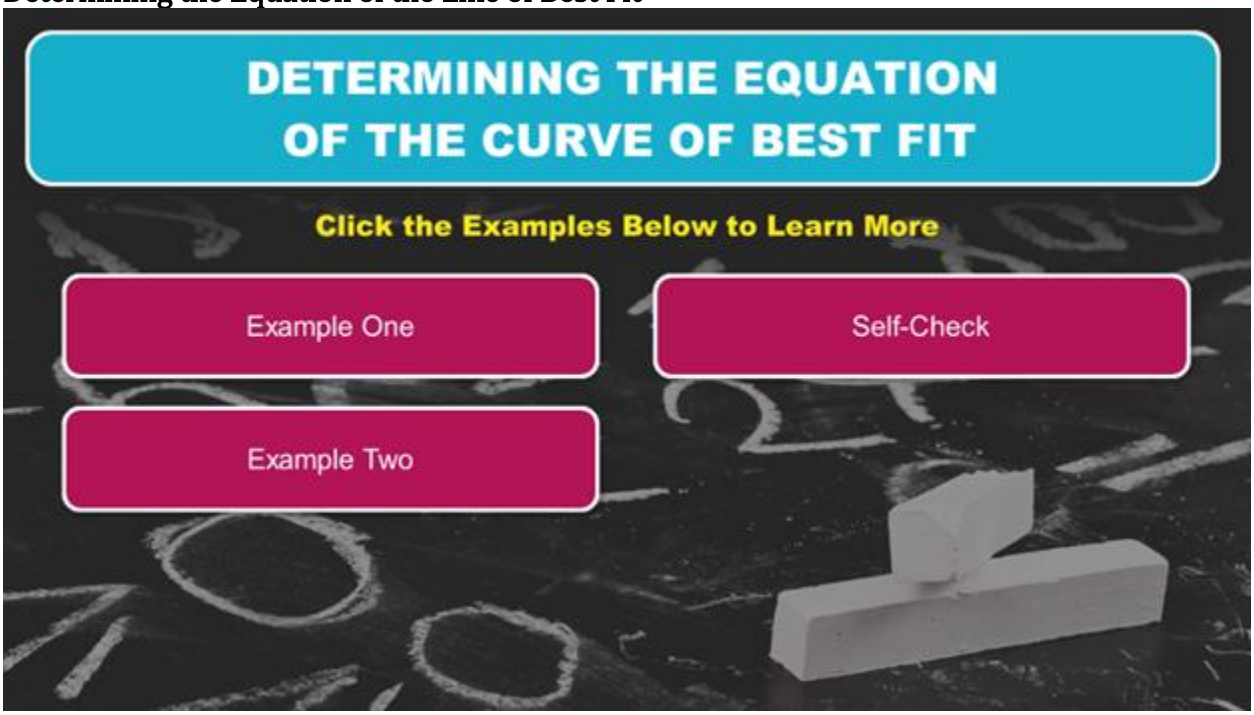
Module 12: Statistics

Topic 2: Determining the Equation of the Curve of Best Fit

Introduction

Hi there! I'm so glad you could join me for this lesson in Algebra I. In this lesson, you will learn how to use the graphing calculator to determine the equation of the curve of best fit.

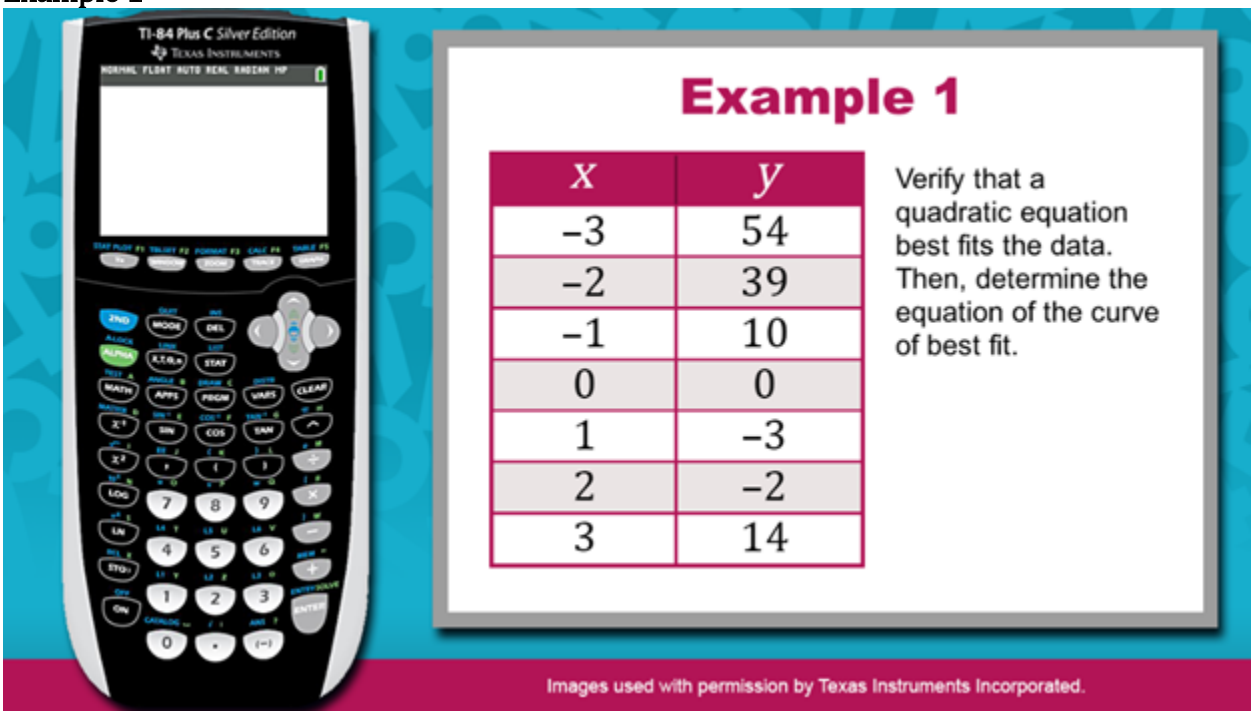
Determining the Equation of the Line of Best Fit



Click the examples below to learn more.

Module 12: Statistics
Topic 2: Determining the Equation of the Curve of Best Fit

Example 1



Verify that a quadratic equation best fits the data. Then, determine the equation of the curve of best fit.

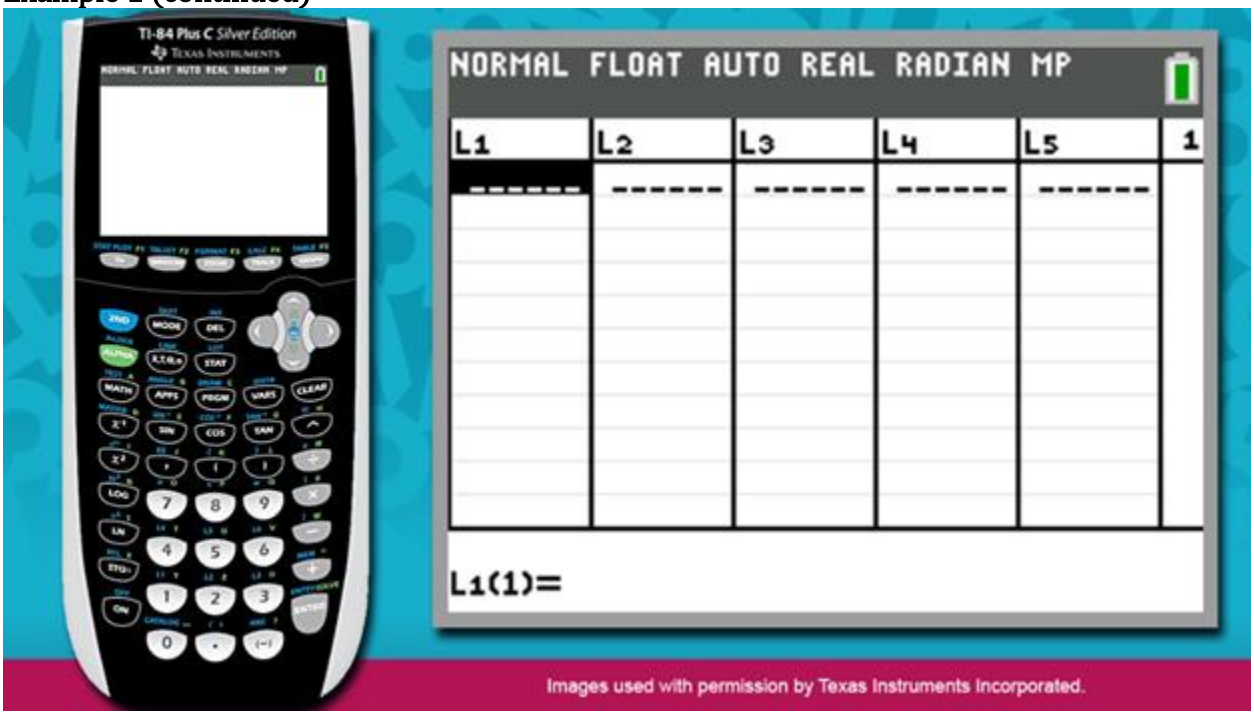
x	y
-3	54
-2	39
-1	10
0	0
1	-3
2	-2
3	14

Example 1 (continued)

To verify that a quadratic equation best fits the data, begin by using the graphing calculator to generate a scatterplot.

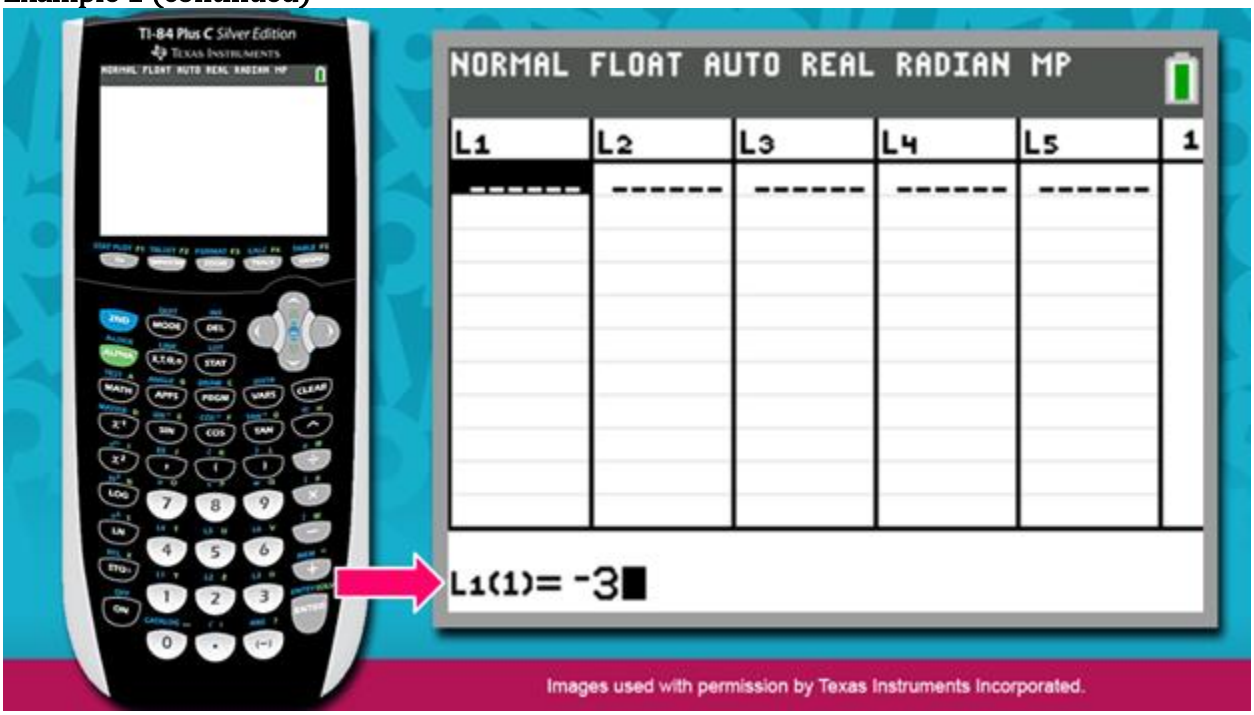
Press the STAT key, located two keys to the right of the green ALPHA key. This key allows you to access the statistics functions of the calculator.

Example 1 (continued)



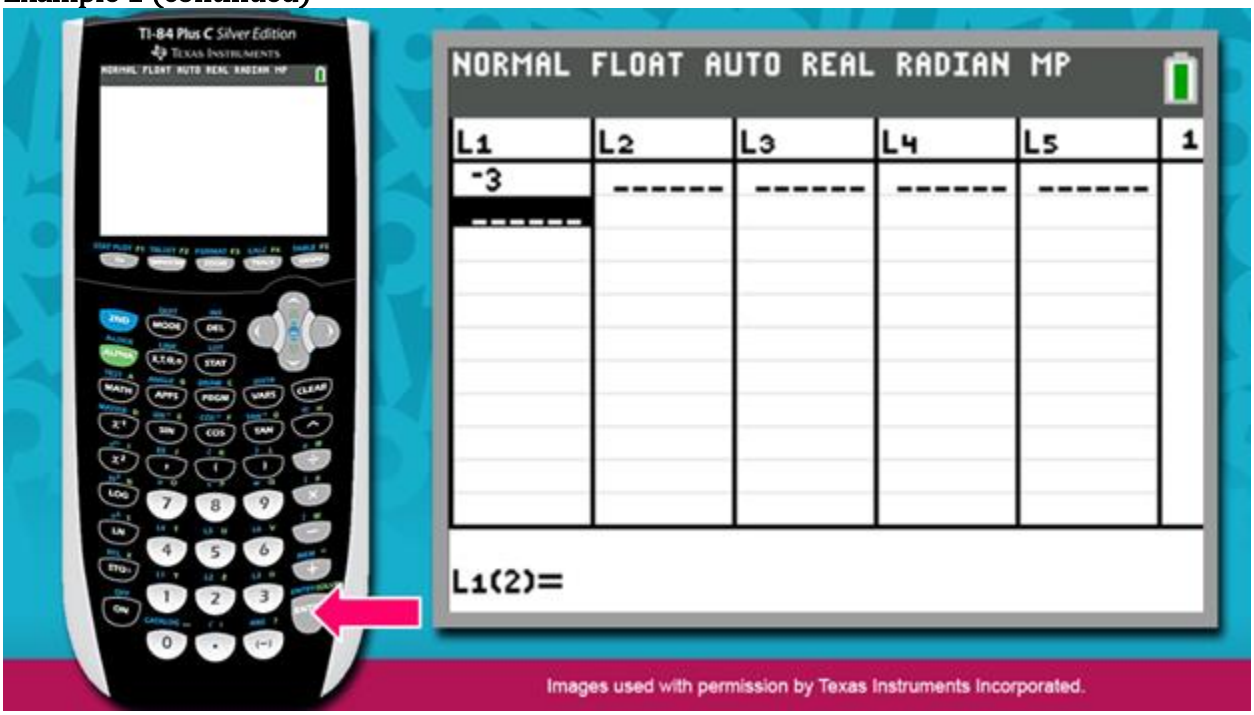
Press ENTER to access the Edit function. Notice that a table appears, with the headings L1, L2, L3, etc. Here is where you will enter the values of x and y.

Example 1 (continued)



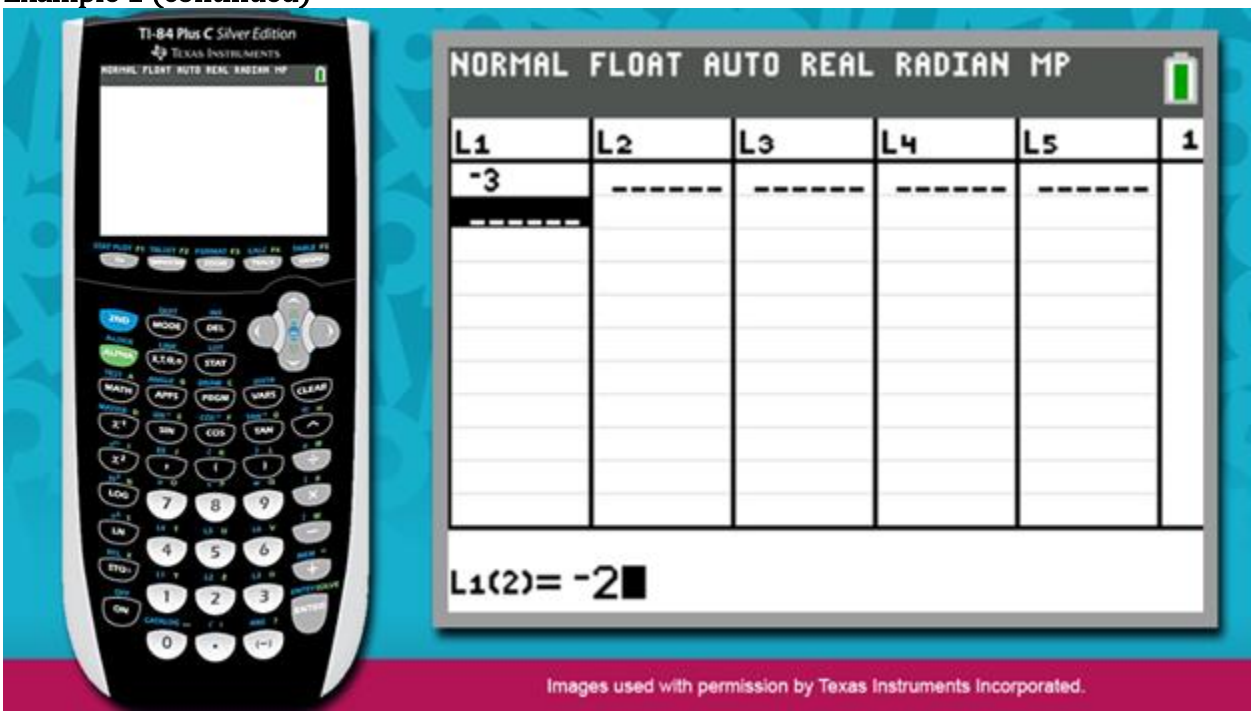
Enter the x-values into L1. To enter the first value, press the negative sign and then press 3. Notice that the value appears at the bottom of the window.

Example 1 (continued)



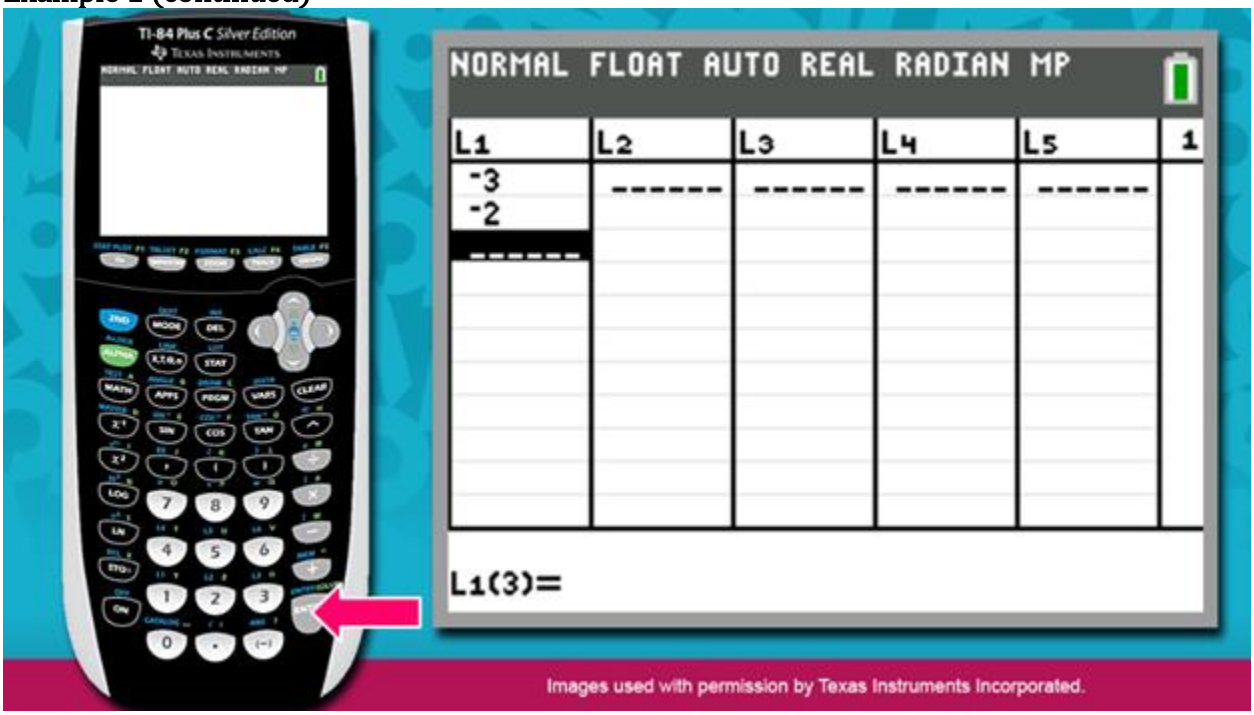
Then, press ENTER to include the value in L1.

Example 1 (continued)



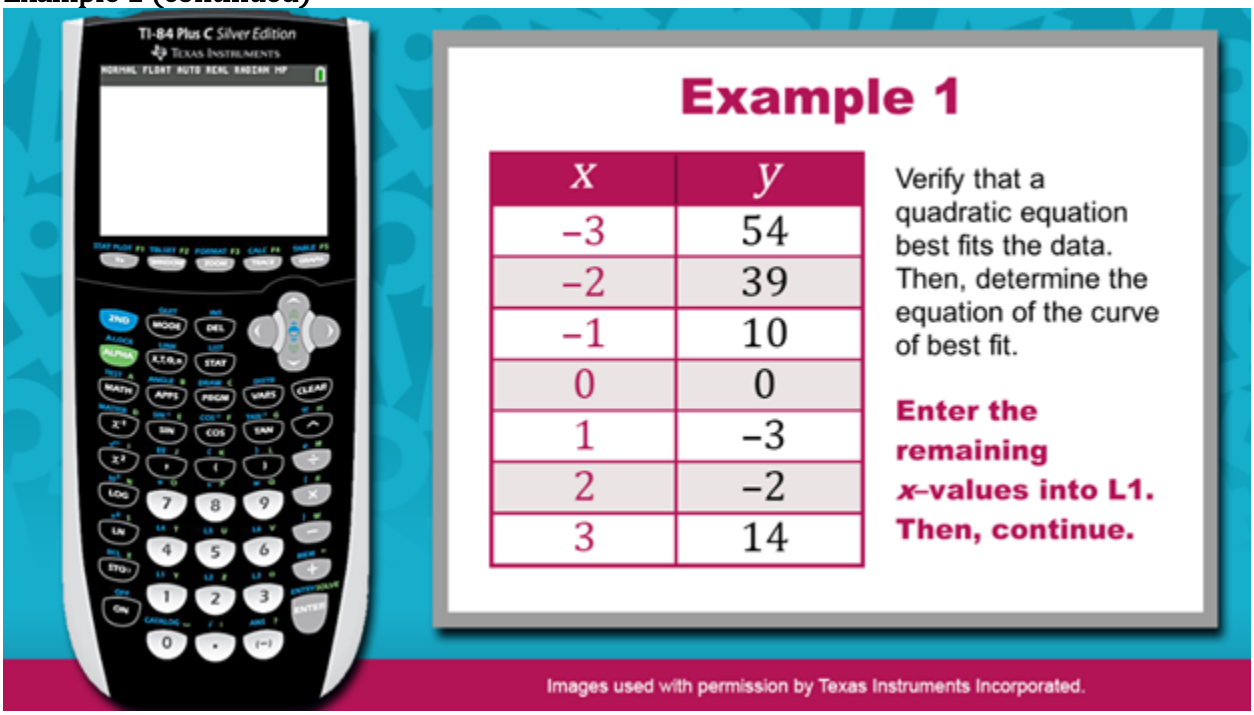
To ENTER the next value, press the negative sign and then press 2.

Example 1 (continued)



Then, press ENTER to include the value in L1.

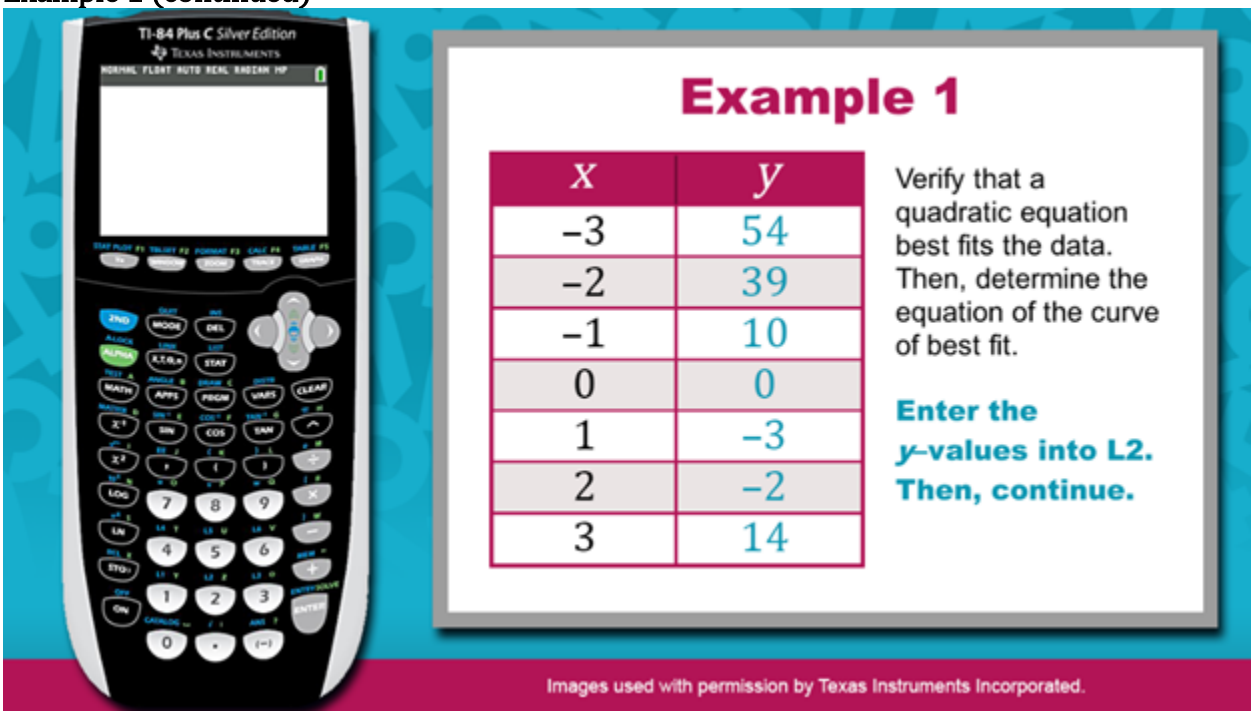
Example 1 (continued)



Continue this process until all of the x-values are entered into L1.

x	y
-3	54
-2	39
-1	10
0	0
1	-3
2	-2
3	14

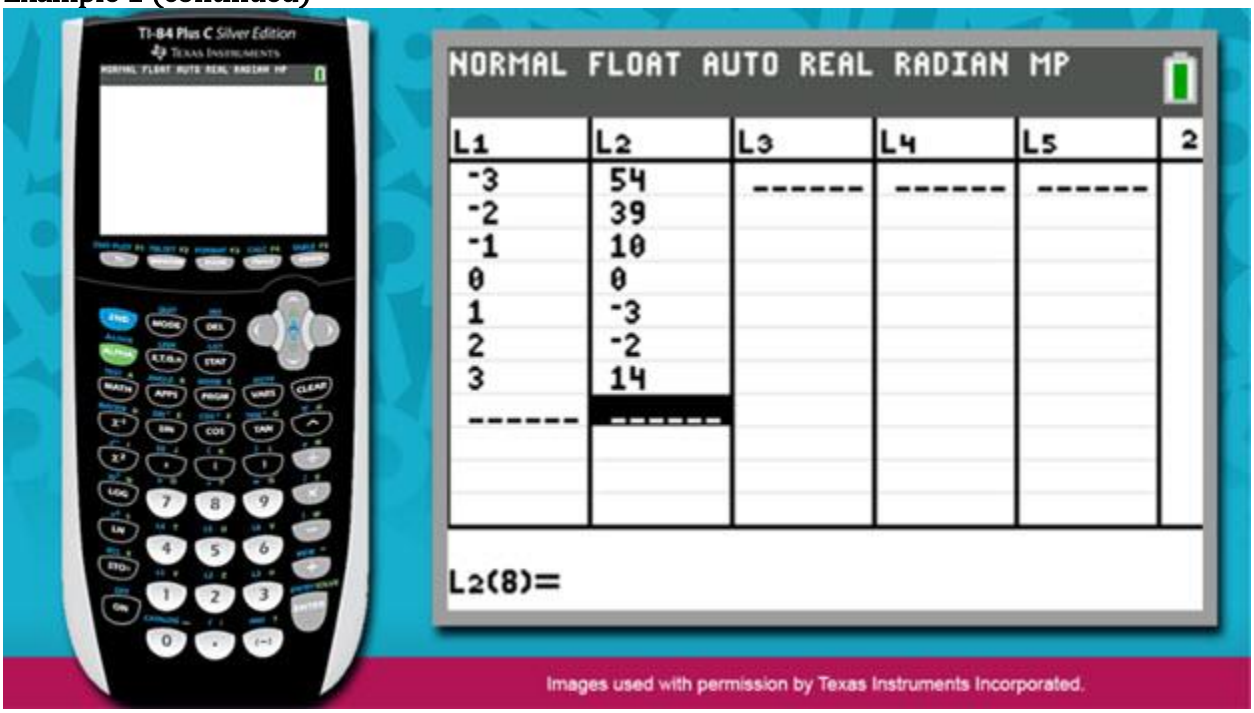
Example 1 (continued)



Next, press the right arrow key. Enter the y-value that corresponds to each x-value into L2.

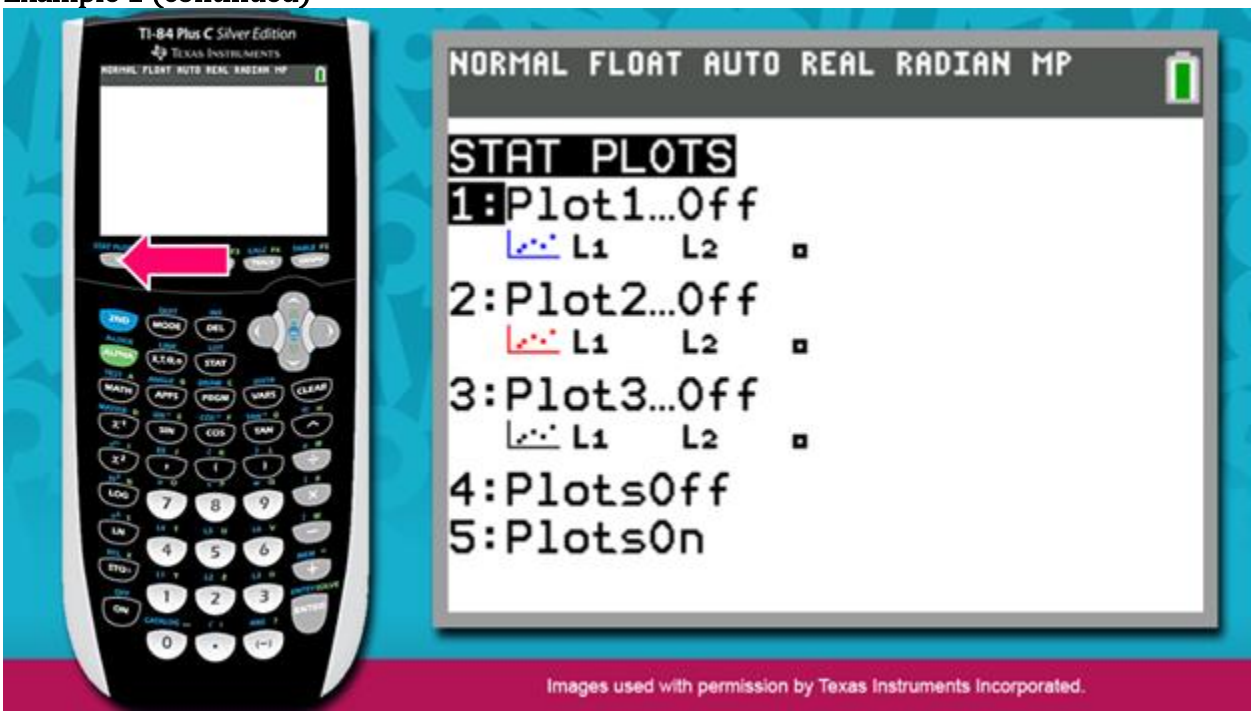
x	y
-3	54
-2	39
-1	10
0	0
1	-3
2	-2
3	14

Example 1 (continued)



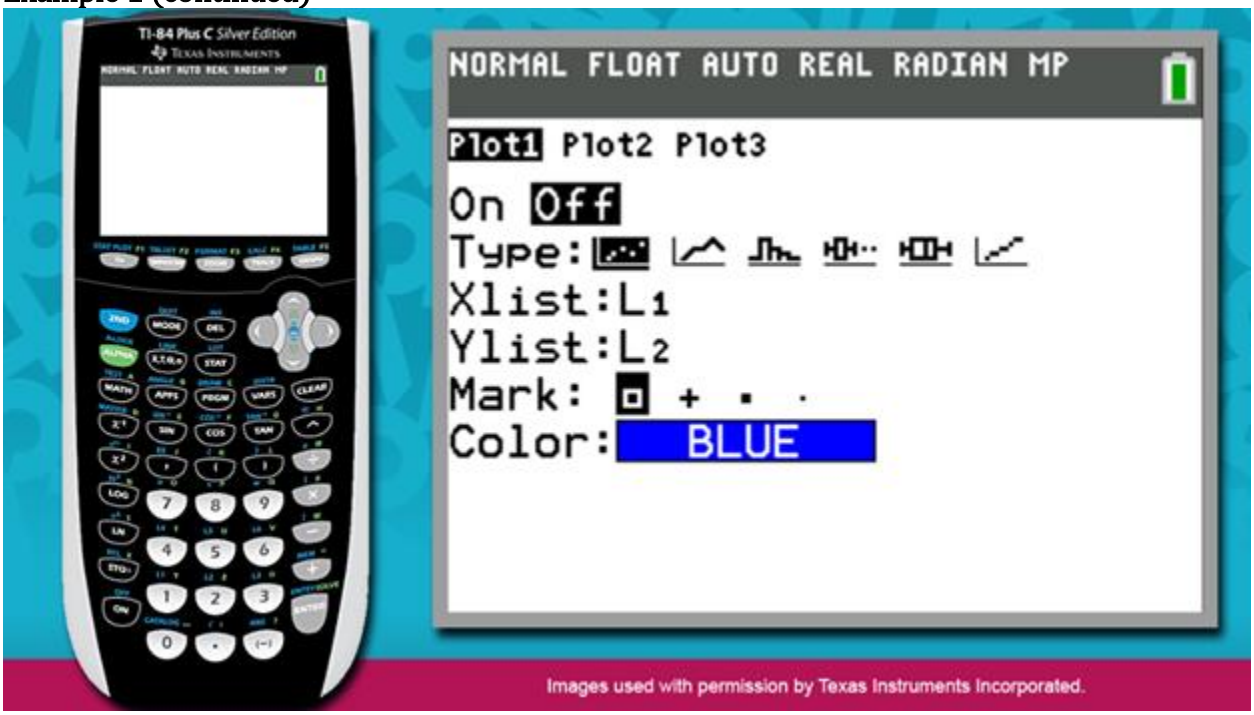
Now that the data is entered into the calculator, you can generate a scatterplot.

Example 1 (continued)



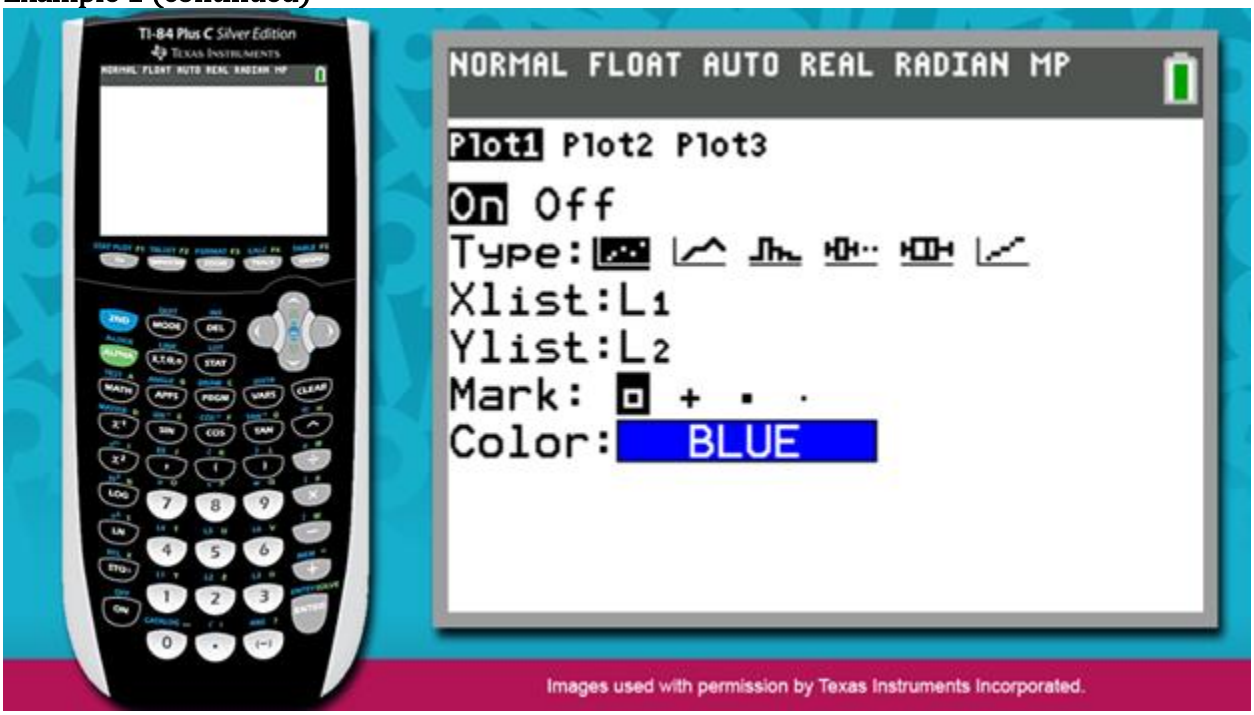
Press 2nd. This key allows you to access a function stamped above a calculator key. Now, press the Y= key to access the STAT PLOTS menu. Press ENTER to choose Plot 1.

Example 1 (continued)



Notice that the plots are currently turned off. To view the scatterplot, you must turn the plots on.

Example 1 (continued)

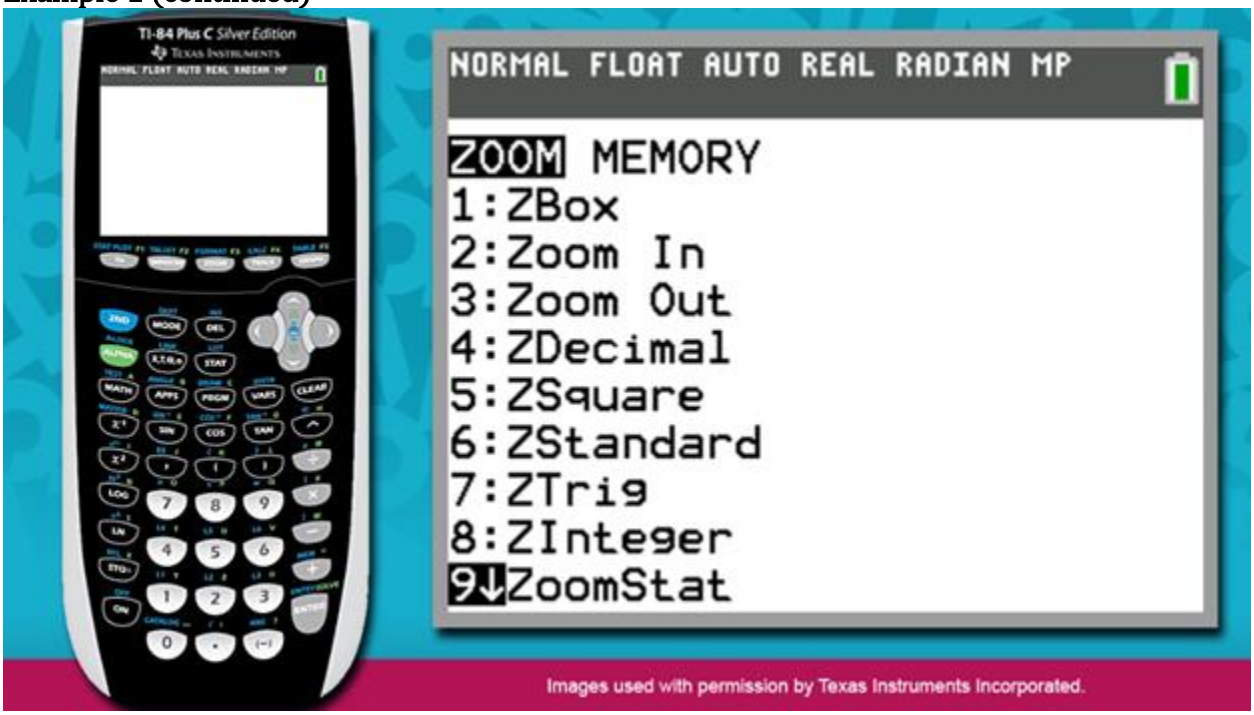


Make sure that the cursor is blinking on "On" and press ENTER. Also, verify that the type of graph that the calculator will generate based on the current data is a scatterplot. Confirm that L1 corresponds to the x-values and L2 corresponds to the y-values. Note that each point on the scatterplot will appear as a blue square.

Example 1 (continued)

Next, press ZOOM, located in the very top row of keys.

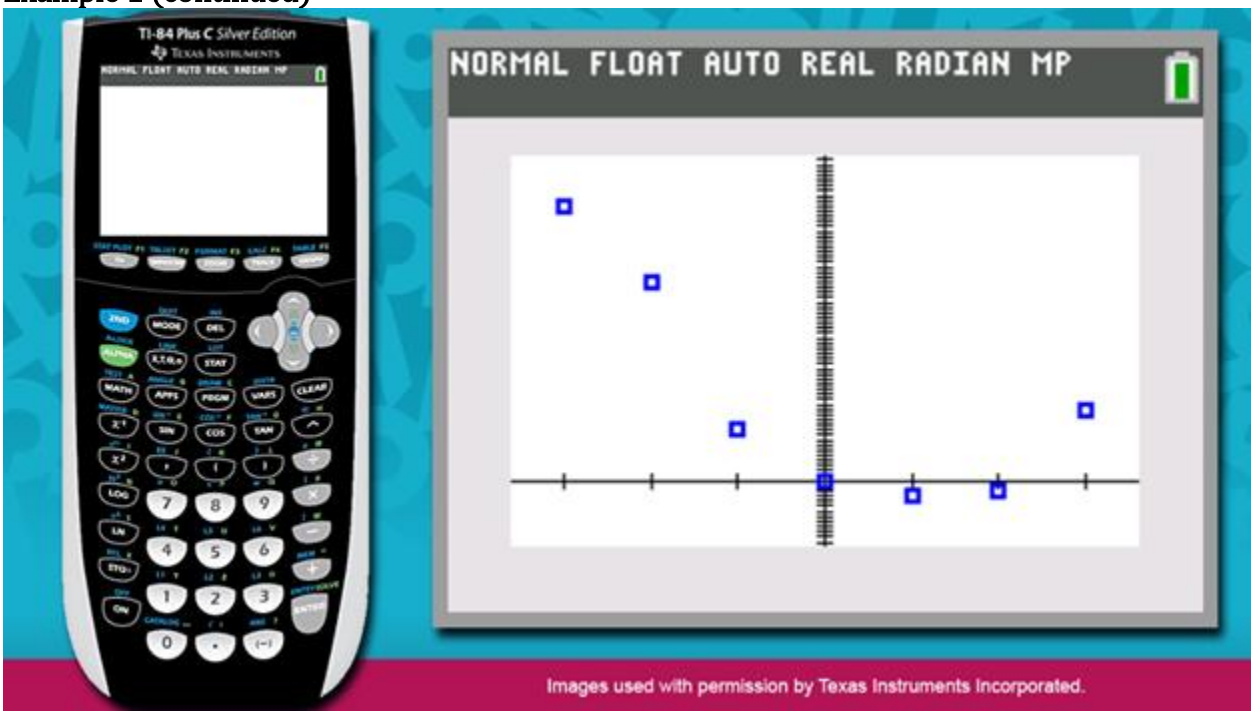
Example 1 (continued)



Then, press the down arrow key to move the cursor to the ninth option, ZoomStat. This option will inform the calculator to set the necessary window to view the scatterplot.

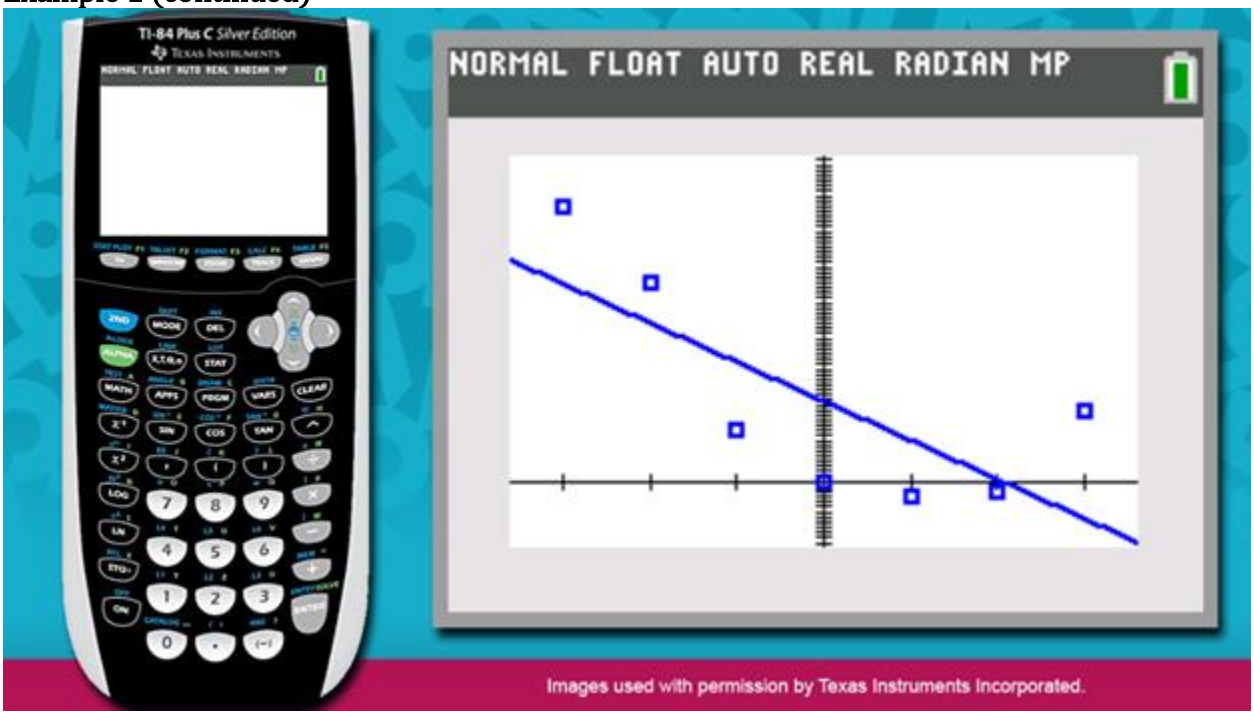
Press ENTER.

Example 1 (continued)



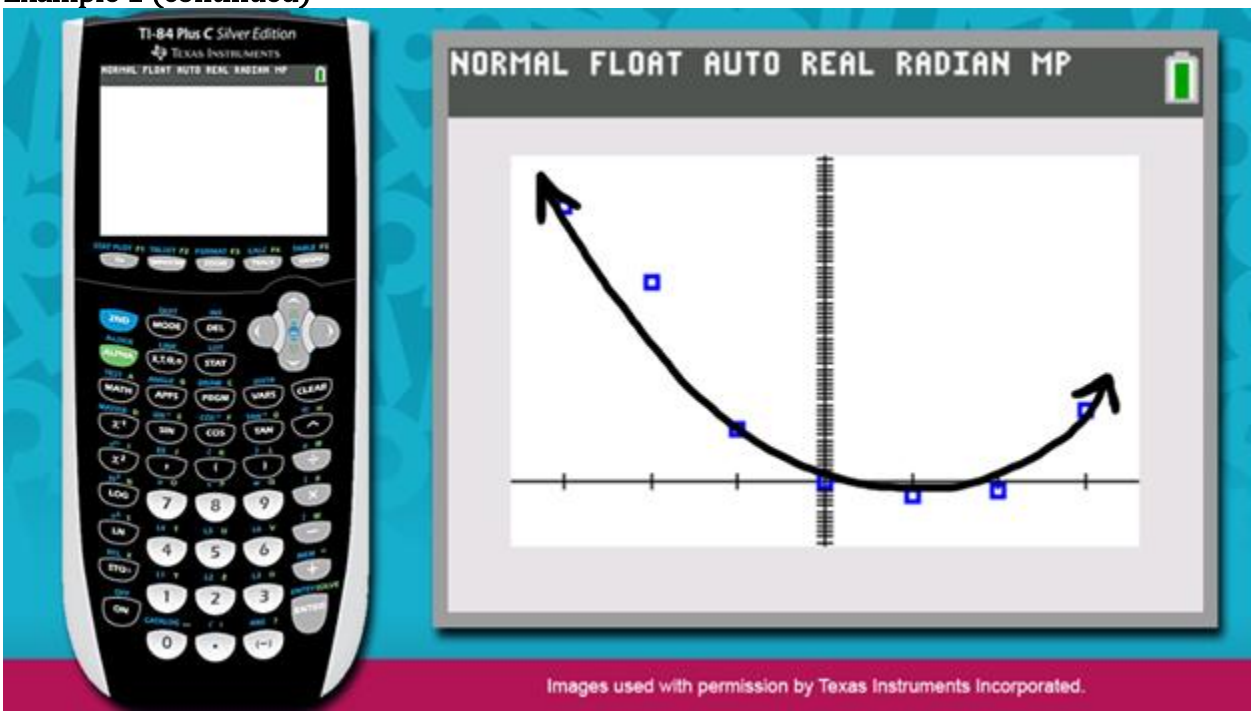
Consider the relationship between the x-values and y- values. The trend is not linear.

Example 1 (continued)



A linear equation is not a reasonable model of the relationship between the input and output values.

Example 1 (continued)



Rather than a line, the position of the points resembles a parabola. A quadratic equation will best fit the data.

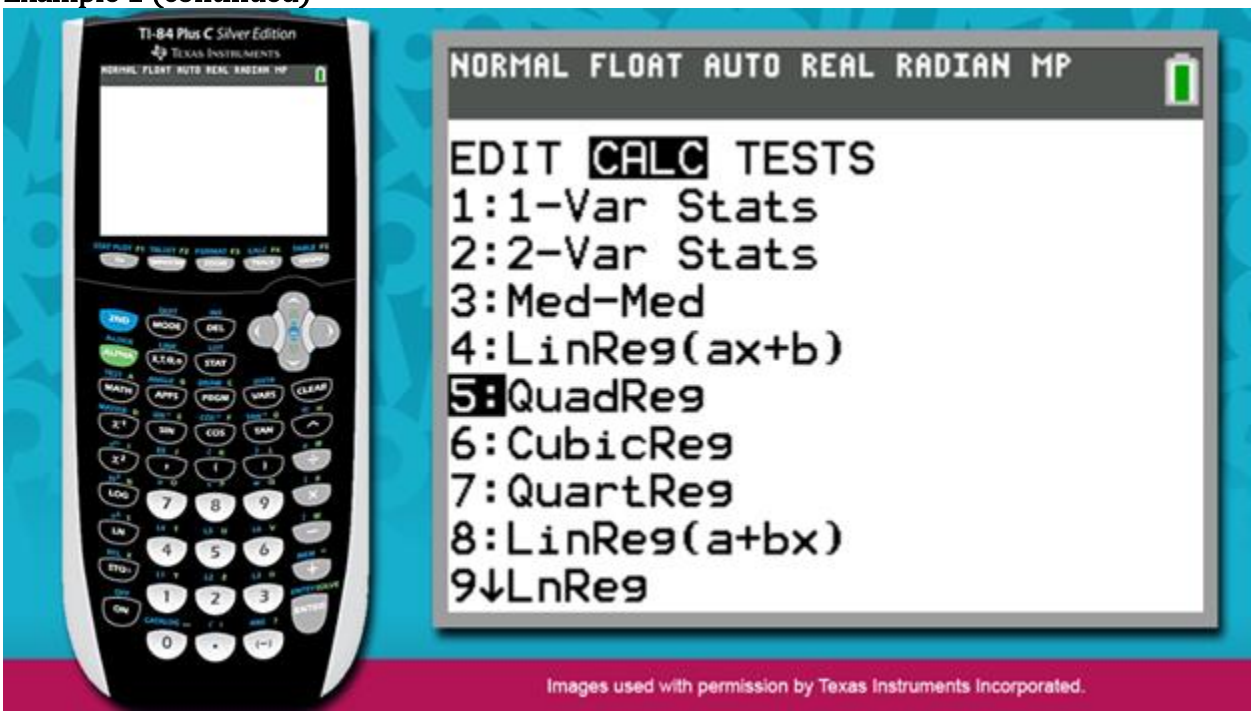
Example 1 (continued)

To determine the quadratic equation, press STAT.

Example 1 (continued)

Press the right arrow key to access the Calculate functions.

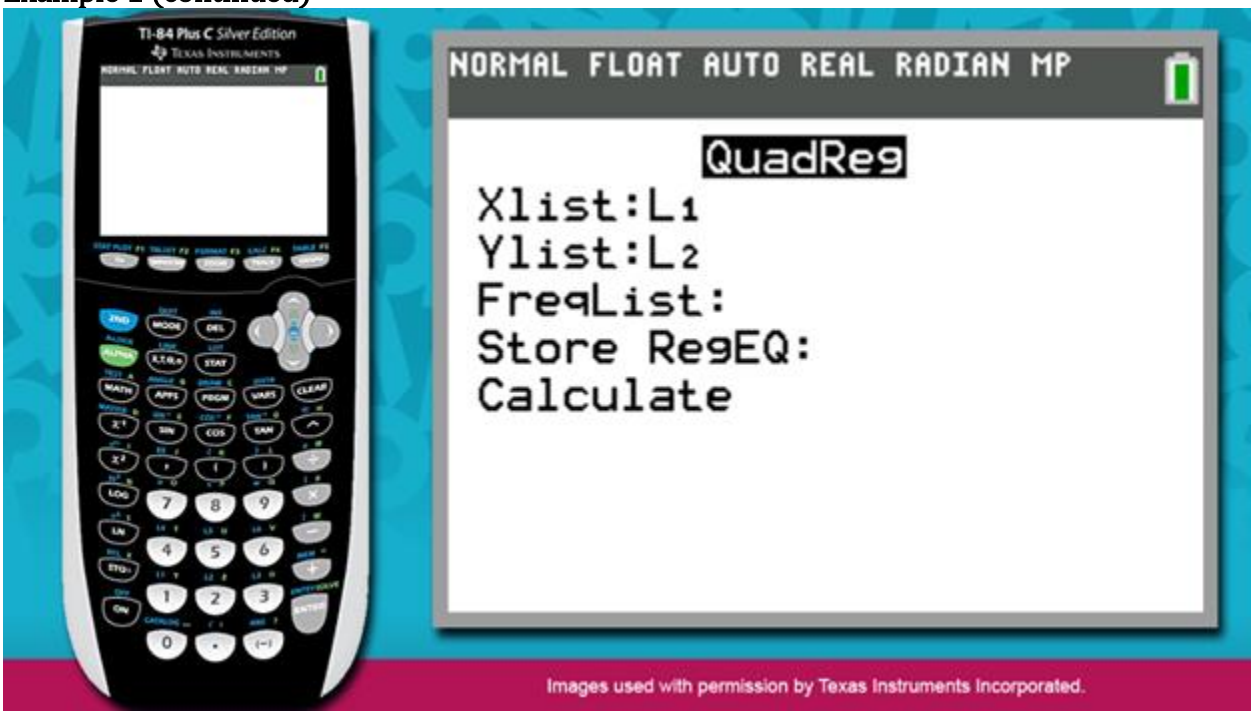
Example 1 (continued)



Press the down arrow key to select the fifth option in the list, QuadReg, an abbreviation for quadratic regression. This option will prompt the calculator to generate a quadratic equation to model the relationship.

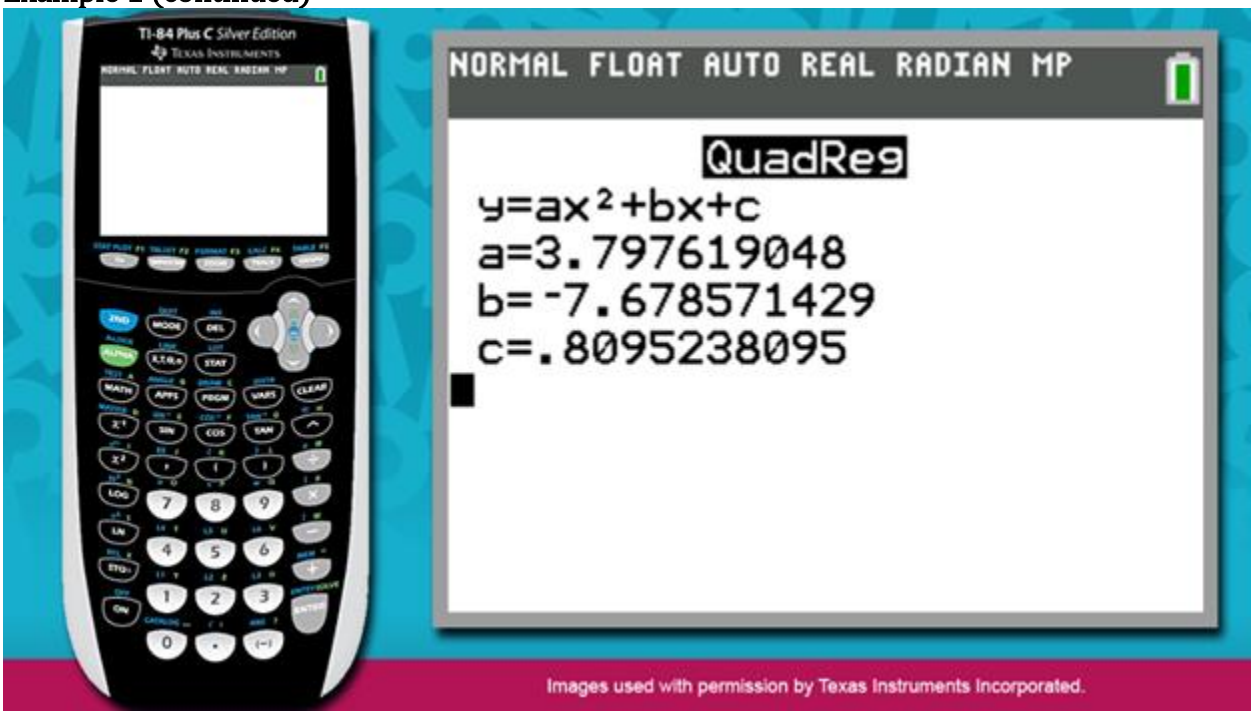
Press ENTER.

Example 1 (continued)



The Quadratic Regression menu now appears on the screen. Press ENTER to progress through each prompt. After you press ENTER at the Calculate prompt, a new screen appears.

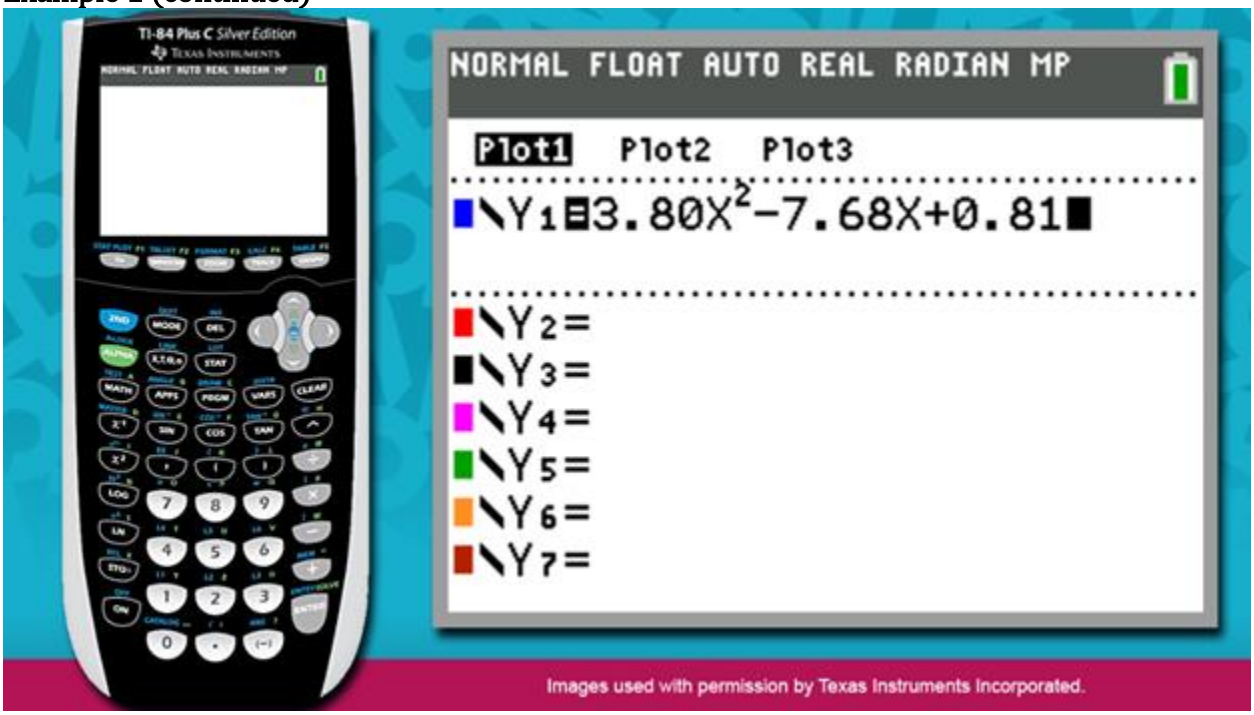
Example 1 (continued)



The calculator has generated the quadratic equation that best fits the data, in the form $y = ax^2 + bx + c$. If the values of a, b, and c are rounded to the nearest hundredths, the equation can be written as $y = 3.80x^2 - 7.68x + 0.81$.

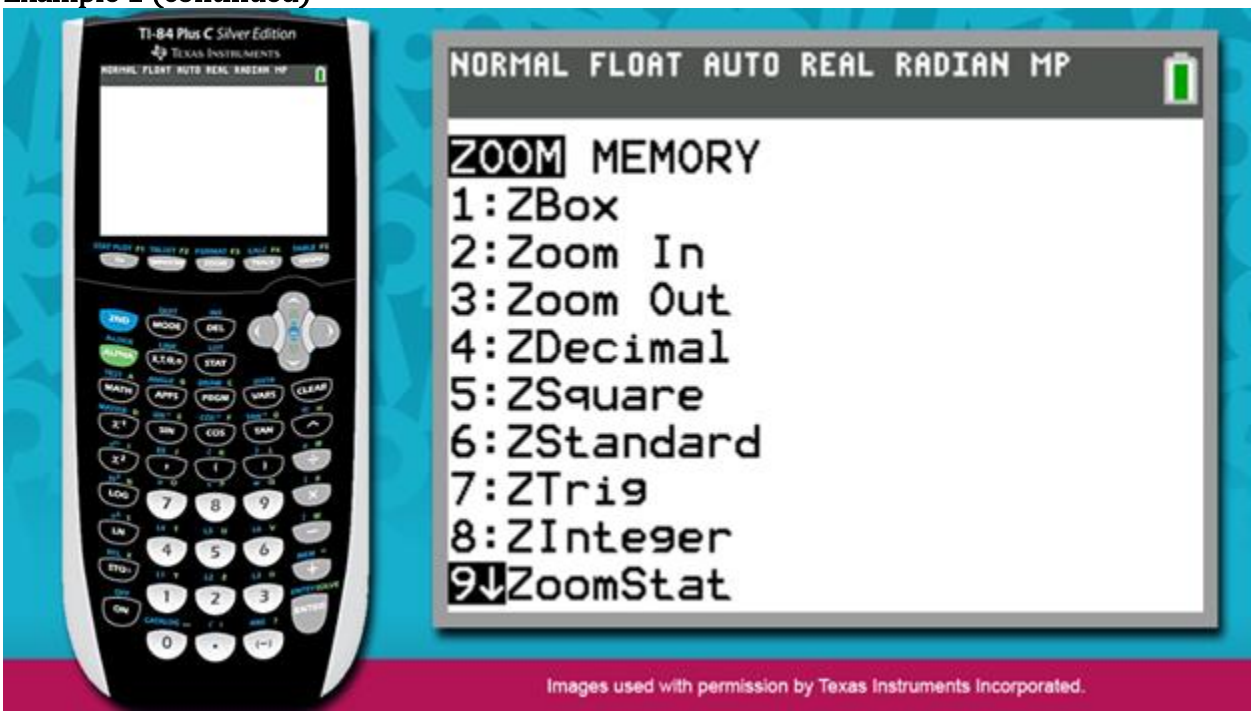
Graph the quadratic equation to continue investigating the curve of best fit.

Example 1 (continued)



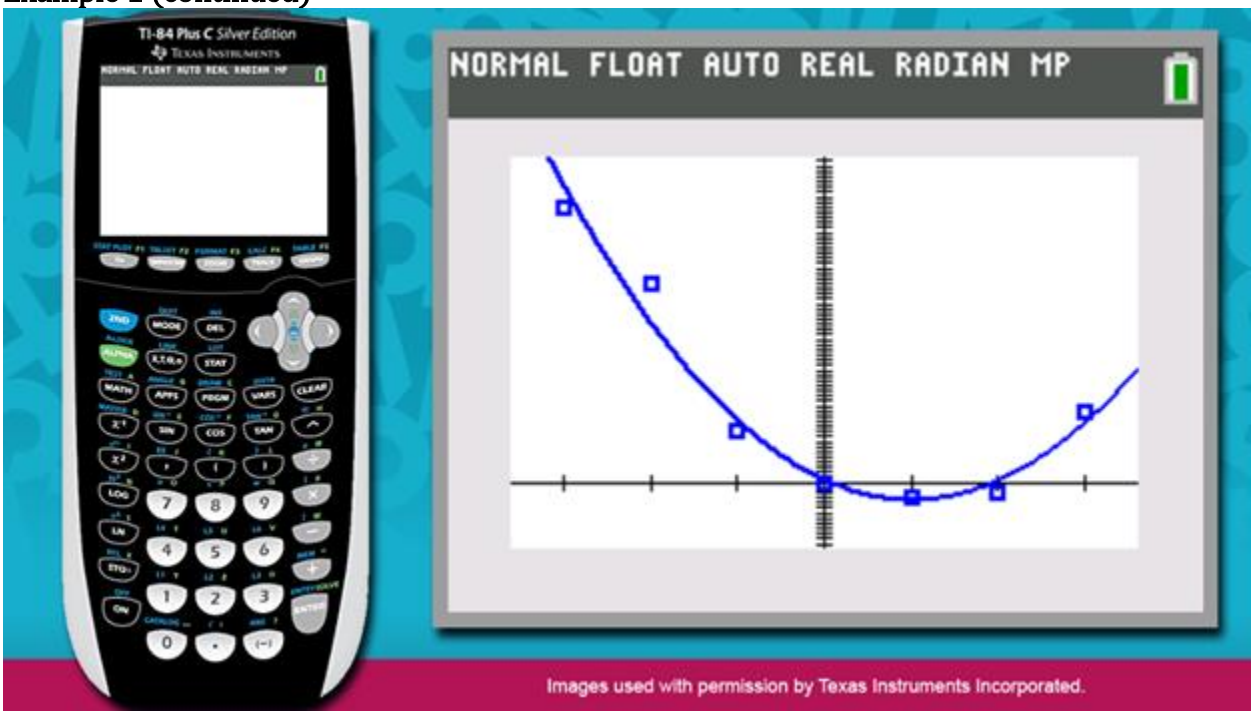
Press the Y= key. Then, enter the expression to the right of the equals sign in the equation of the curve of best fit.

Example 1 (continued)



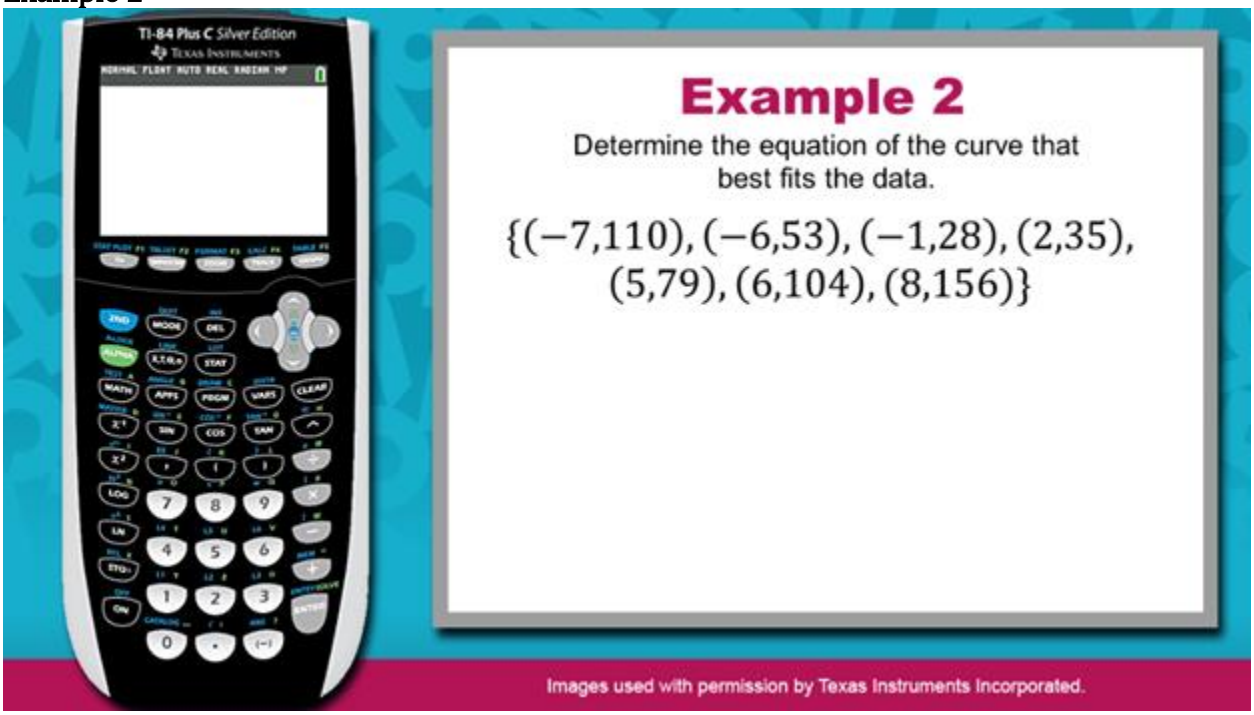
Next, press ZOOM. Once again, select the ninth option in the list, ZoomStat.

Example 1 (continued)



Notice that the graph of the curve of best fit is included in the scatterplot. The curve appears to model a reasonable estimate of the pattern present in the data.

Example 2



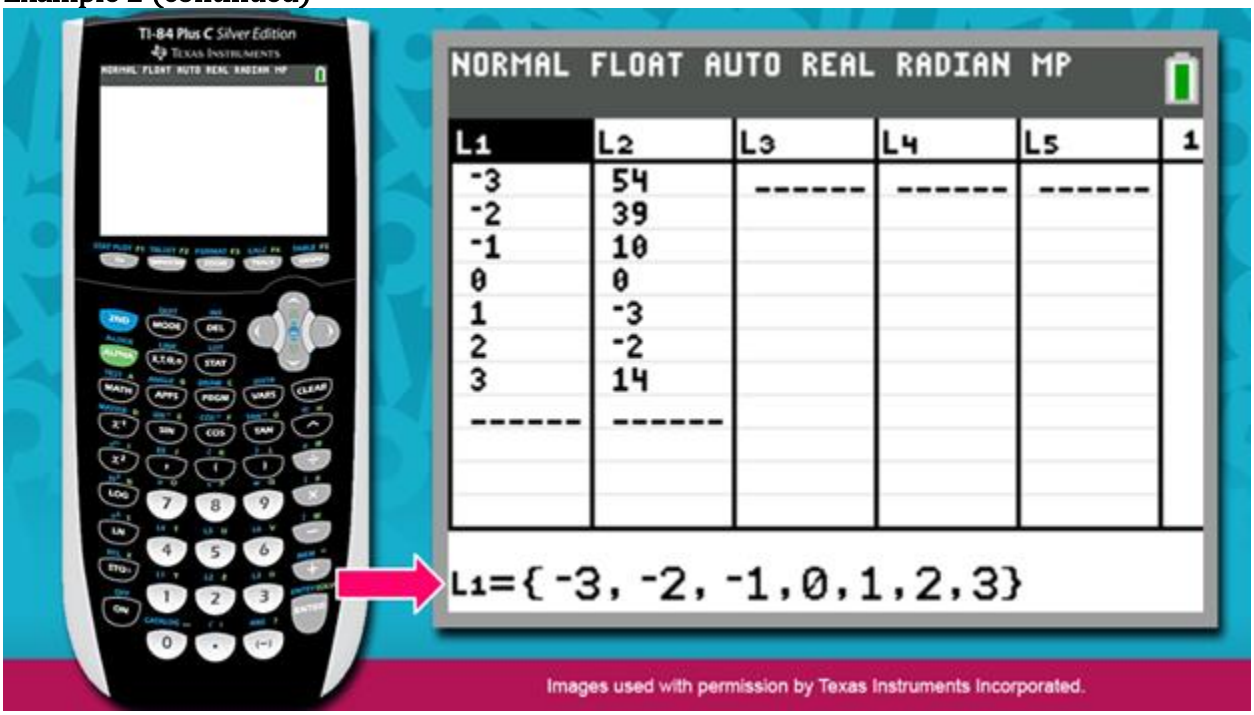
Determine the equation of the curve that best fits the data.

$$\{(-7, 110), (-6, 53), (-1, 28), (2, 35), (5, 79), (6, 104), (8, 156)\}$$

Example 2 (continued)

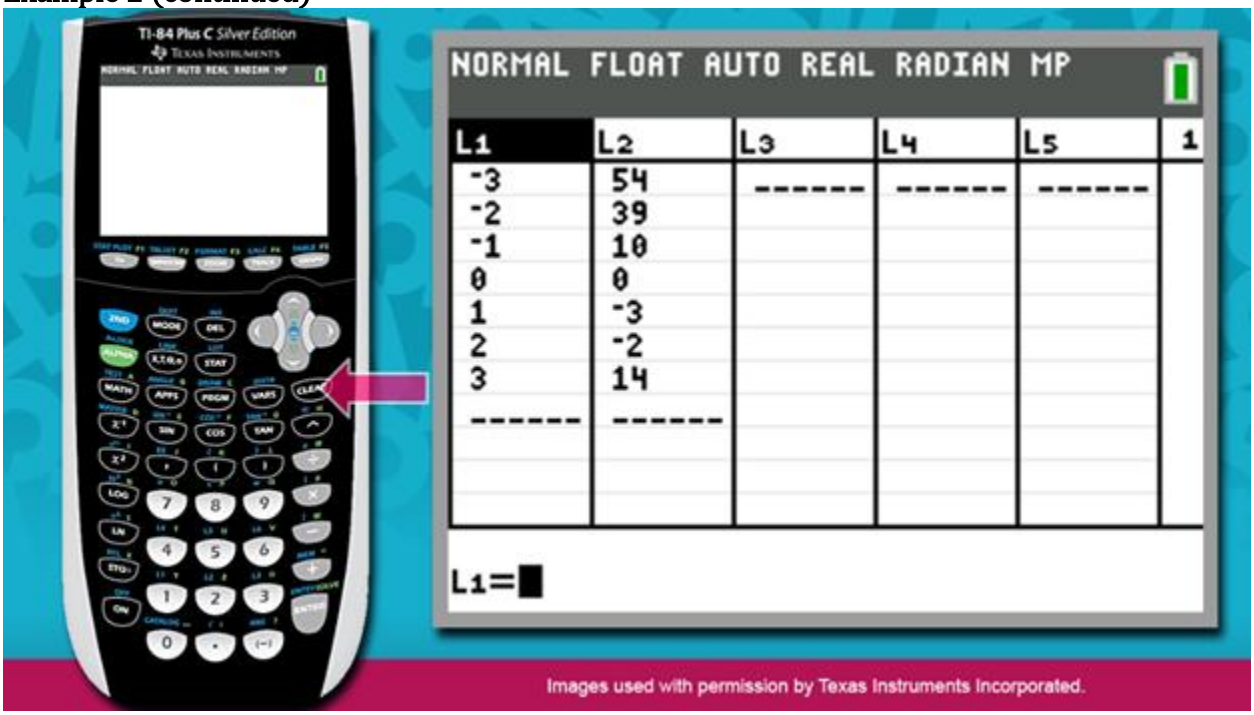
To enter the data for this example, you must first clear the data from the previous example. Press STAT. Then, press ENTER to choose the Edit function.

Example 2 (continued)



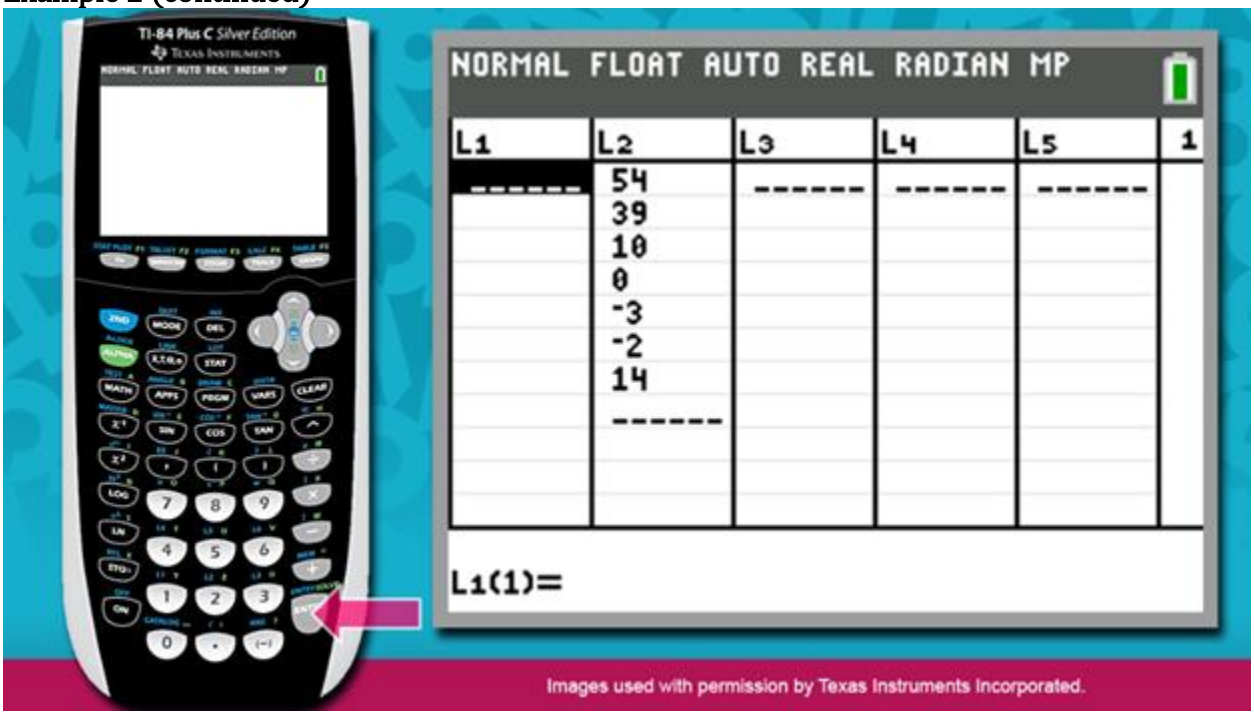
Move the cursor to the L1 header. Notice the set of x-values is shown at the bottom of the window.

Example 2 (continued)



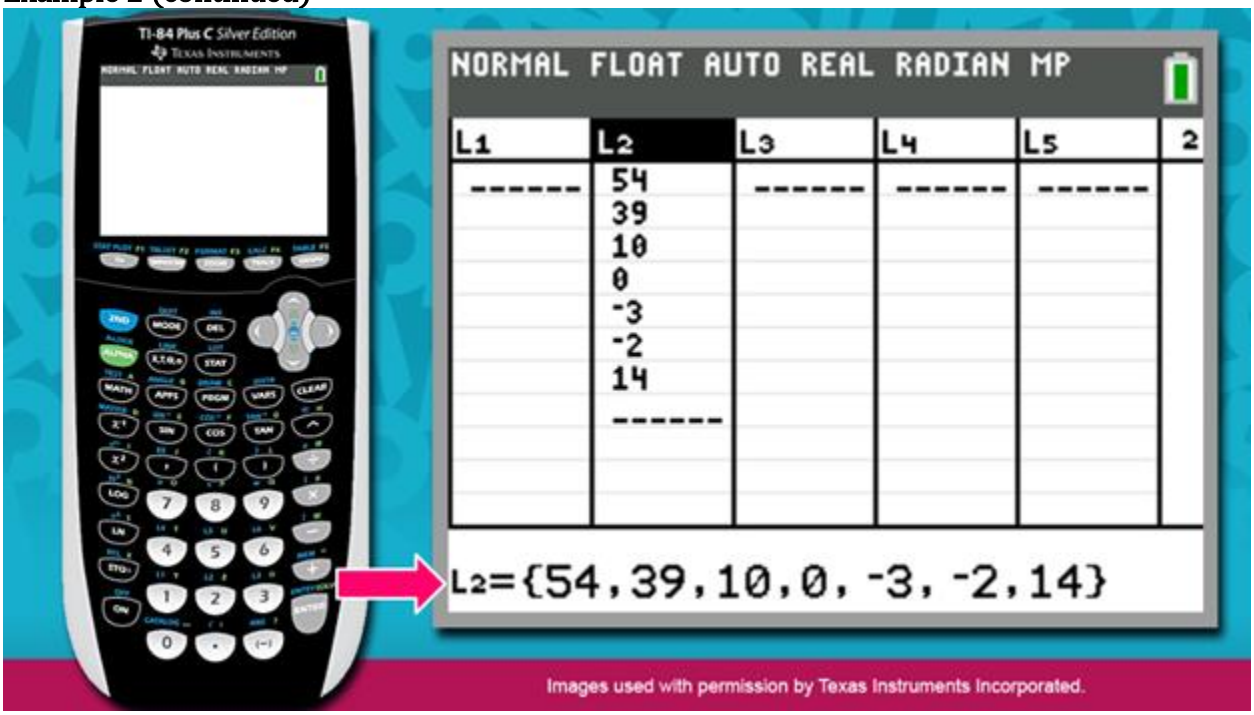
Press CLEAR.

Example 2 (continued)



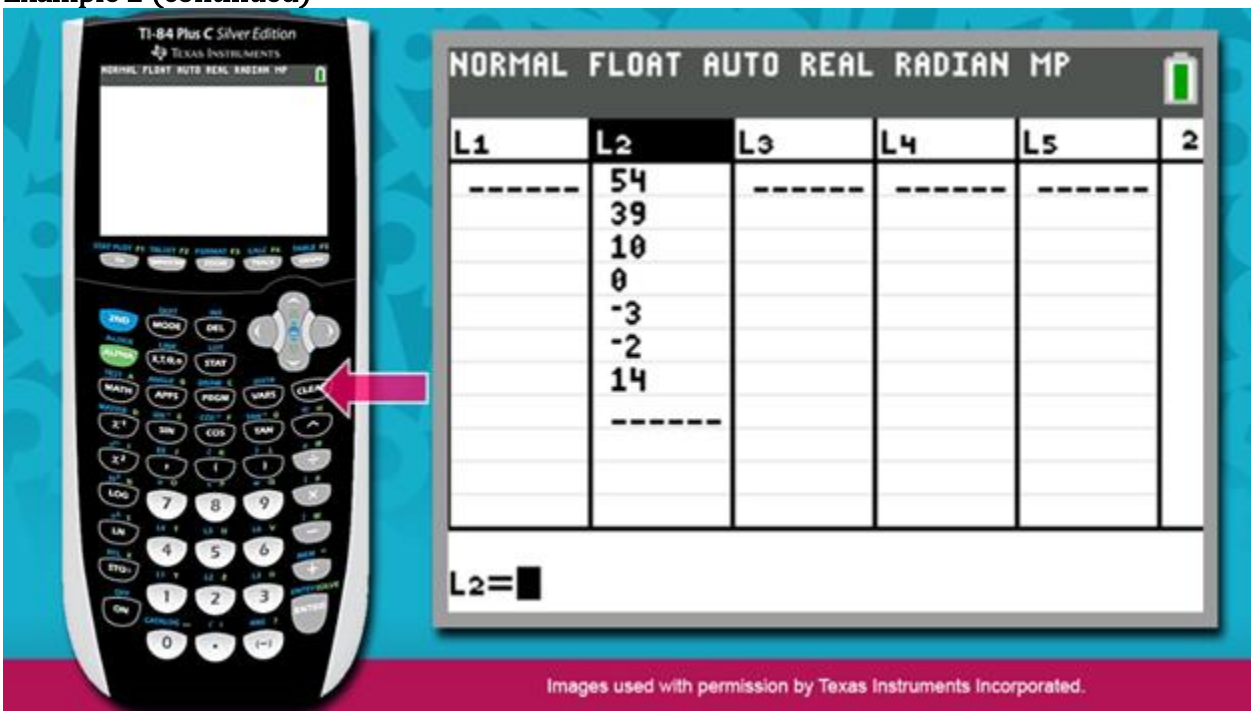
Then, press ENTER. The x-values are now cleared from L1.

Example 2 (continued)



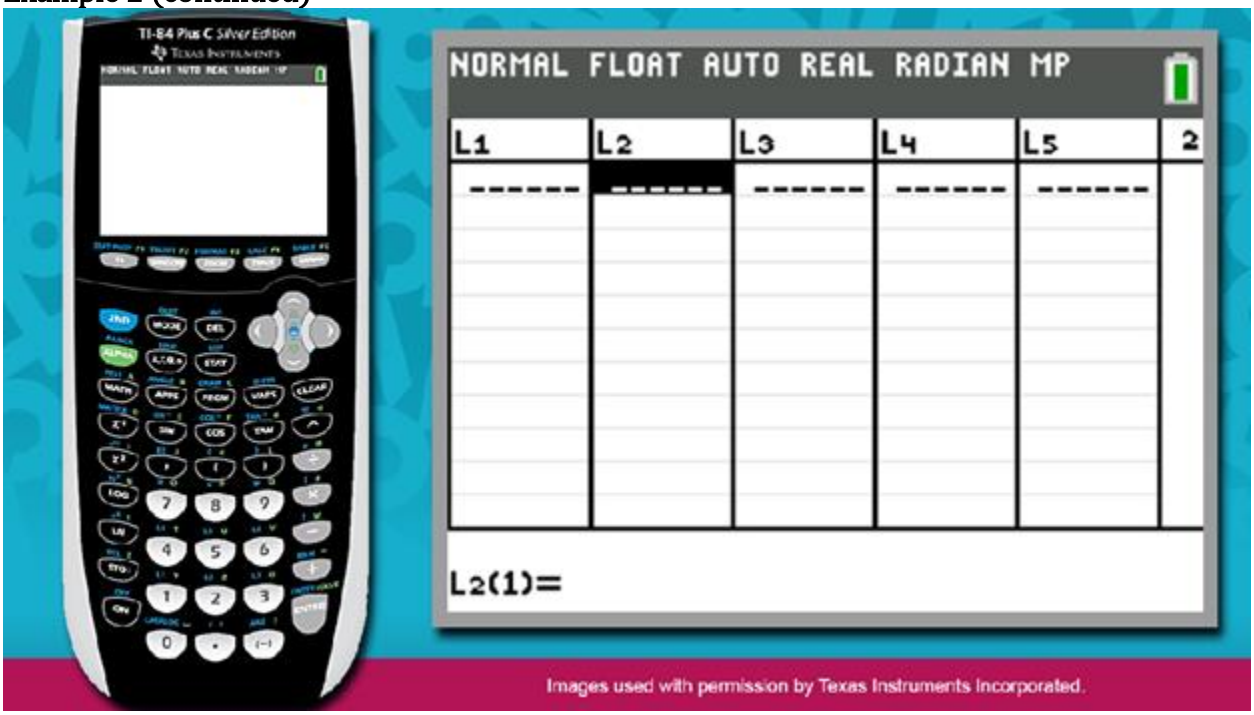
Now, move the cursor to the L2 header. Notice that the set of y-values is shown at the bottom of the window.

Example 2 (continued)



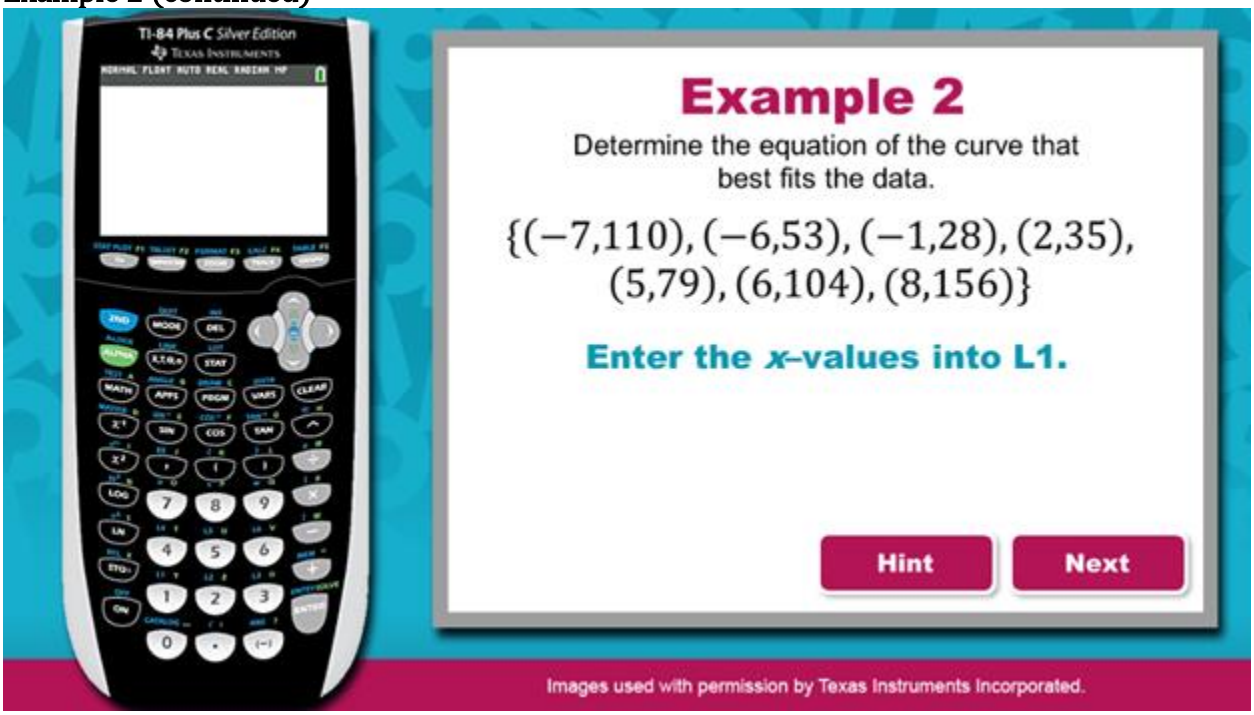
Press CLEAR.

Example 2 (continued)



Then, press ENTER. The y-values are now cleared from L2.

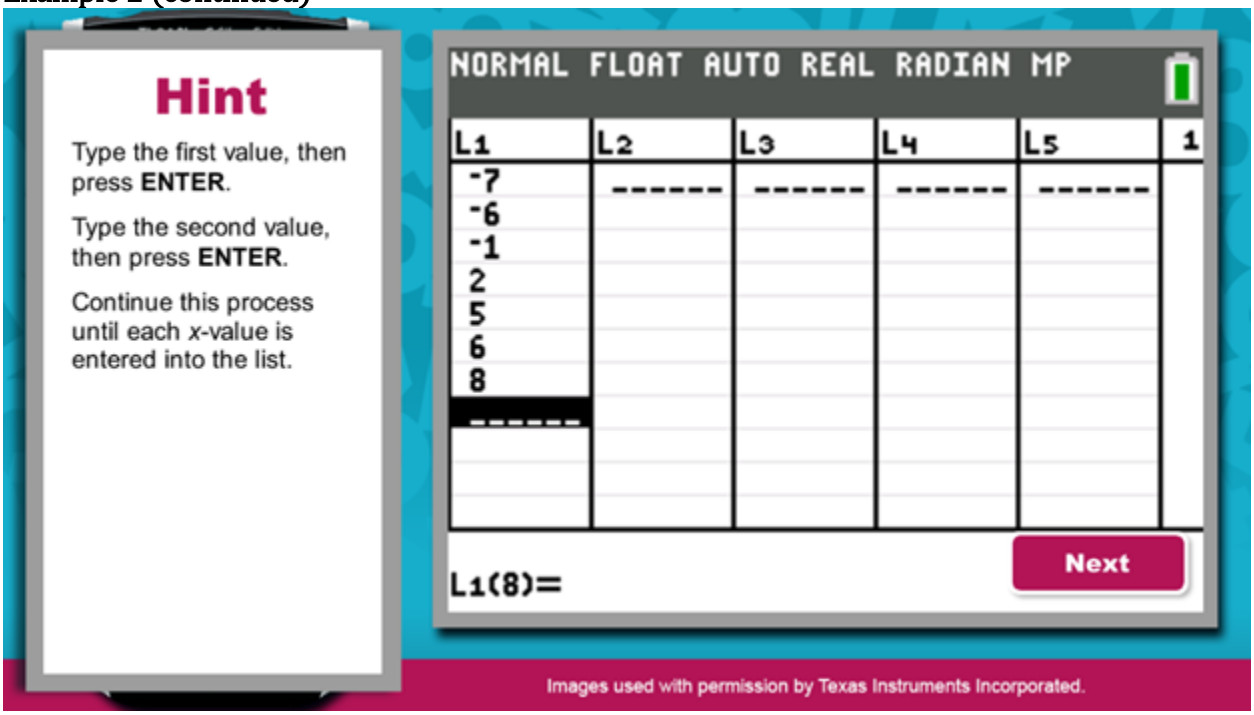
Example 2 (continued)



Now that you have cleared both L1 and L2, you can enter the appropriate values into each column. Enter the x-values into L1.

$$\{(-7, 110), (-6, 53), (-1, 28), (2, 35), (5, 79), (6, 104), (8, 156)\}$$

Example 2 (continued)

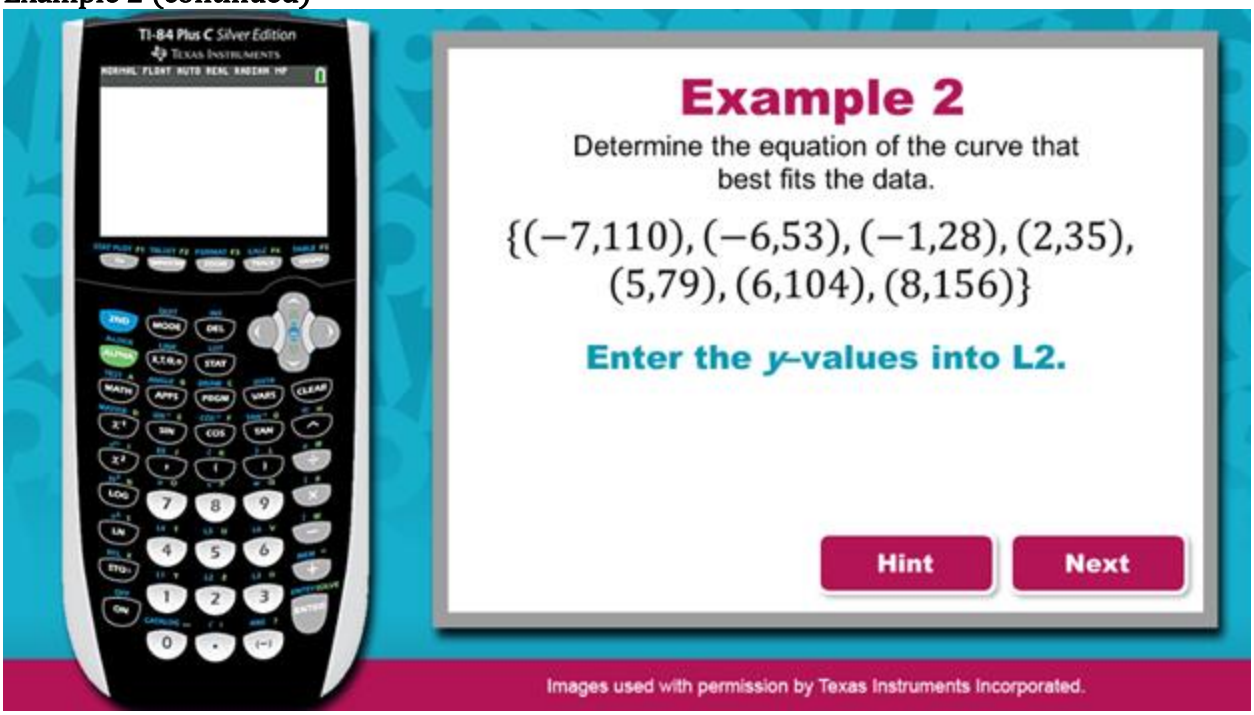


Hint: Type the first value, then press ENTER.

Type the second value, then press ENTER.

Continue this process until each x-value is entered into the list.

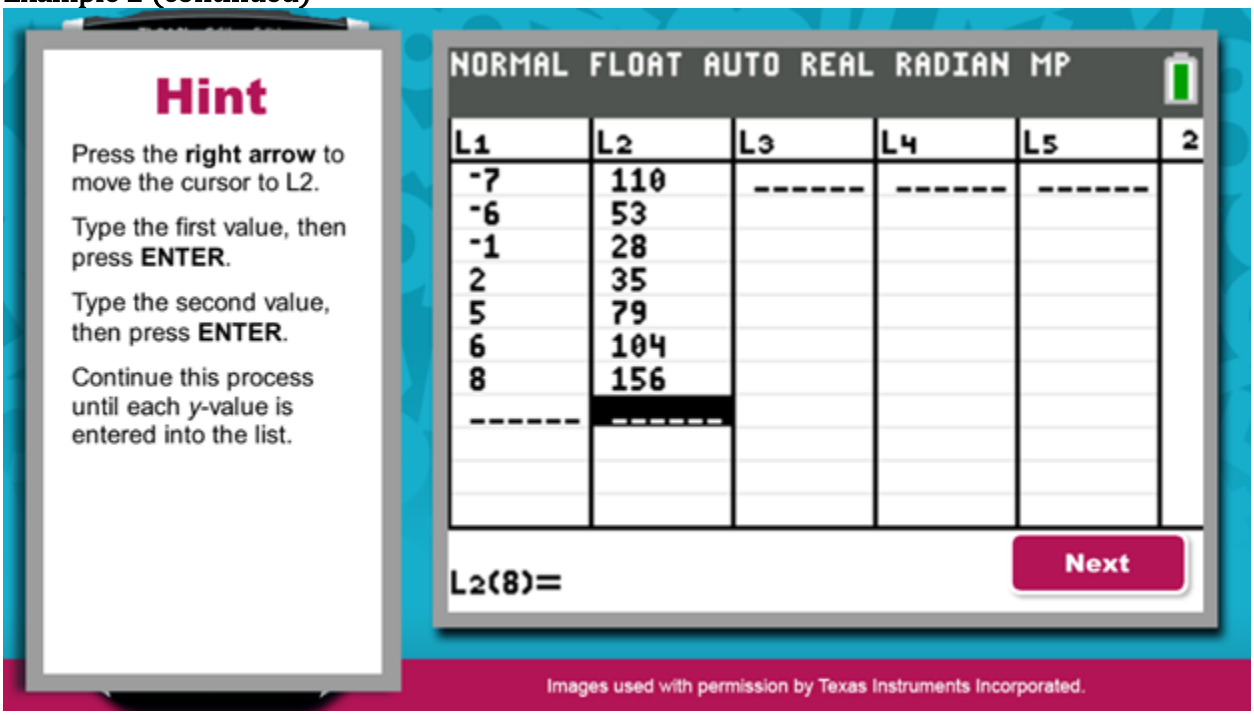
Example 2 (continued)



Enter each corresponding y-value into L2.

$$\{(-7, 110), (-6, 53), (-1, 28), (2, 35), (5, 79), (6, 104), (8, 156)\}$$

Example 2 (continued)



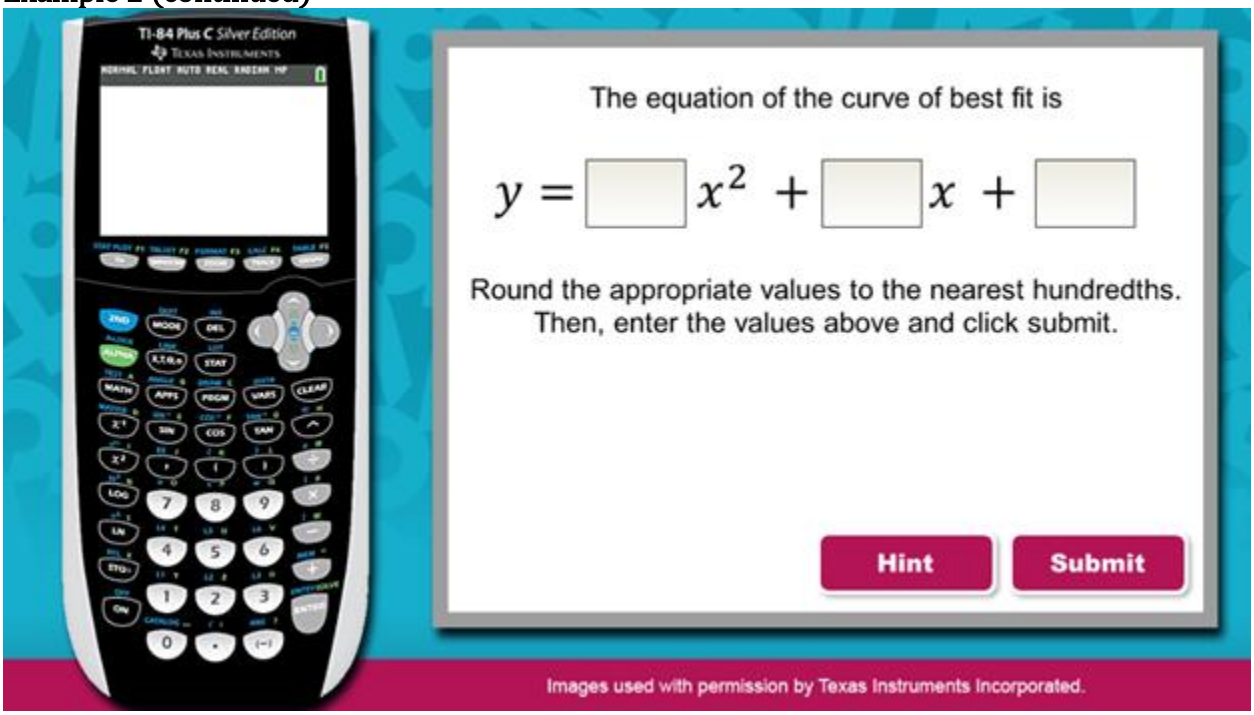
Hint: Press the right arrow to move the cursor to L2.

Type the first value, then press ENTER.

Type the second value, then press ENTER.

Continue this process until each y-value is entered into the list.

Example 2 (continued)

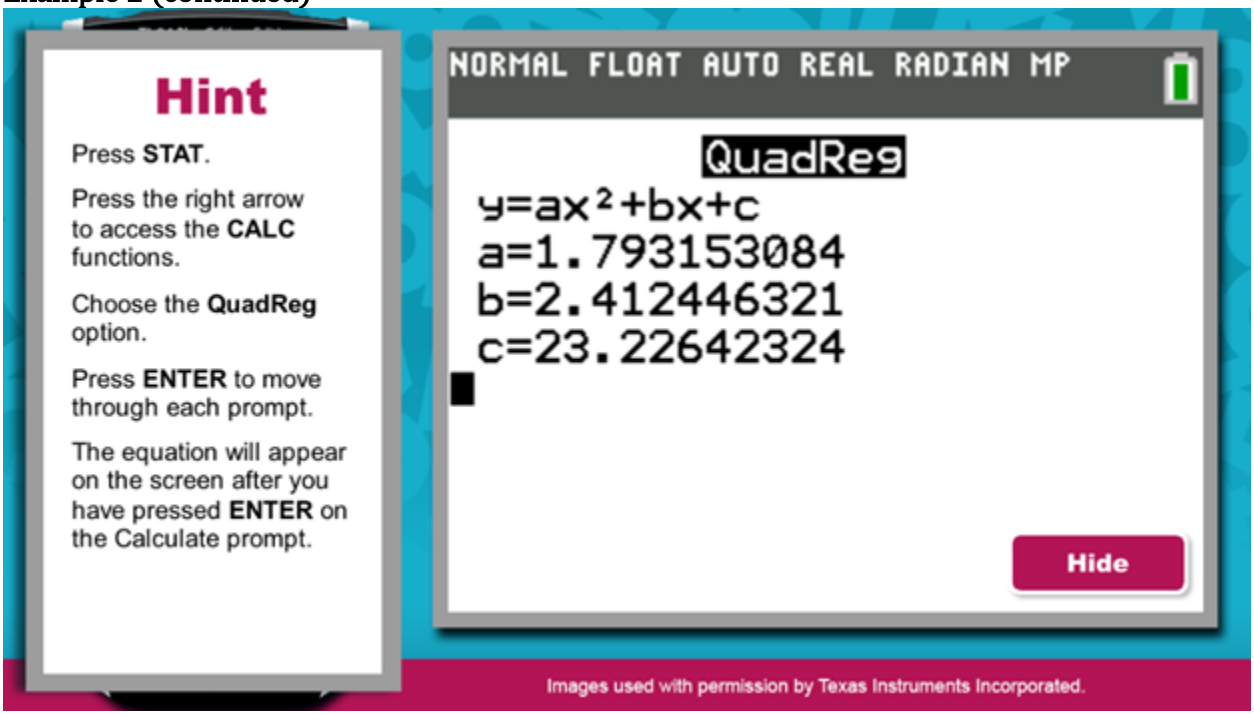


Next, generate the equation of the curve of best fit.

The equation of the curve of best fit is $y = \_\_\_x^2 + \_\_\_x + \_\_\_$.

Round the appropriate values to the nearest hundredths. Then, enter the values above and click submit.

Example 2 (continued)



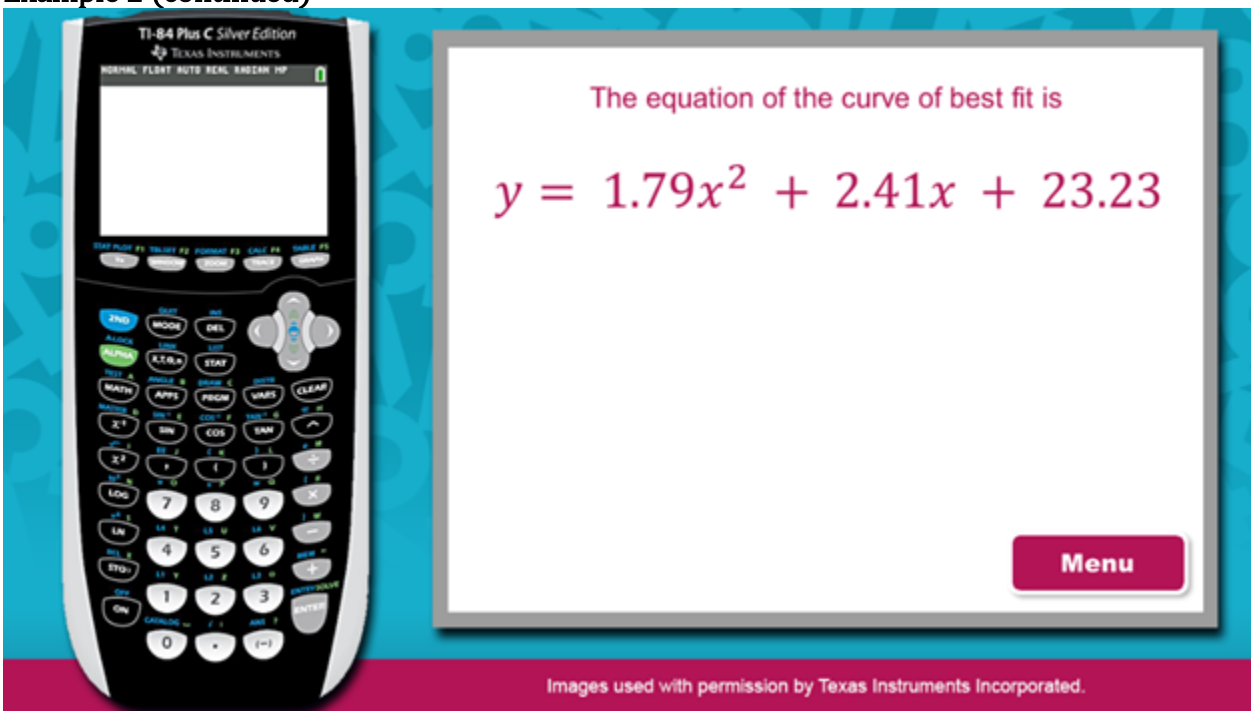
Hint: Press STAT.

Press the right arrow to access the CALC functions.

Then, choose the QuadReg option. Press ENTER to move through each prompt.

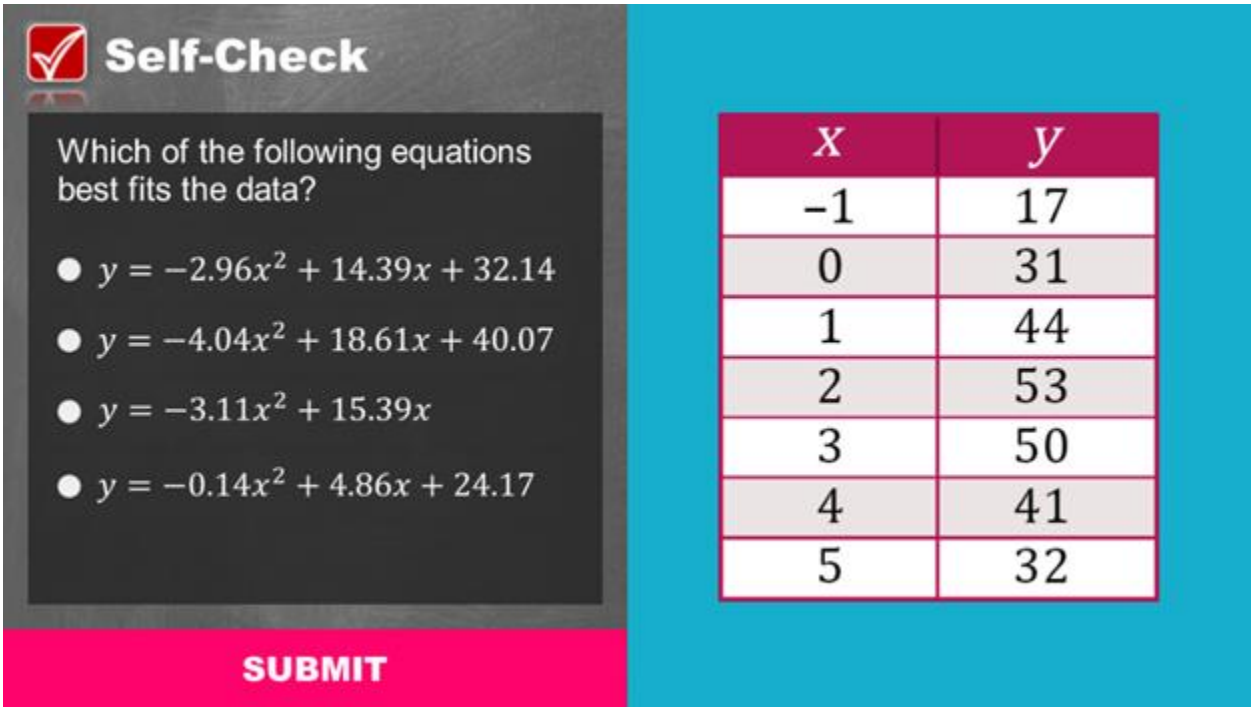
The equation will appear on the screen after you have pressed enter on the CALCULATE prompt.

Example 2 (continued)



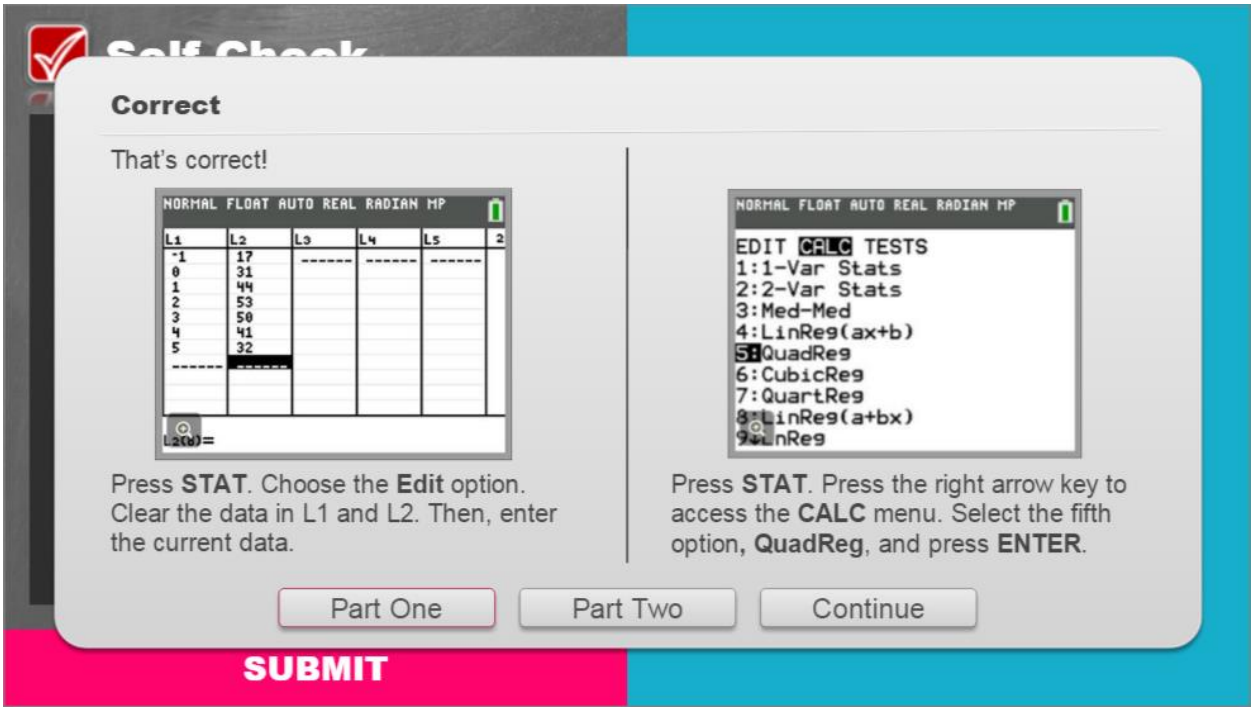
The equation of the curve of best fit is $y = 1.79x^2 + 2.41x + 23.23$.

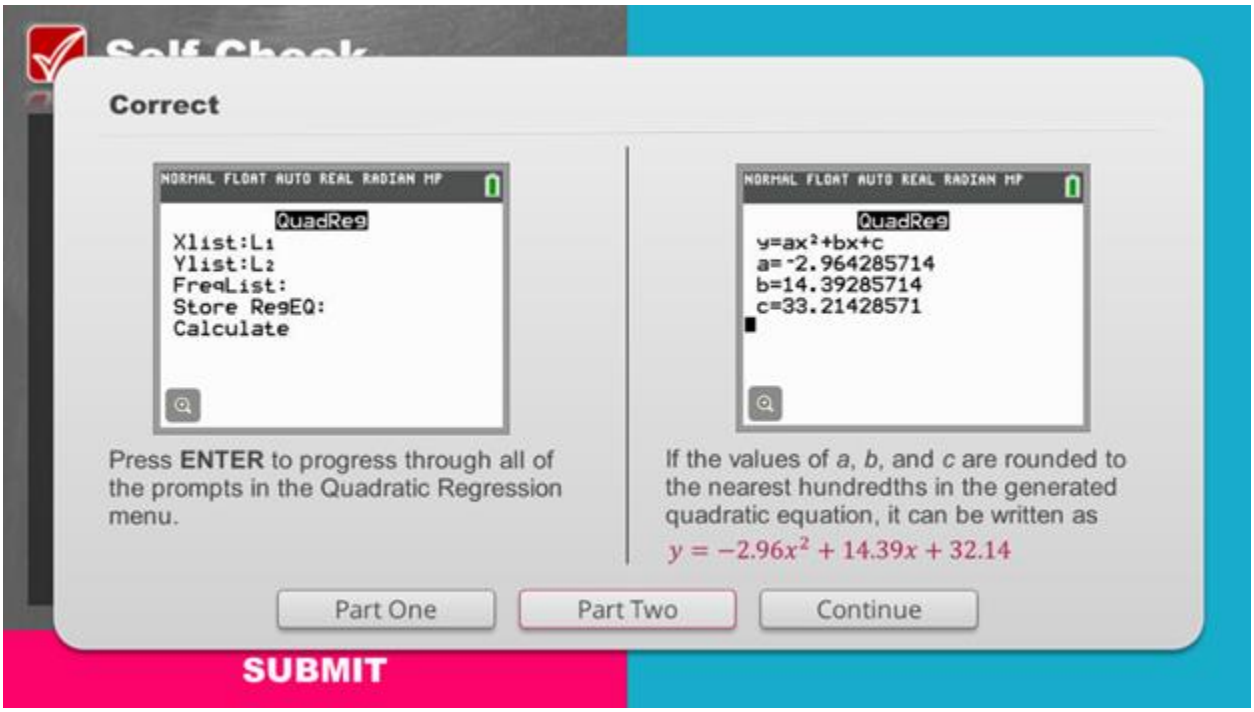
Self-Check 1



Solve the problem in the image above to check your understanding of the content.

Self-Check 1: Answer





For your reference, the images above show the correct solution to the self-check problem.

Conclusion

You have reached the conclusion of this lesson where you learned how to use the graphing calculator to determine the equation of the curve of best fit.