

<b>LessonTitle: Transforming Snoopy and Bridget</b>		<b>Geo 6.1</b>
<b>Utah State Core Standard and Indicators</b> Geometry Content Standards Process Standards 1-4		
<b>Summary</b>		
In this lesson, students create a picture on the graphing calculator screen using coordinate points in a list. They transform the picture by revising the lists. In the second activity, students predict coordinates for specified transformations. A third calculator transformation activity, Bridget Blockhead, is also included—this could be used as assessment.		
<b>Enduring Understanding</b>	<b>Essential Questions</b>	
The coordinate grid enables us to specify locations in transformations.	How do you transform figures on the coordinate grid ?	
<b>Skill Focus</b>	<b>Vocabulary Focus</b>	
<ul style="list-style-type: none"> <li>• Reflecting and translating a geometric shape in a coordinate grid.</li> <li>• Predicting coordinates for specified transformations.</li> </ul>		
<b>Assessment</b>		
Use Bridget Blockhead. (see below)		
<b>Materials:</b> Graphing Calculators, Computers with Geometer’s Sketchpad, graph paper, Worksheets		
<b>Launch</b>		
<b>Explore</b>		
<b>Summarize</b>		
<b>Apply</b>		

**Directions:** To give students a visual understanding of transformations in the coordinate plane, please access and use Reflections and Translations in the Coordinate Plane, pages 38-39, Exploring Geometry with Geometer’s Sketchpad. This will introduce them to the four quadrants and to setting up a grid using Geometer’s sketchpad. The Snoopy and Bridget activities were designed for the graphing calculator, but could also be done using Geometer’s Sketchpad.

You could also read and discuss A Fly on the Ceiling, A Math Myth by Dr Julie Glass. This book is a myth about Rene Descartes inventing the coordinate grid.

**The directions for creating a picture using lists are included below. The directions for the TI 83 also include a short introductory to transforming on the calculator. This is probably useful.**

The Bridget transformations activity is intended as an assessment. Please note that the activity is more difficult than the Snoopy activity. This is still appropriate as an assessment. If students understand the concept of transformation using coordinate points, they can problem solve to discover the more difficult rules.

Note: In addition to drawing a picture using calculator lists, students can also draw on the calculator screen. To do so,

- set the x and y scales in the window to 1.
- Press Draw, 1, Enter.
- Clear all equations in y=.
- Turn all plots off. (2<sup>nd</sup>, y=, 4, enter.)
- Push Graph.
- Press Draw, 2.
- Use the arrow keys to go up and down. Press enter when you want a point.
- Continue. After the second point, press enter again in order to begin a new line. Continue.

To store pictures in the calculator, do the following: Draw, Sto, 1, 2<sup>nd</sup> Apps, 4, 1(or 2 or 3), enter. (The calculator can store 3 pictures. You must remember where your picture is.)

### Directions for creating a picture on the TI 73

1) Reset the calculator.

- Turn **ON** calculator.
- Press and release 2<sup>nd</sup> and then press 0. (MEM is in yellow above the zero)
- Under the memory menu, press 7 (reset) press 1 (ALLRAM) press 2 (reset) **ENTER**.
- You are now on the Home Screen. Press 2<sup>nd</sup> **MODE** (QUIT) when you want to exit a menu and return to the Home screen.

2) Set your screen window.

3) Mode Settings.

Press **WINDOW**: Set the following.

Xmin = -17  
Xmax = 17  
 $\Delta X$  = (skip this one)  
Xscl = 5  
Ymin = -17  
Ymax = 17  
Yscl = 5

Press **MODE**: Set all to the left

(All highlighting is on the left)

4) Prepare the plot.

- Press 2<sup>nd</sup>, and **Y=** ( PLOT) Number one should be highlighted.
- Press ENTER.
- Highlight On
- Down arrow, right arrow to the Line Graph
- Press ENTER, arrow down.
- Xlist should say L1 and Ylist should say L2.
- Arrow down to Mark.
- Arrow right, highlight the **dot**
- Press ENTER.

5) Format the screen to draw a picture.

- Press 2<sup>nd</sup> and **ZOOM**: (FORMAT)
- Highlight then **ENTER**

CoordOn  
GridOFF      LabelOFF  
AxesOFF      ExprOFF

6) Enter the data.

- Press **LIST**, this is where we will enter data
- Enter the domain values (x's) in L1.
- Enter the range values (y's) in L2.
- Make certain the values are in order and that the x and y values correspond.

## Directions for creating and transforming a picture on the TI 83 calculator

1. Use the stat registers and statplots to graph a triangle.

- Clear out lists
  - Clear the Y=
  - Set window
- |      |    |   |
|------|----|---|
| Xmin | -6 | This is a small window for a small picture. |
| Xmax | 6  |   |
| Xscl | 1  |   |
| Ymin | -4 |   |
| Ymax | 4  |   |
| Yscl | 1  |   |

- Enter the coordinates of the vertices of the triangle into  $L_1$  and  $L_2$ . The X's in  $L_1$  and Y's in  $L_2$ . (Note: The first point is entered into the list again at the bottom in order for the figure to close.)

	$L_1$	$L_2$
A (1, 3)	1	3
B (1, 2)	1	2
C (3, 1)	3	1
	1	3

- Graph the triangle using Stat Plots. Go to statplots and turn on plot one (all others need to be off). Select the line plot. Highlight the location of the x-coordinates ( $L_1$ ) and the location of the y-coordinates ( $L_2$ ).

Choose your mark and press GRAPH. You should see your triangle.

2. Translating the triangle three units to the left and one unit down will change the coordinates of the vertices.

- Use your graph paper to sketch both the preimage and image. Write the coordinates of the image points below.

A (1, 3)	A' (____, ____)
B (1, 2)	B' (____, ____)
C (3, 1)	C' (____, ____)

- Observe the change in the coordinates and write a rule describing the transformation of any given point (x, y) under this translation.

3. Now perform the translation on the graphing calculator using the rule you discovered.

- From the home screen type:  $L_1 - 3$  sto  $L_3$  Enter. Notice that these are the X-coordinates of the image you sketched!
- Now input the y-coordinates:  $L_2 - 1$  sto  $L_4$  Enter
- Turn on statplot 2 as above and highlight  $L_3$  and  $L_4$  as new locations for and y.
- Press GRAPH and you will see both pre-image and image.

4. Now you can do translations of all types! Try these:

- Move the triangle 5 units left and 3 units down.
- Move the triangle 2 units left and 2 units up.

5. Write a general rule for the translation of figures.

### EXTENSION:

Using the example presented in class as a model, tell how you will get the calculator to perform:

1. Reflection of the triangle

- Over the x-axis
- Over the y-axis
- Over the line  $y = x$

2. Rotation of the triangle about the origin

- Of 90 degrees
- Of 180 degrees
- Of -90 degrees

3. Dilation from the origin of the triangle

- With a scale factor of 2
- With a scale factor of  $1/3$
- With a scale factor of -2

## Snoopy on the Graphing Calculator

1) Follow the directions to set up your calculator to create this picture.

- |             |              |             |           |              |             |
|-------------|--------------|-------------|-----------|--------------|-------------|
| 1. (-2,2)   | 9. (-6,-16)  | 17. (3,-15) | 25. (1,0) | 33. (9,11)   | 41. (-10,9) |
| 2. (-4,0)   | 10. (-3,-17) | 18. (6,-11) | 26. (0,2) | 34. (7,16)   | 42. (-7,6)  |
| 3. (-6,-3)  | 11. (-1,-17) | 19. (6,-9)  | 27. (1,4) | 35. (5,17)   | 43. (-5,5)  |
| 4. (-6,-8)  | 12. (-2,-15) | 20. (4,-11) | 28. (3,5) | 36. (3,17)   | 44. (-2,4)  |
| 5. (-4,-12) | 13. (-2,-13) | 21. (2,-11) | 29. (4,2) | 37. (1,16)   | 45. (-2,2)  |
| 6. (-4,-14) | 14. (1,-13)  | 22. (3,-9)  | 30. (5,1) | 38. (-1,15)  |             |
| 7. (-7,-12) | 15. (0,-16)  | 23. (3,-6)  | 31. (8,4) | 39. (-7,14)  |             |
| 8. (-9,-12) | 16. (1,-17)  | 24. (2,-3)  | 32. (9,7) | 40. (-10,12) |             |

2) After the coordinate points are entered, press **GRAPH**

3) Press **TRACE** to move from coordinate point to point using the arrows. Record the coordinate points for the following.

- The tip of the nose. \_\_\_\_\_
- The tip of his right toe. \_\_\_\_\_
- The tip of his left toe. \_\_\_\_\_
- The back of his neck. \_\_\_\_\_
- The coordinate ( -6, -16 ) is on his \_\_\_\_\_ .
- The coordinate ( 8, 4 ) is on his \_\_\_\_\_ .
- What do you think a good coordinate would be for his eye? \_\_\_\_\_
  
- Did you have as much dog-gone fun as I did? (don't answer that!)

## Which Way Snoopy?

Predict what you could do with your lists to...

- Make snoopy face the opposite direction?
  
- Flip Snoopy upside down.
  
- Flip Snoopy upside down facing the opposite direction
  
- Make snoopy fall on his tail (falling right).
  
- Make snoopy fall on his nose (falling left).

Experiment with the following to help you.

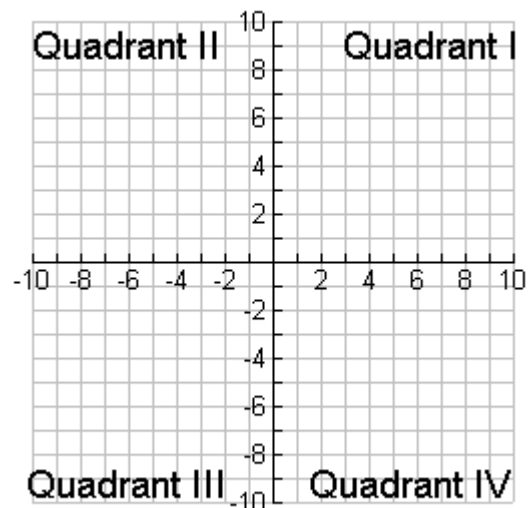
1) Plot these points on a grid. Connect the points as you go.. Then draw a reflection of the figure in quadrant 1. Fill in the new point coordinates:

x	y		x	y
-6	6			
-6	1			
-2	3			

Plot these points. Draw a reflection in Quadrant III. Fill in the new points.

x	y		x	y
6	-6			
6	-1			
2	-3			

Explain what you must do to reflect from left to right or right to left..

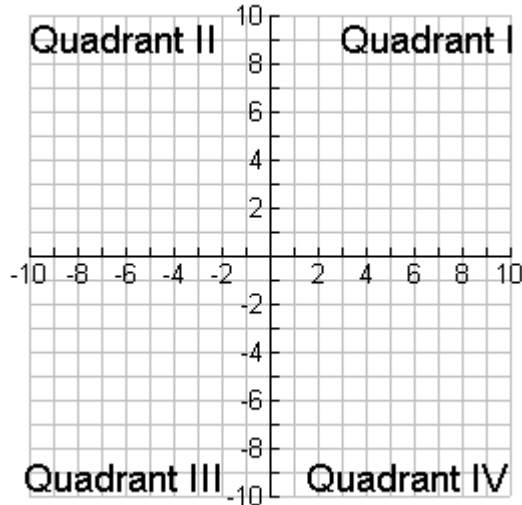


Now plot these points. Change the x values to the opposite sign and graph..

x	y	x	y
-6	6		6
-6	1		1
2	3		3

x	y	x	y
6	-6		-6
6	-1		-1
-2	-3		-3

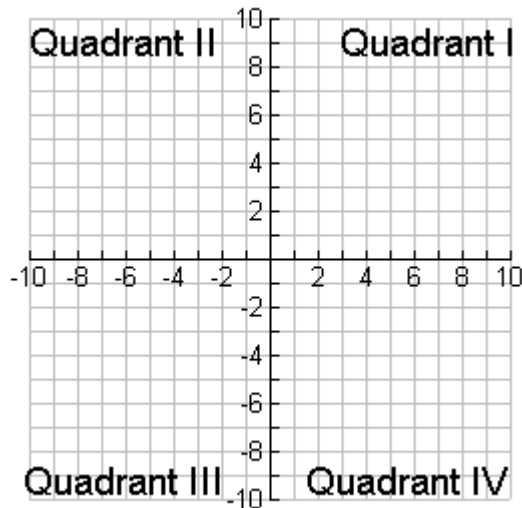
What happened? Why?



2) Plot these points on a grid. Connect the points as you go. Make a reflection of this figure in quadrant I. Record the coordinates for the reflection in the table. What change must be made in the coordinate points? \_\_\_\_\_

IV		I		III	
x	y	x	y	x	y
5	-2				
3	-4				
5	-5				
2	-7				
2	-2				

Reflect the figure in quadrant I and put it in Quadrant III. What must happen?



Explain the difference between reflecting back and forth and reflecting up and down.

into

up

**Now go back and check or revise your answers about moving Snoopy. Think hard about the falling moves!**

# Slides and Flips

## Transformations on a Coordinate Plane

1) Write the coordinates for ...  
Figure 1 \_\_\_\_\_

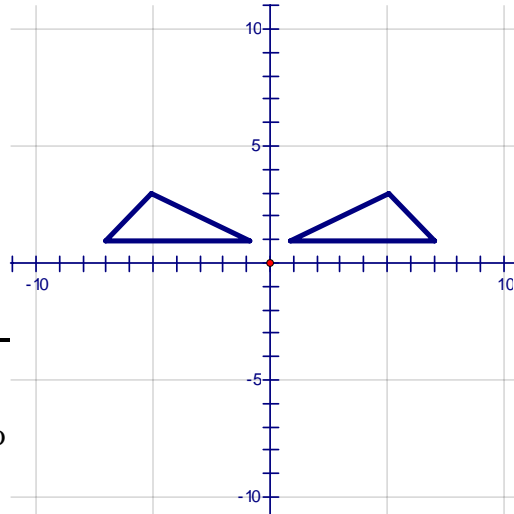
Figure 2 \_\_\_\_\_

2) What happened to figure 1 to transform it

3) Predict the coordinates for triangle 1 if shifted 3 units right.

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4) Write a rule to help you remember how to figure horizontally using just the coordinate



to figure 2?

shifted 3

slide a points.

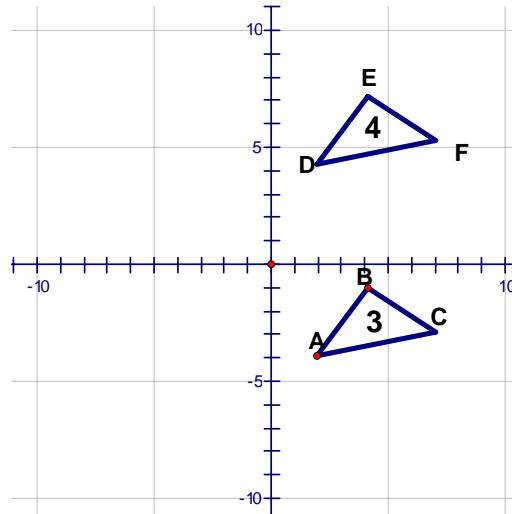
5) Write the coordinates for the triangles.  
Triangle 3 \_\_\_\_\_

Triangle 4 \_\_\_\_\_

6) What happened to figure 3 to transform it to figure 4?

7) Predict the coordinates for triangle 3 if shifted up 5 units.

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8) Write a rule for transforming a shape vertically using just coordinate points.

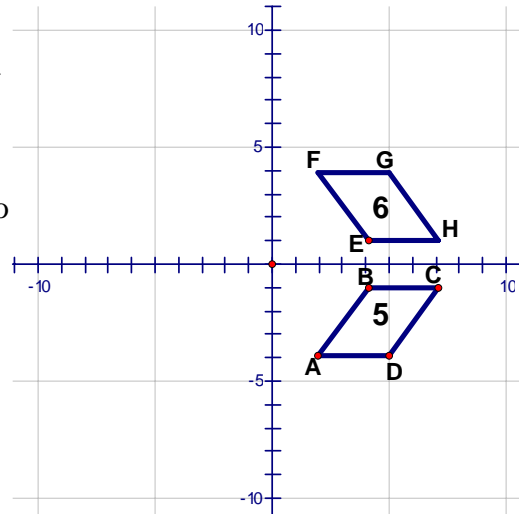
9) Write the coordinates for...

Figure 5 \_\_\_\_\_

Figure 6 \_\_\_\_\_

10) What happened to figure 5 to transform it to 6?

11) Predict the coordinate points for figure 6 if reflected over the y axis. Verify your prediction.



figure

12) Write a rule to help you remember what to do to flip a figure over the x axis. Over the y axis.

13) Describe the transformation of figure A needed to transform it to each congruent figure

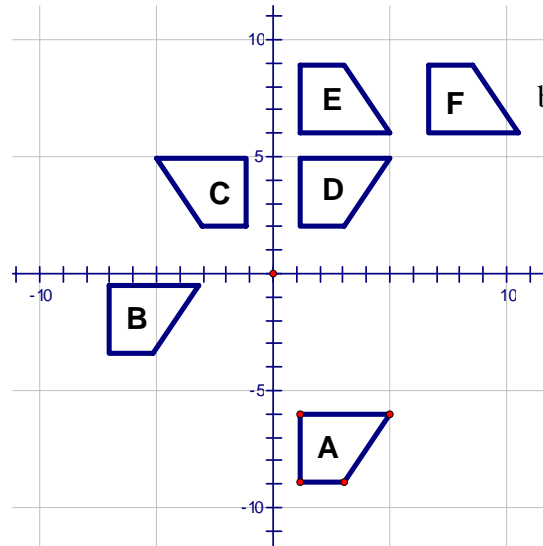
Figure B

Figure C

Figure D

Figure E

Figure F



below?

# Geo 6.1 Assessment

# “Bridget Blockhead”

Plot and connect the following points in order. To complete your picture, connect the last point to the first point.

(0, 3) (2, 3) (2, 7) (-2, 7) (-2, 3) (0, 3) (-½, 2) (-4 ½, 2) (-8, 0) (-4, 0) (-½, 2) (-4, -4)  
 (-2, -4) (-2, -8) (-4, -11) (4, -11) (2, -8) (2, -4) (4, -4) (½, 2) (4, 0) (8, 0) (4 ½, 2) (½, 2)

Bridget	Transformation	Result
(x, y)	Right 3	(x + 3, y)
(x, y)	Down 2	
(x, y)	Left 4 and up 1	
(x, y)	Vertical stretch of 3	
(x, y)	Horizontal shrink of ½	
(x, y)	Vertical Reflection	
(x, y)	Horizontal Reflection	
(x, y)	Vertical and Horizontal Reflections	
(x, y)		
(x, y)	Lay her down to the right.	
(x, y)	Rotate 90 degrees left	
(x, y)	Betty on Bridget’s Shoulder	

- Draw “Bob Blockhead” using the rule (2x, 2y).
- Draw “Betty Blockhead” using the rule (.5x, .5y)
- Draw “Block Blockhead” using the rule (x, 2y).

- Move Bob Blockhead 9 units to the right.
- Put Betty on Bob’s left shoulder (his left—the shoulder on his right as you look at him)
- Put Betty on Bridget’s shoulder.