Activity Overview

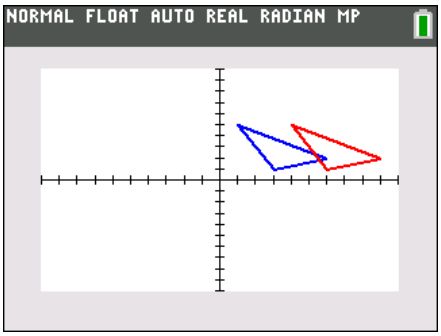
In this activity, students investigate transformations, slides and scaling, of a triangle using lists. They will add, subtract and multiply numbers to the list and describe the changes that have occurred. Students are to make the connection between changing the x- or y-values and the transformation.

Topic: Geometry

- Transform shapes using lists.
- Describe informal transformations such as slides and scaling.

Teacher Preparation and Notes

- Students should already be familiar with entering data in lists and setting up stat plots.
- **To download the student worksheet, go to education.ti.com/exchange/mi**



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:

- Move_It_Student.pdf
- Move_It_Student.doc

Tech Tips:

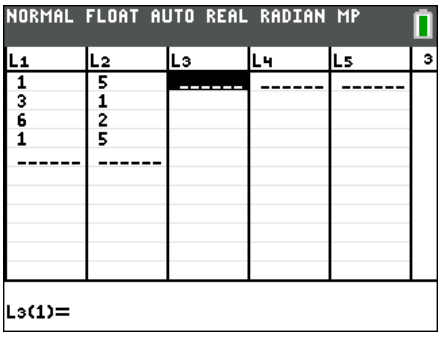
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials
- Any required calculator files can be distributed to students via handheld-to-handheld transfer.

Part 1 – Move Those *x*'s

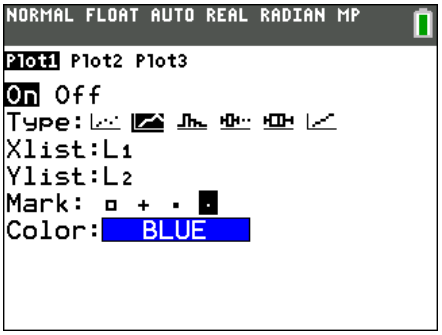
In Part 1, students enter two lists of numbers (coordinates) and look at translating a figure horizontally. Help students see the pattern in *x*-values with the given transformations.

Questions 1–2

To enter the data, press [STAT] and select **1:Edit…**. Enter the *x*-coordinates in L1 and the *y*-coordinates in L2. If there is already data in the lists, arrow up to the top of the lists and press [CLEAR] [ENTER] in each list.

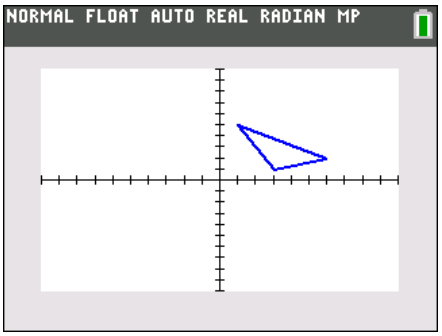


After entering the coordinates, press [2nd] [STAT PLOT] [ENTER] to set up **Plot1**. Notice that the Type is set to instead of the typical . This will connect the points to form the figure. Set up **Plot2** in a similar manner replacing L1 with L3 and L2 with L4.

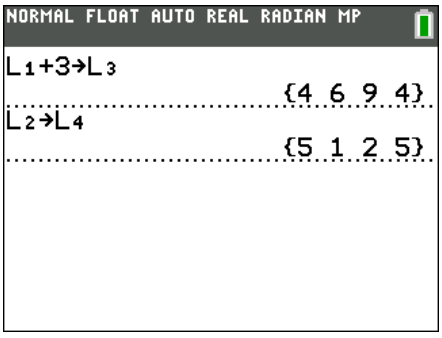


Note: To enter the names of the lists (L1, L2, L3, L4), press [2nd] [LIST] and select the appropriate name.

Students may notice that the figure is a triangle which has only 3 vertices, but the lists show 4 points. Explain to them that first and last coordinates are the same. This vertex is repeated so the plot could draw the sides of the triangle and draw a closed figure.

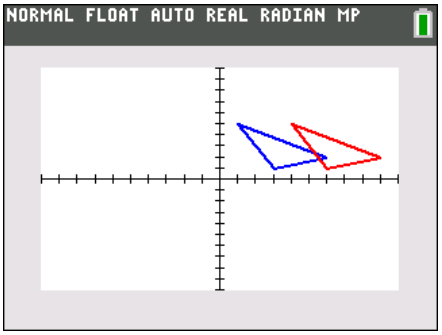


On the Home screen, students will transform the lists. To perform the calculations for Exercise 1, press the following: [2nd] [LIST] [1] [+] [3] [STO▶] [2nd] [LIST] [3] [ENTER] and [2nd] [LIST] [2] [STO▶] [2nd] [LIST] [4] [ENTER]. This will change the elements in L1 and store them in L3 and store L2 without change into L4. Students need to view the graph before entering the commands for Exercise 2.



Questions 3–5

Students should recognize that the *x*-values changed by the amount added or subtracted. They should see the effect on the figure, shifting left or right. If needed, you can give students additional translations for deeper understanding.



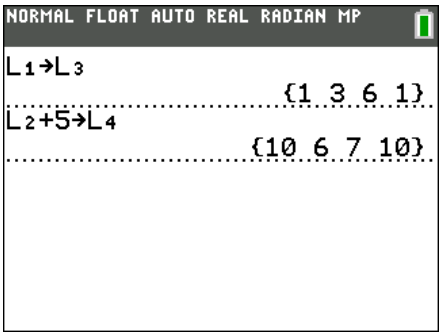
Part 2 – Move Those *y*'s

In Part 2, students look at changing the *y*-values of coordinates and the resulting translation.

Questions 6–7

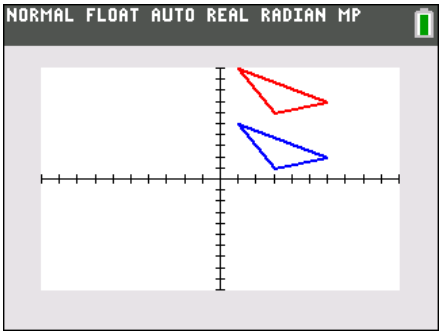
The same lists are used from Part 1. In this set of exercises, students will be manipulating the *y*-values to see the resulting translation.

Keystrokes for the Home screen calculations are very similar to Exercises 1 & 2. This time, L2 is being adjusted before storing to L4. Be sure to discuss the translation with students after viewing the graph for Exercise 6 and then again after viewing the graph for Exercise 7.



Questions 8–10

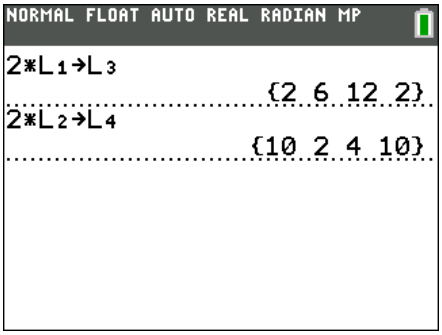
Students should recognize that the *y*-values are changed by the number added or subtracted. They should also see the shift up or down of the triangle.



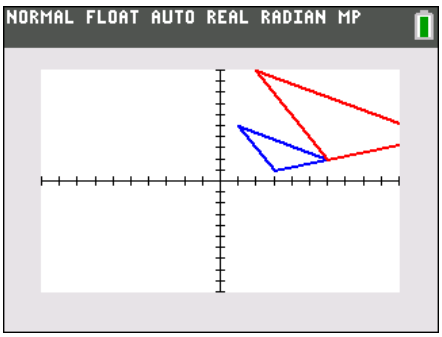
Part 3 – Change That Shape

Questions 11–12

Students will again use the Home screen to perform the transformations on the lists. Unlike the previous problems, both the *x*- and *y*-values will change, multiplied by a scale factor. When entering the fraction in Exercise 12, students can use the [ALPHA] [F1] shortcut.



Questions 13–15

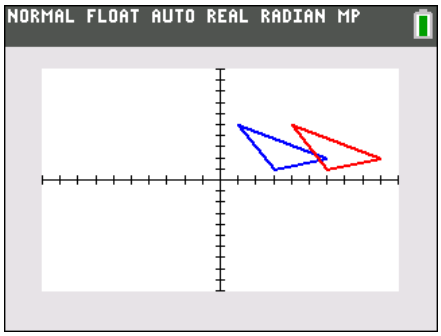


Students should observe that each *x*-value and *y*-value doubles when multiplied by 2 and is halved when multiplied by $\frac{1}{2}$. They should also see that the triangle's sides double or halve in size. It is important that students understand that the figure will get smaller or bigger in size when *both* the *x*- and *y*-values are multiplied by the *same* scale factor.

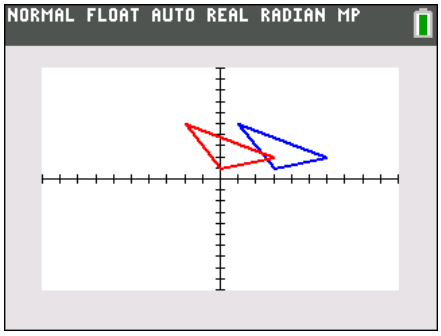
Solutions – Student Worksheet

Part 1

1. L1 + 3 → L3; L2 → L4 **Answer:**



2. L1 – 3 → L3; L2 → L4 **Answer:**

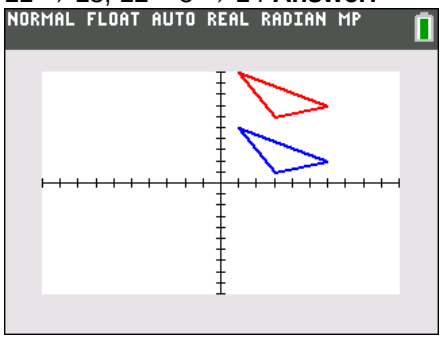


3. How did the *x*-values change? **Answer: The *x*-values increased or decreased by 3.**
4. How did the triangle move? **Answer: The triangle moved to the right or left by 3.**
5. What happens when a number is added to or subtracted from the *x*-values of a figure?

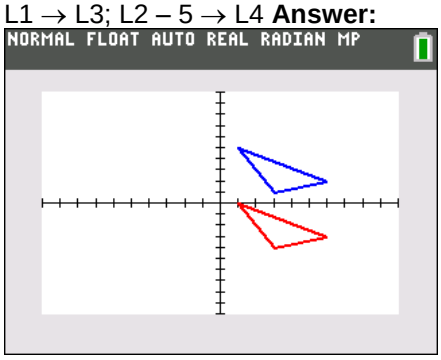
   Answer: The figure shifts along the *x*-axis by the number added or subtracted.

Part 2

6. L1 → L3; L2 + 5 → L4 **Answer:**



7. L1 → L3; L2 – 5 → L4 **Answer:**

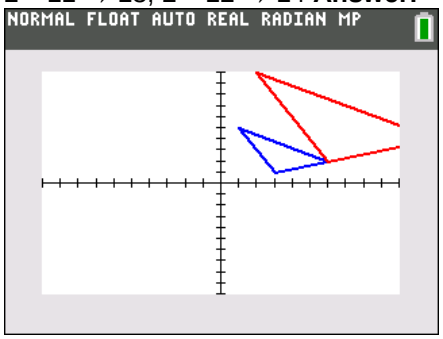


8. How did the *y*-values change? **Answer: The *y*-values increased or decreased by 5.**
9. How did the triangle move? **Answer: The triangle moved to up or down by 5.**
10. What happens when a number is added to or subtracted from the *y*-values of a figure?

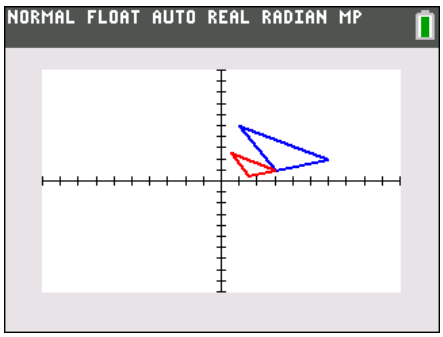
    Answer: The figure shifts along the *y*-axis by the number added or subtracted.

Part 3

11. $2 * L1 \rightarrow L3$; $2 * L2 \rightarrow L4$ **Answer:**



12. $\frac{1}{2} * L1 \rightarrow L3$; $\frac{1}{2} * L2 \rightarrow L4$ **Answer:**



13. How did the *x*-values and the *y*-values change? **Answer: Both the *x*-values and *y*-values doubled or halved.**

14. How did the triangle change? **Answer: The sides of the triangle doubled or halved in size.**

15. What happens when a number between 0 and 1 or greater than 1 is multiplied by the *x*- and *y*-values of a figure? **Answer: The figure increases or decreases in size.**