

Geometry H
Rotations

A. Plot the points A(1, 0), B(5, 0), and C(3, -2)

1st: Reflect ABC over x-axis to A'B'C'

2nd: Reflect A'B'C' over y-axis to A''B''C''

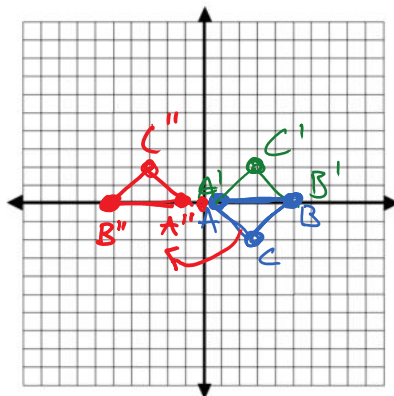
Compare ABC to A''B''C''.

$$A(1, 0) \Rightarrow A''(-1, 0)$$

$$B(5, 0) \Rightarrow B''(-5, 0)$$

$$C(3, -2) \Rightarrow C''(-3, 2)$$

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



Rotation 180°

B. Plot the points A(1, 0), B(5, 0), and C(3, -2)

1st: Reflect ABC over y = x to A'B'C'

2nd: Reflect A'B'C' over the y-axis to A''B''C''

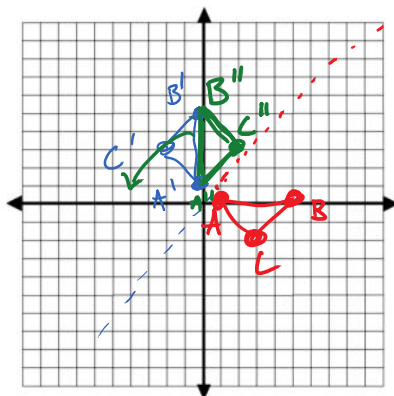
Compare ABC to A''B''C''.

$$A(1, 0) \rightarrow A''(0, 1)$$

$$B(5, 0) \rightarrow B''(0, 5)$$

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

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



Counterclockwise 90° Rotation

Generalize:

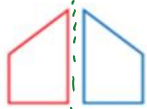
90° $(x, y) \rightarrow (-y, x)$

180° $(x, y) \rightarrow (-x, -y)$ *

270° $(x, y) \rightarrow (y, -x)$
(-90°)

$(x, y) \Rightarrow (x, y)$

Is it a rotation?



Reflection



Translation

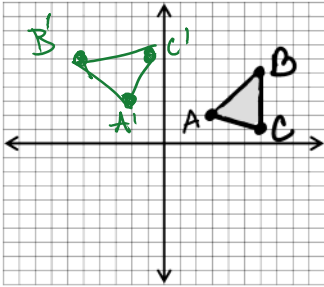


Rotation



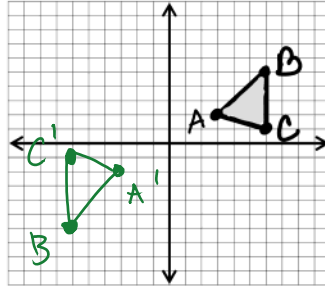
Rotation

1. Rotate $\triangle ABC$, 90° about the origin



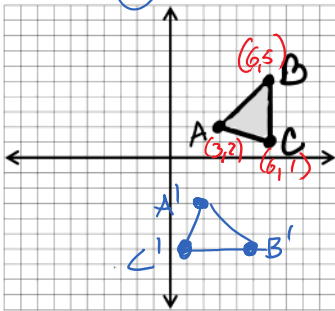
$A'(-2, 3)$ $B'(-5, 6)$ $C'(-1, 6)$

2. Rotate $\triangle ABC$ 180° about the origin



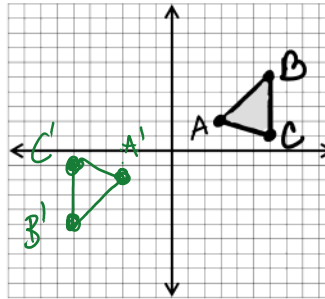
$A'(-3, -2)$ $B'(-6, -5)$ $C'(-6, -1)$

3. Rotate $\triangle ABC$, -90° about the origin



$A'(2, -3)$ $B'(5, -6)$ $C'(1, -6)$

4. Rotate $\triangle ABC$, -180° about the origin



$A'(-3, -2)$ $B'(-6, -5)$ $C'(-6, -1)$

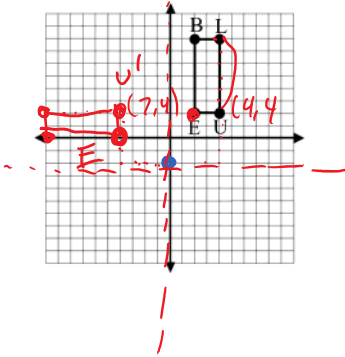
$$90^\circ \rightarrow (-y, x)$$

$$180^\circ \rightarrow (-x, -y)$$

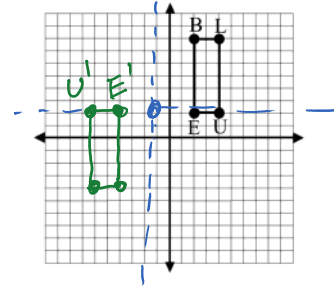
$$270^\circ / -90^\circ \rightarrow (y, -x)$$

Let's get crazy!

5. Rotate 90° about $(0, -2) = R_{(90^\circ, (0, -2))}$



6. Rotate 180° about $(-1, 2) = R_{(180^\circ, (-1, 2))}$



$$90^\circ \rightarrow (-y, x)$$

$$180^\circ \rightarrow (-x, -y)$$