Geometry Honors   Date ___Key___

Transformations: Rotations

Essential question: How do you draw the image of a figure under a rotation?

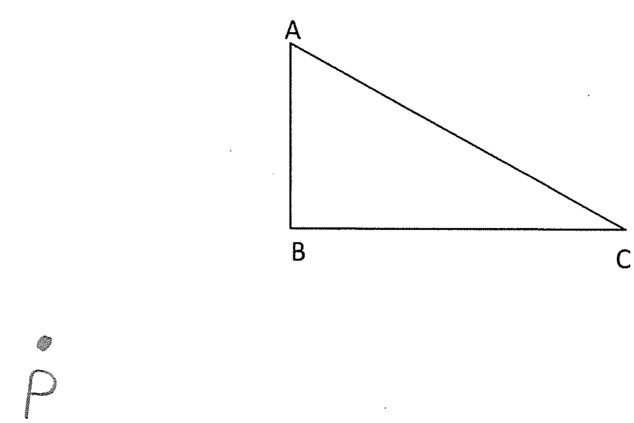
A rotation is a transformation around a fixed point, called ___a center of rotation___, such that the following is true. Center of R

- Every point and its image are the same distance from P.
- All angles with vertex P formed by a point and its image have the same measure. This angle measure is the angle of rotation

Mini-lesson 1: **How to rotate figures using a ruler and protractor**

Draw the image of ΔABC with center of rotation P and the angle of rotation is 90°, counterclockwise.

1. Draw $\overline{PA}$. Then use protractor to draw a ray that is 90° with $\overline{PA}$.
2. Use a ruler to mark point A' along the ray so that PA' = PA.
3. Repeat the above steps to get B' and C'. Then connect the points.

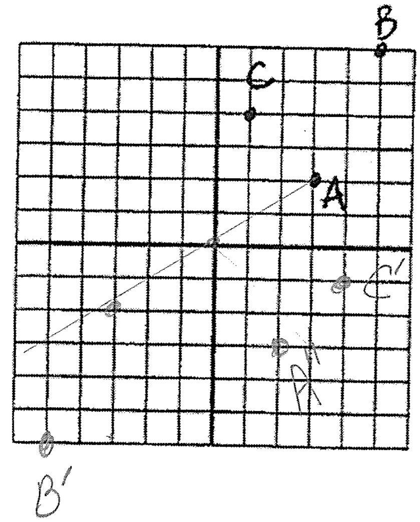


Mini-Lesson 2: **Drawing rotations on a coordinate plane**

We will discover the rules for rotations around the origin on a coordinate plane.

Rotate the following points about the origin in the given direction. Then write its rule in coordinate notation.

(If you need to, draw a line thru (0,0) and that point)



1. $A(3,2)$ **90° counterclockwise:** A' $(-2,3)$

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

2. $B(5,6)$ **180° clockwise:** B' $(-5,-6)$

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

point out → **3.** $C(1,4)$ **90° clockwise:** C' $(4,-1)$

same

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

4. A (3,2) 270° counterclockwise: A' $(2,-3)$

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

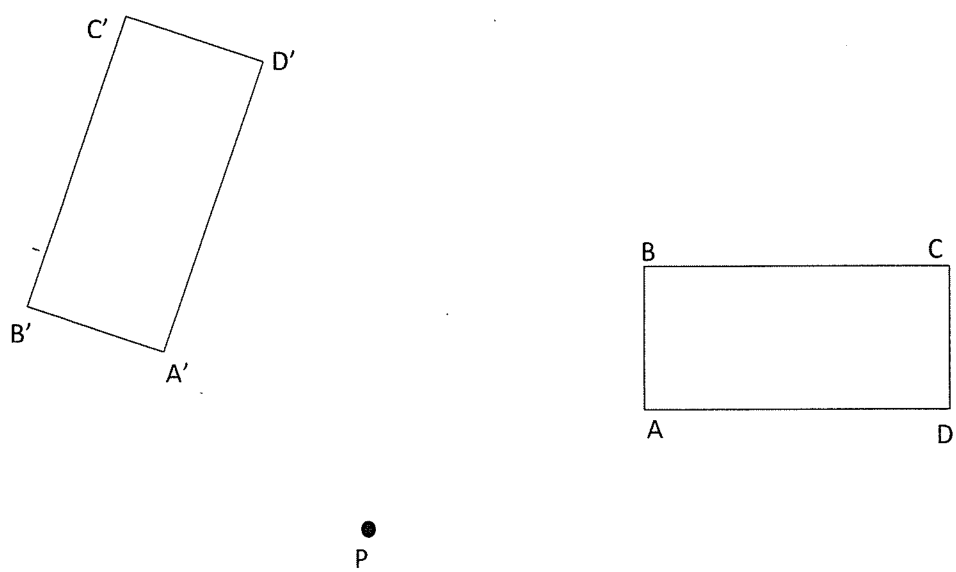
5. B (5,6) 360°

$P(x,y) \rightarrow P'(x,y)$

Note: When no direction is specified, assume that the rotation is counterclockwise.
Note: A counterclockwise rotation of x° is the same as the clockwise rotation of (360 – x)°.

Mini-Lesson 3: **Specifying angles of rotations**

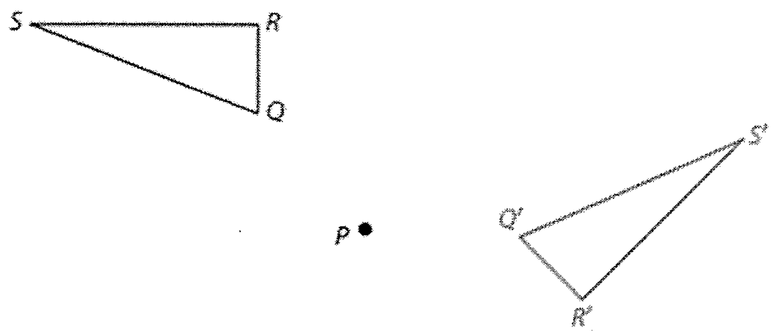
Example: Find the angle of rotation and direction of rotation in the given figure. Point P is the center of rotation.



Steps for finding the rotation angle:

1. Draw segments from the center of rotation to vertex A and to A'.
2. Measure the angle formed by the segments.
3. Determine the direction by comparing the image to the preimage. Remember: starting point is the preimage.
4. State the angle of rotation along with direction.

Practice on the following:



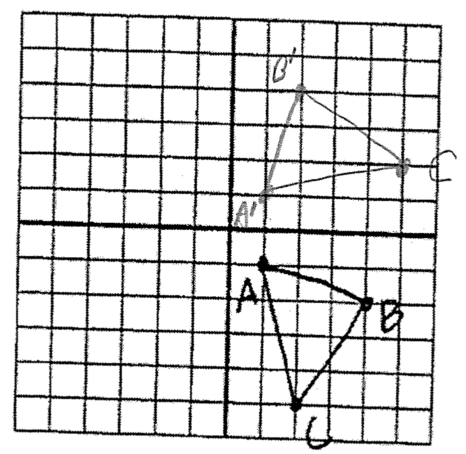
Practice: On the graphs below, first state the coordinates of the image by using the rules. Then plot the vertices, not by using your coordinates, but by following the angle of rotation about the origin. Then check to see if your coordinates found by rules matches those on your graph.

1. 90° counterclockwise

$A(1,-1) \rightarrow A'$ (1, 1)

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

$C(2,-5) \rightarrow C'$ (5, 2)

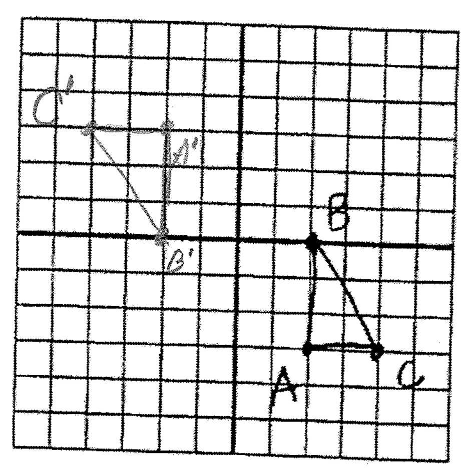


2. 180° clockwise

$A(2,-3) \rightarrow A'$ (-2, 3)

$B(2,0) \rightarrow B'$ (-2, 0)

$C(4,-3) \rightarrow C'$ (-4, 3)

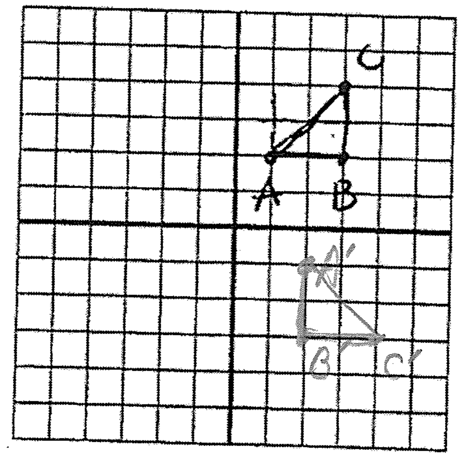


3. 90° clockwise

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

$B(3,2) \rightarrow B'$ (2, -3)

$C(3,4) \rightarrow C'$ (4, -3)



State the segment or triangle that represents the image.

a) 90° clockwise rotation of $\overline{AB}$ about P $\overline{CD}$

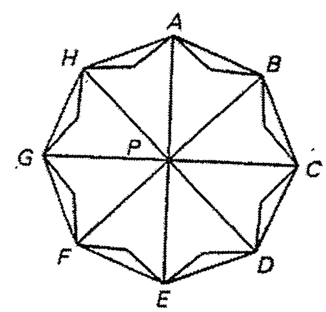
b) 90° clockwise rotation of $\overline{DE}$ about P $\overline{FG}$

c) 90° counterclockwise rotation of $\overline{GH}$ about P $\overline{EF}$

d) 180° counterclockwise rotation of $\overline{EF}$ about P $\overline{AB}$

e) 180° clockwise rotation of ΔDPE about P ΔHPA

f) 45° counterclockwise rotation of ΔHPA about P ΔGPH



See attached

Homework!

1. State the segment or triangle that represents the image.

a) 90° clockwise rotation of $\overline{AB}$ about P

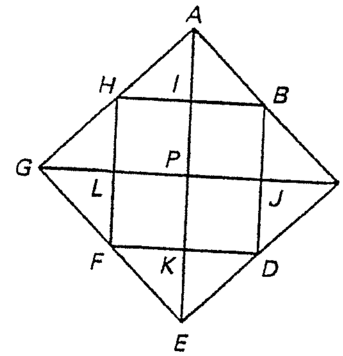
b) 90° clockwise rotation of $\overline{DE}$ about P

c) 90° counterclockwise rotation of $\overline{GH}$ about P

d) 180° counterclockwise rotation of $\overline{EF}$ about P

e) 180° clockwise rotation of ΔCJD about P

f) 90° counterclockwise rotation of ΔGLF about P



2. On the graphs below, plot and connect the following points. Then rotate them about the origin, with the given degree and direction. Connect the image points.

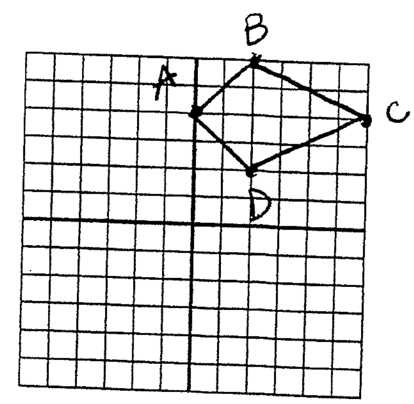
a) 90° counterclockwise

$A(0,4) \to A'$

$B(2,6) \to B'$

$C(6,4) \to C'$

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



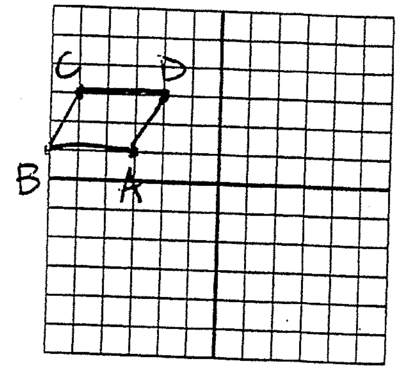
b) 180° clockwise

$A(-3,1) \to A'$

$B(-6,1) \to B'$

$C(-5,3) \to C'$

$D(-2,3) \to D'$



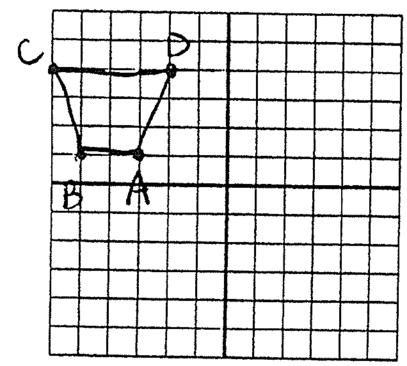
c) 90° clockwise

$A(-3,1) \rightarrow A'$

$B(-5,1) \rightarrow B'$

$C(-6,4) \rightarrow C'$

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



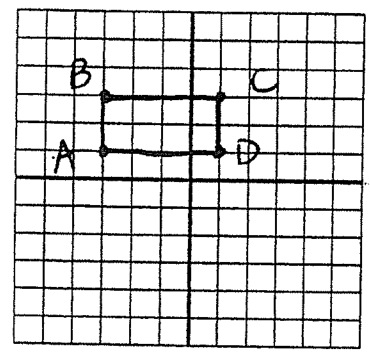
d) 90° clockwise

$A(-3,1) \rightarrow A'$

$B(-3,3) \rightarrow B'$

$C(1,3) \rightarrow C'$

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



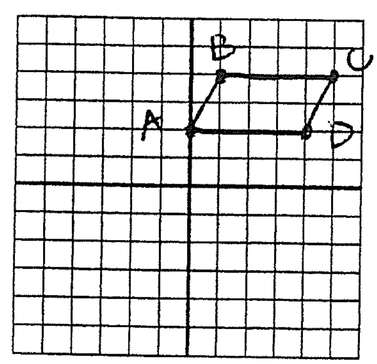
e) 90° counterclockwise

$A(0,2) \rightarrow A'$

$B(1,4) \rightarrow B'$

$C(5,4) \rightarrow C'$

$D(4,2) \rightarrow D'$



Also: Pg 84 #s 3, 4, 9, 11

copy onto a page. Don't draw on the textbook!