Geometry H
Rotations Notes

Name : ______________________________________
Date : _______________________ Period : ________

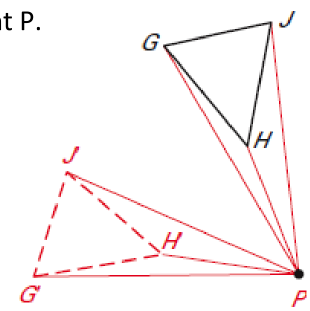
Learning Targets

- I can rotate an image about a point.
  - ✓ I can use coordinate notation to describe a rotations about the origin in the coordinate plane.
  - ✓ I can use properties of rotations to find missing measures in figures.

Vocabulary:

- In a ***rotation***, a figure is turned about a fixed point, called the ***center of rotation.***
- In a rotation, rays drawn from the center of rotation to a point and its image form the ***angle of rotation.***

In the diagram below $\Delta G'H'J'$ is the image of ΔGHJ rotated 60° about point P.



→Point P is the center of rotation.

→ $\angle GPG'$, $\angle JPJ'$, *and* $\angle HPH'$ are all 60° angles.

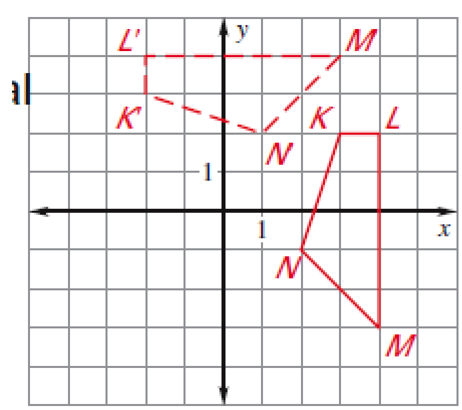
Special Note – <u>Unless stated otherwise</u>, we will perform our rotations COUNTERCLOCKWISE (CCW).

Let's try to discover the coordinate rules for rotations in the coordinate plane ☺

<u>**EXAMPLE 1**</u> – Rotations 90° about the origin

In the diagram below, K'L'M'N' is the image of KLMN under a 90° rotation about the origin.

Complete the following:



K(3, 2) → K'(-2, 3)

L(4, 2) →L'(-2, 4)

M(4, -3) → M'(___, ___)

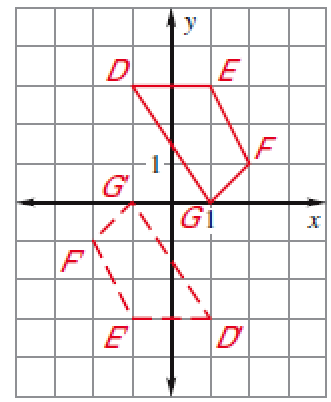
N(2, -1) → N'(___, ___)

Can you write a rule to represent this transformation?

(a, b) → (____, ____)

<u>EXAMPLE 2</u> – Rotations 180° about the origin

In the diagram D’E’F’G’ is the image of DEFG under a 180° rotation about the origin.



Complete the following:

D(-1, 3) → D’(1, -3)

E(1, 3) → E’(-1, -3)

F(2, 1) → F’(___, ___)

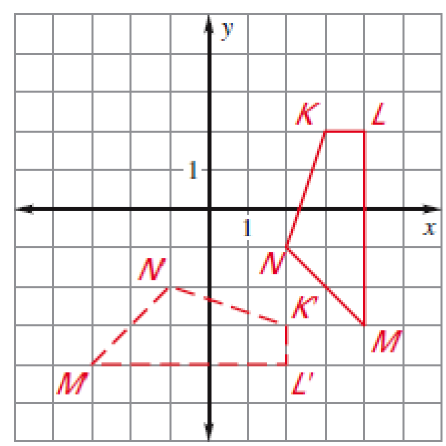
G(1, 0) → G’(___, ___)

Can you write a rule to represent this transformation?

(a, b) → (_____, _____)

<u>EXAMPLE 3</u> – Rotations 270° about the origin

In the diagram K’L’M’N’ is the image of KLMN under a 270° rotation about the origin.



Complete the following:

K(3, 2) → K’(2, -3)

L(4, 2) → L’(2, -4)

M(4, -3) → M’(___, ___)

N(2, -1) → N’(___, ___)

Can you write a rule to represent this transformation?

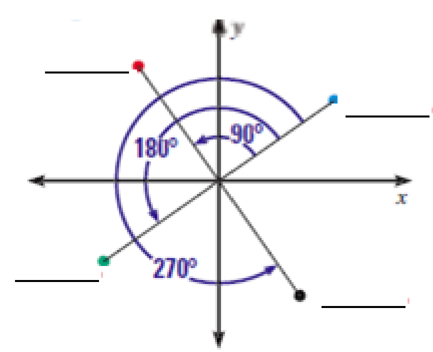
(a, b) → (_____, _____)

<u>Rotations in the coordinate plane about the origin:</u>

For a rotation of 90°CCW (270° CW): (x,y) → _______________

For a rotation of 270°CCW (90°CW): (x, y)→_______________

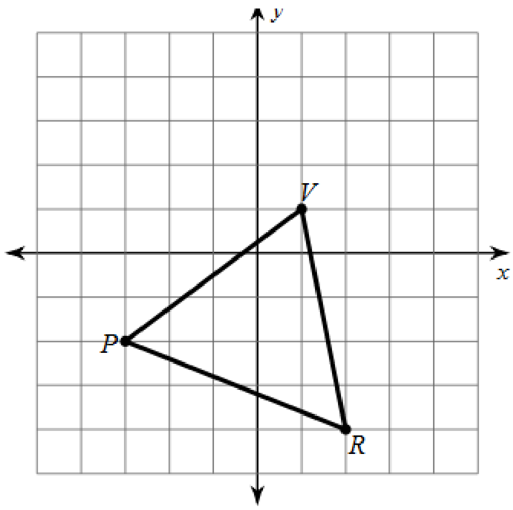
For a rotation of 180°: (x, y)→______________



Example 1: Rotate a figure about the origin using the coordinate rules.
Rotate the figure with the given vertices about the origin using the given angle of rotation. List the coordinates of the vertices of the image.

a) 180° about the origin

(x, y) → ________



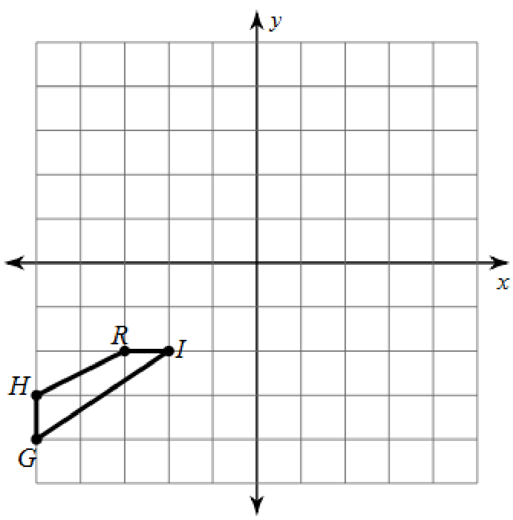
P(-3, -2) → P' ________

R(2, -4) → R' ________

V(1, 1) → V' ________

b) 90°CCW about the origin

(x, y) → ________



G(-5, -4) → G' ________

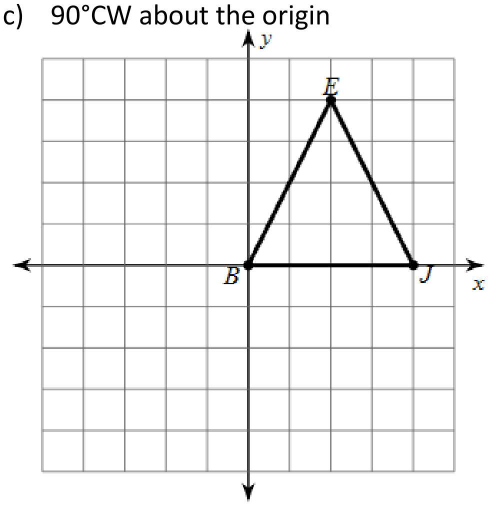
H(-5, -3) → H' ________

R(-3, -2) → R' ________

I(-2, -2) → I' ________

c) 90°CW about the origin

(x, y) → ________



B(0, 0) → B' ________

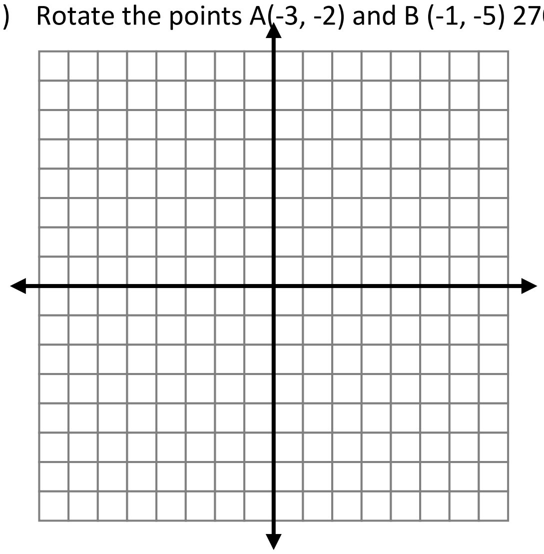
E(2, 4) → E' ________

J(4, 0) → J' ________

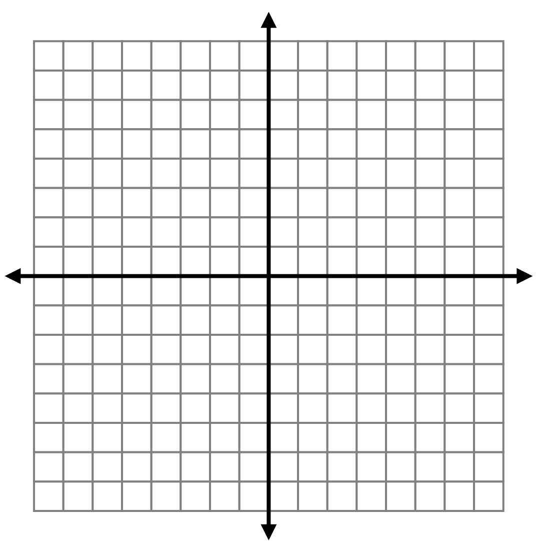
Rotations on the coordinate plane don't always have to be done with respect to the origin! We can rotate 90°, 180°, and 270° about any point in the coordinate plane. Once again, we will use perpendicular slopes to help us find the image points, but we will count from the given point, not the origin ☺

Example 2: Rotate a figure about a point that is not the origin.

a) Rotate the points A(-3, -2) and B (-1, -5) 270° CCW about the point (2,0).



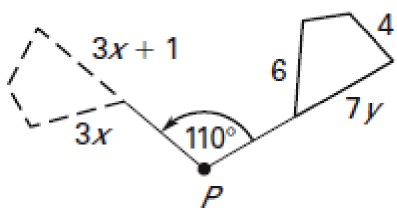
b) Rotate the points A (-1, 1) and B(-4,2) 180° about the point (0, -2).



A rotation is an **isometry.** This means that the original figure (preimage) and the rotated figure (image) are the same size and shape (congruent). We can use this fact to find missing measurements by matching up the congruent parts.

EXAMPLE 3: Find side lengths in a rotation.

a) The quadrilateral below is rotated about *P*. Find the values of x and y.



b) The quadrilateral below is rotated about *P*. Find the values of x and y.