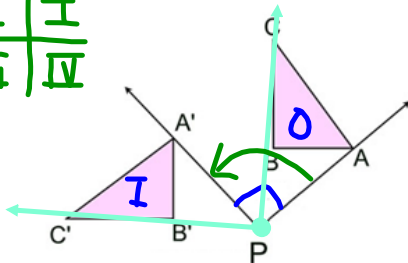


Geometry Transformations: Rotations

A rotation is a **isometric transformation** that turns a figure about a fixed point called the center of rotation.

$\frac{II}{IV} \mid \frac{I}{III}$



Rays drawn from the center of rotation to a point and its corresponding image form the angle of rotation.

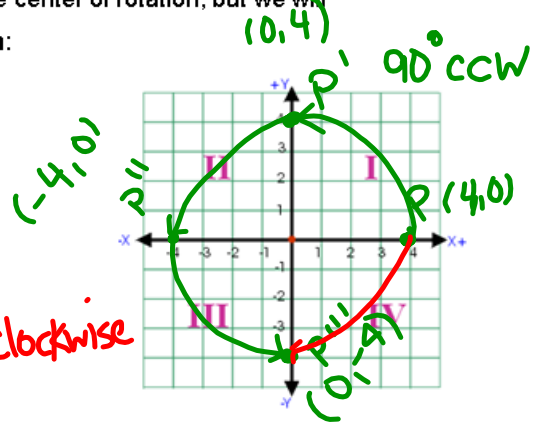
Positive angles rotate the figure counter-clockwise
 Negative angles rotate the image clockwise.

A figure may be rotated any number of degrees around the center of rotation, but we will concentrate on rules concerning rotations about the **origin**:

- | Coordinate Rules for Rotations about the <u>Origin</u> | |
|--|-------------------------------|
| • 90° rotation: | $(x, y) \rightarrow (-y, x)$ |
| • 180° rotation: | $(x, y) \rightarrow (-x, -y)$ |
| • 270° rotation: | $(x, y) \rightarrow (y, -x)$ |

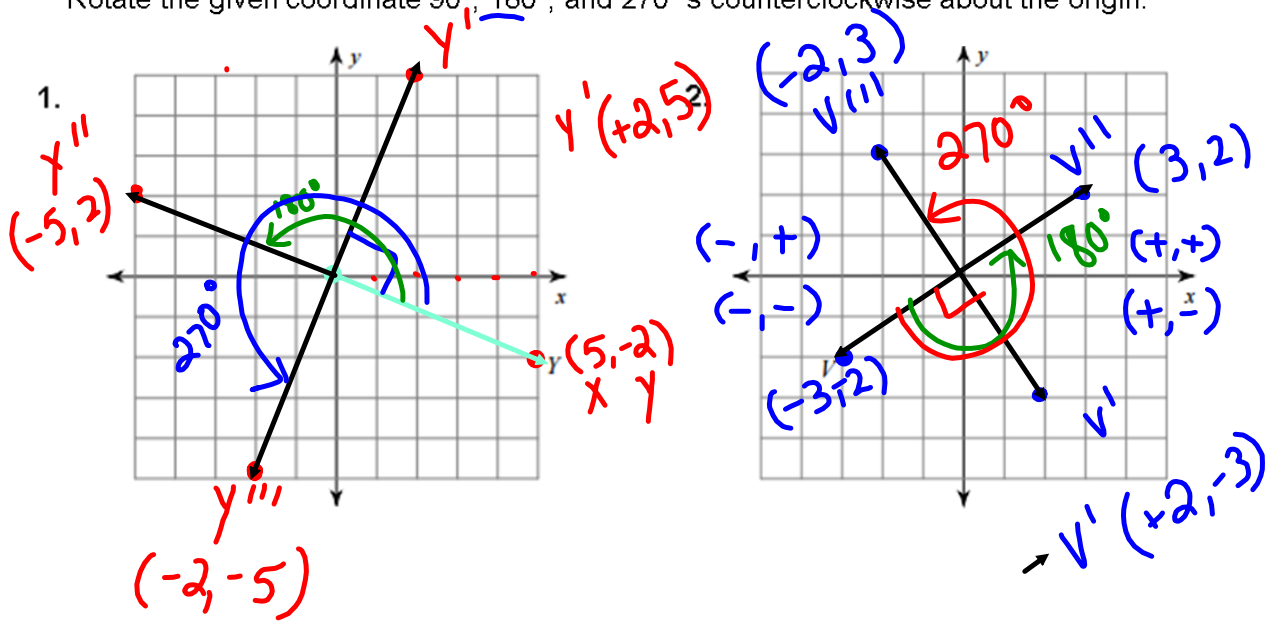
-90°

Same as 90 clockwise



Examples:

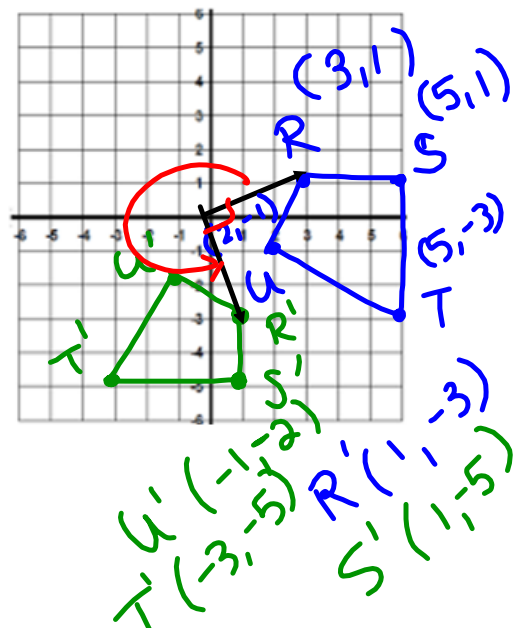
Rotate the given coordinate 90° , 180° , and 270° 's counterclockwise about the origin.



3. Graph quadrilateral $RSTU$ with vertices $R(3, 1)$, $S(5, 1)$, $T(5, -3)$, and $U(2, -1)$. Then rotate the quadrilateral 270° about the origin.

- $R(3, 1) \rightarrow R'(\underline{\hspace{2cm}})$
- $S(5, 1) \rightarrow S'(\underline{\hspace{2cm}})$
- $T(5, -3) \rightarrow T'(\underline{\hspace{2cm}})$
- $U(2, -1) \rightarrow U'(\underline{\hspace{2cm}})$

Should we assume clockwise?
Or counter clockwise?

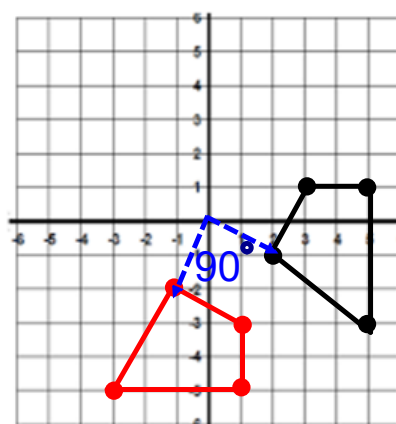


3. Graph quadrilateral $RSTU$ with vertices $R(3, 1)$, $S(5, 1)$, $T(5, -3)$, and $U(2, -1)$. Then rotate the quadrilateral 270° about the origin.

- $R(3, 1) \rightarrow R'(\underline{1, -3})$
- $S(5, 1) \rightarrow S'(\underline{1, -5})$
- $T(5, -3) \rightarrow T'(\underline{-3, -5})$
- $U(2, -1) \rightarrow U'(\underline{-1, -2})$

Remember!

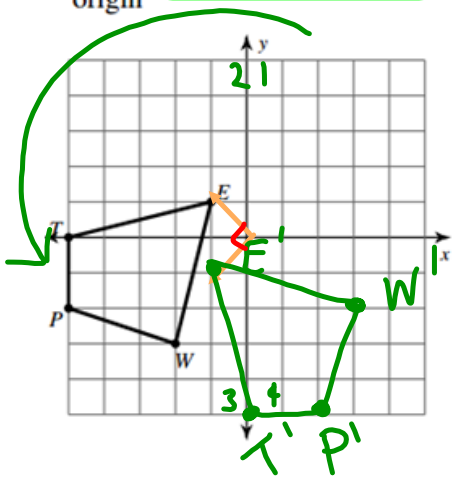
270° CCW is the same as 90° C



You Try!!!

Find the coordinates of the vertices of each figure after the given transformation. Then rotate the figure.

4. rotation **90° counterclockwise** about the origin



T(-5, 0)
 E(-1, 1)
 W(-2, -3)
 P(-5, -2)

T' (0, -5)
 E' (-1, -1)
 W' (3, -2)
 P' (2, -5)

(t, -)

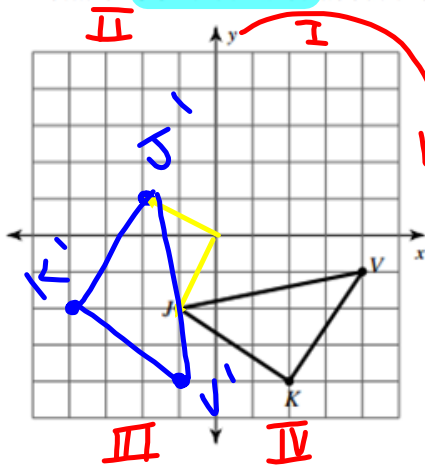
-

You Try!!!

Find the coordinates of the vertices of each figure after the given transformation. Then rotate the figure.

270° CCW
or

5. rotation 90° clockwise about the origin



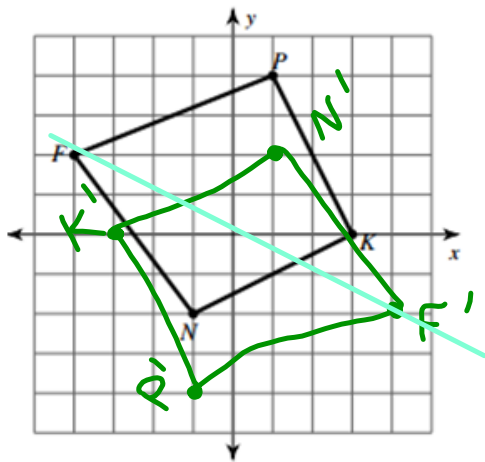
J (-1, -2)
K (2, -4)
V (4, -1)

J' (-2, 1)
K' (-4, 2)
V' (-1, 4)

You Try!!!

Find the coordinates of the vertices of each figure after the given transformation. Then rotate the figure.

6. rotation 180° about the origin



CCW

$P(1,4)$

$P'(-1,-4)$

$K(3,0)$

$K'(-3,0)$

$N(-1,-2)$

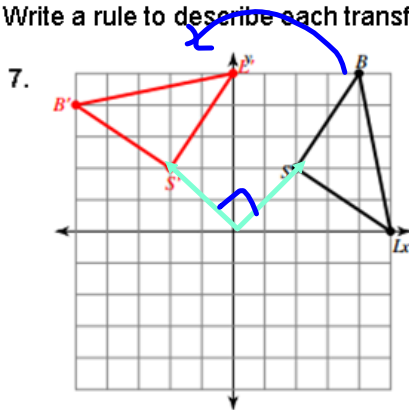
$N'(1,2)$

$F(-4,2)$

$F'(4,-2)$

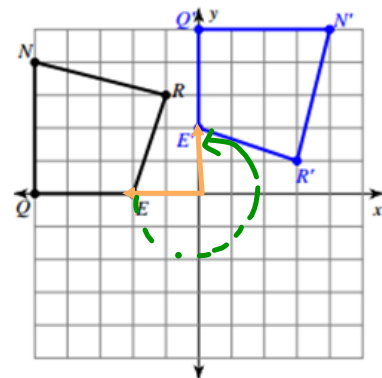
Examples:

Write a rule to describe each transformation in words and proper notation.



90° CCW

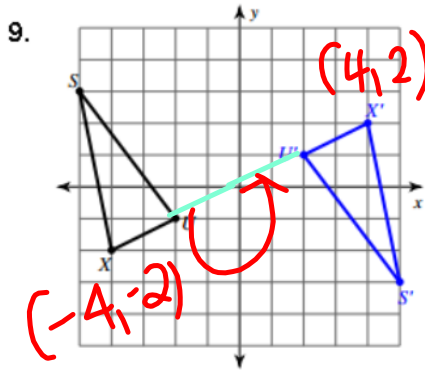
90° CCW
 $(x, y) \Rightarrow (-y, x)$



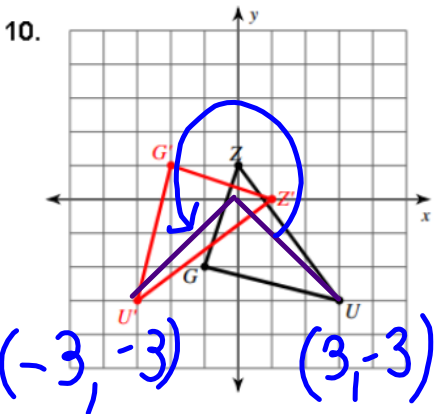
270° CCW
 $(x, y) \Rightarrow (y, -x)$

You Try!!!

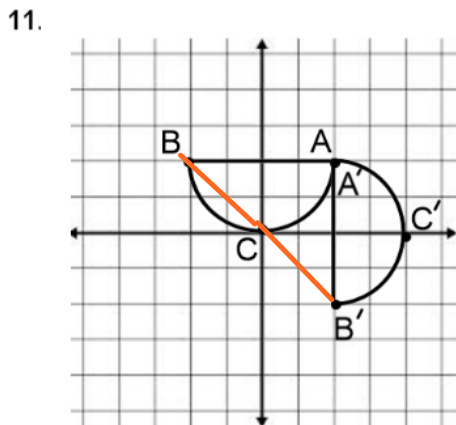
Write a rule to describe each transformation in words and proper notation.



rotation 180° CCW
 $(x, y) \rightarrow (-x, -y)$



270° CCW
 $(x, y) \rightarrow (y, -x)$



180° CCW
 $(x, y) \rightarrow (-x, -y)$

