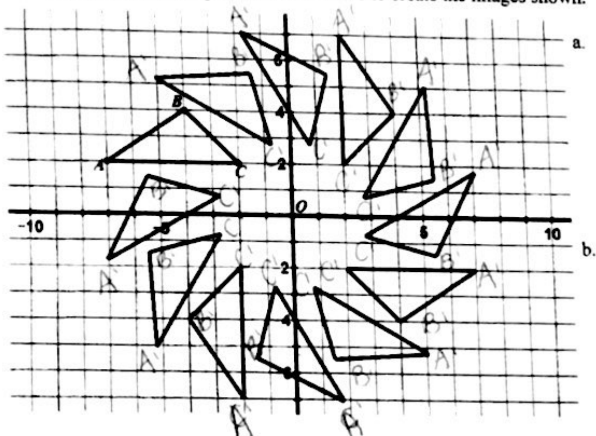
Name:________________________ Date:________________ Per.________

U10 CWK #4

Properties of Rotations

1. In the grid below, ΔABC has been **rotated** counterclockwise with the **center of rotation** at the origin O. This process was repeated several times to create the images shown.



a. Using tracing paper, trace ΔABC and the x-axis. Holding your pencil as an anchor on the origin, rotate the triangle counterclockwise to see how the images were created.

b. Label the corresponding vertices of the images of ΔABC.

c. Describe the relationship between **C and its images to the center of rotation O**. Do the same for A and its images. Does this relationship to the center of rotation hold true for B and its images?

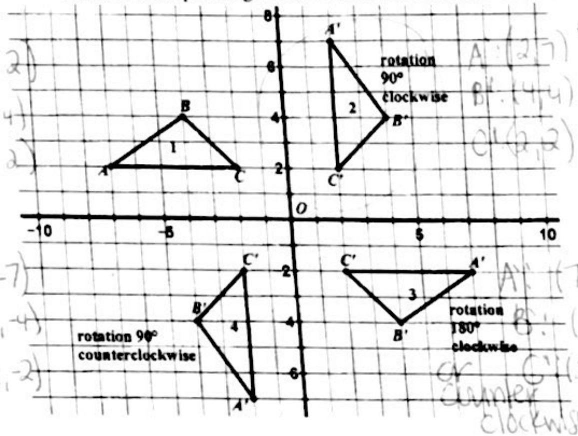
d. If there are 360° in one full rotation, determine the angle of rotation from one image to the next in the picture above.

$\frac{360°}{12 \text{ shapes}} = 30°$ each

2. The picture from the previous page was modified so that only the images that are increments of 90° rotations of the pre-image ΔABC are shown. The center of rotation is the origin O.

A (-7,2)
B (-4,4)
C (-2,2)

A' (-2,-7)
B' (-4,-4)
C' (-2,-2)



A' (2,7)
B' (4,4)
C' (2,2)

A' (7,-2)
B' (4,-4)
C' (2,-2)

a. Verify using tracing paper that the descriptions of the rotations are accurate.

b. The rotation from figure 1 to figure 4 has been described as a rotation 90° counterclockwise. How would you describe this rotation in the clockwise direction?

or counter clockwise

c. Consider the rotation from Figure 1 to Figure 2, a rotation 90° clockwise. Find the slopes of the following segments:

$\overline{AB}$ = 2/3 $\overline{BC}$ = $-\frac{2}{2}$ = -1 $\overline{AC}$ = 0

$\overline{A'B'}$ = -3/2 $\overline{B'C'}$ = $\frac{2}{2}$ = 1 $\overline{A'C'}$ = und

d. Use the slopes from the previous question to determine the relationship between corresponding segments in a 90° rotation.

e. Which segments would you expect to be perpendicular in the rotation from Figure 1 to Figure 4, the rotation 90° counterclockwise? Use slope to support your answer.

f. Determine the coordinate rule for a 90° rotation clockwise about the origin. Connect this rule to the slopes of perpendicular lines.

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

g. Determine the coordinate rule for a 90° rotation counterclockwise about the origin. Connect this rule to the slopes of perpendicular lines.

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

h. Describe what happens in a 180° rotation of a figure. What is the relationship of the corresponding segments?

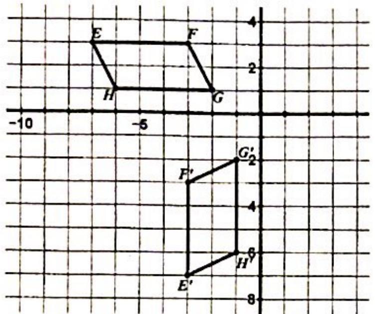
2 reflections

i. Determine the coordinate rule for a rotation of 180°. Connect this rule to your answer for part h.

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

* In 90° rotation, corresponding slopes are opposite reciprocals
* Corresponding sides are still congruent

3. For the following rotation, the center of rotation is the origin.



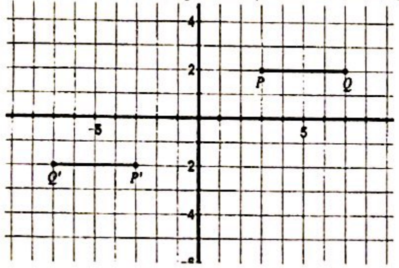
a. Determine the angle of rotation. Be sure to also indicate a direction of rotation.

90° counterclockwise

b. If the slope of $\overline{EH}$ is -2, determine the slope of $\overline{E'H'}$ without doing any calculations.

$\frac{1}{2}$ (opposite reciprocal)

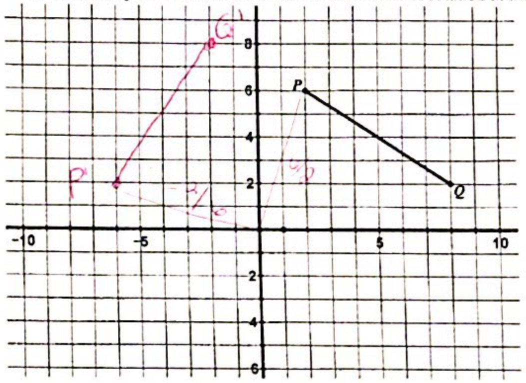
4. For the following rotation, the center of rotation is the origin.



a. Determine the angle of rotation. Be sure to also indicate a direction of rotation.

180° clockwise

5. Rotate $\overline{PQ}$ 90° counterclockwise with the center of rotation at the origin and label the image.



a. How can you verify using slope that your image is in fact a 90° rotation?

$-\frac{4}{6} \Rightarrow \frac{6}{4}$ opposite reciprocals

b. How can you verify using distance that the center of rotation is the origin?

Slopes of corresponding parts to center of rotation are also opposite reciprocals

6. Rotate ΔABC 180° counterclockwise with the center of rotation at the origin and label the image.