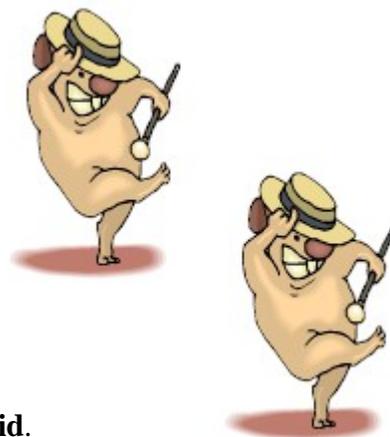


Translations (Using Geometer's Sketchpad 4.0)

Discover what happens when you translate 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.

There are two methods for translating images:

1. Translate 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 **Translate**. State the fixed distance and fixed angle. Try to keep the translated figure on the screen.



2. Translate by a Marked Vector: Construct a segment AB anywhere on the screen, then select, in order points A and B. Under **TRANSFORM**, choose **Mark vector**. Select the original triangle. Choose **TRANSFORM, Translate**. Choose **By Marked Vector**.

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:

Translation: $T_{a,b}(x, y) \rightarrow (\quad , \quad)$

2. 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 translation? _____
3. 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 translation? _____
4. Delete all figures except the original triangle. (Draw a marquee around the figure and press DELETE.)
- From the left vertical tool bar, choose the line tool --  arrow to right to get line . Draw a line anywhere on the screen. Keep the line relatively close to the triangle.
- Plot a point anywhere on the screen about 2 inches from the line. Highlight the point and the line. Choose **CONSTRUCT, Parallel line**.
5. Mark the first line as a mirror (Highlight line, choose **TRANSFORM, Mark mirror**). Highlight the original triangle, choose TRANSFORM, Reflect. Using this same process, choose the image triangle and reflect it over the parallel line.
- What do you notice about the relationship between the original triangle and the final reflection? _____

With this observation in mind, a translation can be described as a composition of which two transformations? _____

