

Geometry Activity

Introduction:

In geometry we can reflect, rotate, translate, and dilate a figure. In this activity lists and statistical plots on the TI-83 Plus Silver Edition will be used to illustrate and explore the relationships.

Calculator Setup:

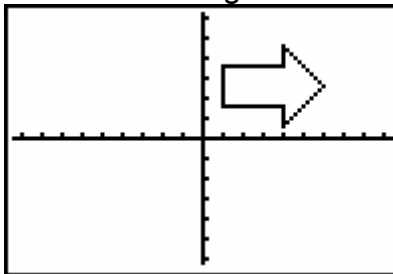
Set your window so that the values for min and max on both x and y are double what they would be in the ZDecimal window.

```
WINDOW
Xmin=-9.4
Xmax=9.4
Xscl=1
Ymin=-6.2
Ymax=6.2
Yscl=1
Xres=1
```

Then enter the following numbers in L₁ and L₂ respectively.

L ₁	L ₂
1	1.5
4	1.5
4	.5
6	2.5
4	4.5
4	3.5
1	3.5
1	1.5

Finally create a connected scatterplot in Plot 1 using L₁ as the x values and L₂ as the y values. Use the smallest mark so the points won't show up in the figure. You should have a screen like the following when finished.



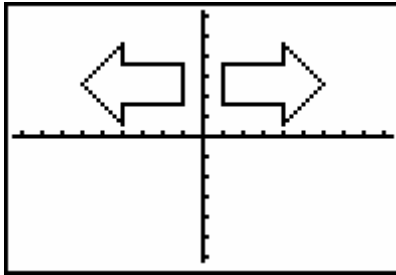
The x values for this figure are stored in L₁ and the y values are stored in L₂.

Rotations and Reflections:

Now in the statistics editor move to the column heading for L_3 and type $-L_1$. Likewise move to the column heading for L_4 and type $-L_2$. This will give you the negative x values in L_3 and the negative y values in L_4 . To create reflections and rotations you can explore with different combinations of L_1 , L_2 , L_3 , and L_4 .

	Ordered Pair	Lists (x then y)
Original image:	(x, y)	L_1 vs. L_2
Reflection over x axis	$(-x, y)$	L_3 vs. L_2
Reflection over y axis	$(x, -y)$	L_1 vs. L_4
Reflection over x then y	$(-x, -y)$	L_3 vs. L_4
Rotation 90° about origin	$(-y, x)$	L_4 vs. L_1
Rotation 180° about origin	$(-x, -y)$	L_3 vs. L_4
Rotation 270° about origin	$(y, -x)$	L_2 vs. L_3
Reflection about $y = x$	(y, x)	L_2 vs. L_1

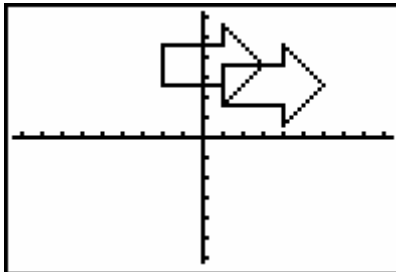
The image below shows the original image and the reflection over the x axis as an example.



Students could be asked to draw these by hand and by using the calculator to emphasize the skills.

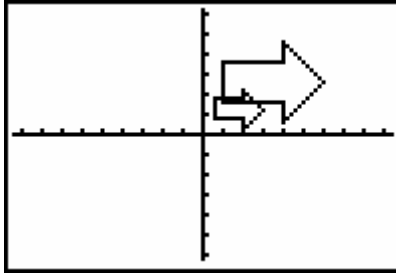
Translations:

To translate a figure horizontally you need to add or subtract from the x values. Likewise to translate a figure vertically you need to add or subtract from the y values. Go to the column heading for L_5 and type $L_1 - 3$. Next go to the column heading for L_6 and type $L_2 + 1$. Then create a plot with L_5 as the x values and L_6 as the y values. This should be an image shifted left 3 units and up 1 unit.



Dilations:

To dilate a figure horizontally the x values must be multiplied by a scaling factor and likewise to dilate it vertically the y values must be multiplied by a scaling factor. In the column heading for L_5 type $.5L_1$ and in the column heading for L_6 type $.5L_2$. The plot of L_5 vs. L_6 should be a reduction of 50% of the original.



Extension Ideas:

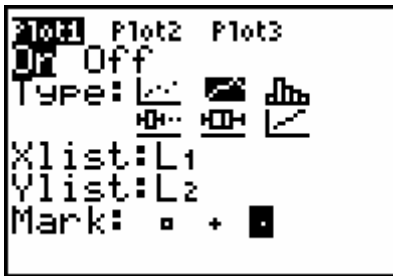
- Have students design their own image and move through the reflections to create “artwork”.
- Explore rotations of other degree measures. This requires Trigonometry, but is a useful extension if appropriate.
- Play match my image. Create an original and an image that has been manipulated. Have students explore until they match your new image.

Name _____

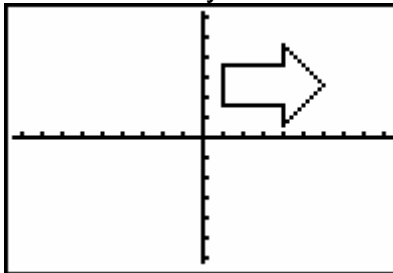
Student Activity Sheet – Geometry Activity

You have received two lists L_1 and L_2 via the TI-Navigator hubs. Also you should have received a window setting. You will not need to change these throughout the entire activity. This activity will ask you to explore certain connected scatterplots to learn about transformations, rotations, reflections, and dilations.

Begin by creating a connected scatterplot of L_1 vs. L_2 . Your setup should look like the following for Plot 1. You will use L_1 as the x-values and L_2 as the y-values.



Because you have been sent the window setting you do not need to change those settings. Simply press \square and you should see the following image.



Now you need to create some lists of your own. We want to create the negatives of the lists we used to create the original graph. To do this press \dots then \square . This will take you to the list editor where you will see the numbers send from the teacher.

L1	L2	L3	1
4	1.5	-----	
4	1.5		
4	1.5		
6	2.5		
4	4.5		
4	3.5		
1	3.5		

$L1(1) = 1$

Move your cursor to the column heading for L_3 and press $\leftarrow y \rightarrow$. This will make L_3 be a negative copy of L_1 . Repeat this process for L_4 by making a negative copy of L_2 .

L_2	L_3	L_4
1.5	-1	-----
1.5	-4	
2.5	-4	
2.5	-6	
4.5	-4	
4.5	-4	
6.5	-1	

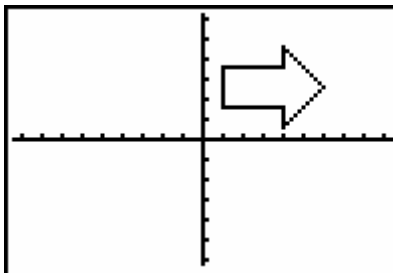
$L_4 = -L_2$

Now let's make sure we understand what we have. We have the original x-values in L_1 and the original y-values in L_2 . Also we now have the negative x values in L_3 and the negative y values in L_4 . To create different images you can explore with different combinations of L_1 , L_2 , L_3 , and L_4 in plot 2.

L_3 vs. L_2

Make a prediction about what will happen if you create a graph of L_3 vs. L_2 . How will the new image compare to the original? _____

Create the plot in Plot 2 and sketch your result in the plot below. Was your prediction correct? If not what happened? _____

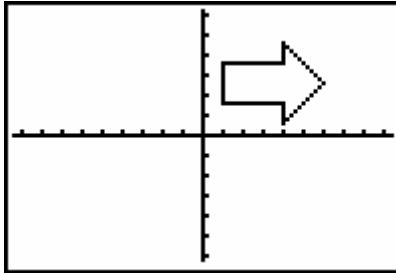


Reflections: _____

L₁ vs. L₄

Make a prediction about what will happen if you create a graph of L₁ vs. L₄. How will the new image compare to the original? _____

Create the plot in Plot 2 and sketch your result in the plot below. Was your prediction correct? If not what happened? _____

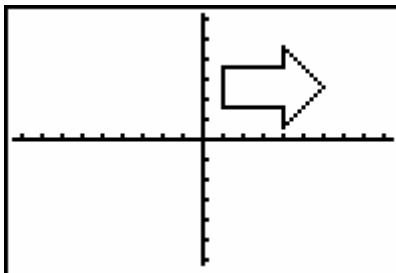


Reflections: _____

L₃ vs. L₄

Make a prediction about what will happen if you create a graph of L₃ vs. L₄. How will the new image compare to the original? _____

Create the plot in Plot 2 and sketch your result in the plot below. Was your prediction correct? If not what happened? _____

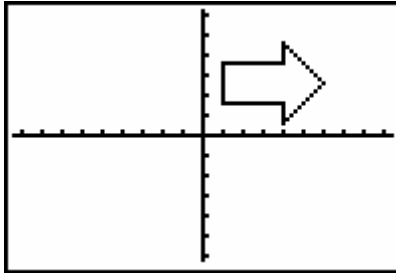


Reflections: _____

L_4 vs. L_1

Make a prediction about what will happen if you create a graph of L_4 vs. L_1 . How will the new image compare to the original? _____

Create the plot in Plot 2 and sketch your result in the plot below. Was your prediction correct? If not what happened? _____

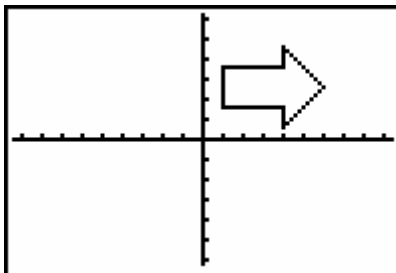


Reflections: _____

L_2 vs. L_3

Make a prediction about what will happen if you create a graph of L_2 vs. L_3 . How will the new image compare to the original? _____

Create the plot in Plot 2 and sketch your result in the plot below. Was your prediction correct? If not what happened? _____

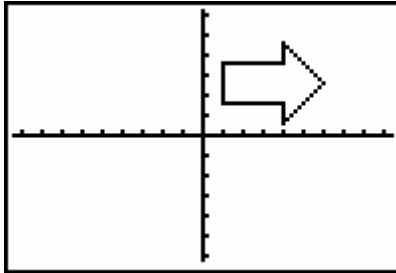


Reflections: _____

L_2 vs. L_1

Make a prediction about what will happen if you create a graph of L_2 vs. L_1 . How will the new image compare to the original? _____

Create the plot in Plot 2 and sketch your result in the plot below. Was your prediction correct? If not what happened? _____



Reflections: _____

Now create and explore with your own image using a connected scatterplot. List the coordinates for the x-values and the y-values below and draw a picture of your creation.

x values	
y values	

