

# Unit 1 Lesson 3

## Rotations With Coordinates

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Math 2 – Honors  
Unit 1 – Geometric Transformations  
Lesson 3 – Rotations with Coordinates

Name \_\_\_\_\_  
Date \_\_\_\_\_ Pd \_\_\_\_\_

**Rotations**

**Definition:**

A **rotation** is a type of transformation which is a turn in a given direction for a given number of degrees around a fixed point. To rotate an object, you must specify the degree of rotation, the point around which the rotation is to occur, and the direction.

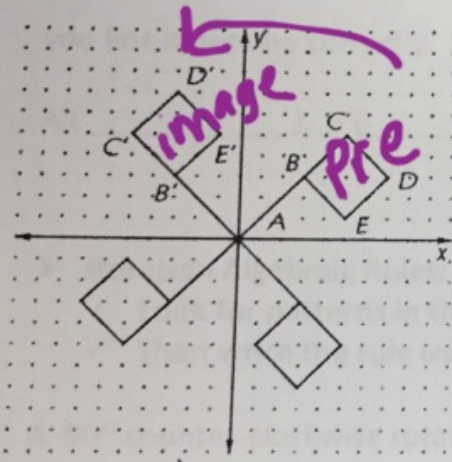
- Rotations can be completed in two directions: counter-clockwise & clockwise
- In Math 3: Negative angle measures will indicate a clockwise rotation.

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➤ Visualizing Rotations Centered About the Origin

The flag shown below is rotated about the origin  $90^\circ$ ,  $180^\circ$ , and  $270^\circ$ . Flag ABCDE is the **preimage**. Flag A'B'C'D'E' is a  $90^\circ$  counterclockwise rotation of ABCDE.



left ↙

Counter-Clockwise  
90° Degrees!

right ↘

Clockwise  
270° Degrees!

**NOTE:** Unless otherwise specified, the standard for rotations is **counterclockwise!**

➤ Notation for Rotations:  $\mathcal{R}$  # degrees

➤ Examples:

$\mathcal{R}_{90^\circ}$	$\equiv$	$\mathcal{R}_{270^\circ CW}$
$\mathcal{R}_{180^\circ}$	$\equiv$	$\mathcal{R}_{180^\circ CW}$
$\mathcal{R}_{270^\circ}$	$\equiv$	$\mathcal{R}_{90^\circ CW}$

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➤ **Rotations on the Coordinate Plane Exploration:** Triangle ABC has coordinates A(2, 0), B(3, 4), C(6, 4). Trace the triangle and the x – and y – axes on patty paper.

1) Rotate *Triangle ABC* 90°, using the axes you traced to help you line it back up. Record the new coordinates.

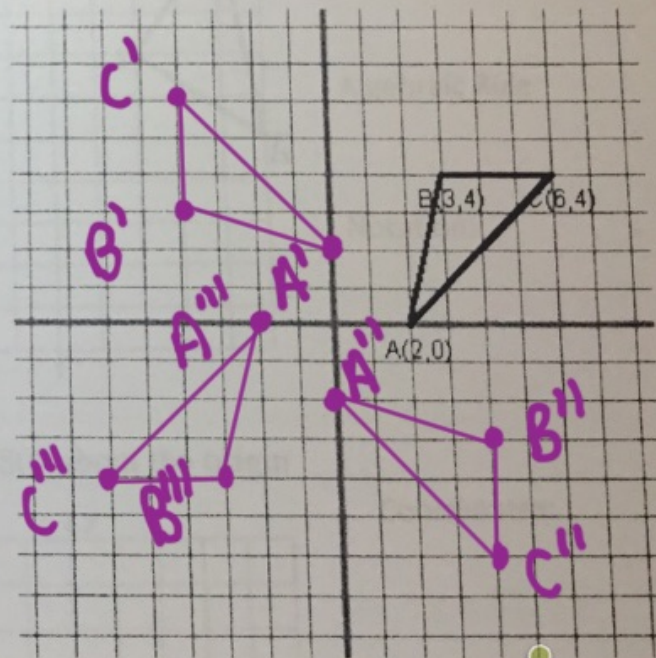
A' ( 0 , 2 ), B' ( -4 , 3 ), C' ( -4 , 6 )

2) Rotate *Triangle ABC* 270°, using the axes you traced to help you line it up. Record the new coordinates.

A'' ( 0 , -2 ), B'' ( 4 , -3 ), C'' ( 4 , -6 )

3) Rotate *Triangle ABC* 180°, using the axes you traced to help you line it back up correctly. Record the new coordinates.

A''' ( -2 , 0 ), B''' ( -3 , -4 ), C''' ( -6 , -4 )



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➤ **Rotation Algebraic Rules:**

- ✓ Look for patterns in the above examples to help complete the following rotation rules.
- ✓ Then write the rule using proper notation for 1 – 3.

1. A  $90^\circ$  counter-clockwise rotation maps  $(x, y) \rightarrow ( \underline{-y} , \underline{x} )$ . Notation:  $R_{90^\circ}$


2. A  $270^\circ$  counter-clockwise rotation maps  $(x, y) \rightarrow ( \underline{y} , \underline{-x} )$ . Notation:  $R_{270^\circ}$

3. A  $180^\circ$  rotation maps  $(x, y) \rightarrow ( \underline{-x} , \underline{-y} )$ . Notation:  $R_{180^\circ}$

4. A rotation of  $270^\circ$  **clockwise** is equivalent to a rotation of  $\underline{90^\circ \text{ CCW}}$ .

5. A rotation of  $270^\circ$  **counterclockwise** is equivalent to a rotation of  $\underline{90^\circ \text{ CW}}$ .

6. A rotation of  $180^\circ$  **counterclockwise** is equivalent to a rotation of  $\underline{180^\circ \text{ CW}}$ .

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