

Lesson 2.4:

Rotations

Essential Question

What are the three basic ways to move an object in a plane?

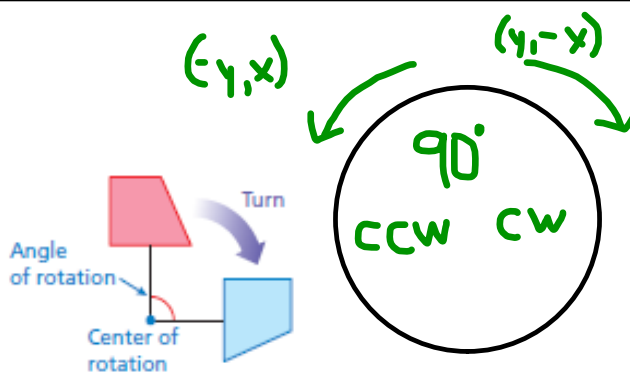
Translation, reflection, rotation

Key Idea

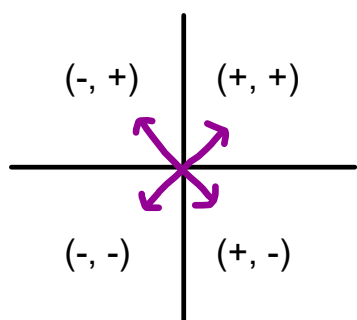
Rotations

A **rotation**, or *turn*, is a transformation in which a figure is rotated about a point called the **center of rotation**. The number of degrees a figure rotates is the **angle of rotation**.

In a rotation, the original figure and its image are congruent.



- 180: $(x, y) \rightarrow (-x, -y)$
- 90 cw: $(x, y) \rightarrow (y, -x)$
- 90 ccw: $(x, y) \rightarrow (-y, x)$



With a 180 rotation, the point/figure moves to the opposite quadrant, where the signs of the coordinates are opposite.

You must rotate the puzzle piece 270° clockwise about point P to fit it into a puzzle. Which piece fits in the puzzle as shown?

The vertices of a trapezoid are $W(-4, 2)$, $X(-3, 4)$, $Y(-1, 4)$, and $Z(-1, 2)$. Rotate the trapezoid 180° about the origin. What are the coordinates of the image?

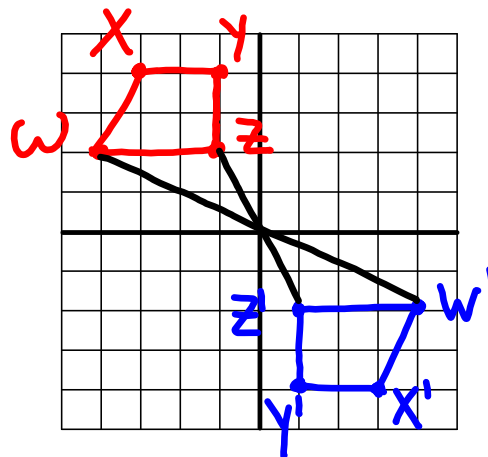
$$(x, y) \rightarrow (-x, -y)$$

$$W(-4, 2) \rightarrow W'(4, -2)$$

$$X(-3, 4) \rightarrow X'(3, -4)$$

$$Y(-1, 4) \rightarrow Y'(1, -4)$$

$$Z(-1, 2) \rightarrow Z'(1, -2)$$



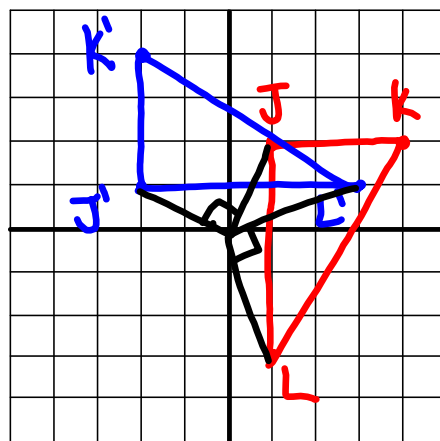
The vertices of a triangle are $J(1, 2)$, $K(4, 2)$, and $L(1, -3)$. Rotate the triangle 90° counterclockwise about the origin. What are the coordinates of the image?

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

$$J(1, 2) \rightarrow J'(-2, 1)$$

$$K(4, 2) \rightarrow K'(-2, 4)$$

$$L(1, -3) \rightarrow L'(3, 1)$$



The vertices of a rectangle are $A(-3, -3)$, $B(1, -3)$, $C(1, -5)$, and $D(-3, -5)$. Rotate the rectangle 90° clockwise about the origin, and then reflect it in the y -axis. What are the coordinates of the image?

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

$$A(-3, -3) \rightarrow A'(-3, 3) \rightarrow A''(3, 3)$$

$$B(1, -3) \rightarrow B'(-3, -1) \rightarrow B''(3, -1)$$

$$C(1, -5) \rightarrow C'(-5, -1) \rightarrow C''(5, -1)$$

$$D(-3, -5) \rightarrow D'(-5, 3) \rightarrow D''(5, 3)$$

