# Rotations (Using Geometer's Sketchpad 4.0) 

Discover what happens when you rotate a triangle.
Open software and set up: Open Geometer's Sketchpad 4.0.


®.
Expand the screen to full screen view. On the left vertical toolbar, be sure that the arrow is clicked. Under DISPLAY, choose Show Text Palette.

## Set the graph grid: Under GRAPH, choose Grid Form, Square Grid.

Plot the points for the triangle: Under GRAPH, choose Plot Points and plot (2,1), $(6,2),(3,4)$. In the drop down box for Plot Points, use your mouse (or TAB key) to enter the coordinates. Hit PLOT.

Complete the triangle: To draw the triangle, highlight (by clicking on) the three points. Choose CONSTRUCT, Segments. If you would like to label your triangle vertices, choose the A from the left vertical toolbar, and click on each point. Highlight the three vertices only of the triangle. Choose CONSTRUCT, Interior. Adjust your color by right clicking in the triangle interior and choosing a new color.

Measure the coordinates: Highlight one point. Be sure only the point is highlighted. Under MEASURE, choose Coordinates. This will place the coordinates on the screen. Repeat this process for each of the points.

Mark the point of rotation: Highlight the origin. Under TRANSFORM, choose Mark center. We are getting ready to rotate the triangle about the origin.

Rotate the figure: You will need to select the triangle by drawing a marquee around the figure. With your arrow clicked, use your mouse to click a starting corner to draw a box (marquee) around the triangle. The triangle will become highlighted. Under TRANSFORM, choose
 Rotate and enter $90^{\circ}$.


Now investigate:

1. Measure the coordinates of the image triangle. What do you notice?

Generalize your hypothesis into a rule that will illustrate the changes in the coordinates:

$$
\text { Rotation: } \quad R_{90^{\circ}}(x, y) \rightarrow(\quad, \quad)
$$

2. Was the rotation clockwise or counterclockwise? $\qquad$
3. Highlight one side of the original triangle. Choose MEASURE, Length. Record this length. $\qquad$ Highlight the corresponding side in the image triangle. MEASURE, Length. Record this length.
$\overline{\text { Do the sides of a triangle maintain their lengths through a rotation? }}$ $\qquad$
4. Choose an angle in the original triangle by highlighting three vertices in order. Choose MEASURE, Angle. Record this measurement. $\qquad$
Highlight the corresponding angle in the image triangle. MEASURE, Angle. Record this measurement. $\qquad$
Do the angles of a triangle maintain their measurements through a rotation? $\qquad$
5. Delete everything except the original triangle. Rotate the original triangle $180^{\circ}$.

Measure the coordinates of the image triangle. What do you notice? $\qquad$
Generalize your hypothesis into a rule that will illustrate the changes in the coordinates:

$$
\text { Rotation: } R_{180^{\circ}}(\mathrm{x}, \mathrm{y}) \rightarrow(\quad, \quad)
$$

6. Delete everything except the original triangle. Rotate the original triangle $180^{\circ}$. Measure the coordinates of the image triangle. What do you notice? $\qquad$
Generalize your hypothesis into a rule that will illustrate the changes in the coordinates:

$$
\text { Rotation: } R_{270^{\circ}}(\mathrm{x}, \mathrm{y}) \rightarrow(\quad, \quad)
$$



