

Section 3.3 Rotations

**1 Draw Rotations** In Lesson 1-7, you learned that a rotation or turn moves every point of a preimage through a specified angle and direction about a fixed point.

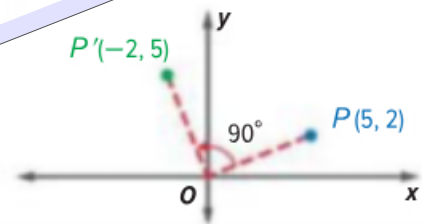
**Key Concept** Rotations in the Coordinate Plane

**90° Rotation**

To rotate a point 90° counterclockwise about the origin, multiply the y-coordinate by  $-1$  and then interchange the x- and y-coordinates.

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

**Example**

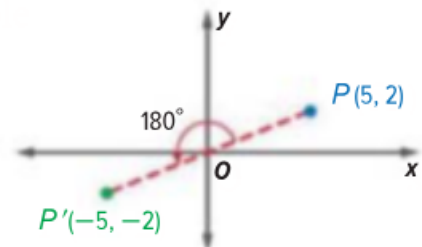


**180° Rotation**

To rotate a point 180° counterclockwise about the origin, multiply the x- and y-coordinates by  $-1$ .

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

**Example**

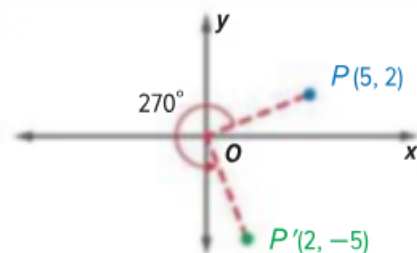


**270° Rotation**

To rotate a point 270° counterclockwise about the origin, multiply the x-coordinate by  $-1$  and then interchange the x- and y-coordinates.

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

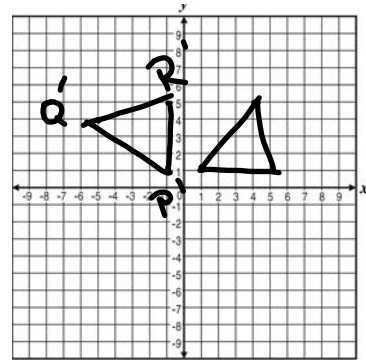
**Example**



**Example 2** Rotate a Figure About the Origin

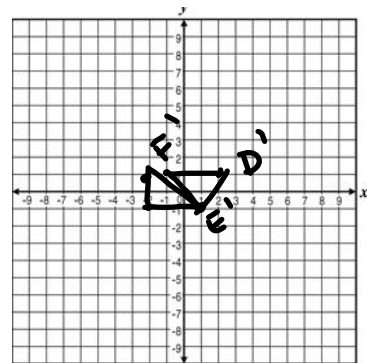
Triangle  $PQR$  has vertices  $P(1, 1)$ ,  $Q(4, 5)$ , and  $R(5, 1)$ . Graph  $\triangle PQR$  and its image after a rotation  $90^\circ$  about the origin.

$$\begin{aligned} P' &(-1, 1) \\ Q' &(-5, 4) \\ R' &(-1, 5) \end{aligned}$$

**Example 2****Rotate a Figure About the Origin**

Triangle  $DEF$  has vertices  $D(-2, -1)$ ,  $E(-1, 1)$ , and  $F(1, -1)$ . Graph  $\triangle DEF$  and its image after a rotation of  $180^\circ$  counter-clockwise about the origin.

$$\begin{aligned} D' &(2, 1) \\ E' &(1, -1) \\ F' &(-1, 1) \end{aligned}$$

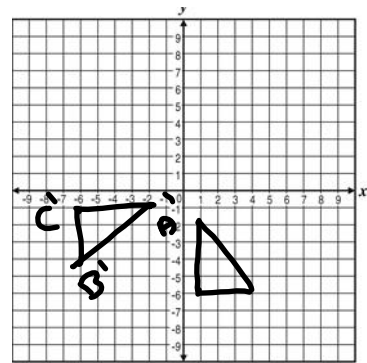


## Example 2

## Guided Practice

Triangle  $ABC$  has vertices  $A(1, -2)$ ,  $B(4, -6)$ , and  $C(1, -6)$ . Draw the image of  $\triangle ABC$  under a rotation of  $270^\circ$  counterclockwise about the origin.

$$\begin{aligned} A' &(-2, -1) \\ B' &(-6, -4) \\ C' &(-6, -1) \end{aligned}$$



Triangle  $JKL$  has vertices  $J(-2, 0)$ ,  $K(-1, -4)$ , and  $L(-4, -3)$ . Graph  $\triangle JKL$  after a rotation  $270^\circ$  about the origin.

$$\begin{aligned} J' &(0, 2) \\ K' &(-4, 1) \\ L' &(-3, 4) \end{aligned}$$

