4.3 Rotations Notes

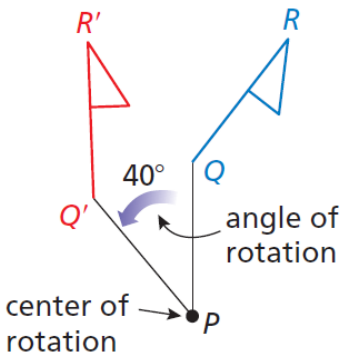
KEY IDEA

Rotations

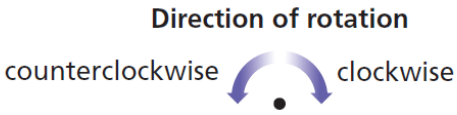
A **rotation** is a transformation in which a figure is turned about a fixed point called the **center of rotation**. Rays drawn from the center of rotation to a point and its image form the **angle of rotation**.

A rotation about a point P through an angle of $x°$ maps every point Q in the plane to a point Q' so that one of the following properties is true.

- If Q is not the center of rotation P, then $QP = Q'P$ and $m\angle QPQ' = x°$, or
- If Q is the center of rotation P, then $Q = Q'$.



The figure above shows a 40° counterclockwise rotation. Rotations can be *clockwise* or *counterclockwise*.

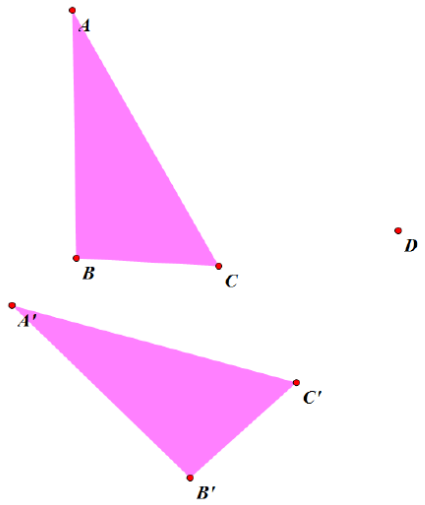


Note: In higher math, counterclockwise is considered a positive direction and clockwise is considered a negative direction.

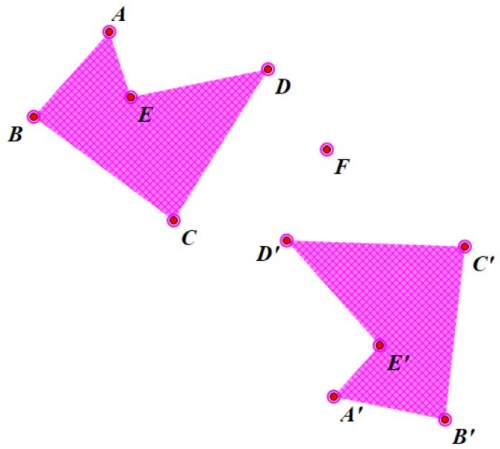
We can find the angle of rotation given a figure, the center of rotation and the image by connecting a point and its image point to the center of rotation and measuring the angle formed (extend the sides of the angle, if necessary).

Find the angle of rotation in each scenario below. Specify counterclockwise (ccw) or clockwise (cw).

1)

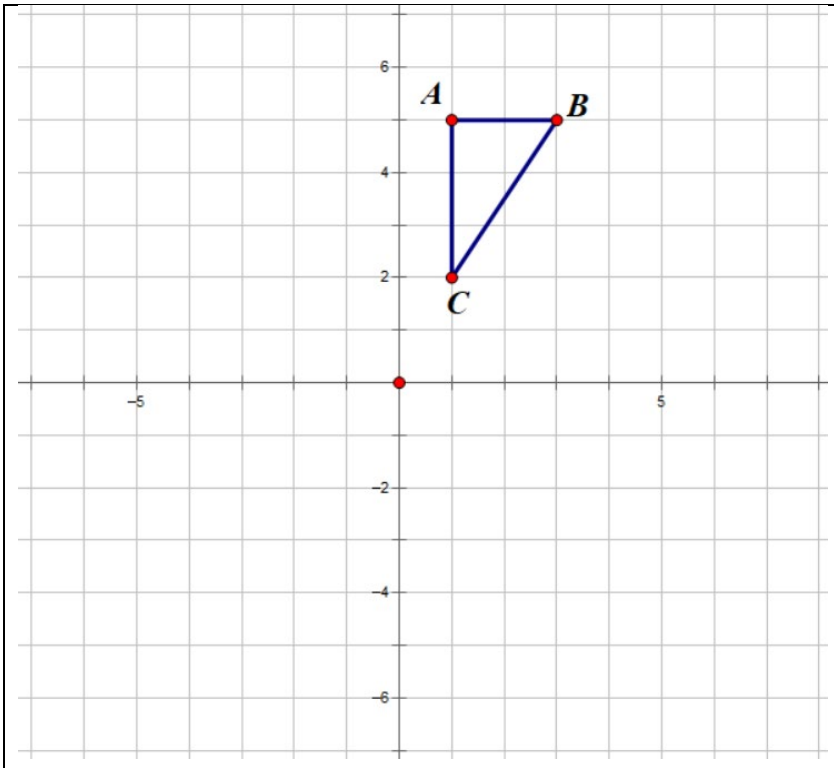


2)



4.3 Rotation Rules Derivations (centered at the origin)

Case 1: ROTATING 90°ccw (same as 270° cw)



Graph the image then write the coordinates of the preimage and the image in the table below:

A(_____,_____)	A'(_____,_____)
B(_____,_____)	B'(_____,_____)
C(_____,_____)	C'(_____,_____)

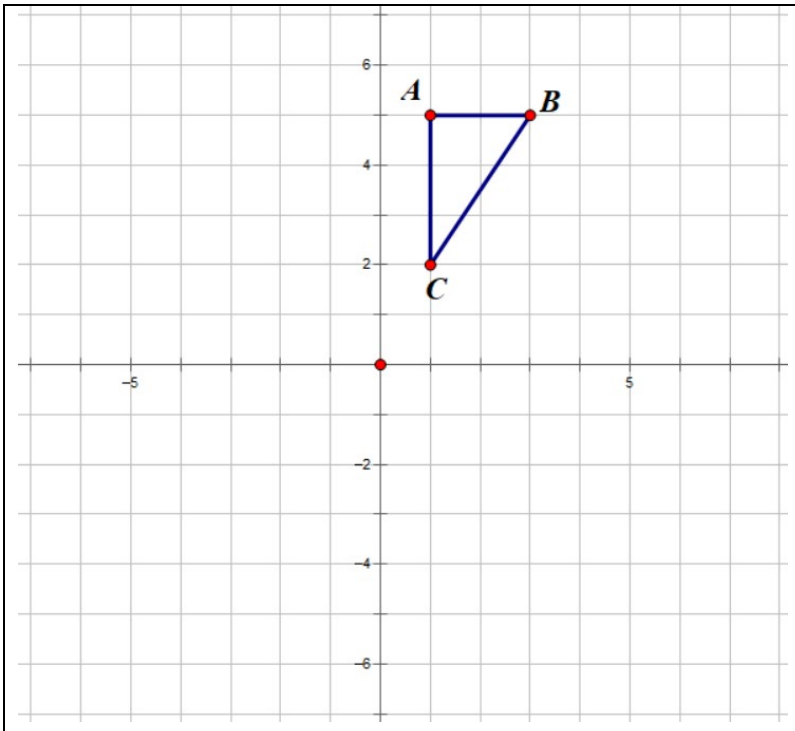
What do you notice?

_____

Write a transformation rule:

(rotating 90° about the origin)

Case 2: ROTATING 180° (cw or ccw)



Graph the image then write the coordinates of the preimage and the image in the table below:

A(_____,_____)	A'(_____,_____)
B(_____,_____)	B'(_____,_____)
C(_____,_____)	C'(_____,_____)

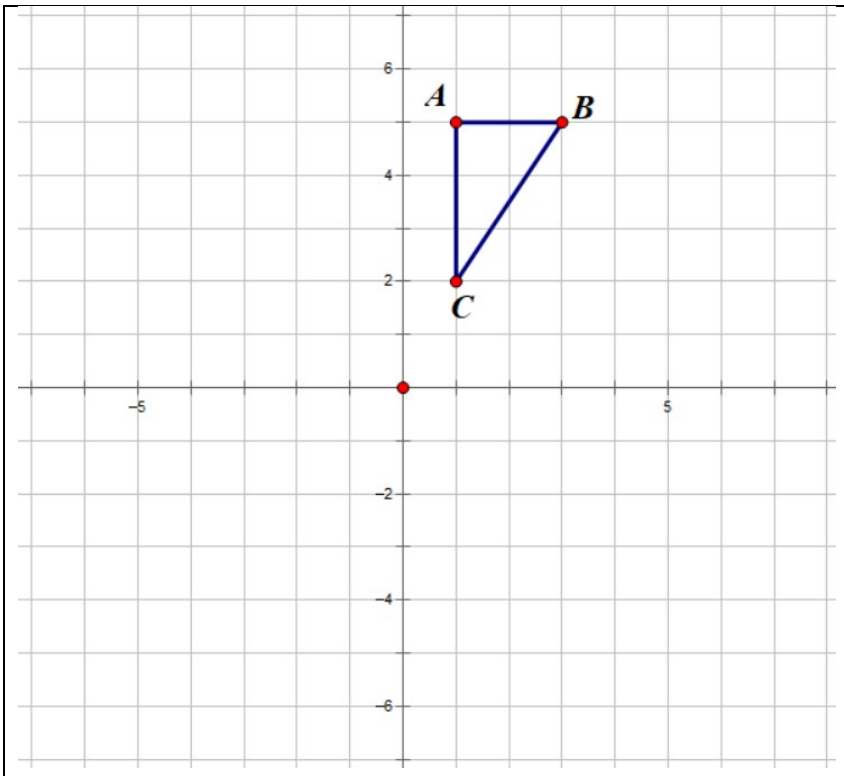
What do you notice?

_____

Write a transformation rule:

(rotating 180° about the origin)

Case 3: ROTATING 270° ccw (same as 90° cw)



Graph the image then write the coordinates of the preimage and the image in the table below:

A(_____,_____)	A'(_____,_____)
B(_____,_____)	B'(_____,_____)
C(_____,_____)	C'(_____,_____)

What do you notice?

_____

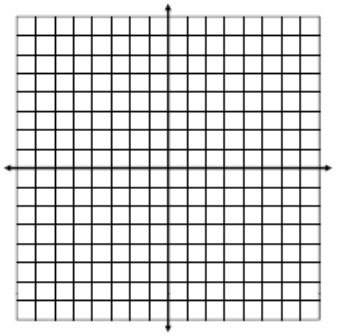
Write a transformation rule:

(rotating 270° about the origin)

Examples (use the rules above to guide you):

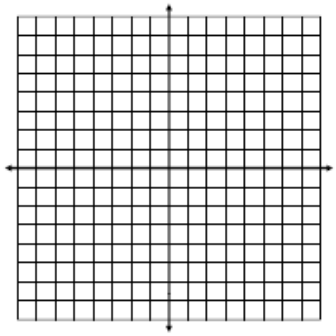
Directions: Graph and label each figure and its image under the given rotation about the origin.

1. Rhombus $ABCD$ with vertices $A(2, 6)$, $B(6, 7)$, $C(5, 3)$, and $D(1, 2)$: **180°**



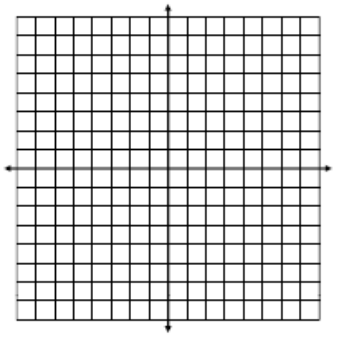
A'(____, ____)
B'(____, ____)
C'(____, ____)
D'(____, ____)

2. Trapezoid $STUV$ with vertices $S(-7, -1)$, $T(-2, -3)$, $U(-2, -5)$, and $V(-7, -7)$: **90° counterclockwise**



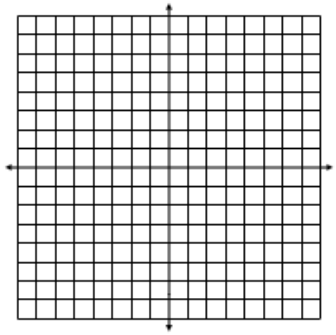
S'(____, ____)
T'(____, ____)
U'(____, ____)
V'(____, ____)

3. Triangle FGH with vertices $F(-7, 8)$, $G(-1, 1)$, and $H(-8, 4)$: **270° counterclockwise**



F'(____, ____)
G'(____, ____)
H'(____, ____)

4. Square $JKLM$ with vertices $J(1, -3)$, $K(5, 0)$, $L(8, -4)$, and $M(4, -7)$: **90° clockwise**



J'(____, ____)
K'(____, ____)
L'(____, ____)
M'(____, ____)