

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.

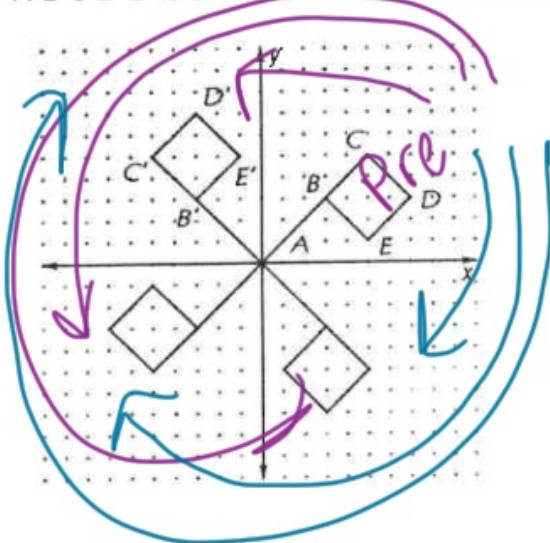
- Rotations can be completed in two directions: counter-clockwise & clockwise
- In Math 3: Negative angle measures will indicate a clockwise rotation.


Rotations with a Coordinate Plane


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




Counterclockwise
90° Degrees!


Clockwise
270° Degrees!

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

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

➤ Examples: \mathcal{R}_{90° $\mathcal{R}_{270^\circ CW}$
 \mathcal{R}_{180° $\mathcal{R}_{180^\circ CW}$
 \mathcal{R}_{270° $\mathcal{R}_{90^\circ CW}$

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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.

CCW about origin

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

$$A'(\underline{0}, \underline{2}), B'(\underline{-4}, \underline{3}), C'(\underline{-4}, \underline{6})$$

CCW about origin

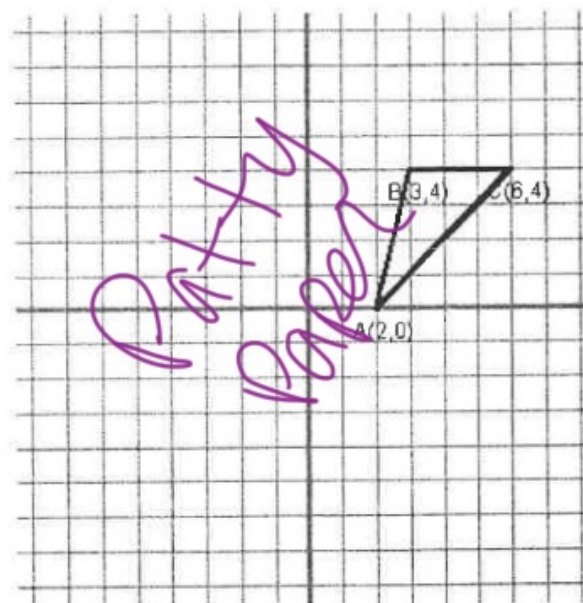
- 2) Rotate *Triangle ABC* 270° , using the axes you traced to help you line it up. Record the new coordinates.

$$A''(\underline{0}, \underline{-2}), B''(\underline{4}, \underline{-3}), C''(\underline{4}, \underline{-6})$$

CCW

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

$$A'''(\underline{-2}, \underline{0}), B'''(\underline{-3}, \underline{-4}), C'''(\underline{-6}, \underline{-4})$$



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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° counter-clockwise rotation maps $(x, y) \rightarrow (\underline{-y}, \underline{x})$. Notation: $R_{90^\circ \text{CCW}}$
2. A 270° counter-clockwise rotation maps $(x, y) \rightarrow (\underline{y}, \underline{-x})$. Notation: $R_{270^\circ \text{CCW}}$
3. A 180° rotation maps $(x, y) \rightarrow (\underline{-x}, \underline{-y})$. Notation: $R_{180^\circ \text{CCW}}$
4. A rotation of 270° **clockwise** is equivalent to a rotation of $\underline{90^\circ \text{CCW}}$.
5. A rotation of 270° **counterclockwise** is equivalent to a rotation of $\underline{90^\circ \text{CW}}$.
6. A rotation of 180° **counterclockwise** is equivalent to a rotation of $\underline{180^\circ \text{CW}}$.

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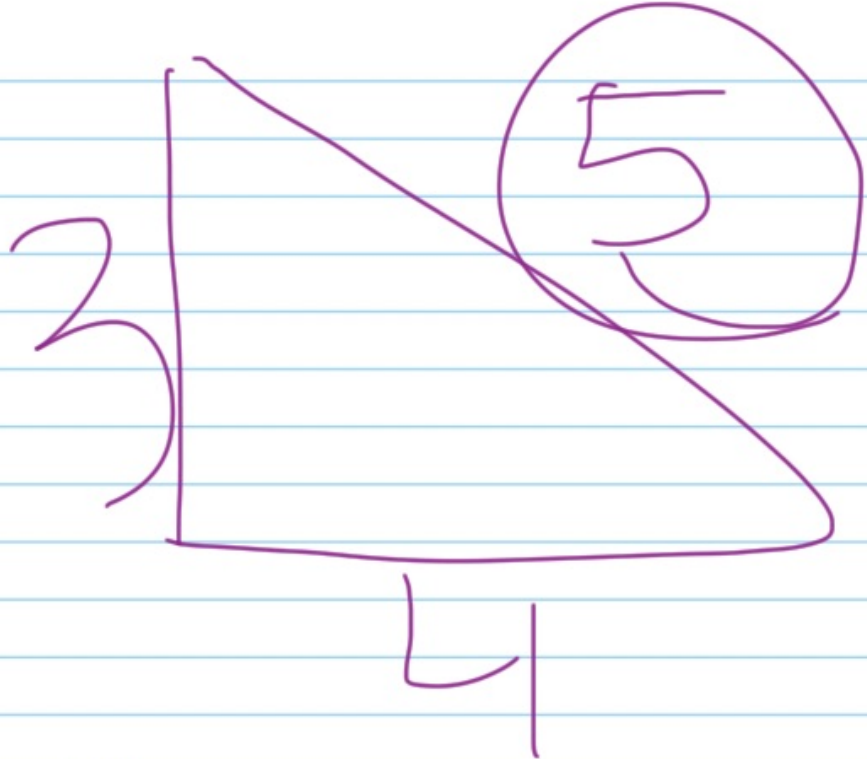
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MVP Pg 4-6

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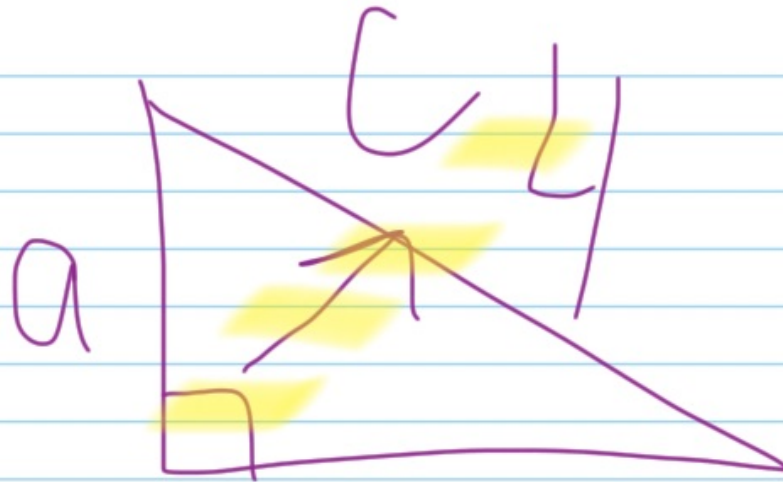
$3^2 + 4^2 = c^2$

$9 + 16 = c^2$

$\sqrt{25} = \sqrt{c^2}$

$c = 5$

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3.87

$$a^2 + (1)^2 = (4)^2$$

$$\sqrt{a^2} = \sqrt{15}$$

$$a^2 + 1 = 16$$

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A handwritten diagram of a right-angled triangle on lined paper. The vertical leg is labeled '3', the horizontal leg is labeled 'b', and the hypotenuse is labeled 'c' with a checkmark and the value $\sqrt{10}$. An arrow points from the hypotenuse label to the value. To the right of the triangle, the equation $b^2 = \sqrt{\quad}$ is written, with an arrow pointing from the 'b' to the 'b' in the equation. Below this, the equation $b = 1$ is written. Below the triangle, the Pythagorean theorem is written as $(3)^2 + b^2 = (\sqrt{10})^2$, which is then simplified to $9 + b^2 = 10$. A green hand icon is in the bottom right corner of the diagram area.