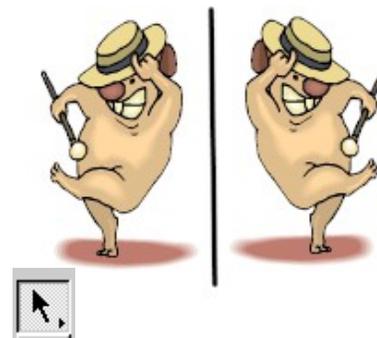


Line Reflections (Using Geometer's Sketchpad 4.0)

Discover what happens when you reflect a triangle over a line.

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 line of reflection: Highlight the y-axis. Under **TRANSFORM**, choose **Mark mirror**. We are getting ready to reflect the triangle over the y-axis.

Reflect 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 **Reflect**.



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:

Reflection in the y-axis: $r_{y\text{-axis}}(x, y) \rightarrow (\quad , \quad)$

Highlight one side of the original triangle. Choose **MEASURE, Length**. Record this length. _____
Highlight the corresponding side in the image triangle. **MEASURE, Length**. Record this length. _____
Do the sides of a triangle maintain their lengths through a reflection? _____

2. Make the x -axis the mirror. Reflect the triangle. 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:

$$\text{Reflection in the } x\text{-axis: } r_{x\text{-axis}}(x, y) \rightarrow (\quad , \quad)$$

Choose an angle in the original triangle by highlighting three vertices in order. Choose MEASURE, Angle. Record this measurement. _____ Highlight the corresponding angle in the image triangle. MEASURE, Angle. Record this measurement. _____ Do the angles of a triangle maintain their measurements through a reflection? _____

3. Delete all figures except the original triangle. (Draw a marquee around the figure and press DELETE.) Draw the line $y = x$ by plotting two coordinates on the line such as $(-1, -1)$ and $(0, 0)$.

From the left vertical tool bar, choose the line tool --  arrow to right to get line . Click on the two points to establish the line. (Lines drawn as functions cannot be marked as mirrors.)

Mark the line as the mirror. Reflect the triangle. 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:

$$\text{Reflection in line } y = x: r_{y=x}(x, y) \rightarrow (\quad , \quad)$$

4. Delete all figures except the original triangle. Draw the line $y = -x$. Mark the line as the mirror. Reflect the triangle. 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:

$$\text{Reflection in line } y = -x: r_{y=-x}(x, y) \rightarrow (\quad , \quad)$$

