Activity Overview

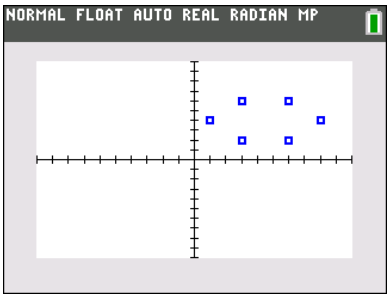
In this activity, students review basic geometry vocabulary while investigating reflections on a coordinate grid.

Topic: Geometry

- Apply transformations and use symmetry to analyze mathematical situations.
- Describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling.

Teacher Preparation and Notes

- Students should be familiar with entering data in lists and creating scatter plots.
- **To download the student worksheet, go to education.ti.com/exchange/mmotg**



This activity utilizes MathPrint™ functionality and includes screen captures taken from the TI-84 Plus C Silver Edition. It is also appropriate for use with the TI-83 Plus, TI-84 Plus, and TI-84 Plus Silver Edition but slight variances may be found within the directions.

Compatible Devices:

- TI-84 Plus Family
- TI-84 Plus C Silver Edition

Associated Materials:

- Mirror_Mirror_on_Graph_Student.pdf
- Mirror_Mirror_on_Graph_Student.doc

Tech Tips:

- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials
- Any required calculator files can be distributed to students via handheld-to-handheld transfer.

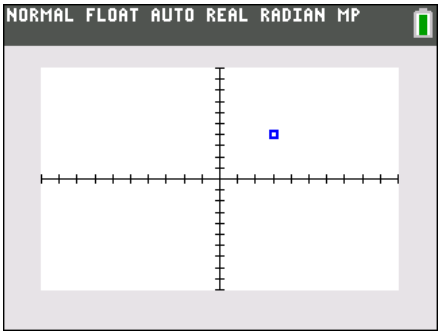
Part 1 – Where Did All the *y*'s Go?

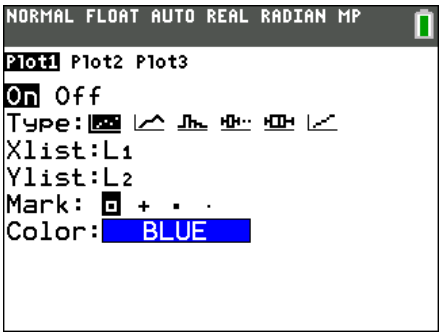
Questions 1–3

Students should begin to see the pattern of reflecting a point over the *x*-axis and *y*-axis.

If you want to give students additional points for practice, you can enter a new point on the graph, follow these key presses. [STAT] [ENTER] and enter the *x*-coordinate in L1 and the *y*-coordinate in L2 (or other lists of your choice). Then display the scatter plot again by pressing [GRAPH].

As a class challenge, you could use the overhead calculator or TI-SmartView emulator, plot a point, and have students "race" to find the reflection given verbally by you. For example, call two students to the front of the class. Plot (1, 5) and display the graph. Call out a reflection, such as "over the *x*-axis" and the student that places their finger on the correct location first wins.



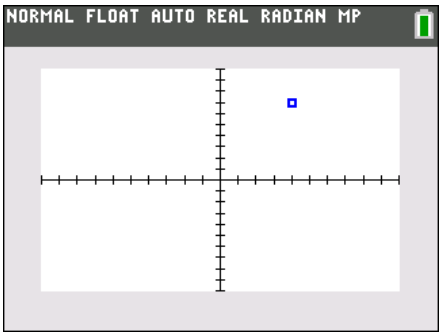


Part 2 – Explore *x*-Coordinate in Reflections

Questions 4-6

Now students concentrate on what happens to the *x*-coordinate during reflections over both the *x*-axis and the *y*-axis.

Again, follow extensions ideas in Part 1 for the *x*-coordinate reflections as well.



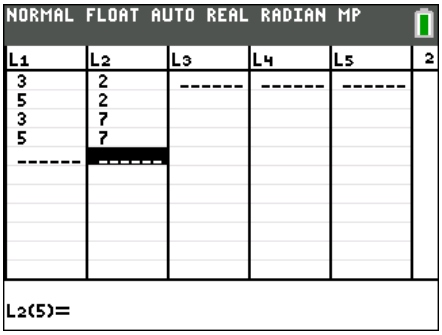
Students should realize that the *x*- and *y*-coordinates behave oppositely when reflected over the same axis. For example, when a point is reflected over the *x*-axis, the *y*-value changes sign (either positive to negative or vice versa) but the *x*-coordinate remains the same. The same happens for a reflection over the *y*-axis. The *y*-coordinate remains the same when reflected over the *y*-axis but the *x*-coordinate changes sign.

Part 3 – Reflecting Figures over the *x*- and *y*-axes

Questions 7–9

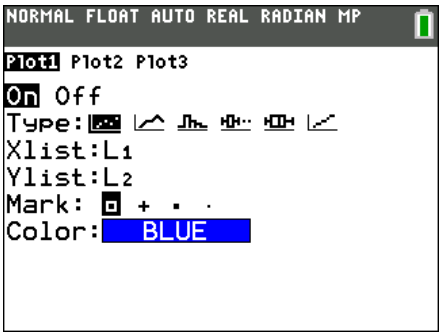
In each question, students should enter the lists given, create a scatter plot and display the graph.

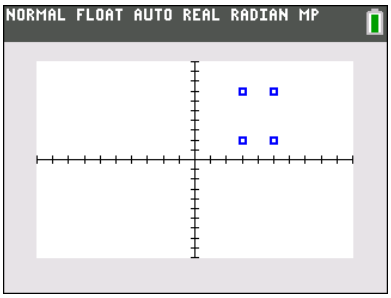
For Question 7, press [STAT], select **1:Edit…** and move to L1. If there is data in L1 and L2, move to the header of L1 and press [CLEAR] [ENTER]. Do the same for L2 if there is data in L2.



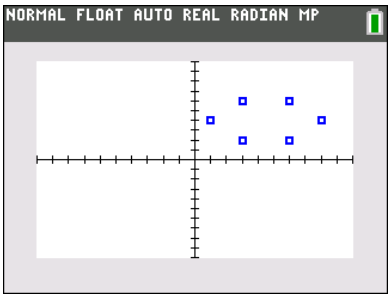
Then, move the cursor back to row one of L1. Press [3] [ENTER] [5] [ENTER] [3] [ENTER] [5] [ENTER]. Move to L2 by pressing ►. Enter the data for L2, [2] [ENTER] [2] [ENTER] [7] [ENTER] [7] [ENTER].

Turn on Stat Plot 1 by pressing [2nd] [Y=] [ENTER]. The scatterplot should be configured as shown to the right. Press [ENTER] to select ON. Make sure Xlist is L1 and Ylist is L2. Then press [ZOOM] and select **ZStandard**.

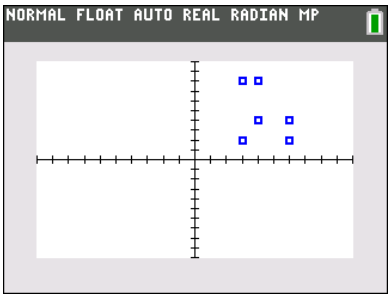




Question 7 – Rectangle



Question 8 – Hexagon



Question 9 – Letter “L”

Students can enter the new L1 and L2 into lists L3 and L4 and then create a second plot of L3 vs. L4 to verify that they have correctly reflected the figure.

Question 10

With this question, students should realize that a reflection over both axes will create a change in sign for both the *x*-coordinate and the *y*-coordinate.

Solutions – Student Worksheet

Part 1

Determine how the *y*-coordinate of the given point in the screenshot changes with the given reflection.

1. Point is reflected over the *y*-axis. Original: _____ New: _____

   Answer: Original: (3, 4), New: 4, no change

   Point is reflected over the *x*-axis. Original: _____ New: _____

   Answer: Original: (3, 4), New: –4, *y*-coordinate is now negative

2. Point is reflected over the *y*-axis. Original: _____ New: _____

   Answer: Original: (–5, 3), New: 3, no change

   Point is reflected over the *x*-axis. Original: _____ New: _____

   Answer: Original: (–5, 3), New: –3, *y*-coordinate is now negative

3. What happens to the *y*-coordinate of a point when reflected over the *x*-axis? *y*-axis?

   Answer: *y*-coordinate changes sign when reflected over the *x*-axis; *y*-coordinate remains the same when reflected over the *y*-axis.

Part 2

Determine how the *y*-coordinate of the given point in the screenshot changes with the given reflection.

4. Point is reflected over the *y*-axis. Original: _____ New: _____

   Answer: Original: (4, 7), New: –4, *x*-coordinate is now negative

   Point is reflected over the *x*-axis. Original: _____ New: _____

   Answer: Original: (4, 7), New: 4, no change

5. Point is reflected over the *y*-axis. Original: _____ New: _____

   Answer: Original: (–2, –4), New: 2, *x*-coordinate is now positive

   Point is reflected over the *x*-axis. Original: _____ New: _____

   Answer: Original: (–2, –4), New: –2, no change

6. What happens to the *y*-coordinate of a point when reflected over the *x*-axis? *y*-axis?

   Answer: *x*-coordinate changes sign when reflected over the *y*-axis; *x*-coordinate remains the same when reflected over the *x*-axis.

Part 3

7. L1 = {3, 5, 3, 5}, L2 = {2, 2, 7, 7}

   R1: Reflect the image over the *y*-axis.

   Answer: New L1: {-3, -5, -3, -5} New L2: {2, 2, 7, 7}

   R2: Reflect the image over the *x*-axis.

   Answer: New L1: {3, 5, 3, 5} New L2: {–2, –2, –7, –7}

8. L1 = {3, 6, 1, 8, 3, 6}, L2 = {2, 2, 4, 4, 6, 6}

   R1: Reflect the image over the *y*-axis.

   Answer: New L1: {–3, –6, –1, –8, –3, –6} New L2: {2, 2, 4, 4, 6, 6}

   R2: Reflect the image over the *x*-axis.

   Answer: New L1: {3, 6, 1, 8, 3, 6} New L2: {–2, –2, –4, –4, –6, –6}

9. L1 = {3,3,4,6,4,6}, L2 = {8,2,8,2,4,4}

   Find a new L3 and L4 for the image reflected over the *x*-axis ***and*** the *y*-axis.

   Answer: reflection over both axes: L3: {–3, –3, –4, –6, –4, –6} L4: {–8, –2, –8, –2, –4, –4}

10. Explain how to create a new list of *x*- and *y*-values to display an image reflected over the *x*- ***and*** *y*-axes.

    Answer: both coordinates change sign with a reflection over both axes