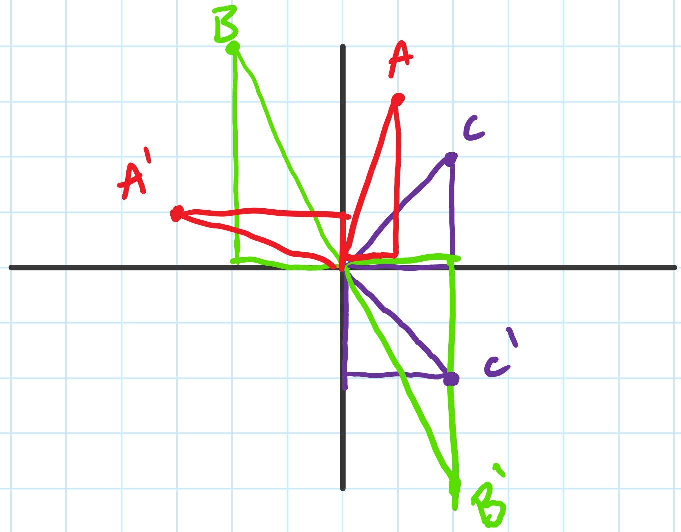
3.3 Rotations

Monday, September 23, 2019 7:46 AM

Warm Up

Rotate the following points counter clockwise around the origin the given degrees.

1) (1, 3), 90°
2) (-2, 4), 180°
3) (2, 2), 270°



Essential Question

What are the properties that identify a rotation?

Goal: "I can. . .

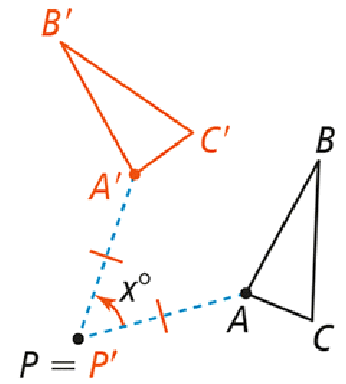
Draw and describe the rotation of a figure about a point of rotation for a given angle of rotation."

Rotations

A rotation $r_{(x°, P)}$ is a transformation that rotates each point in the preimage about a point P, called the center of rotation, by an angle measure of $x°$, called the angle of rotation. A rotation has these properties:

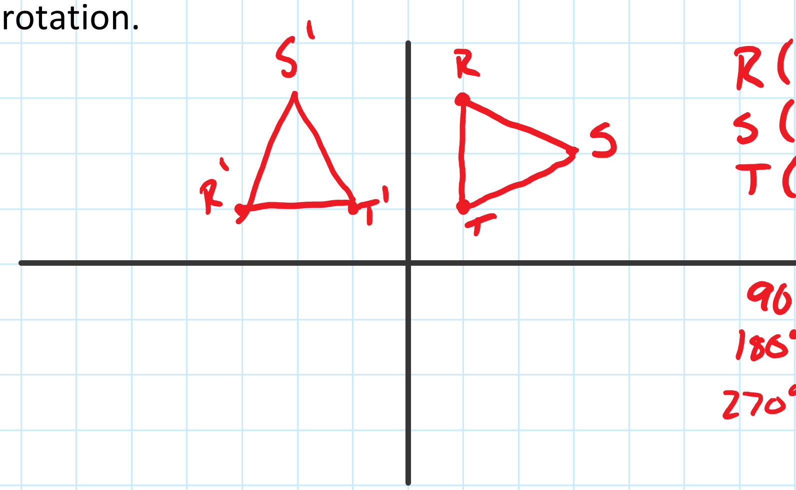
- The image of P is P' (that is, $P' = P$).
- For a preimage point A, $PA = PA'$ and $m\angle APA' = x°$.

A rotation is a rigid motion, so length and angle measure are preserved. Note that a rotation is counterclockwise for a positive angle measure.



Example 1

With the people in your group. Each of you draw your own triangle in quadrant 1 of a coordinate plane. Each of you draw a rotation of 90° counter clock wise into quadrant 2. Identify each of the points accordingly and see if there is a pattern that happens for a 90° counter clock rotation.



R(1,3) R'(-3,1)
S(3,2) S'(-2,3)
T(1,1) T(-1,1)

90° (−y, x) apply again
180° (−x, −y)
270° (y, −x)

Rules of rotation for 90°, 180°, and 270°.

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

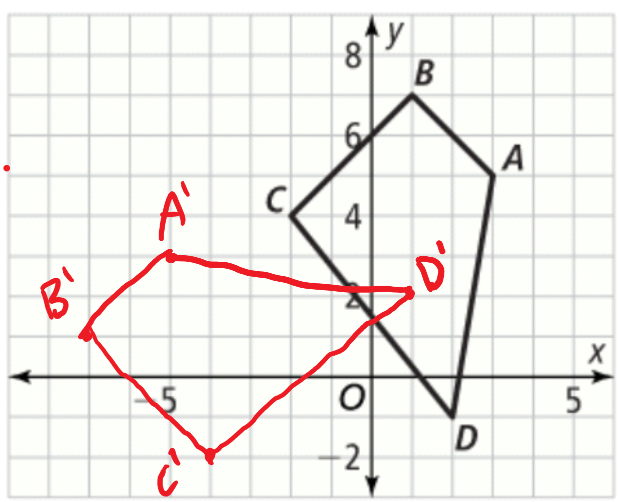
$$r_{(180°,\ O)}\left(x,\ y\right) = \left(-x,\ -y\right)$$

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

Example 2

What is $r_{(90°,\ O)}$ $ABCD$?

Rotate each point 90° or one point and redraw in correct orientation.



---

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

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

$\triangle X'Y'Z'$

$X'(4,-7)$ $Y'(0,-8)$ $Z'(-2,1)$

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

$\triangle X'Y'Z'$

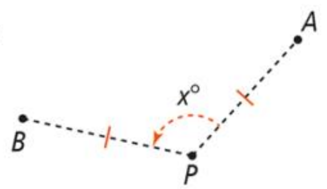
$X'(7,4)\quad Y'(8,0)\quad Z'(-1,-2)$

Reflections in intersecting lines

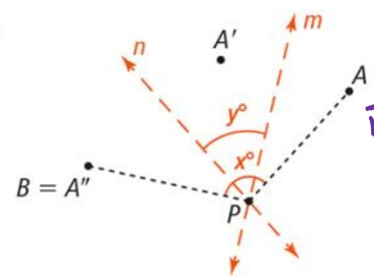
Any rotation is a composition of reflections across two lines that intersect at the center of rotation.

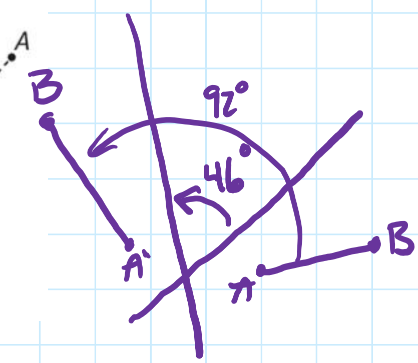
The angle of rotation is twice the angle formed by the lines of reflection.

If...



Then...





PROOF: SEE EXAMPLE 5.

$y° = \frac{1}{2}x°$

Homework

Pg. 127
11, 14, 19-22, 24(Composition Only), 25, 29