Rotation
$A(1, 4)$	
$B(5, 2)$	
$C(2, 0)$	

Rule for 360° rotation about the origin:

$$(x, y) \rightarrow (\quad , \quad)$$

Try-It!

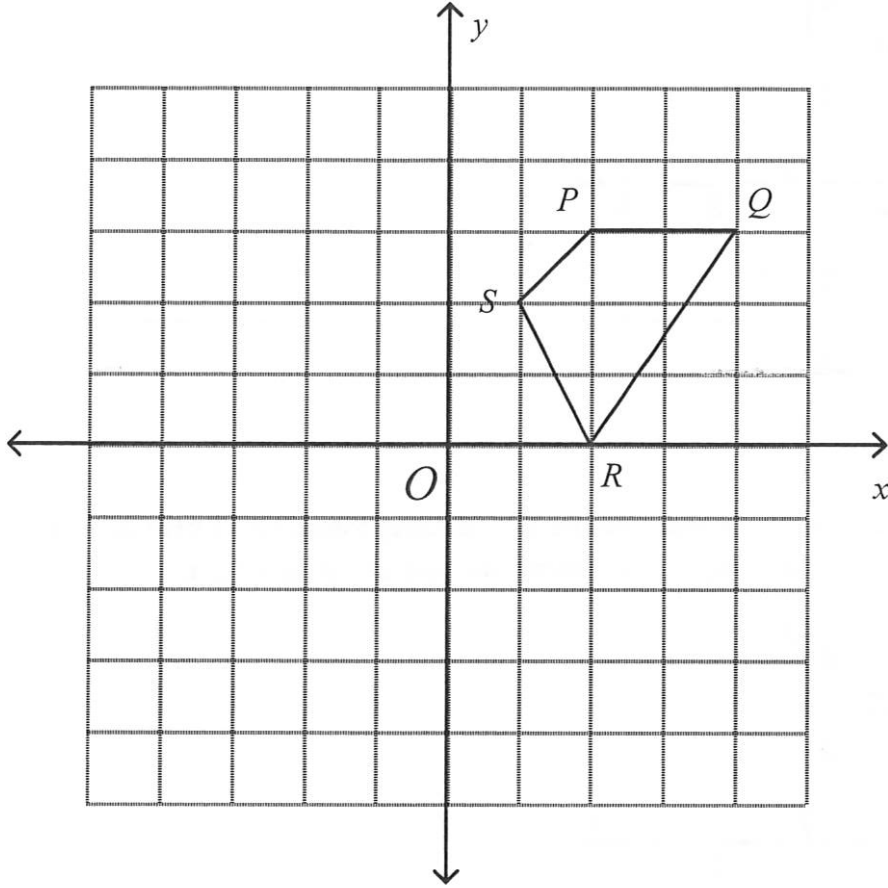
Use the following graph is optional.



1. What are the coordinates of $(3, -2)$ under a 90° counterclockwise rotation about the origin?
2. What are the coordinates of $(-5, 4)$ under a 180° counterclockwise rotation about the origin?
3. What are the coordinates of $(3, 2)$ under a 90° clockwise rotation about the origin?
4. What are the coordinates of $(-6, -4)$ under a 180° clockwise rotation about the origin?

5. Quadrilateral $PQRS$ is plotted on the grid below.

On the graph, draw the image of polygon $PQRS$ after a 90° clockwise rotation. Label the image $P'Q'R'S'$.

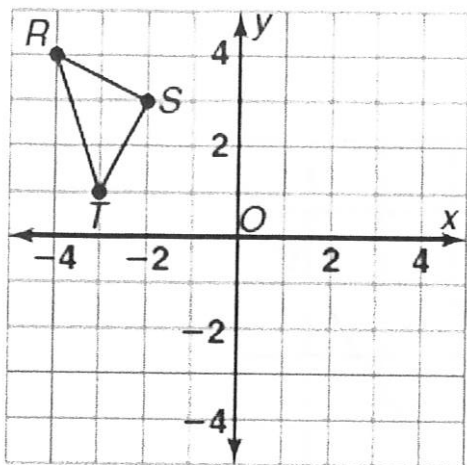


What will be the coordinates of point Q'' after a dilation of polygon $P'Q'R'S'$ using a scale factor of two?

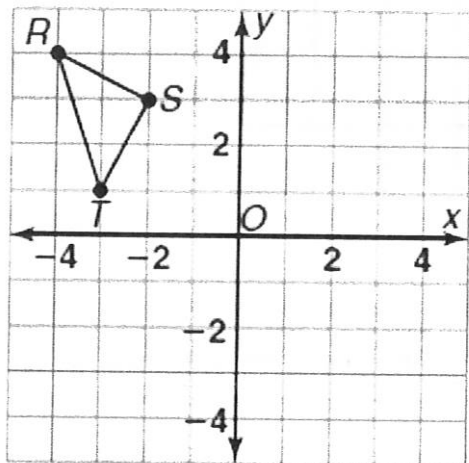
Answer _____

Practice:

- a. Draw the final image created by rotating triangle RST 90° counterclockwise about the origin and then reflecting the image over the x -axis.



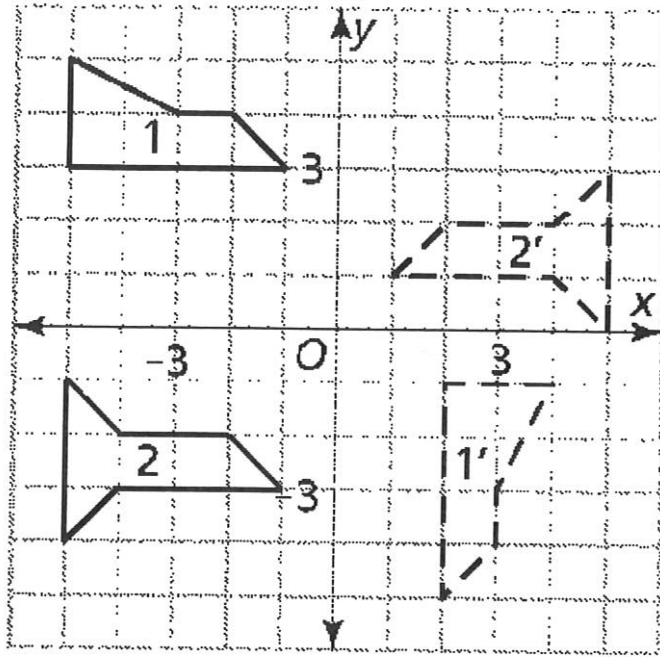
- b. Draw the final image created by reflecting triangle RST over the x -axis and then rotating the image 90° counterclockwise about the origin.



- c. Are the final images in parts (a) and (b) the same? Why or why not?

Complete (if time allows):

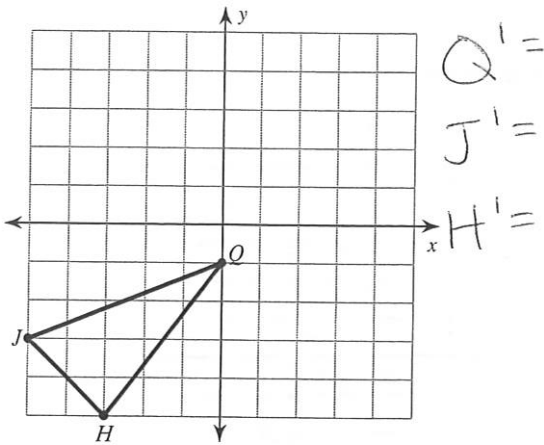
Describe how you could move shape 1 to exactly match shape 1' by using series of transformations.



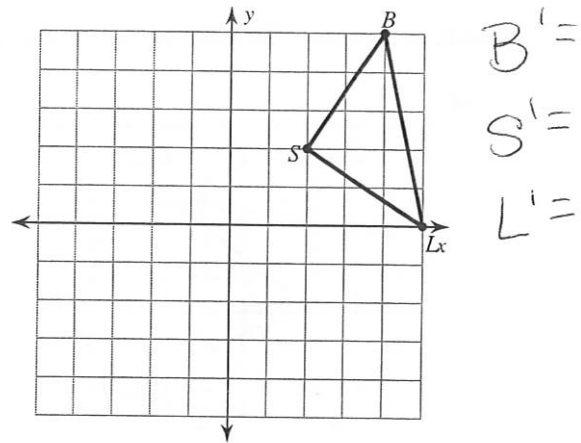
Rotations of Shapes

Graph the image of the figure using the transformation given.

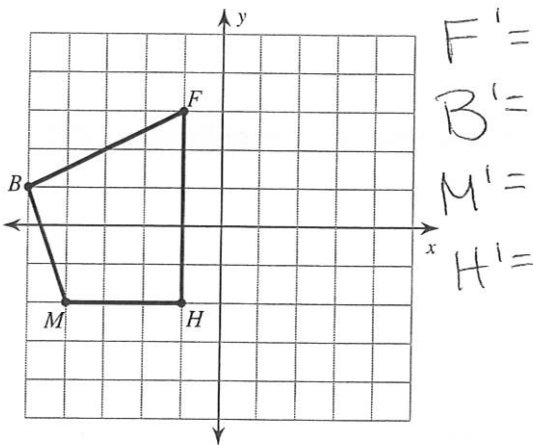
1) rotation 180° about the origin



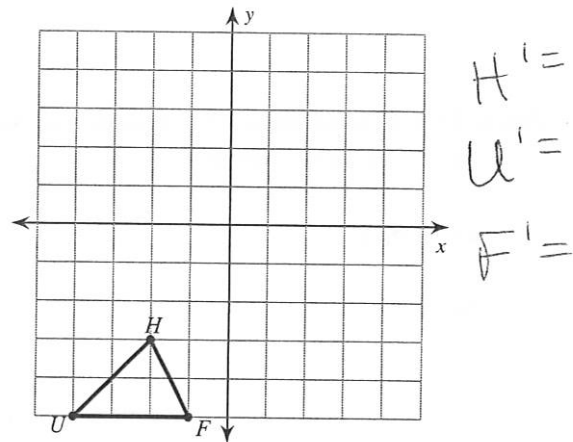
2) rotation 90° counterclockwise about the origin



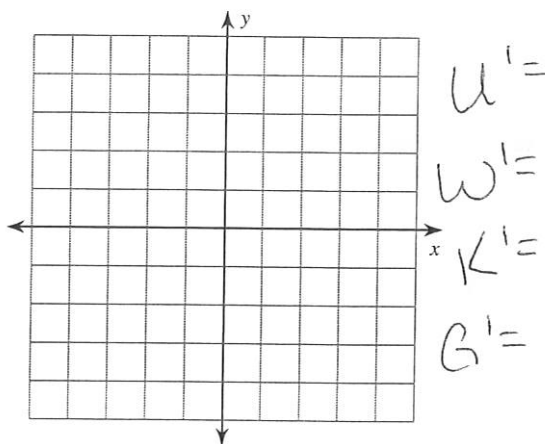
3) rotation 90° clockwise about the origin



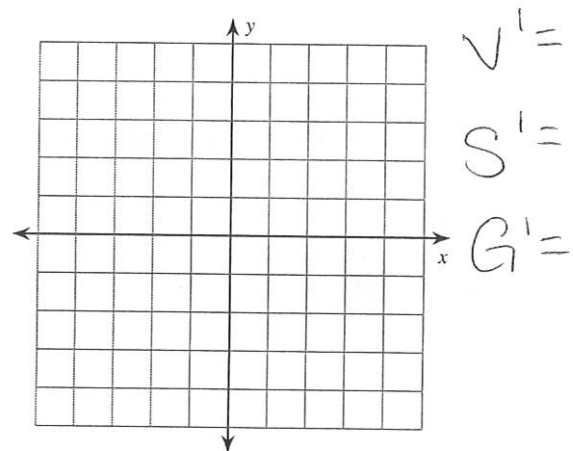
4) rotation 180° about the origin



5) rotation 90° clockwise about the origin
 $U(1, -2), W(0, 2), K(3, 2), G(3, -3)$



6) rotation 180° about the origin
 $V(2, 0), S(1, 3), G(5, 0)$



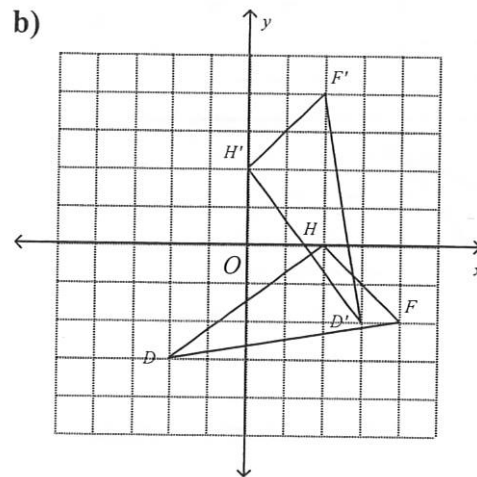
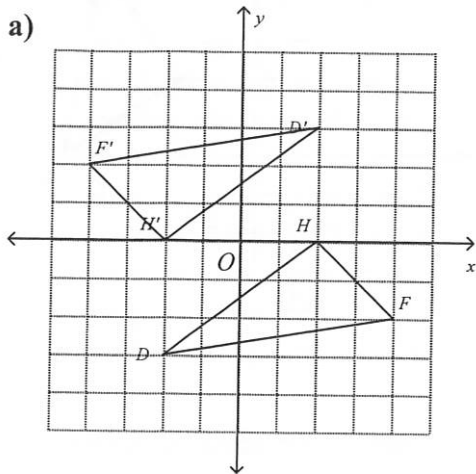
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M8-U2/3: HW #11 – Rotations₂

Class: _____

1. Determine the transformation that produced the following images:



2. Point $A(3, 6)$ is rotated 270° counterclockwise about the origin, what is the coordinate of A' ?
Circle the best answer.

(a) $(-6, 3)$

(c) $(6, -3)$

(b) $(3, 6)$

(d) $(-3, -6)$

3. Point $J(-2, 5)$ is rotated 90° counterclockwise about the origin.
What is the coordinate of J' ?

(a) $(-2, -5)$

(c) $(-5, -2)$

(b) $(5, -2)$

(d) $(-5, 2)$

4. Point $D(1, 3)$ is rotated 180° about the origin. What is the coordinate of D' ?

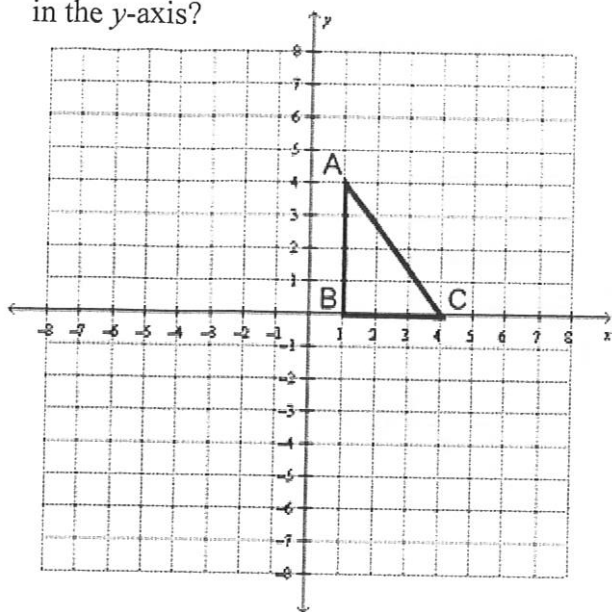
(a) $(-1, 3)$

(c) $(1, 3)$

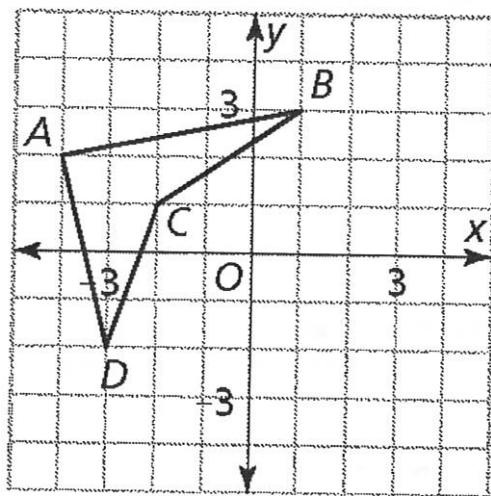
(b) $(1, -3)$

(d) $(-1, -3)$

5. What single transformation is equivalent to a reflection in the x -axis, followed by a reflection in the y -axis?



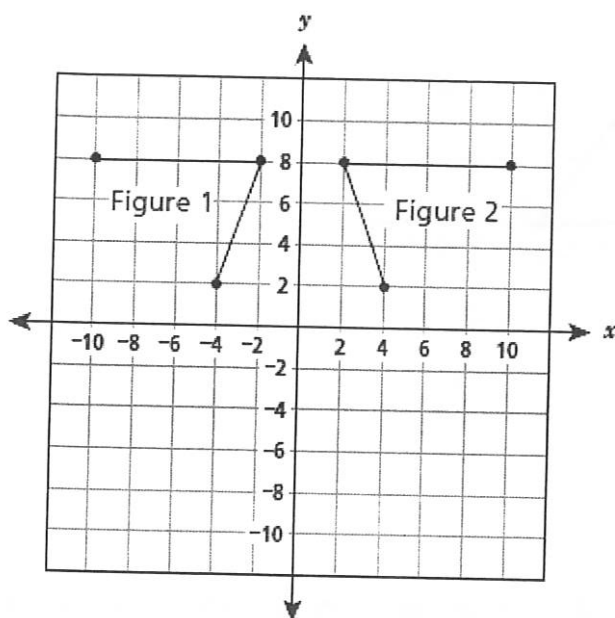
6. Draw the final image created by rotating polygon $ABCD$ 90° counterclockwise about the origin and then reflecting the image in the x -axis.



Is the resulting image similar or congruent? How do we know?

Spiral:

7. Figure 1 can be transformed to create Figure 2 using a single transformation.



Which transformation can be used to accomplish this?

- A dilation
 - B rotation
 - C reflection
 - D translation
8. Rectangle R undergoes a dilation with scale factor 0.5 and then a reflection over the y -axis. The resulting image is Rectangle S . Which statement about Rectangles R and S is true?
- A They are congruent and similar.
 - B They are similar but not congruent.
 - C They are congruent but not similar.
 - D They are neither congruent nor similar.

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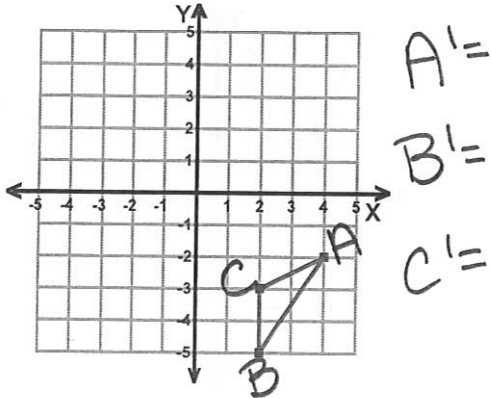
Teacher : _____

Date : _____

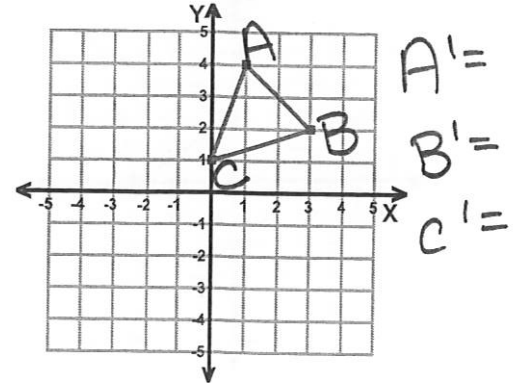
Rotations

ccw = counterclockwise

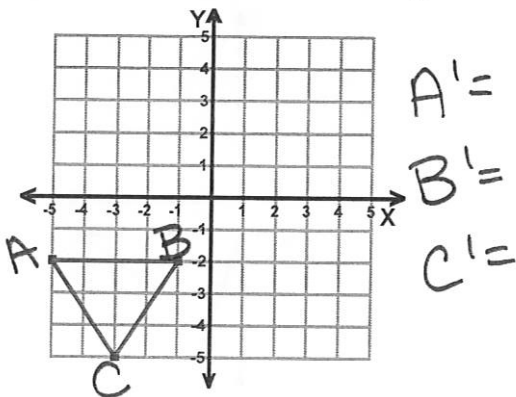
1) Rotation: 180° about the origin



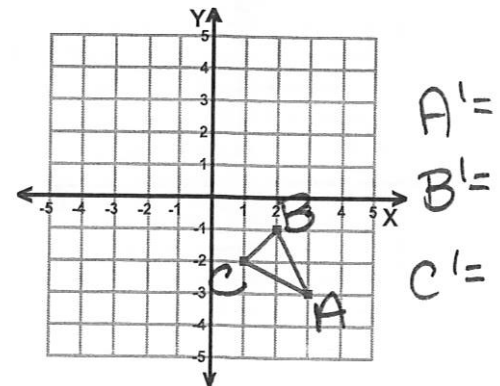
2) Rotation: 90° clockwise about the origin



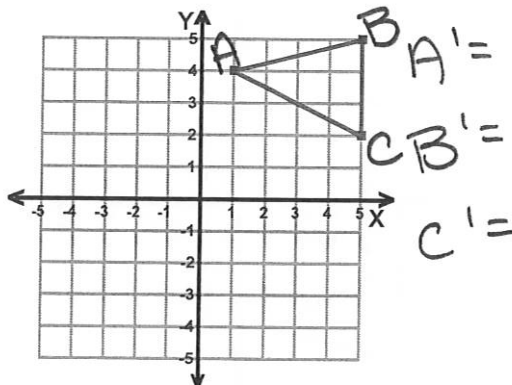
3) Rotation: 180° about the origin



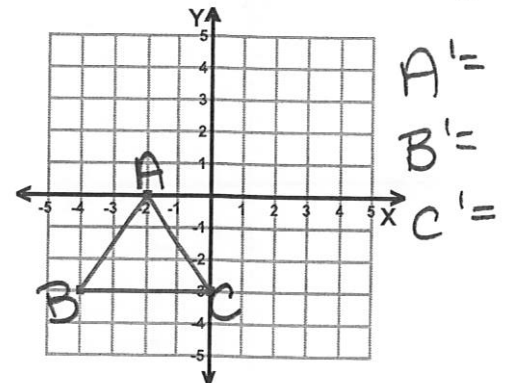
4) Rotation: 90° ccw about the origin



5) Rotation: 90° clockwise about the origin



6) Rotation: 90° ccw about the origin



Name : _____

Score : _____

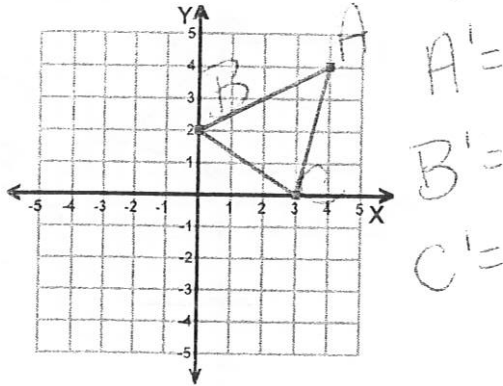
Teacher : _____

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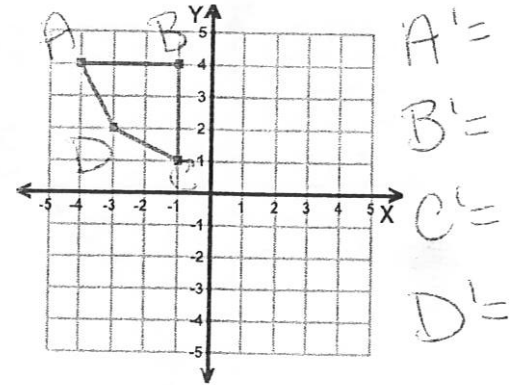
Rotations

ccw = counterclockwise

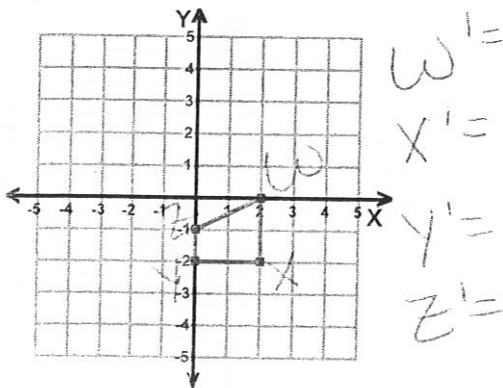
1) Rotation: 90° ccw about the origin



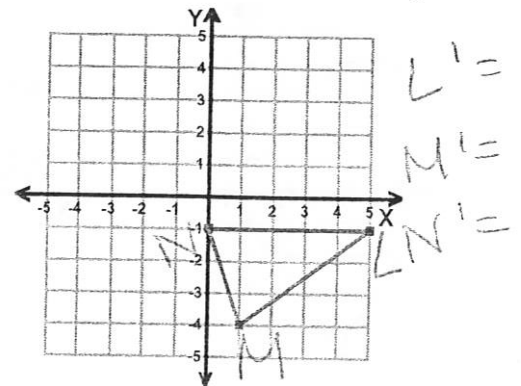
2) Rotation: 90° ccw about the origin



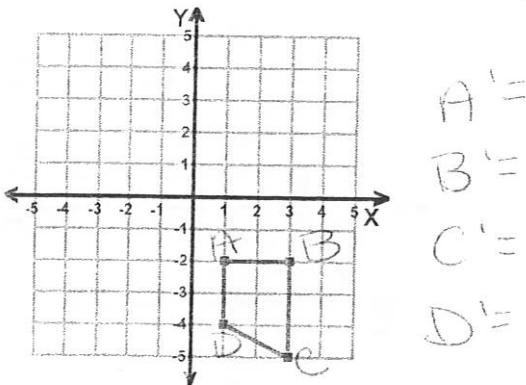
3) Rotation: 180° about the origin



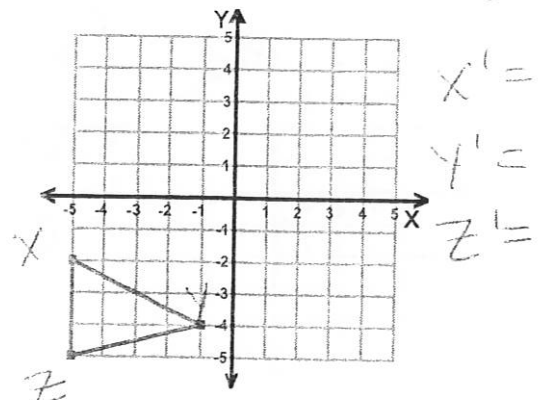
4) Rotation: 180° about the origin



5) Rotation: 90° clockwise about the origin



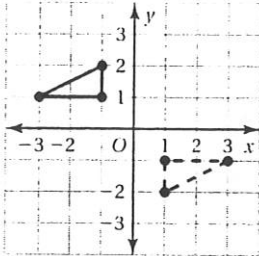
6) Rotation: 90° ccw about the origin



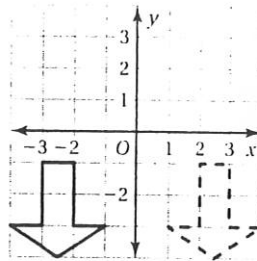
2.4 Practice A

Tell whether the dashed figure is a rotation of the solid figure about the origin. If so, give the angle and direction of rotation.

1.



2.

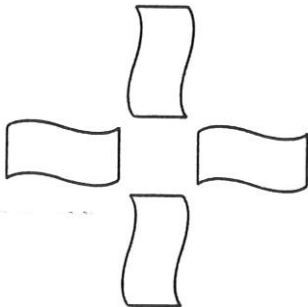


The vertices of a triangle are $A(-4, 1)$, $B(-2, 2)$, and $C(-1, 1)$. Rotate the triangle as described. Find the coordinates of the image.

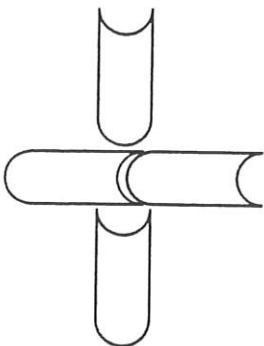
3. 270° clockwise about the origin
4. 90° counterclockwise about the origin
5. 90° counterclockwise about vertex A
6. 180° about vertex C

Tell whether the figure has rotational symmetry.

7.



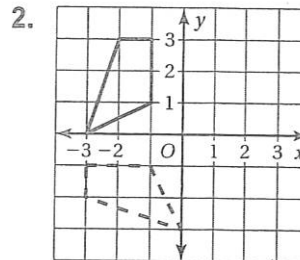
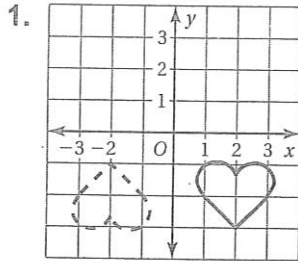
8.



2.4

Practice B

Tell whether the dashed figure is a rotation of the solid figure about the origin. If so, give the angle and direction of rotation.

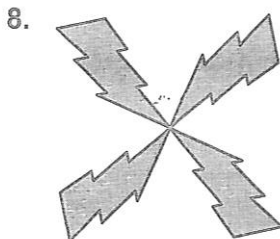
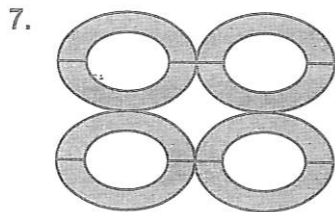


The vertices of a trapezoid are $A(1, 1)$, $B(2, 2)$, $C(4, 2)$, and $D(5, 1)$.

Rotate the trapezoid as described. Find the coordinates of the image.

3. 90° clockwise about the origin
4. 270° counterclockwise about the origin
5. 90° clockwise about vertex A
6. 180° about vertex D

Tell whether the figure has rotational symmetry.



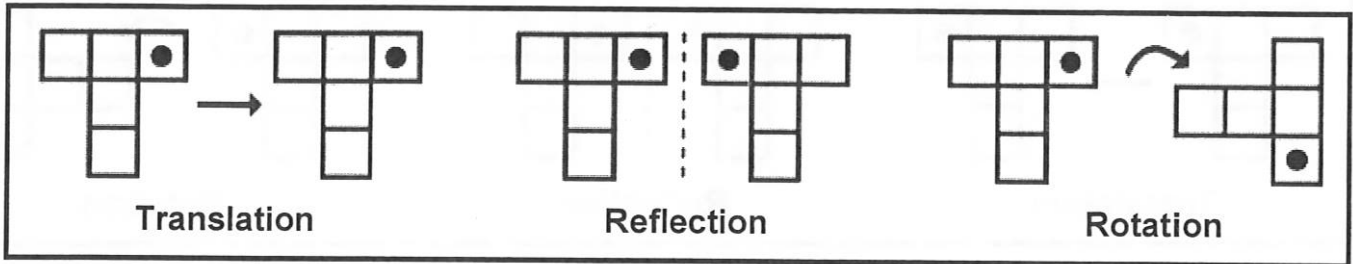
Name : _____

Score : _____

Teacher : _____

Date : _____

Translation, Rotation, and Reflection



Identify each shape as translation, rotation, and reflection.

1)					2)				

3)					4)				

5)					6)				

7)					8)				



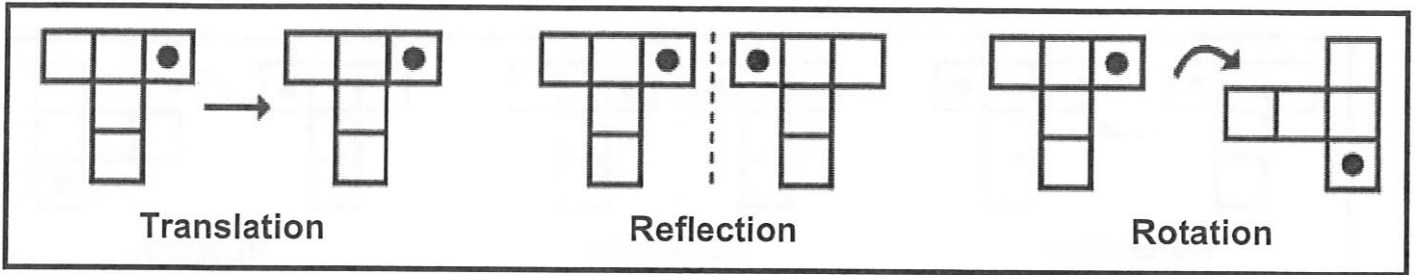
Name : _____

Score : _____

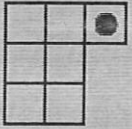
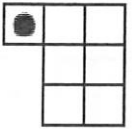
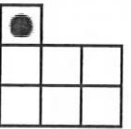
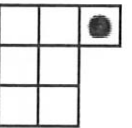
Teacher : _____

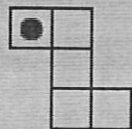
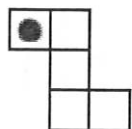
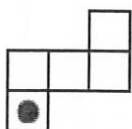
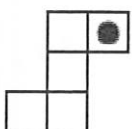
Date : _____

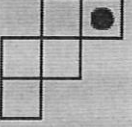
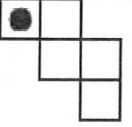
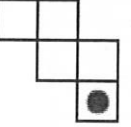
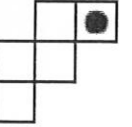
Translation, Rotation, and Reflection

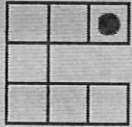
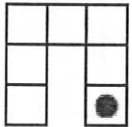
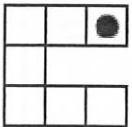
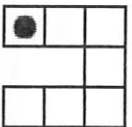


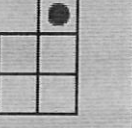
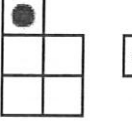
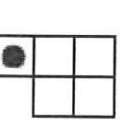
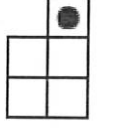
Identify each shape as translation, rotation, and reflection.

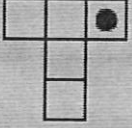
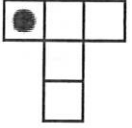
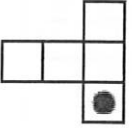
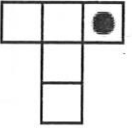
1)    

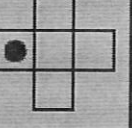
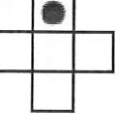
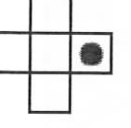
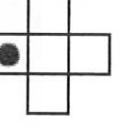
2)    

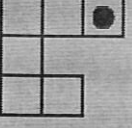
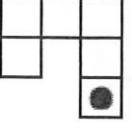
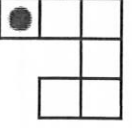
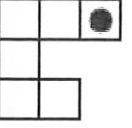
3)    

4)    

5)    

6)    

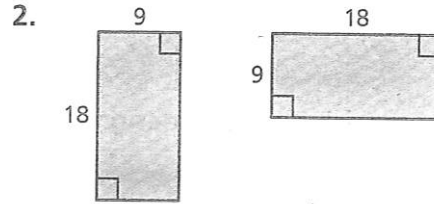
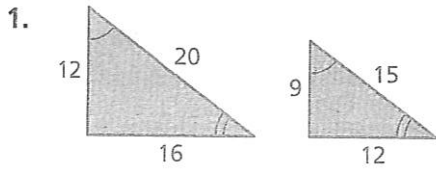
7)    

8)    

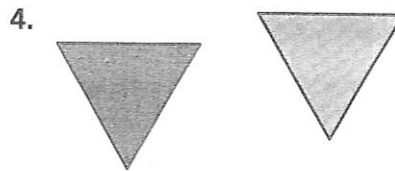
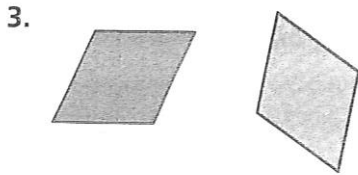


2.4 Quiz

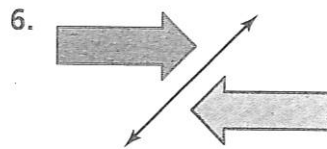
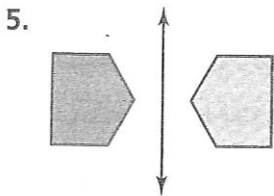
Tell whether the two figures are congruent. Explain your reasoning. (Section 2.1)



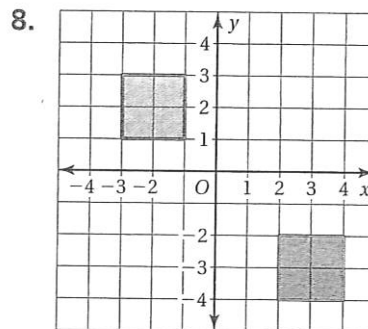
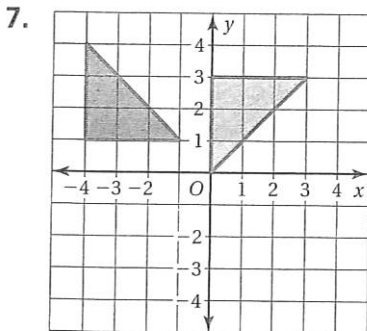
Tell whether the blue figure is a translation of the red figure. (Section 2.2)



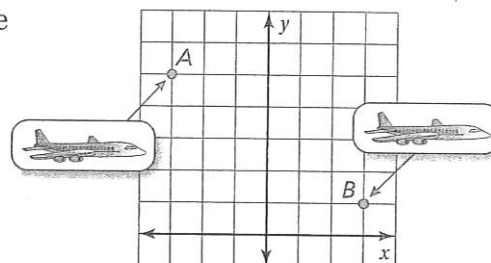
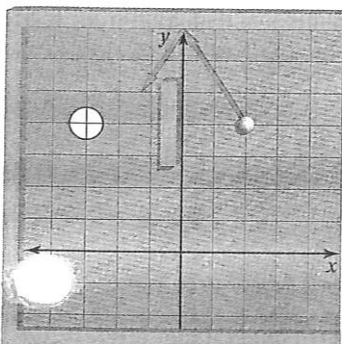
Tell whether the blue figure is a reflection of the red figure. (Section 2.3)



Tell whether the blue figure is congruent to the red figure. Describe two different sequences of transformations in which the blue figure is the image of the red figure. (Section 2.4)



9. AIRPLANE Describe a translation of the airplane from point A to point B. (Section 2.2)



10. MINIGOLF You hit the golf ball along the red path so that its image will be a reflection in the y -axis. Does the golf ball land in the hole? Explain. (Section 2.3)