Rotations in the Coordinate Plane

Rules can be used to rotate a figure 90°, 180°, and 270° about the origin *O* in the coordinate plane.

Counter Clockwise

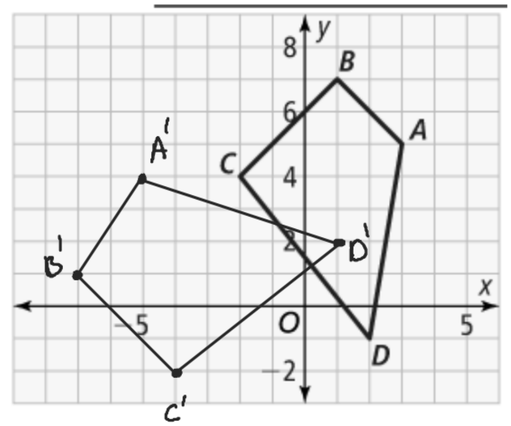
$r_{(90°,\, O)}\left(x,\ y\right) = \left(-y,\ x\right)$ → 270° Clockwise

$r_{(180°,\, O)}\left(x,\ y\right) = \left(-x,\ -y\right)$ → 180° Clockwise

$r_{(270°,\, O)}\left(x,\ y\right) = \left(y,\ -x\right)$ → 90° Clockwise

What is $r_{(90°,\ O)}$ *ABCD*?

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



$A\ (4,5) \to A'(-5,4)$

$B\ (1,7) \to B'\ (-7,1)$

$C\ (-2,4) \to C'(-4,-2)$

$D\ (2,-1) \to D'(1,2)$

2. The vertices of $\triangle XYZ$ are $X(-4,\ 7)$, $Y(0,\ 8)$, and $Z(2,\ -1)$.

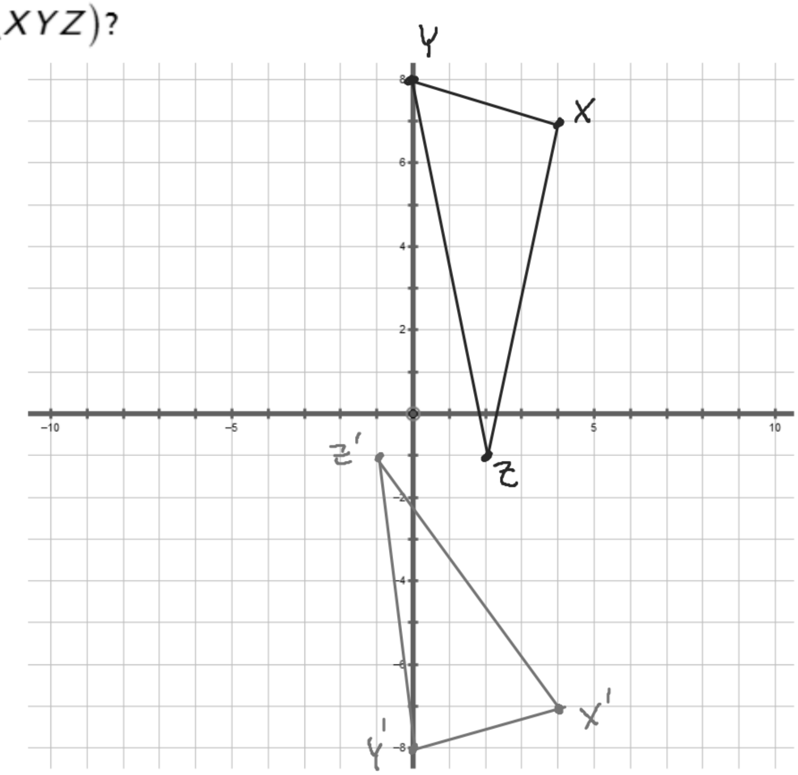
$(x,y) \rightarrow (-x,-y)$

a. What are the vertices of $r_{(180°,\ O)}\ (\triangle XYZ)$?

X' $(4,-7)$

Y' $(0,-8)$

Z' $(-2,1)$



2. The vertices of $\triangle XYZ$ are $X(-4,\ 7)$, $Y(0,\ 8)$, and $Z(2,\ -1)$.

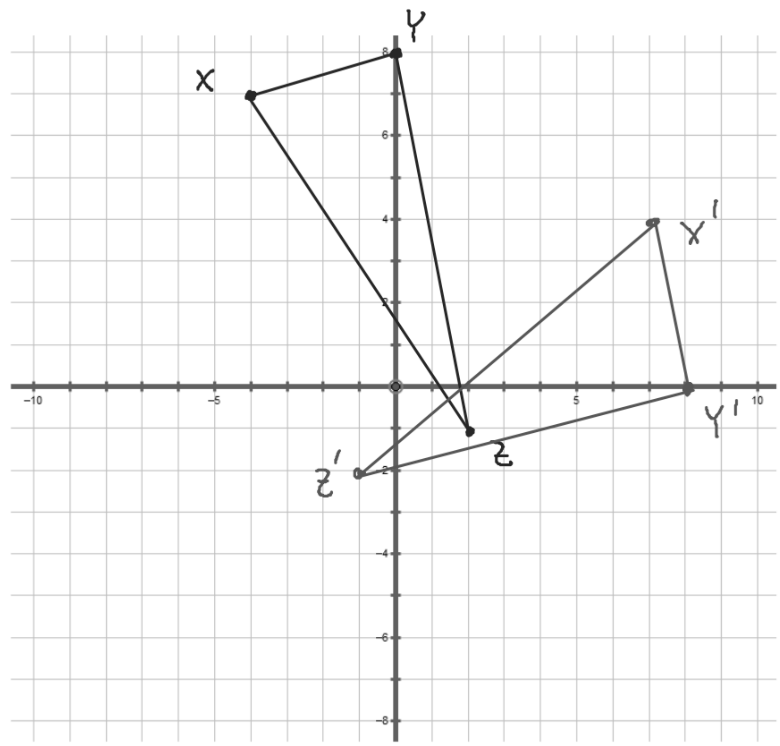
$(x, y) \rightarrow (y, -x)$

b. What are the vertices of $r_{(270°,\ O)}\ (\triangle XYZ)$?

$X'\ (7, 4)$

$Y'\ (8, 0)$

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

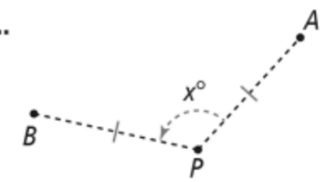


THEOREM 3-2

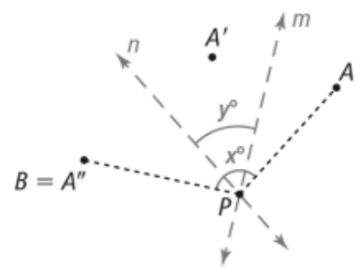
Any rotation is a composition of reflections across two lines that intersect at the center of rotation.

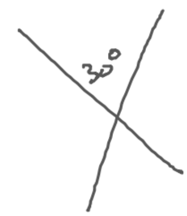
The angle of rotation is twice the angle formed by the lines of reflection.

If...



Then...





PROOF: SEE EXAMPLE 5.

$y^\circ = \frac{1}{2}x^\circ$

Give the coordinates of the image

$$r_{(270°,0)}\ (\Delta XYZ)\ X\ (0,3), Y\ (1,-4), and\ Z\ (5,2)$$