Warm-Up

Write the coordinate of the image.

Reflection:	1. x-axis	2. y-axis	3. y = x
(-3, 4)	(-3, -4)	(3, 4)	(4, -3)
(5, -8)	(5, 8)	(-5, -8)	(-8, 5)
(-2, -9)			

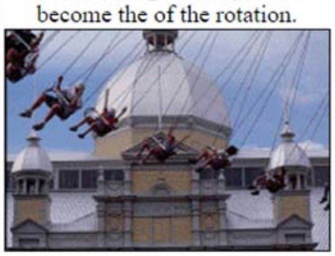
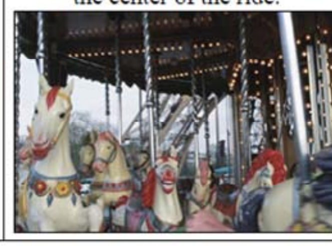
Rotations are TURNS!!

Rotation: A transformation in which the pre-image is rotated around a single point in a circular motion.

Notes about rotations:

- Rotation will be about the origin in a counterclockwise direction unless noted otherwise.
- One full rotation is 360 degrees.
- The distance from the center to any point on the shape stays the same.

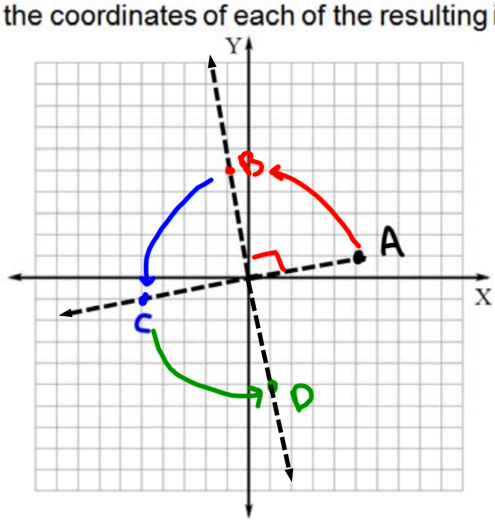
Rotations can be seen, in a variety of situations:

The Earth	Windmills	Pinwheel
The Earth experiences one complete rotation on its axis every 24 hours. 	The blades on windmills convert the energy of wind into rotational energy. 	A children's toy that rotates when blown. 
Amusement Park Swing	**Ferris Wheel**	**Merry-Go-Round**
An amusement park rides, such as the swing, allow you to become the of the rotation. 	Ferris wheels rotate about a center hub. (Yes, the seats tilt to prevent falling.) 	On the merry-go-round, riders become part of the rotation about the center of the ride. 

On the coordinate plane below…

- Graph the coordinate pre-image (5, 1) and label it with the letter A.
- Rotate point A 90 degrees about the origin and label the image with the letter B.
- Rotate point A 180 degrees about the origin and label the image with the letter C. ✓
- Rotate point A 270 degrees about the origin and label the image with the letter D.

List the coordinates of each of the resulting images:



A (5, 1)

Coordinates of image of B: (-1 , 5)

Coordinates of image of C: (-5 , -1)

Coordinates of image of D: (1 , -5)

<u>In general, list the transformation rule for each of the following rotations</u>:

$0°$ (x, y)

90^0 about the origin: $(x, y) \rightarrow (-y, x)$

180^0 about the origin: $(x, y) \rightarrow (-x, -y)$

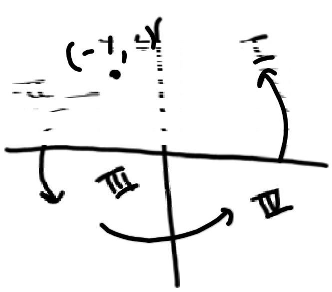
270^0 about the origin: $(x, y) \rightarrow (y, -x)$

Examples:

1. Using your transformation rules, determine the coordinates of the images of each of the following pre-images using the given rotations.

a. Pre-Image: (-4 , 6)
$90°$ Rotation: (-6 , -4)
$180°$ Rotation: (4 , -6)
$270°$ Rotation: (6 , 4)

b. Pre-Image: (-2 , -7)
$90°$ Rotation: (7 , -2)
$180°$ Rotation: (2 , 7)
$270°$ Rotation: (-7 , 2)



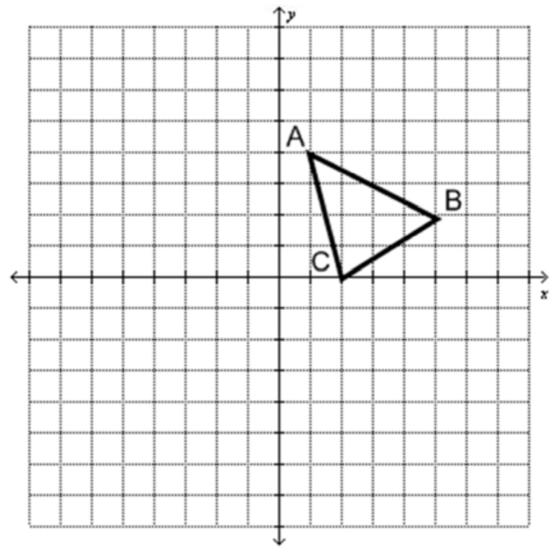
Triangle *ABC* is labeled on your graph below. Determine the coordinates of each of the following rotations and then graph each image.

a) Rotate Triangle *ABC*, 90° counterclockwise. Label the triangle *A'B'C'*.

A (1, 4) → *A'* (-4, 1) $(x,y) \rightarrow (-y, x)$

B (5, 2) → *B'* (-2, 5)

C (2, 0) → *C'* (0, 2)

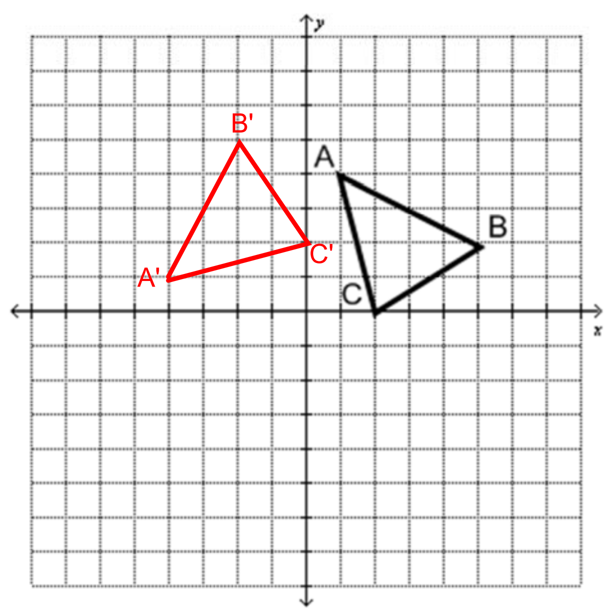


b) Rotate Triangle *ABC*, 180° counterclockwise. Label the triangle *A"B"C"*.

A (1, 4) → *A"* (-1, -4) $(x,y) \rightarrow (-x,-y)$

B (5, 2) → *B"* (-5, -2)

C (2, 0) → *C"* (-2, 0)

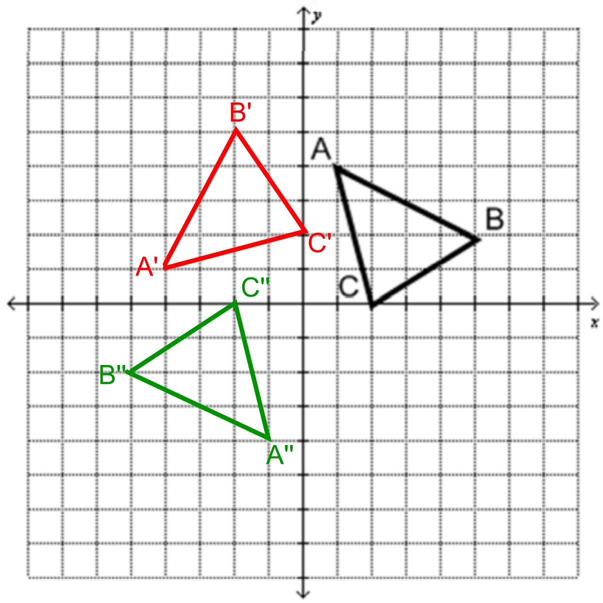


c) Rotate Triangle *ABC*, 270° counterclockwise. Label the triangle *A''' B''' C'''*.

A __(1, 4)__ → *A'''* __(4, -1)__ $(x,y) \rightarrow (y, -x)$

B __(5, 2)__ → *B'''* __(2, -5)__

C __(2, 0)__ → *C'''* __(0, -2)__

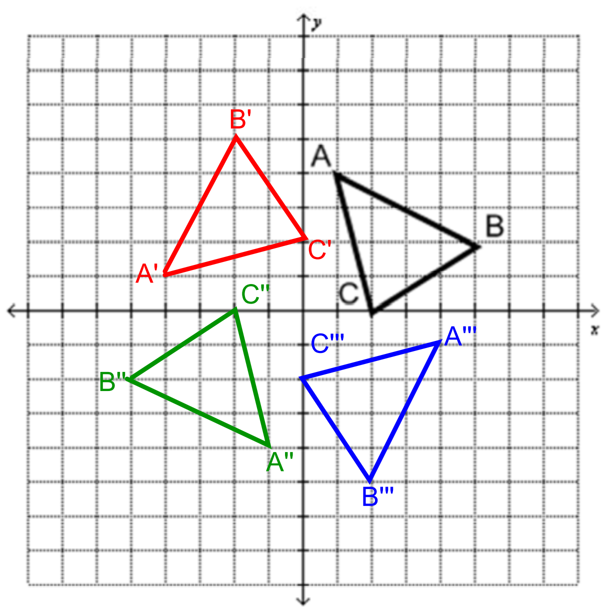


c) Rotate Triangle *ABC*, 270° counterclockwise. Label the triangle *A''' B''' C'''*.

A __(1, 4)__ → *A'''* __(4, -1)__ $(x,y) \rightarrow (y, -x)$

B __(5, 2)__ → *B'''* __(2, -5)__

C __(2, 0)__ → *C'''* __(0, -2)__



4. Rotate 180° counterclockwise.

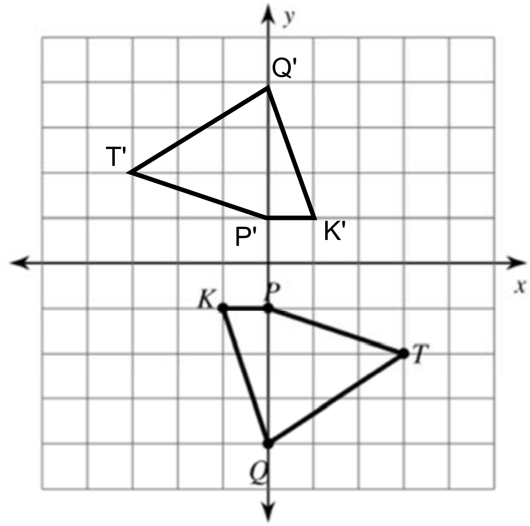
$(x,y) \rightarrow (-x,-y)$

P (0, -1) → P' (0, 1)

K (-1, -1) → K' (1, 1)

Q (0, -4) → Q' (0, 4)

T (3, -2) → T' (-3, 2)



5. Rotate 270° counterclockwise.

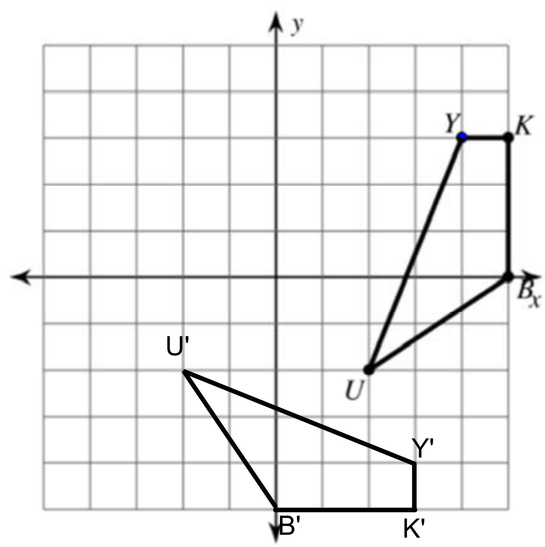
$(x,y) \rightarrow (y, -x)$

Y (4, 3) → Y' (3, -4)

U (2, -2) → U' (-2, -2)

B (5, 0) → B' (0, -5)

K (5, 3) → K' (3, -5)



Preserves shape and size

-Translation

-Reflection

-Rotation

A **dilation** is a transformation that produces an image that is the same shape as the original, but is a different size. A **dilation** stretches or shrinks the original figure. The description of a **dilation** includes the scale factor (or ratio) and the center of the **dilation.**

Transformation Rules Sheet

Line Reflections:

$r_{x\text{-}axis}(x, y) = (x, -y)$

$r_{y\text{-}axis}(x, y) = (-x, y)$

$r_{y=x}(x, y) = (y, x)$

$r_{y=-x}(x, y) = (-y, -x)$

Point Reflection:

$R_{180°}(x, y) = (-x, -y)$

Rotations:

$R_{90°}(x, y) = (-y, x)$

$R_{180°}(x, y) = (-x, -y)$

$R_{270°}(x, y) = (y, -x)$

$R_{-90°}(x, y) = (y, -x)$

Translation:

$T_{a,b}(x, y) = (x + a, y + b)$

Dilation:

$D_k(x, y) = (kx, ky)$

Homework: Rotation Worksheet and Workbook Pg. 48