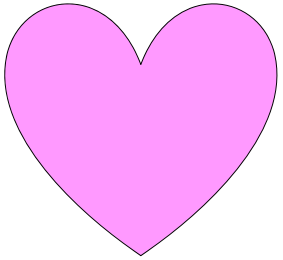
9.1-9.2

Exploring Symmetry, Translations, & Vectors

Line Symmetry

When parts of a figure are _____of each other around a line.



A figure can have more than one line of symmetry.

A

A C D E

M T U V

W Y

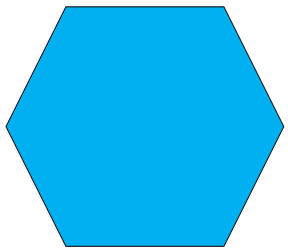
H I O X

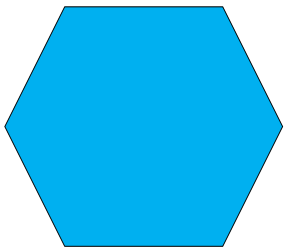
How about these?

S Z

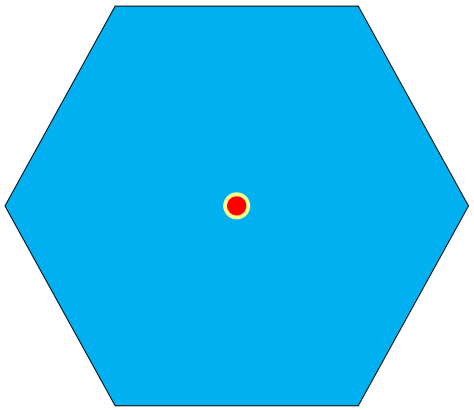
Rotational Symmetry

A figure is said to have rotational (or point) symmetry when you are able to _____ an object to see if it will eventually look the same before it can be turned _____.

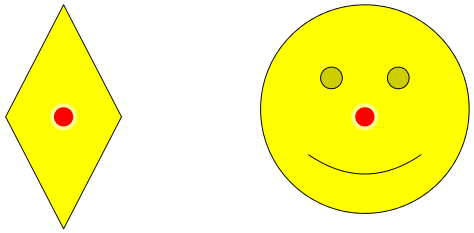


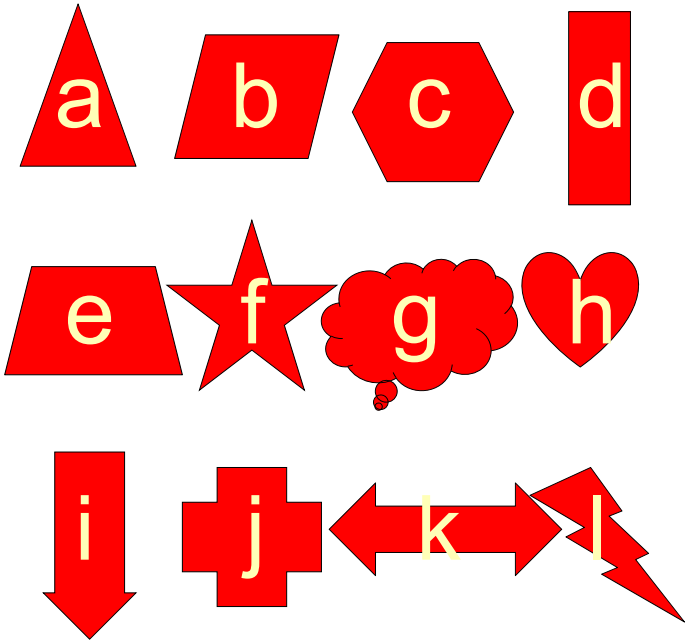


How to figure out the angle of rotation

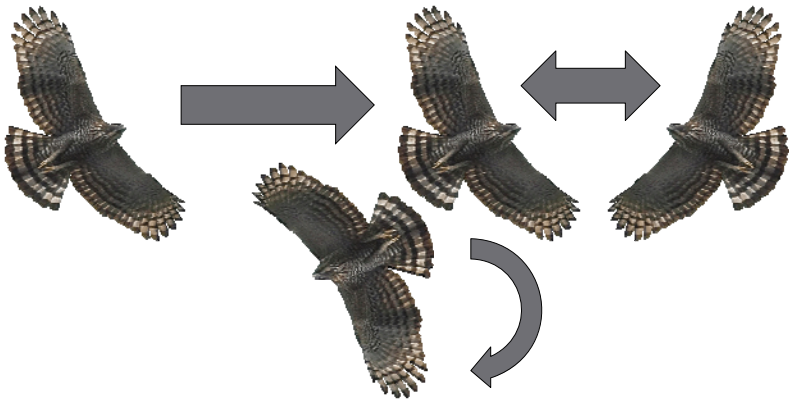


Do these have rotational symmetry?

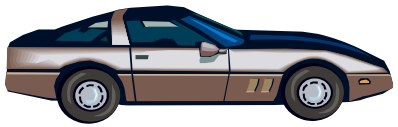


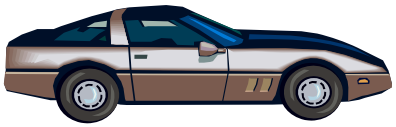


What are Transformations?

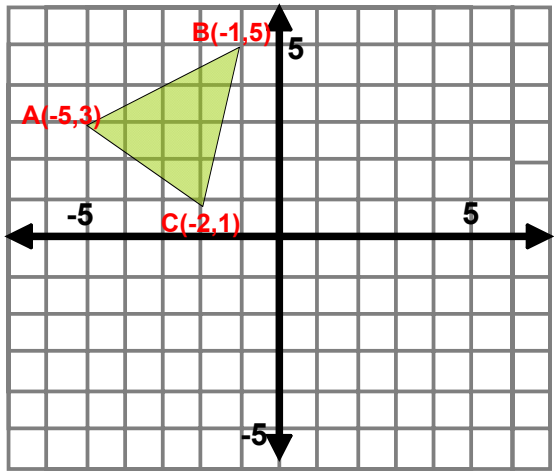


Translation





Translations on a Coordinate Plane Using a Rule



Rule:
(x,y)→(x+6, y-5)

Afterwards…
(x,y)→(x-8, y-2)

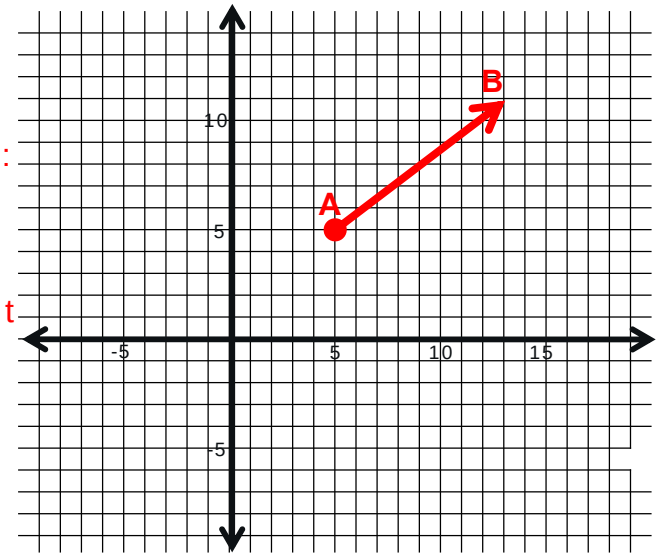
Vectors

A quantity that has direction and magnitude

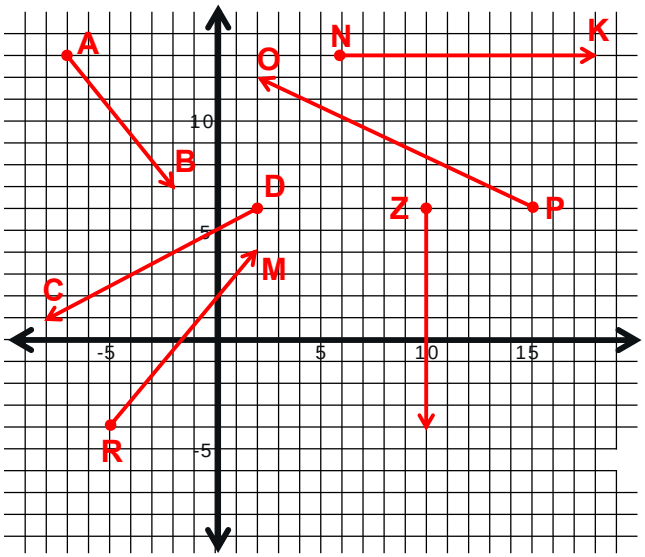
Name:

Magnitude:

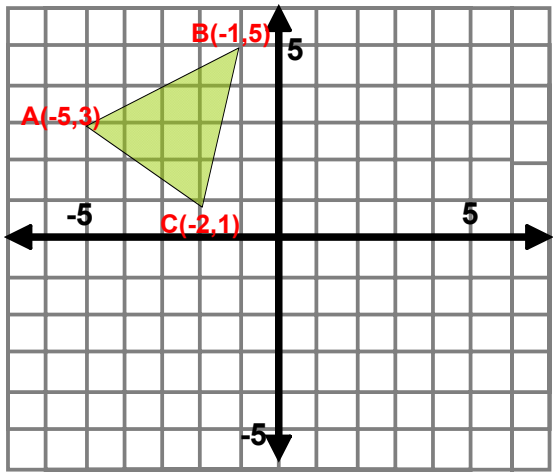
Component Form:



Name the following vectors and indicate their component form.



Translations on a Coordinate Plane Using a Vector



Translate using the components of the vector:

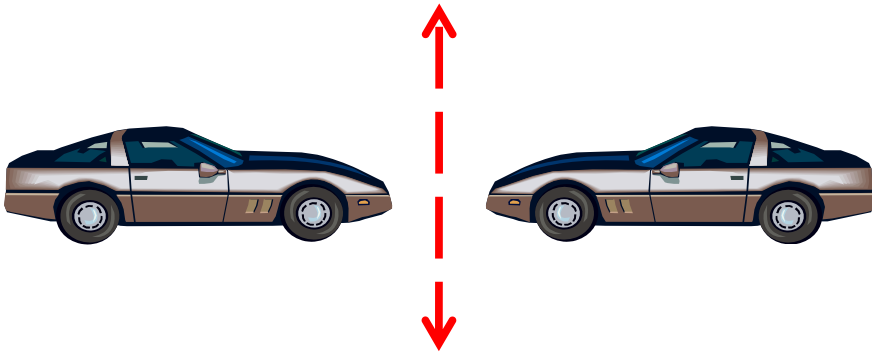
$\langle 5, -6 \rangle$

9.3 Reflections

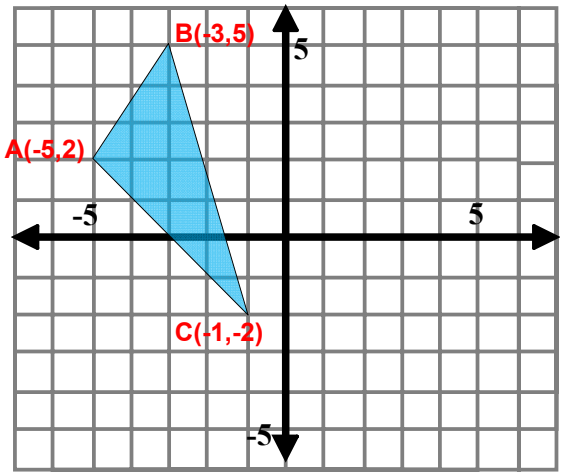
Vocabulary

Reflection

Mirror image of an object across a line or a point

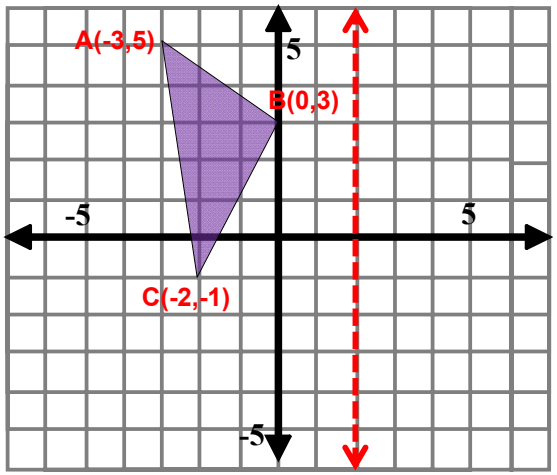


Reflections on a Coordinate Plane



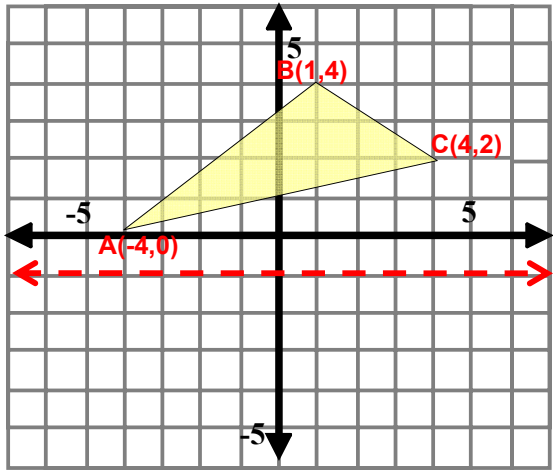
Rule:
Reflect across the y-axis

Reflections on a Coordinate Plane



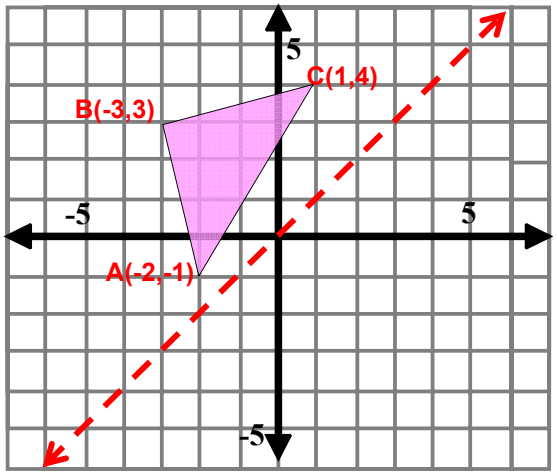
Rule:
Reflect across x=2

Reflections on a Coordinate Plane



Rule:
Reflect across y=-1

Reflections on a Coordinate Plane

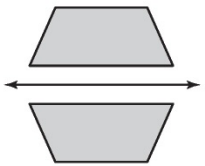


Rule:
Reflect across y=x

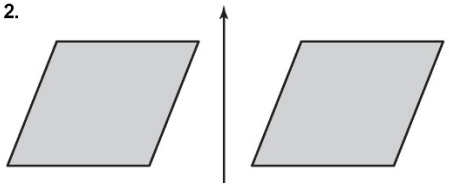
Practice

Tell whether one figure is a reflection of the other figure.

1.

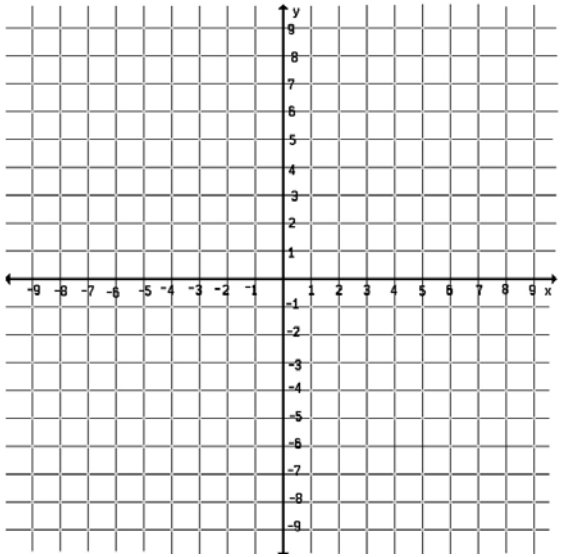


2.



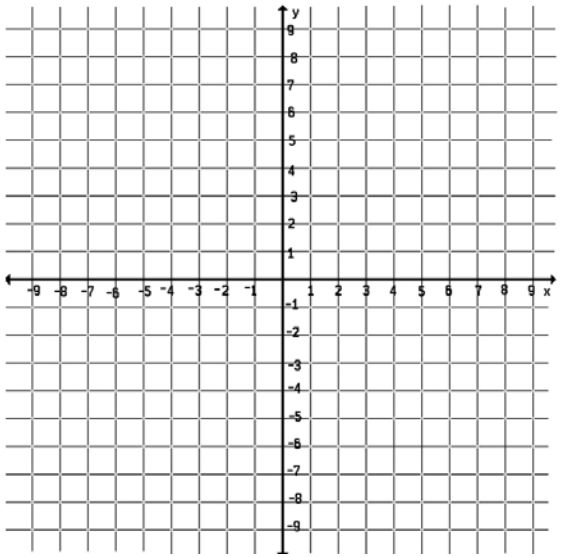
Draw the figure and its reflection in the *x*-axis. Identify the coordinates of the image.

3. $E(0, 2), F(3, 1), G(4, 3)$



Draw the figure and its reflection in the *y*-axis. Identify the coordinates of the image.

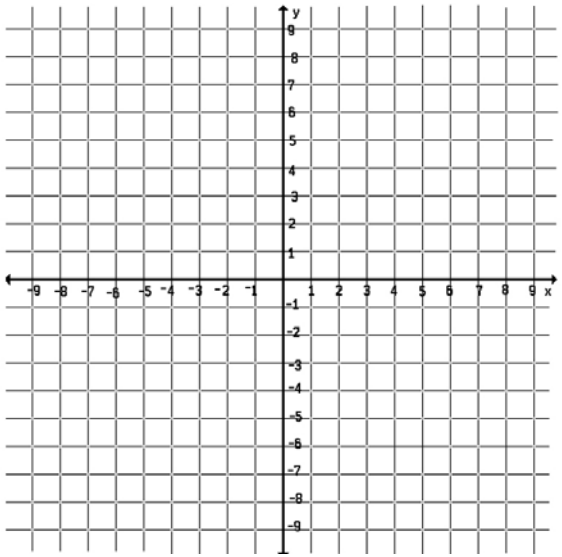
5. $X(0, -1), Y(2, 3), Z(4, -2)$



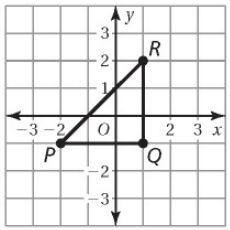
The coordinates of a point and its image are given. Is the reflection in the *x*-axis or *y*-axis?

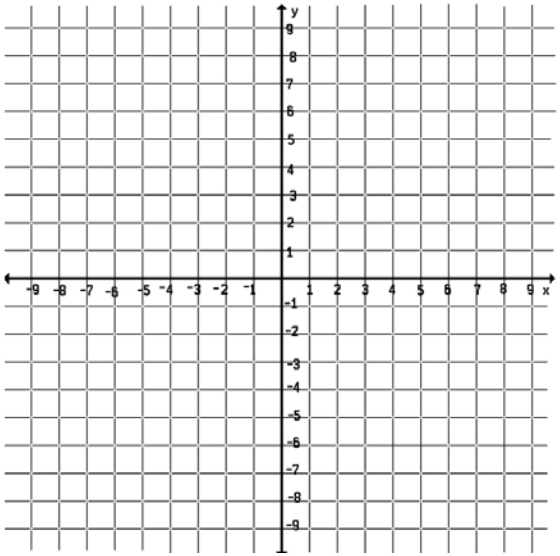
8. $(-5, 2) \rightarrow (5, 2)$

9. $(4, 3) \rightarrow (4, -3)$



10. Translate the triangle 2 units left and 1 unit up. Then reflect the image in the *x*-axis. Graph the resulting triangle.





Name_____ Date_____

9.4 – Exploring Rotations

In this assignment, you need to use the sketch located at my website named: "***9.4 - Rotations (New GEOGEBRA***". Remember to stay on task on this assignment. Make sure you pay very close attention to the directions and questions.

Your goal is to make very good observations. Many of your comments and answers will look like the following:

- "Switch *x*-coordinate and *y*-coordinate."
- "Change the second number to the opposite."
- "Change the first and second numbers to the opposite"

Investigation 1 - Rotating 90° Counter-clockwise (Rotating 270° Clockwise).

For the original figure, what are its coordinates?

A(,) , B(,) , C(,)

At the top left, move the slider so the angle of rotations is at 90°. For the new image, what are its coordinates?

A'(,) , B'(,) , C'(,)

From your observation, what do you notice is the relationship between the original figure and the image? (For help refer to the above comments and answers)

- Switch the ____ coordinate and the ____ coordinate.
- Change the first number to the _____ .

Rule for Rotating 90° counter-clockwise (Rotating 270° clockwise).

Move any point on the original and move it around. Does your hypothesis regarding the coordinates still hold true when a new figure is formed? (Circle one) YES NO

Investigation 2 - Rotating 180 Degrees.

For the original figure, what are its coordinates?

A(,) , B(,) , C(,)

At the top left, move the slider so the angle of rotations is at 180°. For the new image, what are its coordinates?

A'(,) , B'(,) , C'(,)

From your observation, what do you notice is the relationship between the original figure and the image? (For help refer to the above comments and answers)

- Change the first and second number to the _____ .

Rule for Rotating 180°

Move any point on the original and move it around. Does your hypothesis regarding the coordinates still hold true when a new figure is formed? (Circle one) YES NO

Investigation 3 - Rotating 270° Counter-clockwise (Rotating 90° Clockwise).

For the original figure, what are its coordinates?

A(,) , B(,) , C(,)

At the top left, move the slider so the angle of rotations is at 270°. For the new image, what are its coordinates?

A'(,) , B'(,) , C'(,)

From your observation, what do you notice is the relationship between the original figure and the image? (For help refer to the above comments and answers)

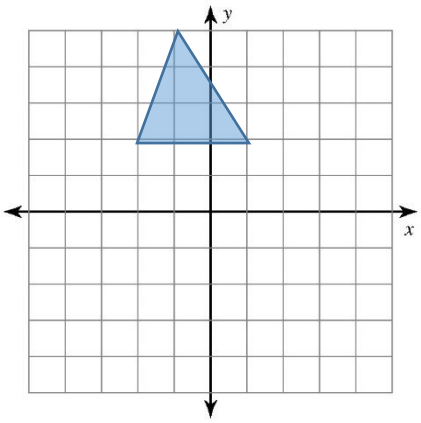
- Switch the ____ coordinate and the ____ coordinate.
- Change the second number to the _____ .

Rule for Rotating 270° counter-clockwise (Rotating 90° clockwise).

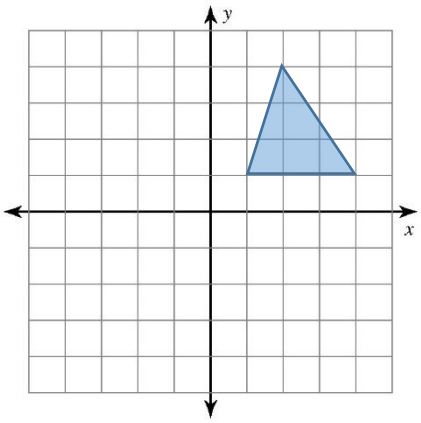
Move any point on the original and move it around. Does your hypothesis regarding the coordinates still hold true when a new figure is formed? (Circle one) YES NO What rule can you come up with?

Graph the image of the figure using the given transformation.

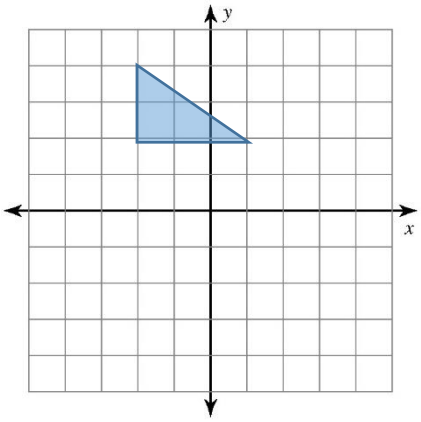
1) rotation 180° about the origin



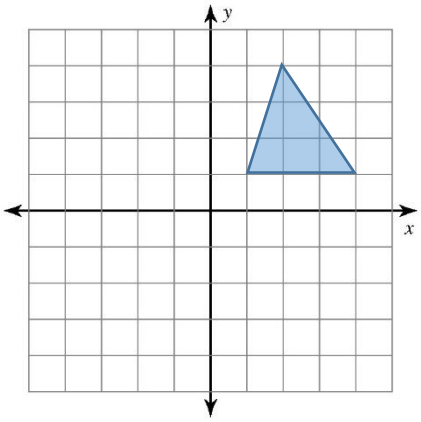
2) rotation 90° counter-clockwise about the origin



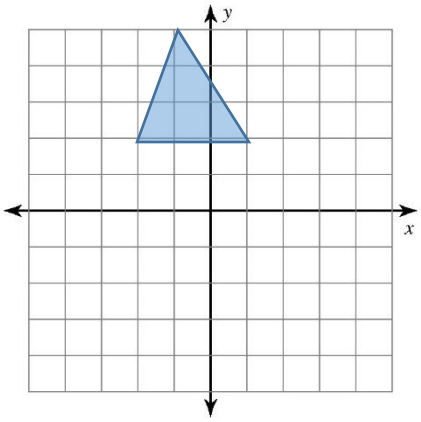
3) rotation 270° counter-clockwise about the origin



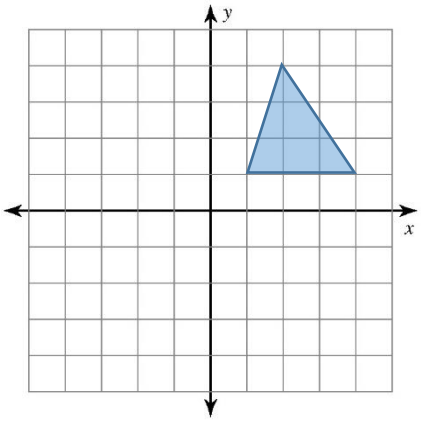
4) rotation 180° about the origin



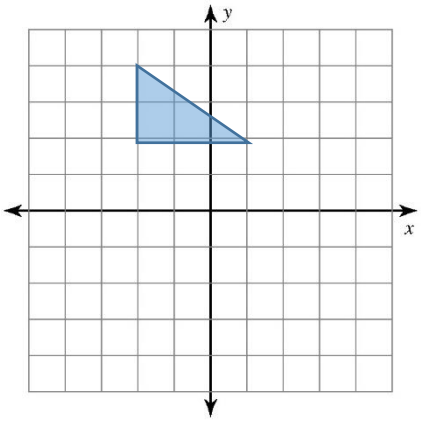
5) rotation 90° clockwise about the origin



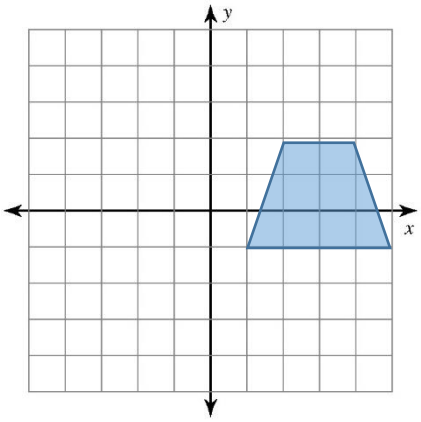
6) rotation 90° clockwise about the origin



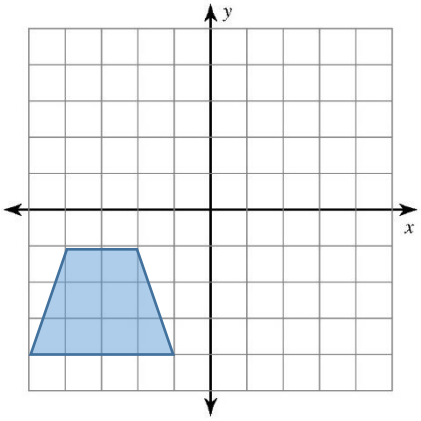
7) rotation 180° about the origin



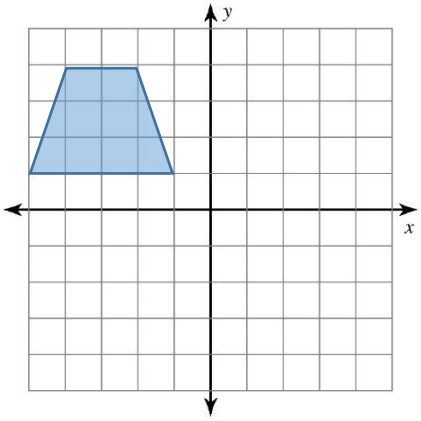
8) rotation 180° about the origin



9) rotation 90° clockwise about the origin



10) rotation 270° counter-clockwise about the origin



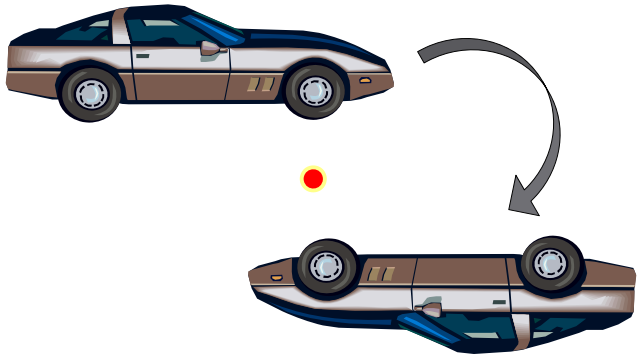
9.4

Rotations

Vocabulary

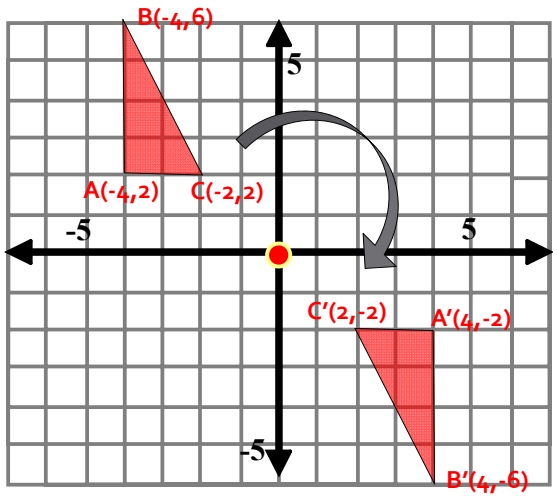
Rotation

Rotating a figure around a point



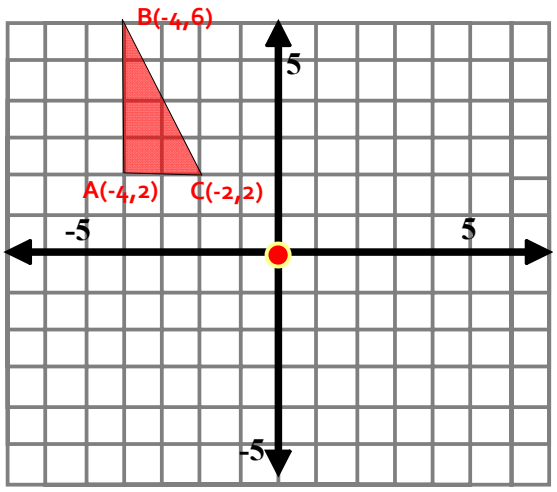
Rotation on a Coordinate Plane

Rotate the figure 180° around the origin



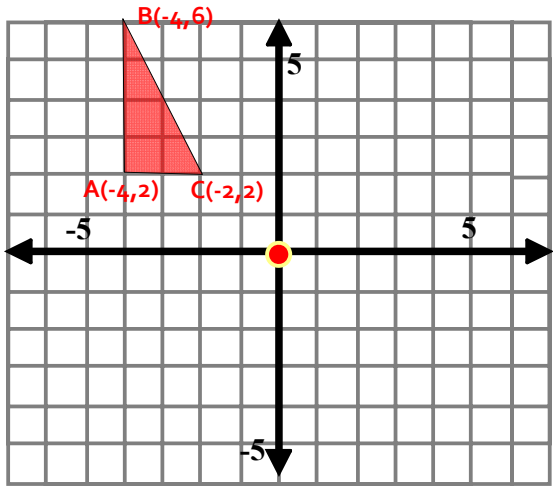
Rotation on a Coordinate Plane

Rotate the 90° clockwise around the origin



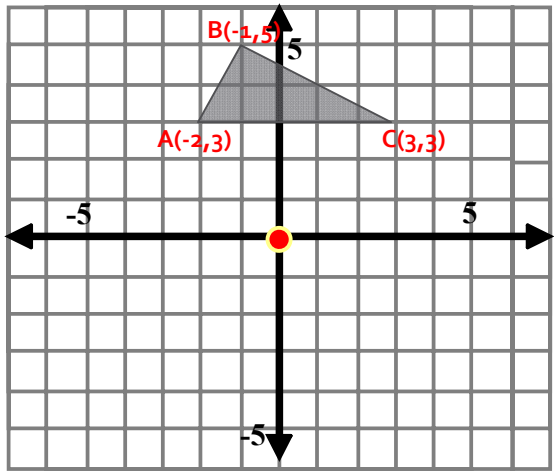
Rotation on a Coordinate Plane

Rotate the 90° counter-clockwise around the origin



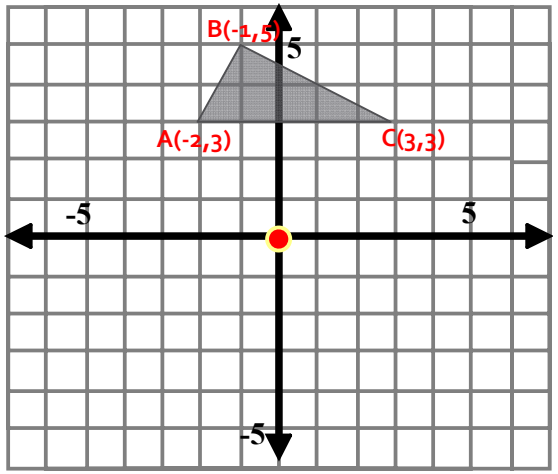
Rotation on a Coordinate Plane

Rotate the figure 180° around the origin



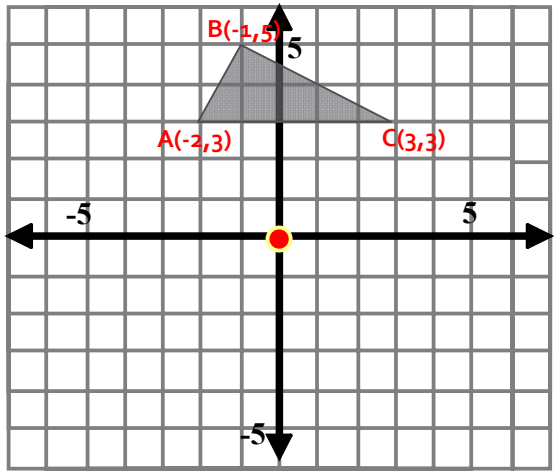
Rotation on a Coordinate Plane

Rotate the figure 90° counter-clockwise around the origin



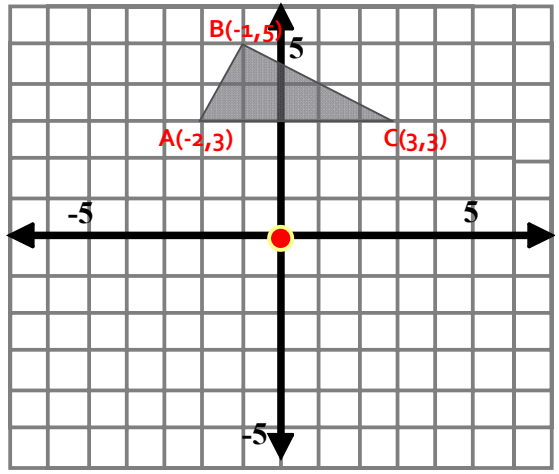
Rotation on a Coordinate Plane

Rotate the figure 270° counter-clockwise around the origin



Rotation on a Coordinate Plane

Rotate the figure 90° clockwise around the origin



9.5

Composition of Transformations

WHAT IS IT????

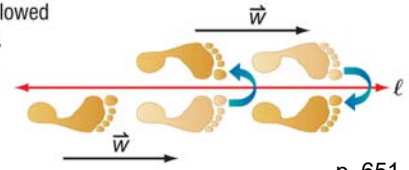
When a transformation is applied to a figure, and then another transformation is applied to its _____, the result is called a _____ of _____.

KeyConcept Glide Reflection

A **glide reflection** is the composition of a translation followed by a reflection in a line parallel to the translation vector.

Example

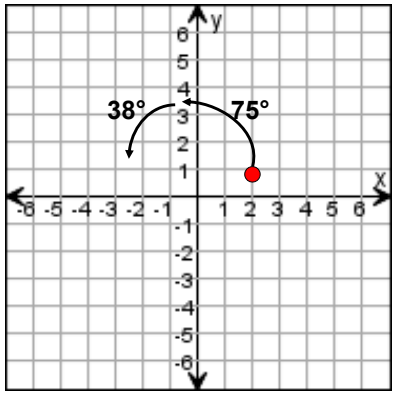
The glide reflection shown is the composition of a translation along $\vec{w}$ followed by a reflection in line ℓ.



p. 651

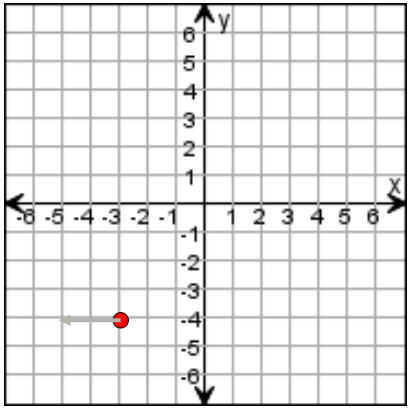
Find a single transformation for a 75° counterclockwise rotation with center (2,1) followed by a 38° counterclockwise rotation with center (2,1)

113° counterclockwise rotation with center (2,1)



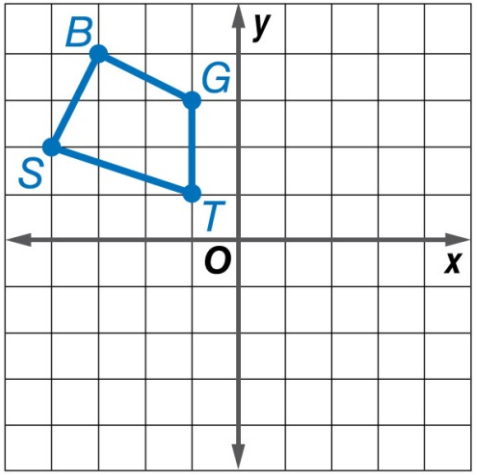
Find a single transformation equivalent to a translation with vector <−2, 7> followed by a translation with vector <9, 3>.

Translation with vector <7, 10>



Practice

Quadrilateral *BGTS* has vertices *B*(–3, 4), *G*(–1, 3), *T*(–1 , 1), and *S*(–4, 2). Graph *BGTS* and its image after a translation along ⟨5, 0⟩ and a reflection in the *x*-axis.



Practice

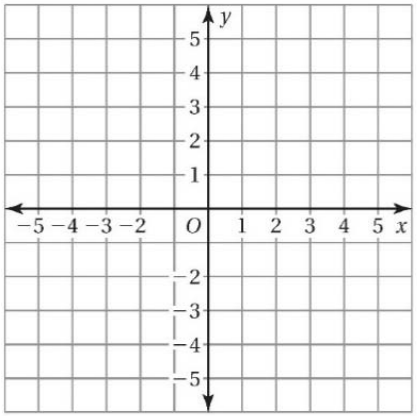
Quadrilateral *RSTU* has vertices *R*(1, –1), *S*(4, –2), *T*(3, –4), and *U*(1, –3). Graph *RSTU* and its image after a translation along ⟨–4, 1⟩ and a reflection in the *x*-axis. Which point is located at (–3, 0)?

A. *R*'

B. *S*'

C. *T*'

D. *U*'



Definitions

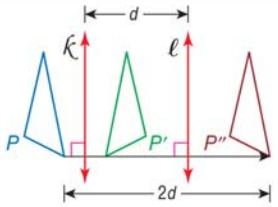
An _____is a transformation that preserves shape and size.

Translations, reflections and rotations are _____..

Theorem 9.2 Reflections in Parallel Lines

The composition of two reflections in parallel lines can be described by a translation vector that is

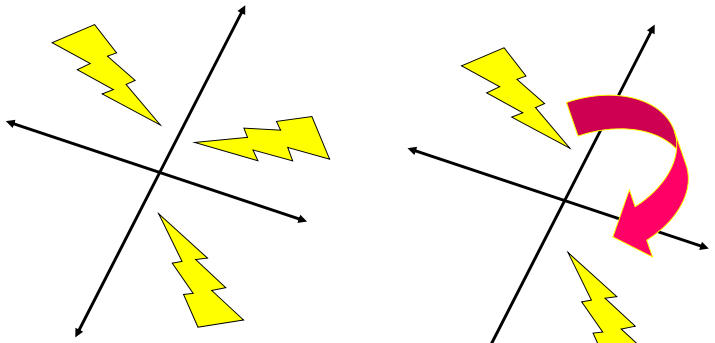
- perpendicular to the two lines, and
- twice the distance between the two lines.



p. 652

Reflections over two parallel lines equals...

Reflections over two intersection lines equals

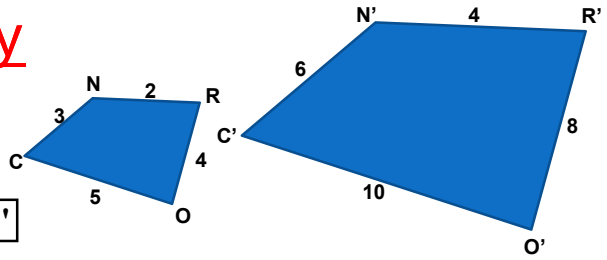


9.6
Dilations

What is a Dilation????

A dilation is transformations that produces a _____ figure by either _____ or _____ the size of the figure.

Similarity



$CORN \sim C'O'R'N'$

List 3 properties of similar shapes:

Scale Factor

Scale factor is how much we are enlarging or reducing a figure

Original or "Pre-image" of Igor

"Image" of Igor

What do you think is the scale factor of the image of Igor?

Scale Factor

Scale factor is how much we are enlarging or reducing a figure

Original or
"Pre-image" of Jack

"Image" of Jack

What do you think is the scale factor of the image of Jack?

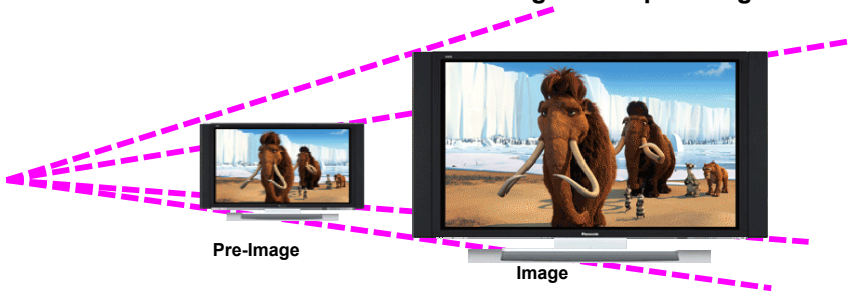
Scale Factor

If the scale is greater than 1, we are _____ the figure.

If the scale is less than 1 but greater than 0, we are _____ the figure.

Center of Dilation

- **The center of dilation is where we reference how we stretched or shrunk a figure.**
- **This can be in the middle or outside the original or "pre-image".**



Pre-Image

Image

Where is the center of dilation this?

Name_____ Period ____

Webquest - Tessellations

1) What is a tessellation?

2) Where in the real world would you see a tessellation?

3) Where have seen a tessellation today?

4) What is a regular tessellation? Draw an example.

5) What kind of shapes would work in a regular tessellation? Why?

6) What is a semiregular tessellation? Draw an example.

7) How do you name a semiregular tessellation?

8) Draw a different semiregular tessellation and name it.

9) What is a demiregular tessellation?

DON'T DO THIS PROBLEM

10) What is a monohedral tessellation?

11) Can any triangle make a monohedral tessellation? Draw an example or counterexample.

12) Can any quadrilateral make a monohedral tessellation? Draw an example or counterexample.

13) What is a translational tessellation?

14) What is a rotational tessellation?

15) Name a couple of artists who specialized in tessellation art.

16) What does an Escher-style tessellation look like?

17) What cultures are known for their fantastic tessellation art, especially in their buildings?