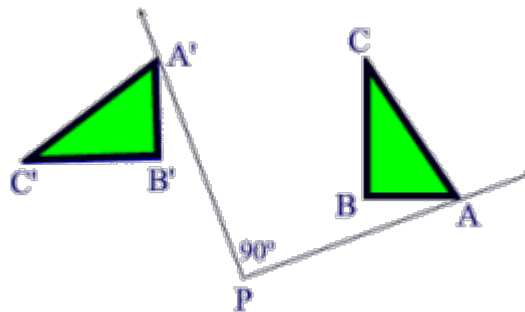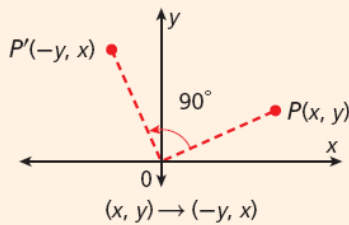# Rotations

A **rotation** is a transformation that turns a figure about a fixed point called the center of rotation. An object and its rotation are the **same shape and size**, but the **figures may be turned in different directions.**   Rotations can occur in either a **clockwise** or **counterclockwise** direction. The figure does not change size.
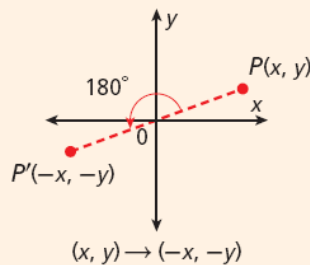

Rotations in the Coordinate Plane

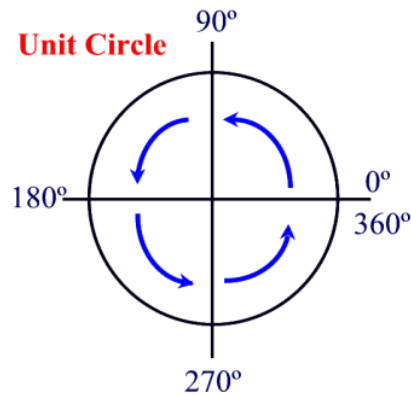| BY 90° ABOUT THE ORIGIN	BY 180° ABOUT THE ORIGIN
$P'(-y, x)$ $90°$ $P(x, y)$ 0 $(x, y) \rightarrow (-y, x)$	$180°$ $P(x, y)$ $P'(-x, -y)$ 0 $(x, y) \rightarrow (-x, -y)$

Notice that a rotation of 180° about the origin is the same as a point reflection. A rotation of 360° would match the image with its preimage. A positive angle of rotation turns the figure counterclockwise, and a negative angle of rotation turns the figure in a clockwise direction.

Counterclockwise	Clockwise	Rule
R_{90}	R_{-270}	$(x, y) \rightarrow (-y, x)$
R_{180}	R_{-180}	$(x, y) \rightarrow (-x, -y)$
R_{270}	R_{-90}	$(x, y) \rightarrow (y, -x)$

Notice that degree movement on a unit circle goes in a **counterclockwise** direction.
You will want to remember the layout of the unit circle when you are graphing figures and their rotations.


Examples

1. What is the image of the point $(6, -3)$ under the rotation R_{90} about the origin?

2. What is the image of the point $(-5, 10)$ under the rotation R_{270} about the origin?

3. What is the image of the point $(2,4)$ under the rotation R_{-90} about the origin?

4. A. Graph and label ΔJKL with vertices $J(2, 2)$, $K(4, -5)$, and $L(-1, 6)$
   B. Graph, label and state the coordinates of $\Delta J'K'L'$, the image of ΔJKL after a rotation of 180° about the origin.
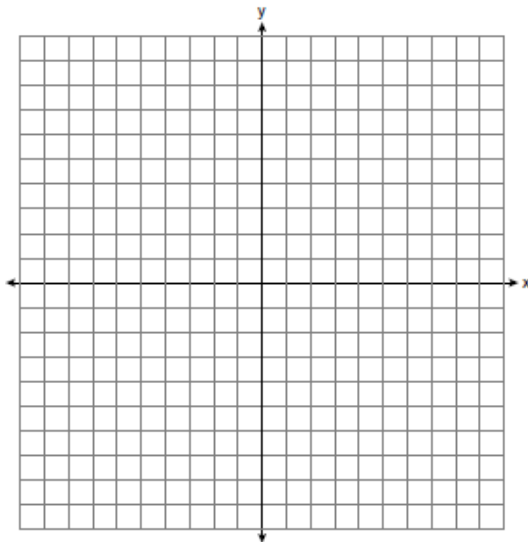
5. A rectangle is plotted on the coordinate plane below. Draw the image of this rectangle after the rotation R_{-90}.
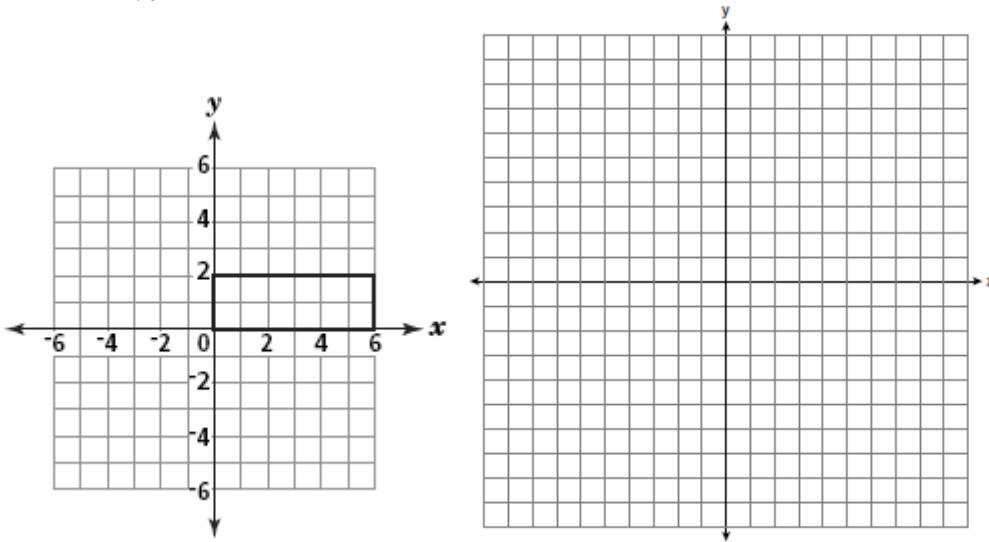
6. A triangle is plotted on the coordinate plane below. Draw the image of this triangle after the rotation R_{90}.
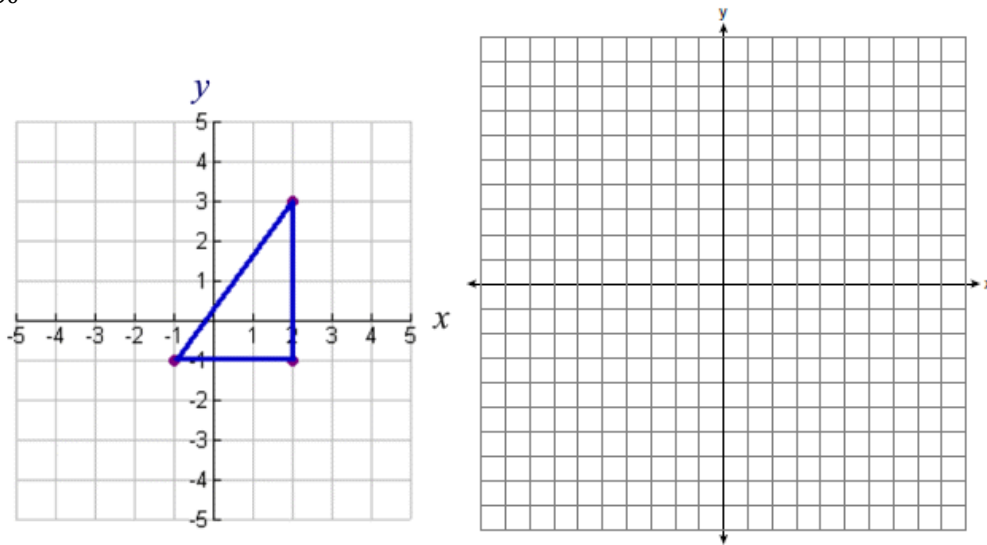
7. A clockwise rotation of 90° is the same as a counterclockwise rotation of _____.

8. A clockwise rotation of 180° is the same as a counterclockwise rotation of _____.

9. A clockwise rotation of 270° is the same as a counterclockwise rotation of _____.

10. A rotation of 360° is the same as a rotation of _____.

11. The drawing below shows a rotation of _____ or _____.
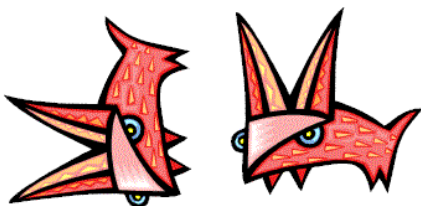
Name _____   Date_____

Lesson 13: Rotations

Exit Ticket

Find the center of rotation and the angle of rotation for the transformation below.