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

∠ of Rotation

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

origin

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

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

R – reflection $R_{y=3}$

r – rotation $r_{(90°,0)}$

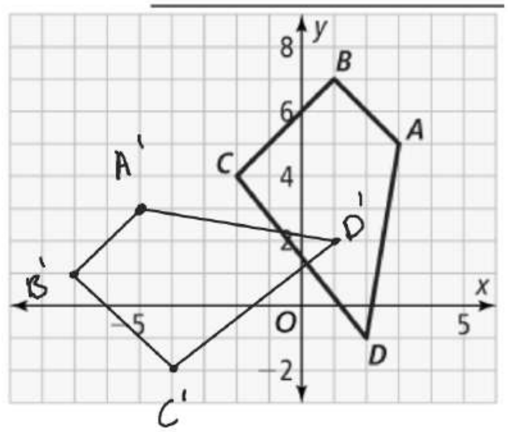
What is $r_{(90°,\ O)}$ *ABCD*? $(x,y) \rightarrow (-y,x)$

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

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

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

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



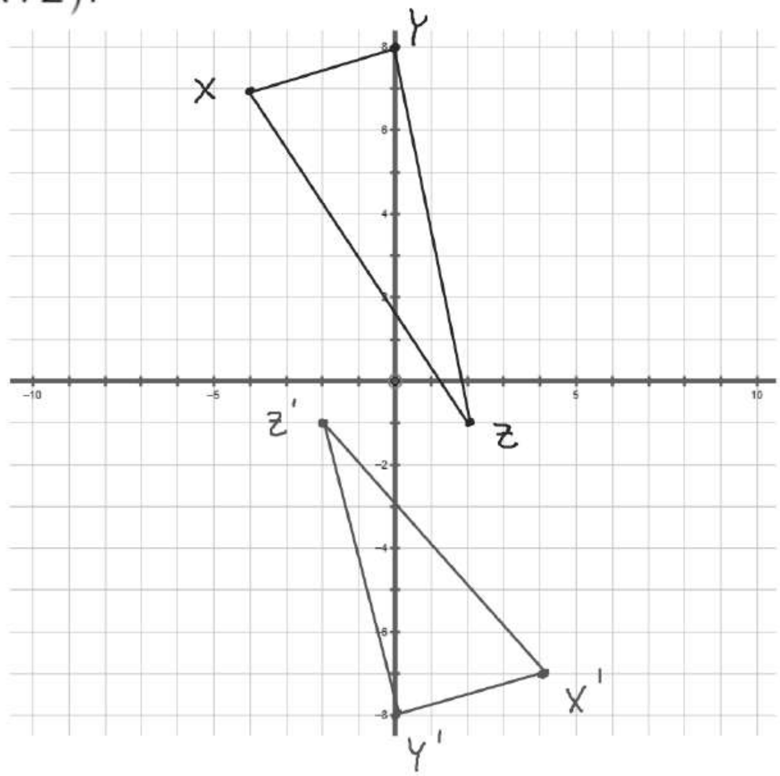
2. The vertices of $\triangle XYZ$ are $X(-4,\ 7)$, $Y(0,\ 8)$, and $Z(2,\ -1)$.

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

$X(-4,7)$ $X'(4,-7)$

$Y(0,8)$ $Y'(0,-8)$

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



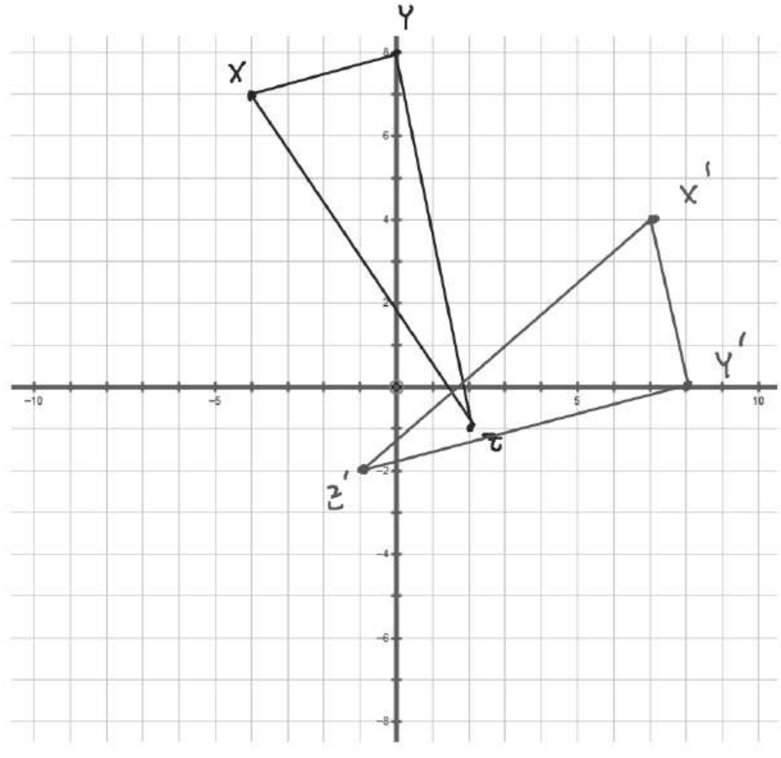
2. The vertices of $\triangle XYZ$ are $X(-4,\ 7)$, $Y(0,\ 8)$, and $Z(2,\ -1)$.

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

$X(-4,7) \rightarrow X'(7,4)$

$Y(0,8) \rightarrow Y'(8,0)$

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

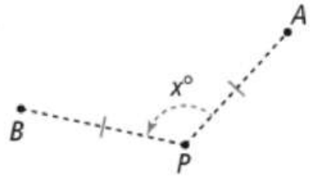


THEOREM 3-2

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

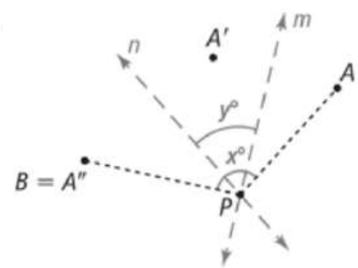
The angle of rotation is twice the angle formed by the lines of reflection.

If...



PROOF: SEE EXAMPLE 5.

Then...



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

Give the coordinates of the image

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

X' (3,0)

Y' (-4,-1)

Z' (2,-5)