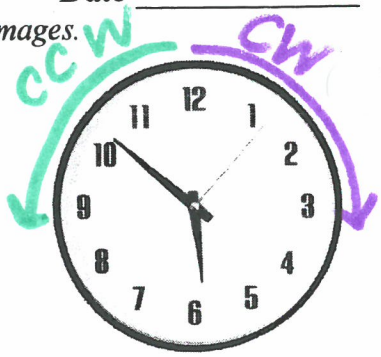
7-4 Rotations

Date _____

Learning Target: *I can rotate figures to create congruent images.*



Warm Up: Define the following-

- Counter- clockwise Turns to the Left
- Clock-wise Turns to the right

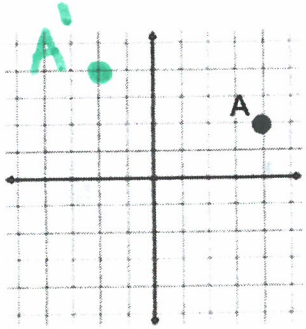
Discovery: "The Rules of Rotations"

Conclusions- Rules for Rotation	**Go the Discovery Problem below:**
$R_{90,\ origin}(x, y)$ Counter-clockwise ↙ move 1 quadrant (−Y , X)	(a) We are going to turn our paper to the **left** (counter-clockwise) to discover the rules of rotation. 90 degrees = *1 time* 180 degrees = *2 times* 270 degrees = *3 times* 360 degrees = *4 times*
$R_{180,\ origin}(x, y)$ Counter-Clockwise ↙ moves 2 Quadrants (−X , −Y)	(b) Read the coordinates as if the axes changed and write them on the line provided.
$R_{270,\ origin}(x, y)$ Counter- Clockwise ↙ moves 3 Quadrants (Y , −X)	
$R_{360,\ origin}(x, y)$ Counter-Clockwise ↙ Stays put! (X , Y)	(c) Try to fill in the rules, but we will review them together!

Discovery Take the point $A(4, 2)$ and rotate it as stated. Plot A' and state its coordinates. (Remember positive numbers, you move in the counter-clockwise (CCW) direction.

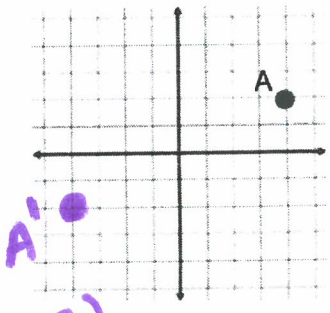
Rotation of 90° (move one quad)

A(4,2)



A': (−2, 4)

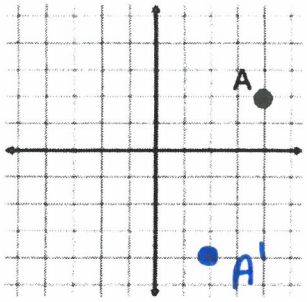
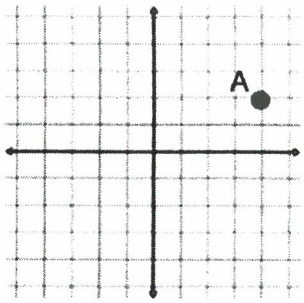
Rotation of 180° (move 2 quads)



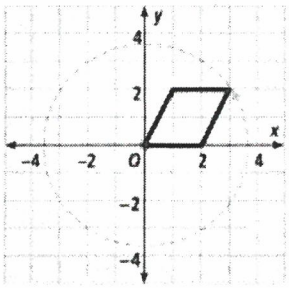
A': (−4, −2)

move 3 Quads

* Stays same!

Rotation of 270°	**Rotation of 360°**
	
A': (2, -4)	A': (4, 2)

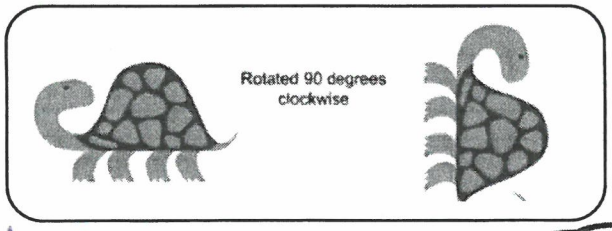
Guided Practice: Rotations on the Coordinate Plane:

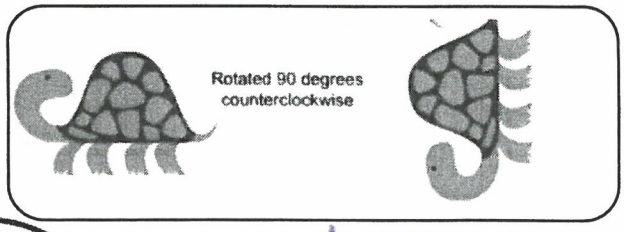


A **rotation** is a rigid motion that turns a figure about a fixed point called the **center of rotation.**

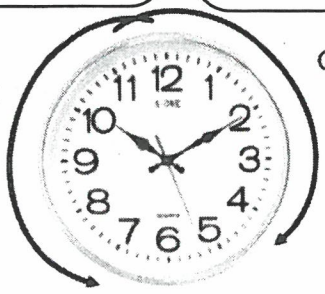
The **angle of rotation** is the number of degrees the figure rotates.

A rotated figure is the image of the original figure (pre-image). The side lengths and angle measures of the rotated figure do not change. As with translations and reflections, each side and angle of a rotated figure corresponds to the same side and angle of its original figure.





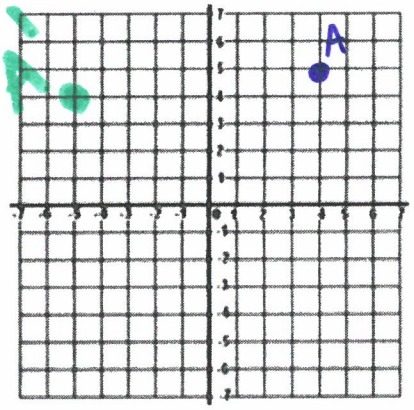
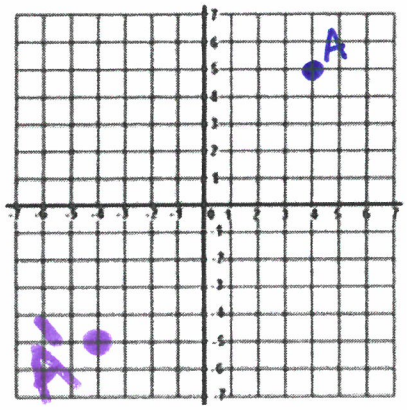
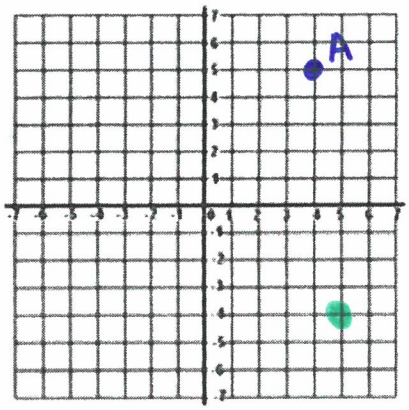
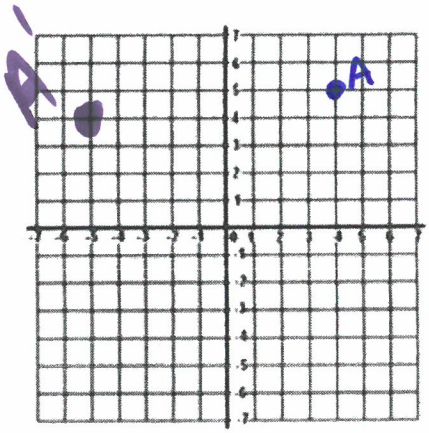
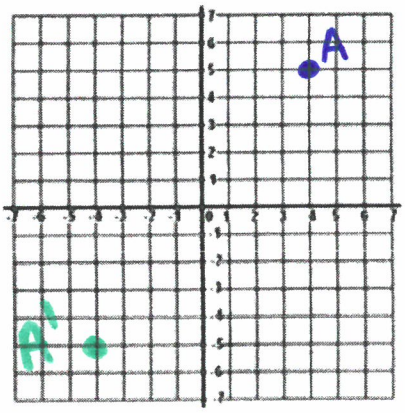
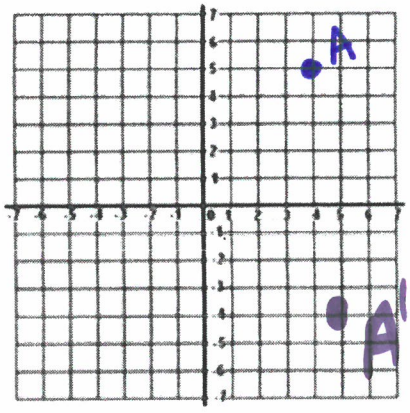
COUNTER CLOCKWISE



CLOCKWISE

** *Positive angles = counter − clockwise*** *** Always counter-clockwise unless stated, otherwise***

Exercise 1- Determine the image of A after each reflection stated:

1 turn.	2 turns	3 turns
A(4,5) and rotate 90° counter-clockwise  A' (-5, 4)	A(4,5) and rotate 180° counter-clockwise  A' (-4, -5)	A(4,5) and rotate 270° counter-clockwise  A' (5, -4)
A(4,5) and rotate 270° clockwise  A' (-5, 4)	A(4,5) and rotate 180° clockwise  A' (-4, -5)	A(4,5) and rotate 90° clockwise  A' (5, -4)

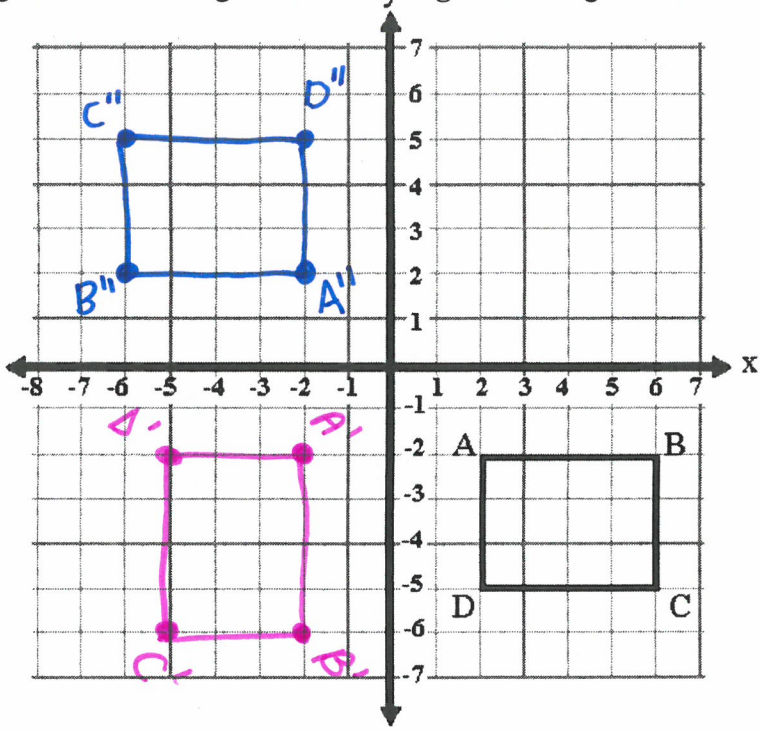
Look at the exercise 1 above, do you notice anything about certain rotations?

90°CCW = 270° CW
180°CCW = 180° CW
270°CCW = 90°CW

Exercise 2- Sarah drew a rectangle on the grid to the right. On the same grid rotate the **original** rectangle about the origin:

a) 90 degrees clockwise and label the new points A'B'C'D'

b) 180 degrees clockwise and label the new points A"B"C"D"



c) Are all the triangles congruent? Explain

Yes, rotation is a rigid motion. It preserves shape + size, so they are all congruent.

Exercise 3- The use of the coordinate plane below is optional:

1. What is the image of Point A(5,8) when rotated 270° about the origin?

ccw 3 turns right

Rule $(y, -x)$ $A'(8, -5)$

2. What is the image of Point A(-2,3) when rotated 180° about the origin?

2 turns $A'(2, -3)$

Rule $(-x, -y)$

3. What is the image of Point A(1,-3) when rotated 90° about the origin?

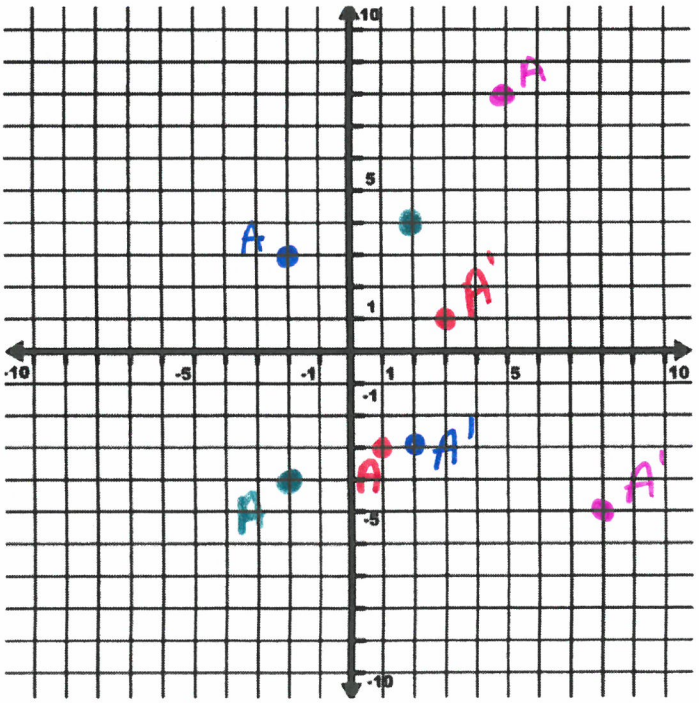
1 turn right $A'(3, 1)$

Rule $(-y, x)$

4. What is the image of Point A(-2,-4) when rotated 180° about the origin?

2 turns $A'(2, 4)$

Rule $(-x, -y)$



What is the image of Point A(3,-5) when rotated 270° about the origin?

Rule → $(x, y) \rightarrow (y, -x)$ $(3, -5) \rightarrow (-5, -3)$