

# Module 12: Statistics

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

### Introduction

A graphic for a lesson introduction. It features a woman with dark curly hair and a pink top on the right side. On the left, there is a white text box with a pink header. The background is blue with faint mathematical symbols like pi, infinity, and numbers.

**Today's Lesson**

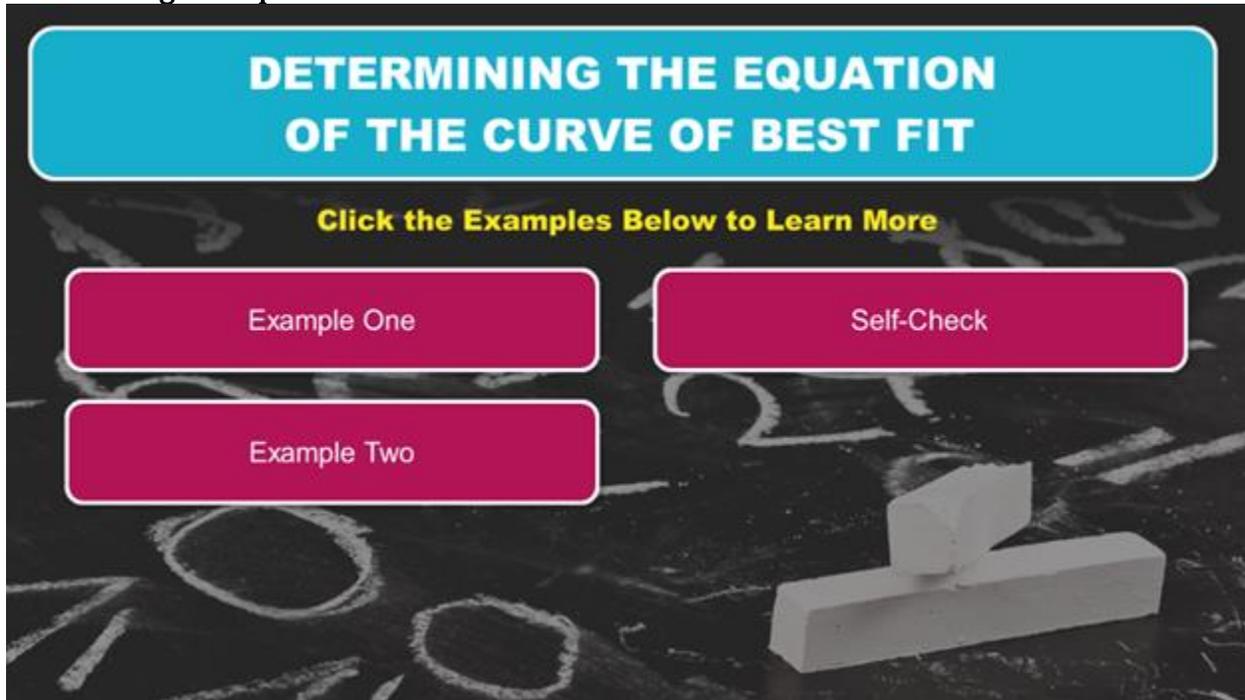
- You will learn how to use the graphing calculator to determine the equation of the curve of best fit.

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.

## Module 12: Statistics

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

#### Determining the Equation of the Line of Best Fit



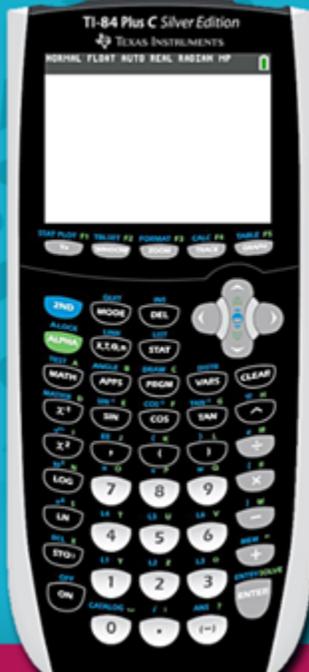
The graphic features a dark background with faint chalkboard-style drawings of circles and lines. At the top, a blue rounded rectangle contains the title "DETERMINING THE EQUATION OF THE CURVE OF BEST FIT" in white, bold, uppercase letters. Below this, a yellow text prompt reads "Click the Examples Below to Learn More". Three pink rounded rectangular buttons are arranged: "Example One" and "Self-Check" are in the top row, and "Example Two" is centered below them. In the bottom right corner, there is a 3D rendering of a white rectangular block with a smaller white rectangular block on top of it.

Click the examples below to learn more.

## Module 12: Statistics

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

#### Example 1



**Example 1**

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

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

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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

## Module 12: Statistics

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

#### Example 1 (continued)



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

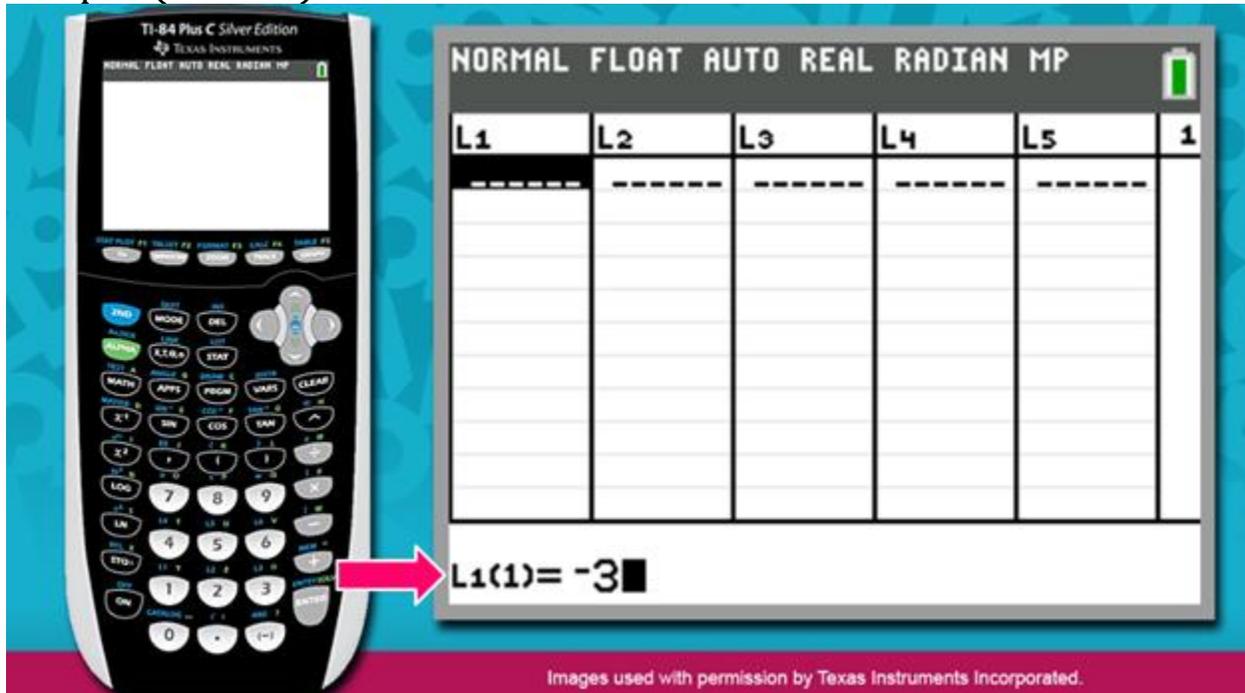
Press the STAT key, located two keys to the right of the green ALPHA key. This key allows you to access the statistics functions of the calculator.



## Module 12: Statistics

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

#### Example 1 (continued)



The image shows a TI-84 Plus C Silver Edition calculator on the left and its data list editor window on the right. The calculator screen displays the mode menu with 'NORMAL' selected. The data list editor window shows a table with columns L1 through L5 and a row indicator '1'. The value '-3' is entered in the L1 column, and a pink arrow points from the calculator's keypad to this entry. The bottom of the window displays 'L1(1) = -3'.

L1	L2	L3	L4	L5	1
-3					

L1(1) = -3

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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.



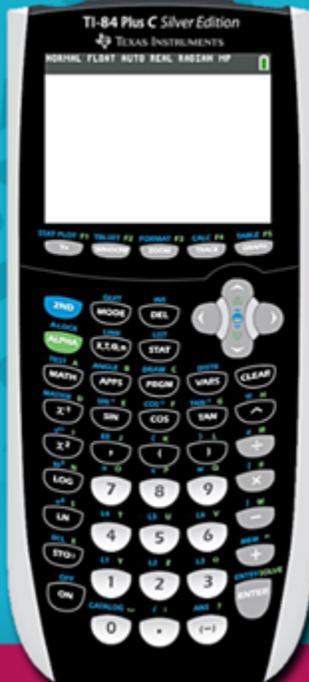




## Module 12: Statistics

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

#### Example 1 (continued)



**Example 1**

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

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

**Enter the remaining  $x$ -values into L1. Then, continue.**

Images used with permission by Texas Instruments Incorporated.

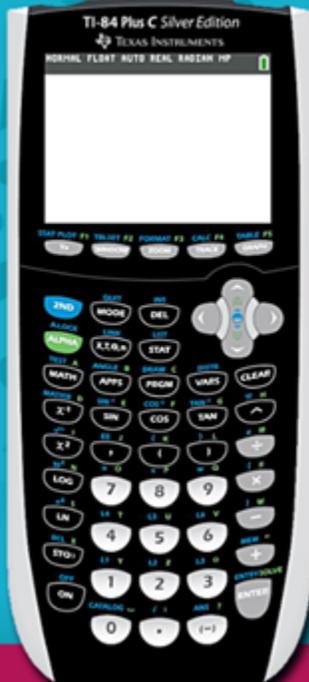
Continue this process until all of the  $x$ -values are entered into L1.

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

## Module 12: Statistics

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

#### Example 1 (continued)



**Example 1**

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

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

**Enter the  $y$ -values into L2. Then, continue.**

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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



## Module 12: Statistics

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

#### Example 1 (continued)

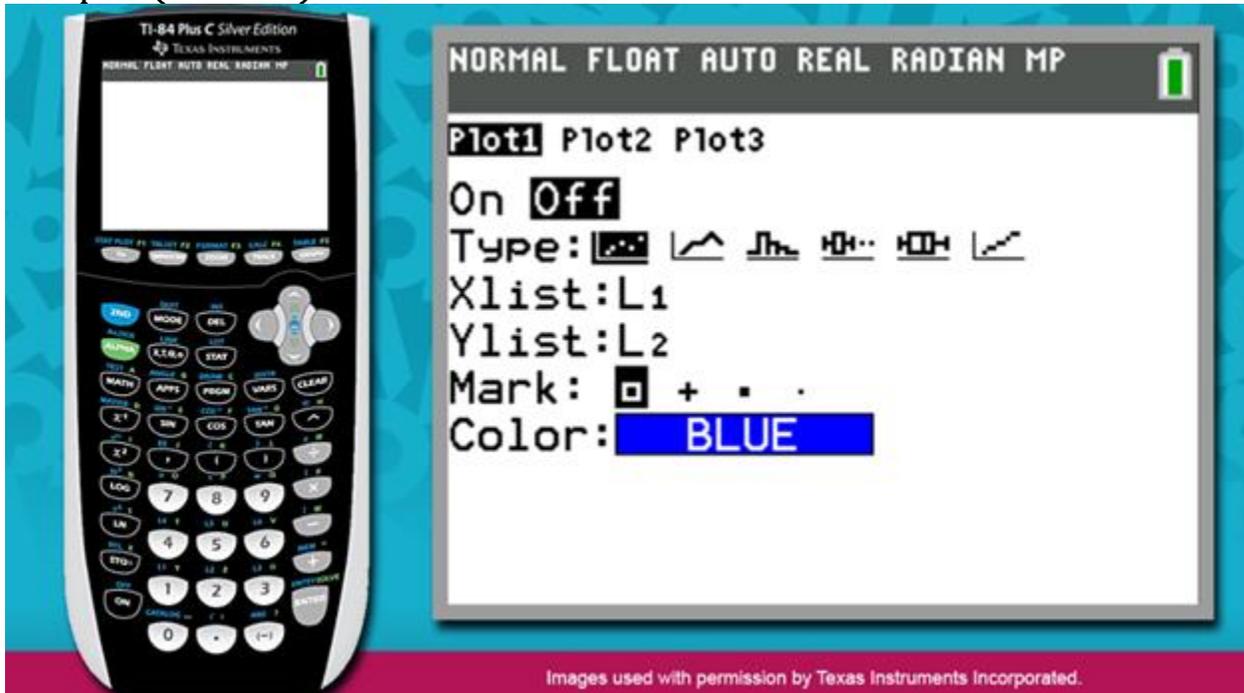


Press 2<sup>nd</sup>. This key allows you to access a function stamped above a calculator key. Now, press the  $Y=$  key to access the STAT PLOTS menu. Press ENTER to choose Plot 1.

## Module 12: Statistics

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

#### Example 1 (continued)

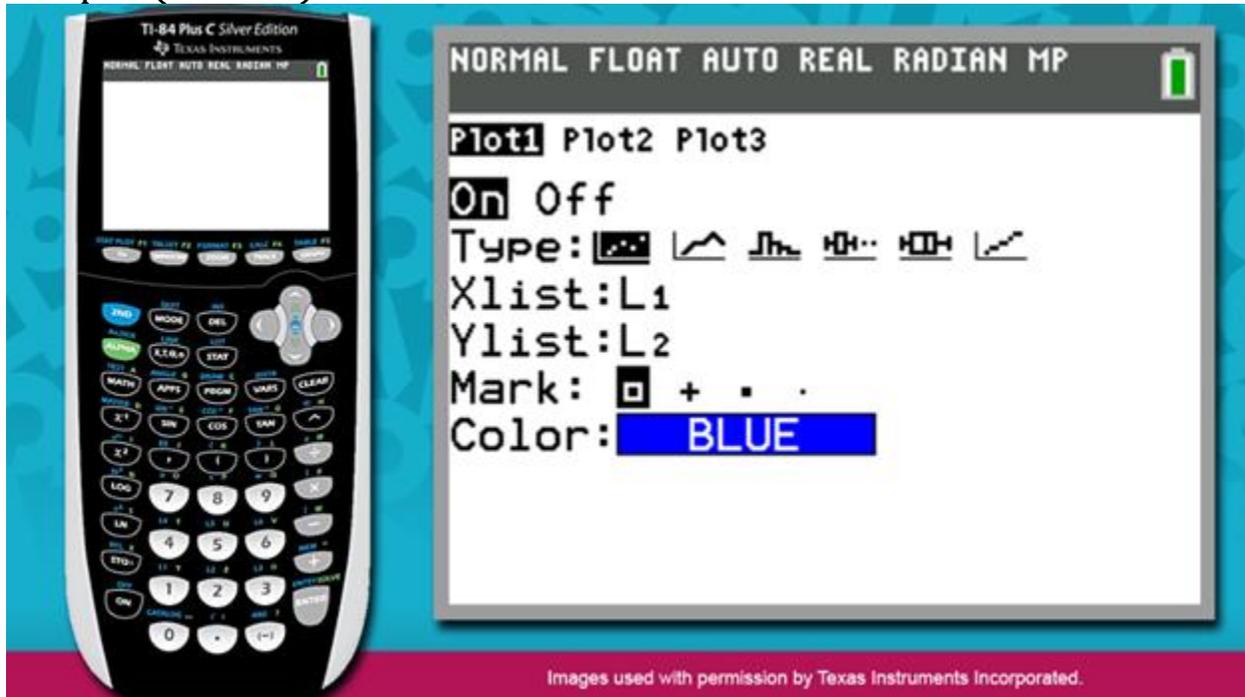


Notice that the plots are currently turned off. To view the scatterplot, you must turn the plots on.

## Module 12: Statistics

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

#### 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.

## Module 12: Statistics

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

Example 1 (continued)

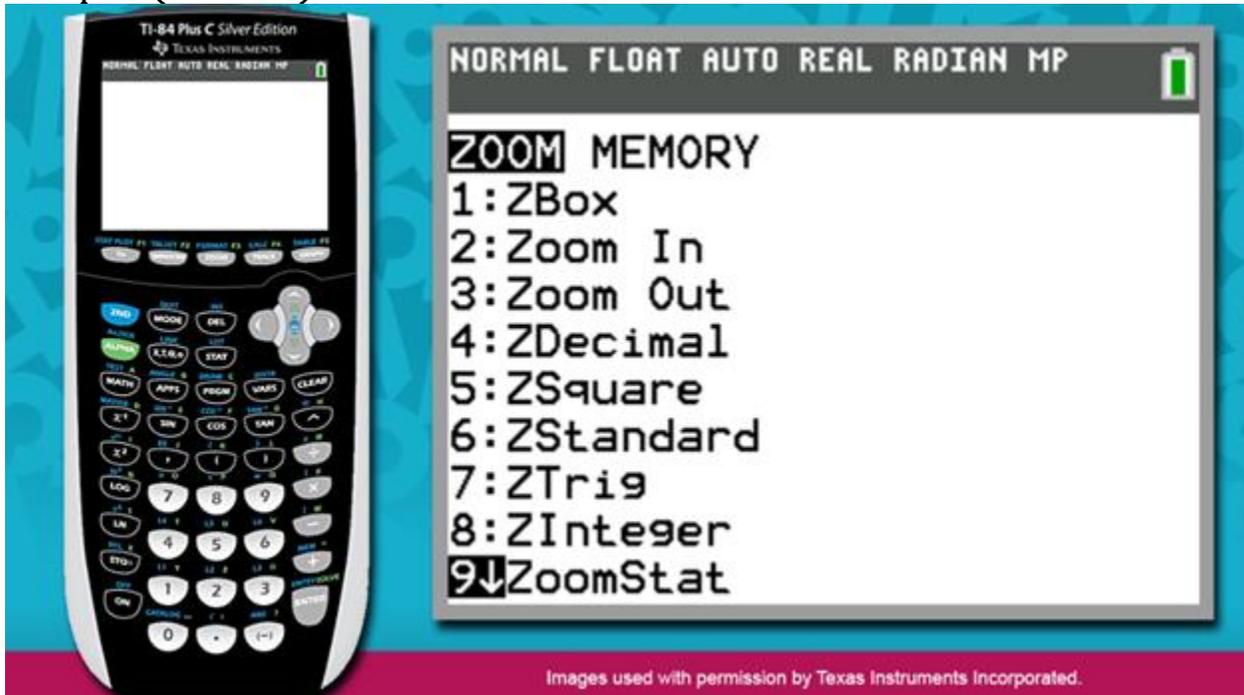


Next, press ZOOM, located in the very top row of keys.

## Module 12: Statistics

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

#### Example 1 (continued)



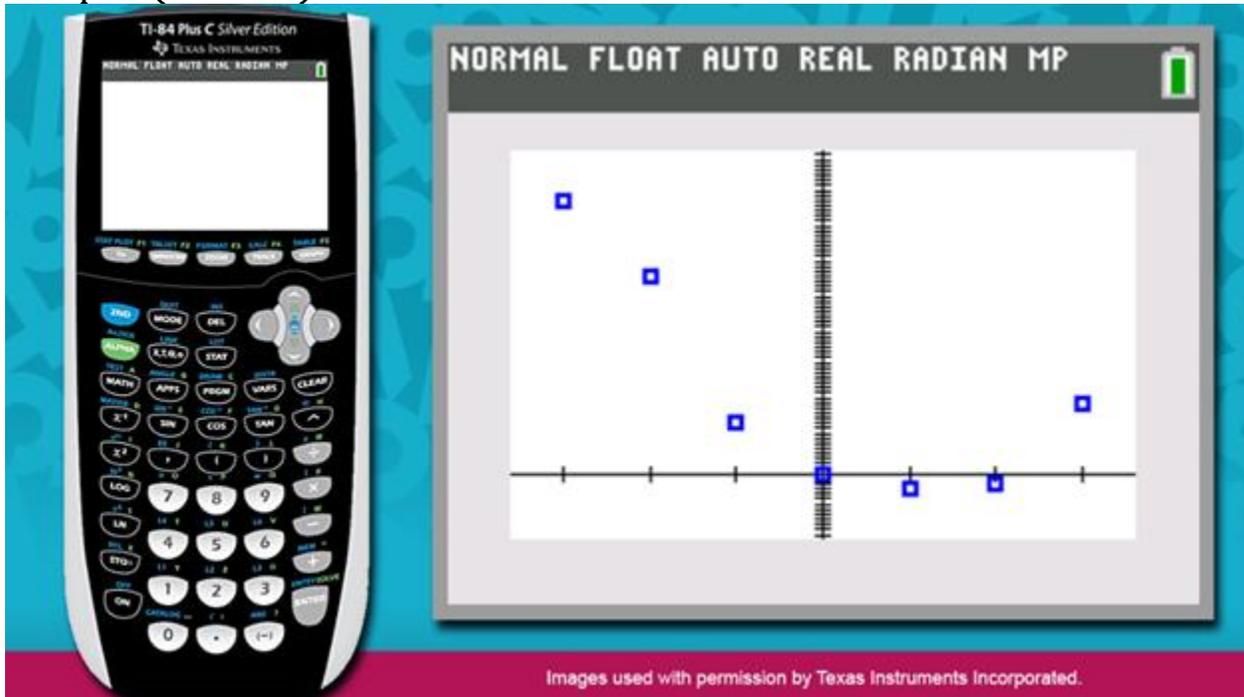
Then, press the down arrow key to move the cursor to the ninth option, ZoomStat. This option will inform the calculator to set the necessary window to view the scatterplot.

Press ENTER.

## Module 12: Statistics

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

Example 1 (continued)

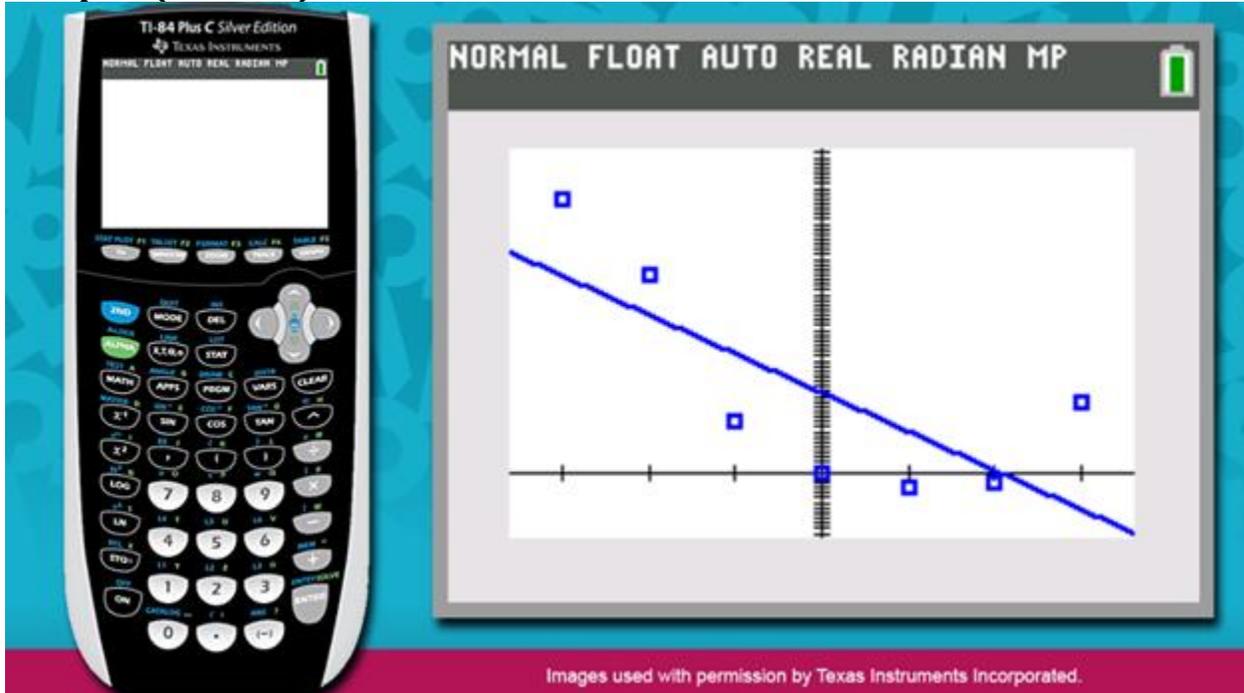


Consider the relationship between the  $x$ -values and  $y$ -values. The trend is not linear.

## Module 12: Statistics

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

#### Example 1 (continued)

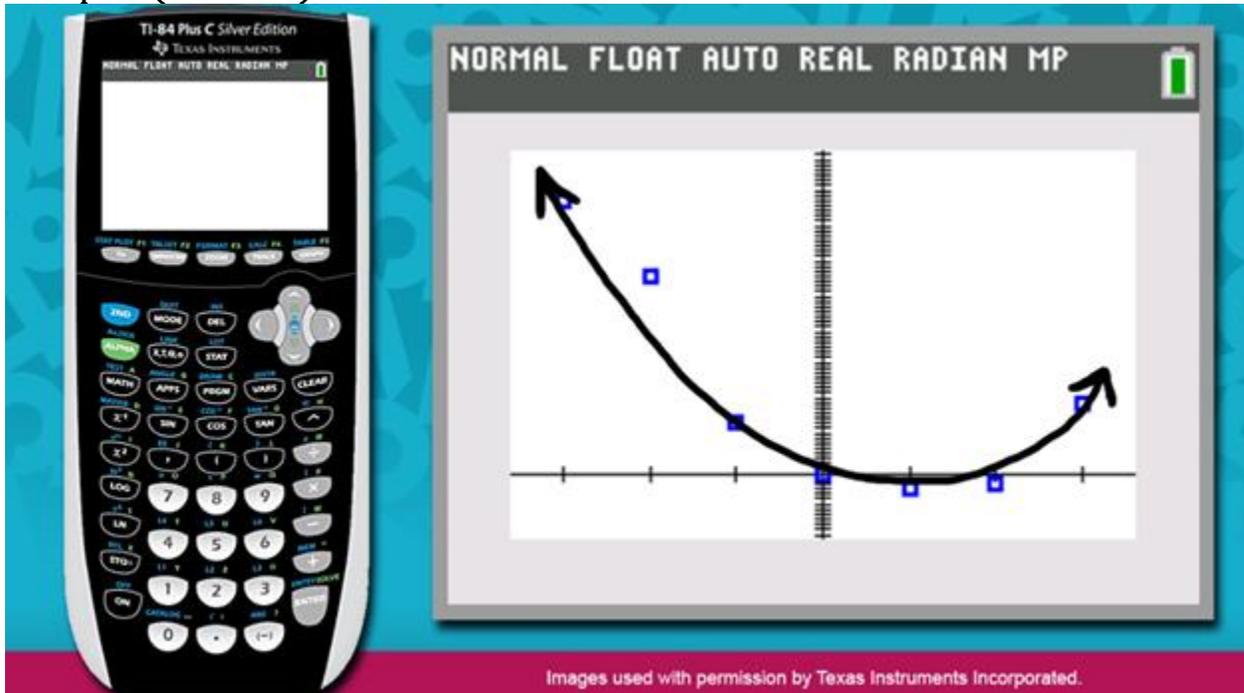


A linear equation is not a reasonable model of the relationship between the input and output values.

## Module 12: Statistics

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

#### Example 1 (continued)



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

## Module 12: Statistics

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

#### Example 1 (continued)



To determine the quadratic equation, press STAT.

## Module 12: Statistics

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

#### Example 1 (continued)



Press the right arrow key to access the Calculate functions.

## Module 12: Statistics

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

#### Example 1 (continued)



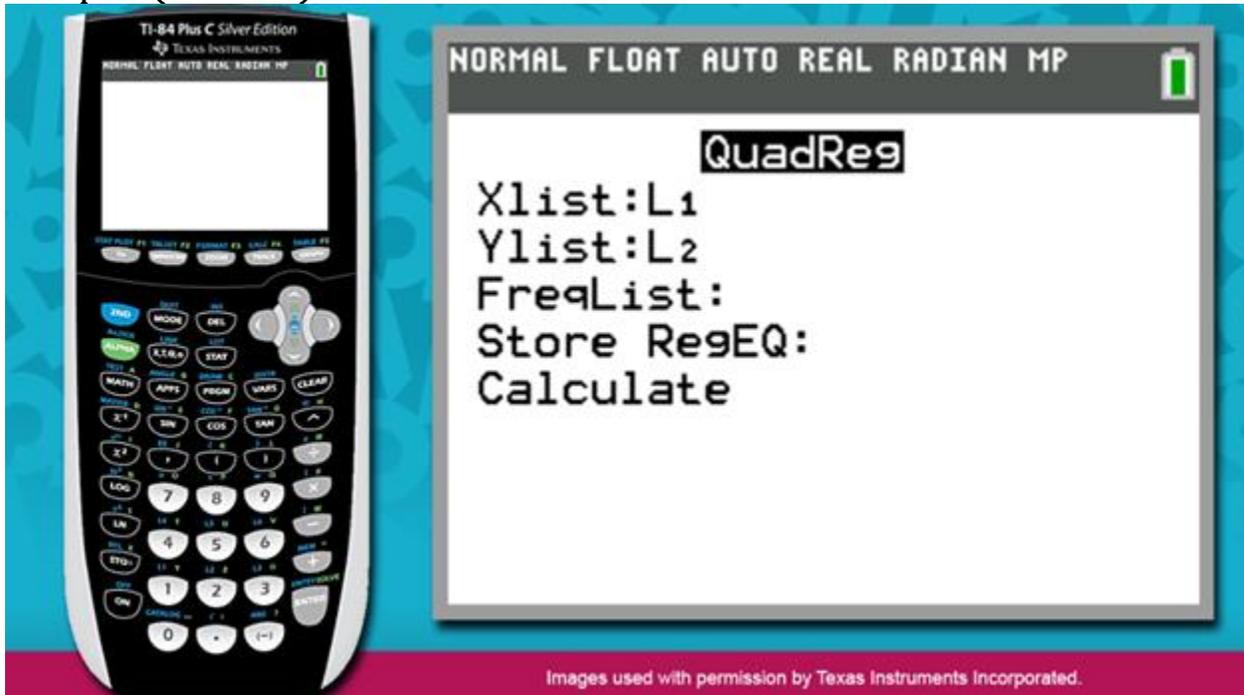
Press the down arrow key to select the fifth option in the list, QuadReg, an abbreviation for quadratic regression. This option will prompt the calculator to generate a quadratic equation to model the relationship.

Press ENTER.

## Module 12: Statistics

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

#### Example 1 (continued)

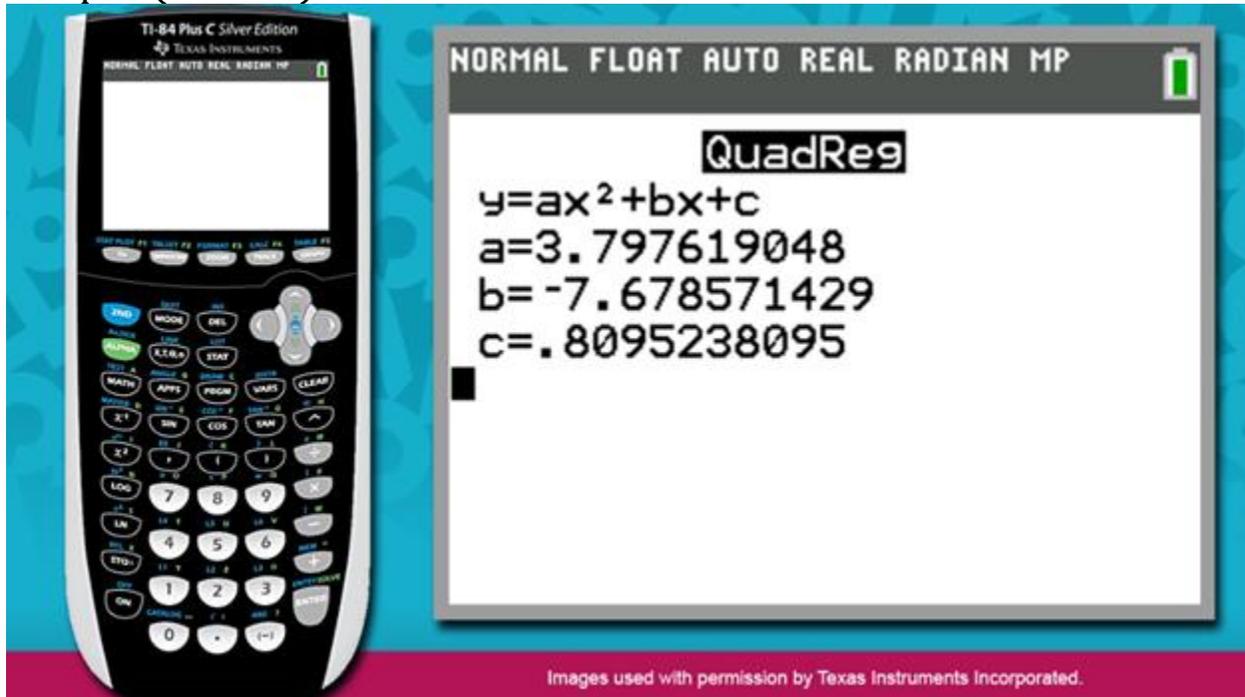


The Quadratic Regression menu now appears on the screen. Press ENTER to progress through each prompt. After you press ENTER at the Calculate prompt, a new screen appears.

## Module 12: Statistics

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

#### Example 1 (continued)



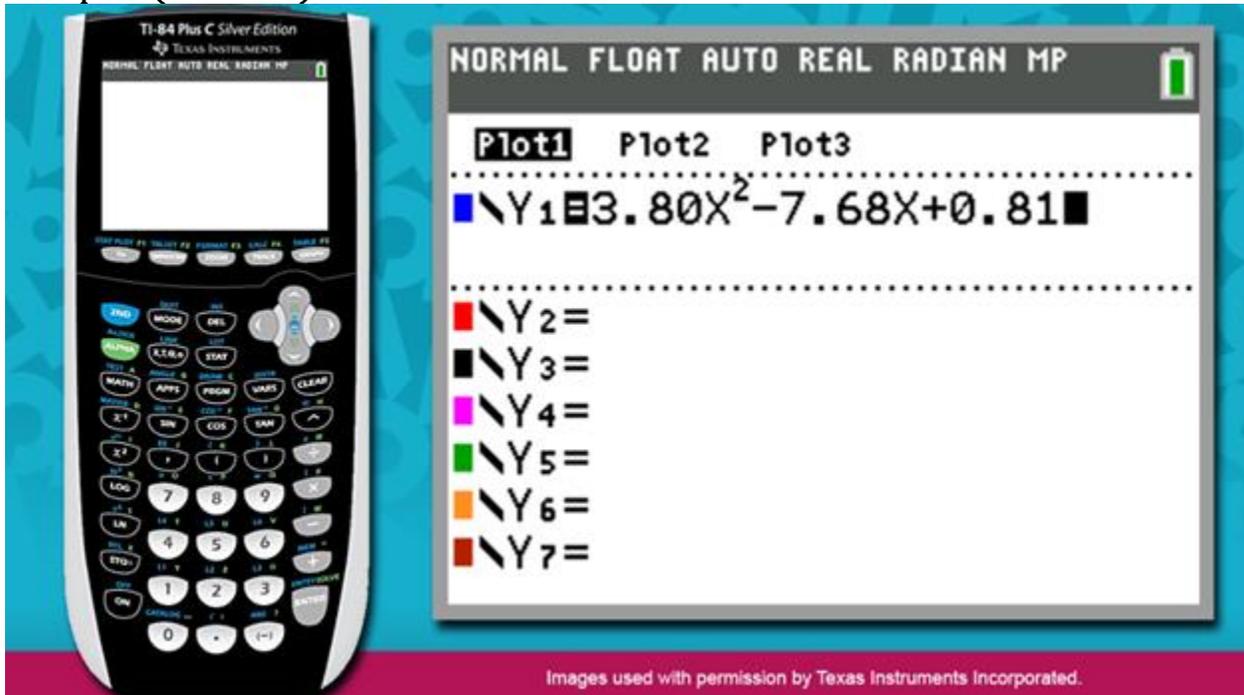
The calculator has generated the quadratic equation that best fits the data, in the form  $y = ax^2 + bx + c$ . If the values of  $a$ ,  $b$ , and  $c$  are rounded to the nearest hundredths, the equation can be written as  $y = 3.80x^2 - 7.68x + 0.81$ .

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

## Module 12: Statistics

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

#### Example 1 (continued)



The image shows a TI-84 Plus C Silver Edition calculator on the left and its screen on the right. The screen displays the following information:

- Mode settings: NORMAL, FLOAT, AUTO, REAL, RADIAN, MP.
- Plot settings: Plot1, Plot2, Plot3.
- Equation for Plot1:  $Y_1 = 3.80X^2 - 7.68X + 0.81$
- Blank lines for Y2, Y3, Y4, Y5, Y6, and Y7.

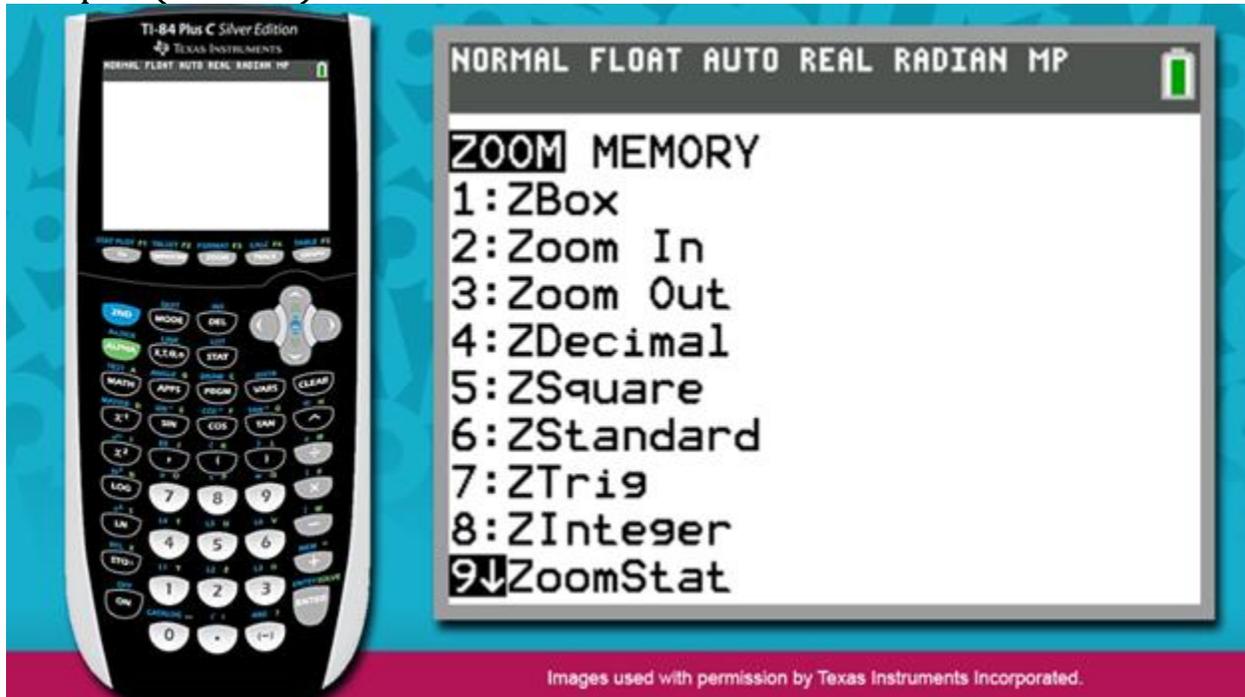
Images used with permission by Texas Instruments Incorporated.

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

## Module 12: Statistics

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

#### Example 1 (continued)

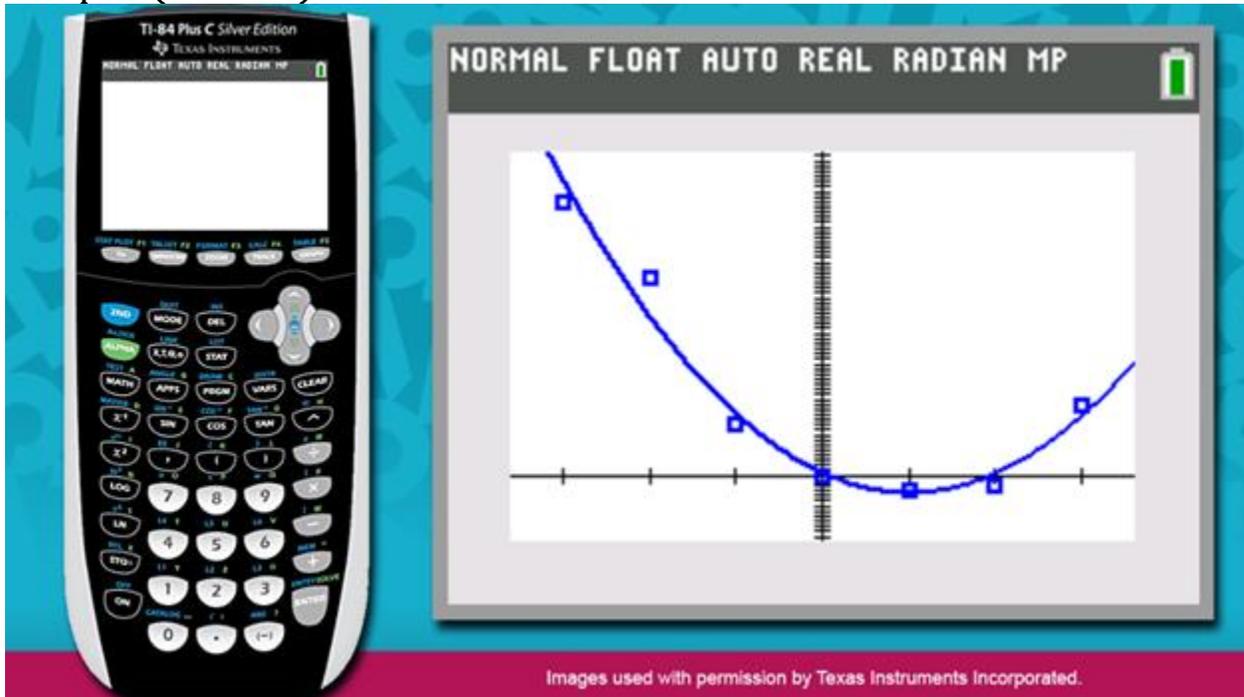


Next, press ZOOM. Once again, select the ninth option in the list, ZoomStat.

## Module 12: Statistics

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

#### Example 1 (continued)

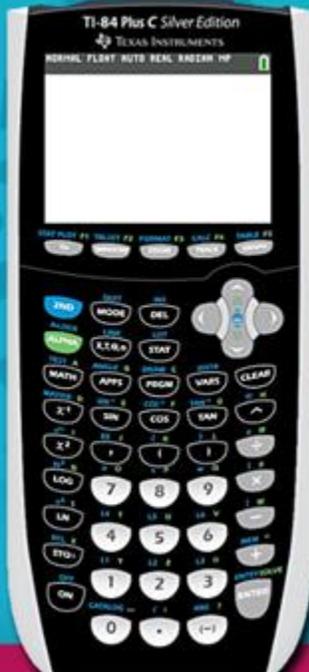


Notice that the graph of the curve of best fit is included in the scatterplot. The curve appears to model a reasonable estimate of the pattern present in the data.

## Module 12: Statistics

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

#### Example 2



**Example 2**

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

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

Images used with permission by Texas Instruments Incorporated.

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

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

## Module 12: Statistics

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

#### Example 2 (continued)

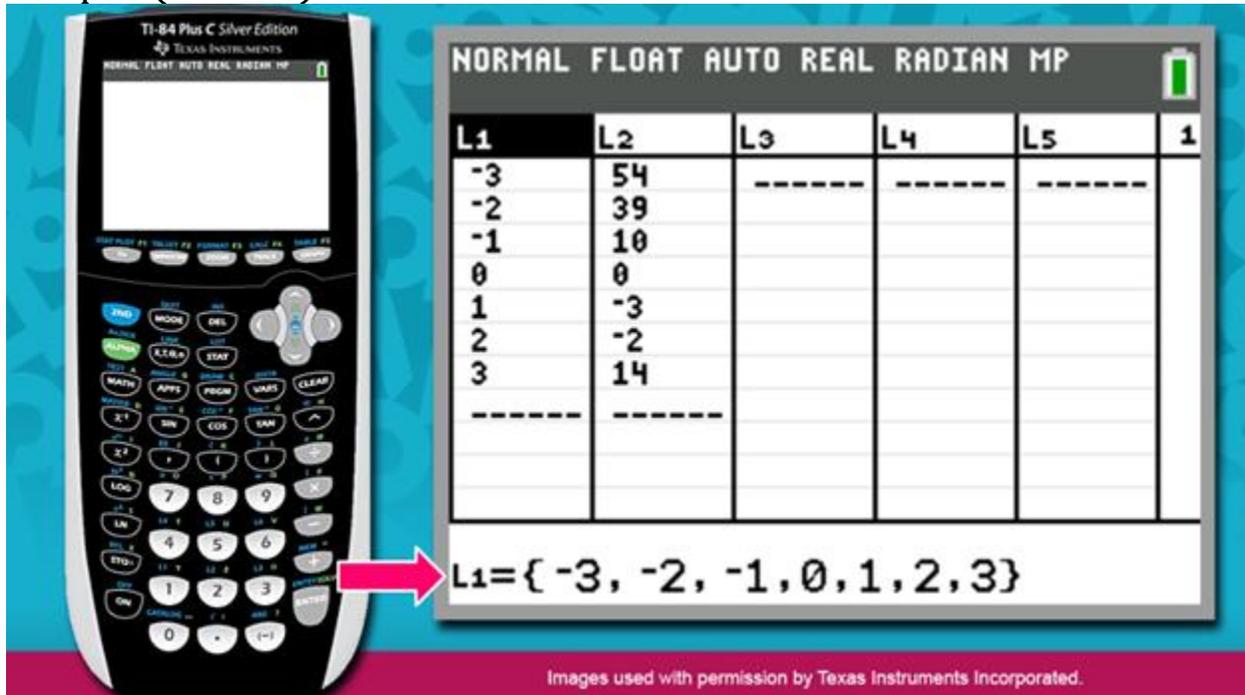


To enter the data for this example, you must first clear the data from the previous example. Press STAT. Then, press ENTER to choose the Edit function.

## Module 12: Statistics

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

#### Example 2 (continued)



The image shows a TI-84 Plus C Silver Edition calculator on the left and a data table on the right. The calculator screen displays the data table. A pink arrow points from the calculator's cursor to the L1 header in the table. The table has columns L1 through L5 and a final column with the number 1. The data in the table is as follows:

L1	L2	L3	L4	L5	1
-3	54	-----	-----	-----	
-2	39				
-1	10				
0	0				
1	-3				
2	-2				
3	14				
-----	-----				

At the bottom of the table, the text  $L_1 = \{-3, -2, -1, 0, 1, 2, 3\}$  is displayed. Below the calculator and table, there is a small text credit: "Images used with permission by Texas Instruments Incorporated."

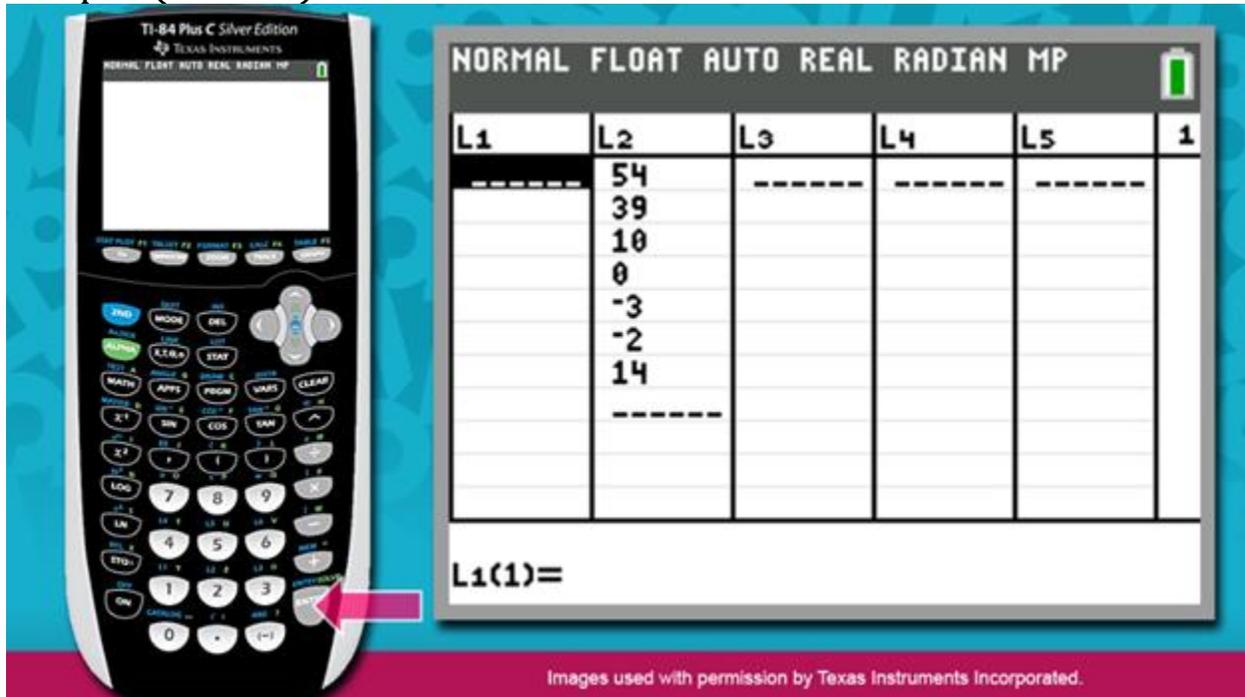
Move the cursor to the L1 header. Notice the set of  $x$ -values is shown at the bottom of the window.



## Module 12: Statistics

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

#### Example 2 (continued)



The image shows a TI-84 Plus C Silver Edition calculator on the left and a data table on the right. The calculator screen displays the data table. A pink arrow points to the ENTER key on the calculator.

L1	L2	L3	L4	L5	1
-----	54	-----	-----	-----	
	39				
	10				
	0				
	-3				
	-2				
	14				
	-----				

L1(1)=

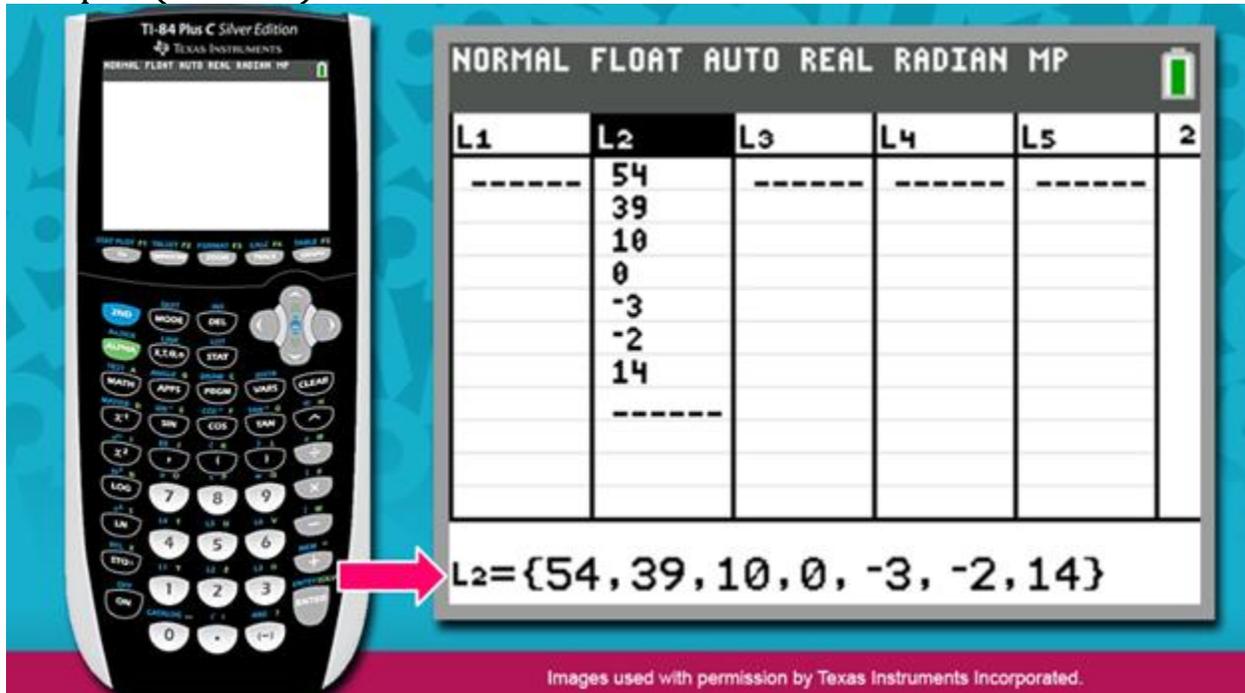
Images used with permission by Texas Instruments Incorporated.

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

## Module 12: Statistics

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

#### Example 2 (continued)



The image shows a TI-84 Plus C Silver Edition calculator on the left and a data list window on the right. The calculator screen displays the mode menu with 'NORMAL' selected. The data list window shows a table with columns L1 through L5 and a row of dashes. The L2 column contains the values 54, 39, 10, 0, -3, -2, and 14. A pink arrow points from the calculator to the L2 header, and the text 'L2={54, 39, 10, 0, -3, -2, 14}' is displayed at the bottom of the window.

L1	L2	L3	L4	L5	2
-----	54	-----	-----	-----	
	39				
	10				
	0				
	-3				
	-2				
	14				
	-----				

L2={54, 39, 10, 0, -3, -2, 14}

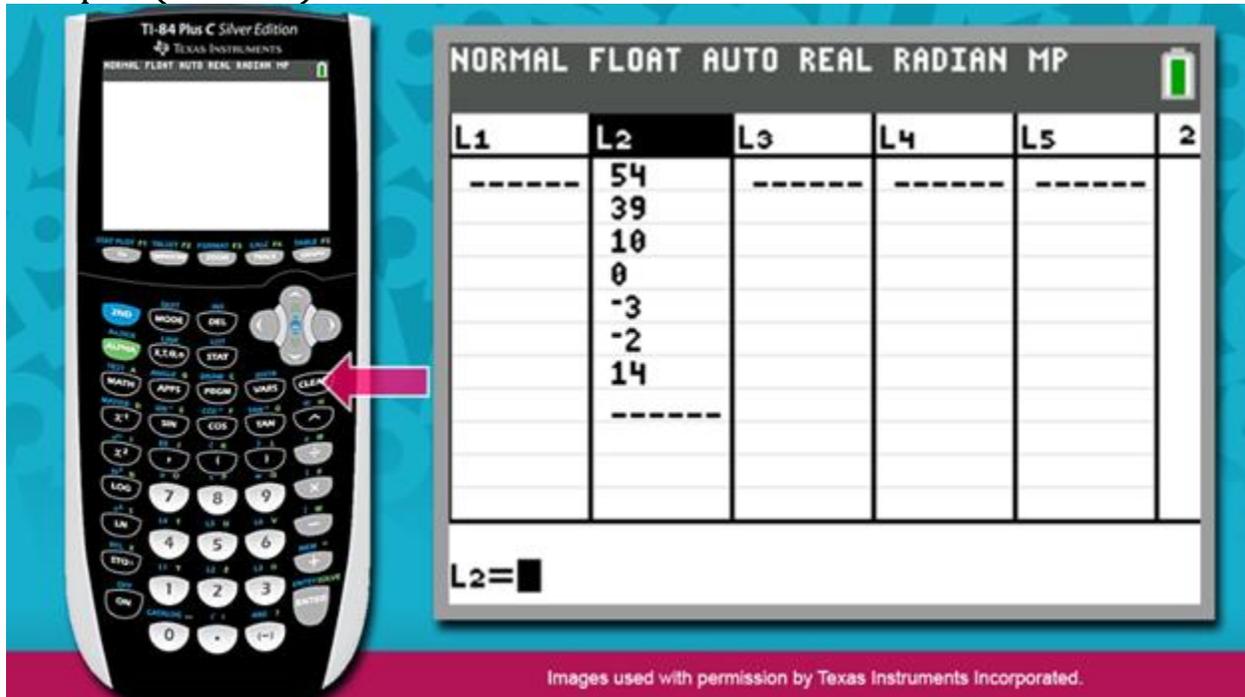
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Now, move the cursor to the L2 header. Notice that the set of y-values is shown at the bottom of the window.

## Module 12: Statistics

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

Example 2 (continued)



The image shows a TI-84 Plus C Silver Edition calculator on the left and a data table on the right. A pink arrow points to the CLEAR button on the calculator. The data table is titled "NORMAL FLOAT AUTO REAL RADIAN MP" and has columns L1, L2, L3, L4, L5, and 2. The L2 column contains the values 54, 39, 10, 0, -3, -2, and 14. The L1 column contains dashes. The L3, L4, and L5 columns are empty. The L2= prompt is visible at the bottom of the table.

L1	L2	L3	L4	L5	2
-----	54	-----	-----	-----	
	39				
	10				
	0				
	-3				
	-2				
	14				
	-----				

L2=

Images used with permission by Texas Instruments Incorporated.

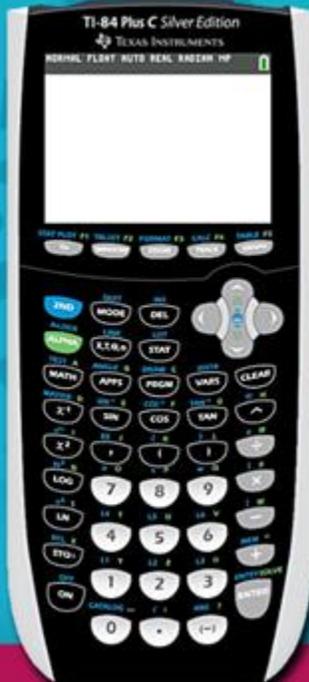
Press CLEAR.



## Module 12: Statistics

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

#### Example 2 (continued)



**Example 2**

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

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

Enter the  $x$ -values into L1.

[Hint](#) [Next](#)

Images used with permission by Texas Instruments Incorporated.

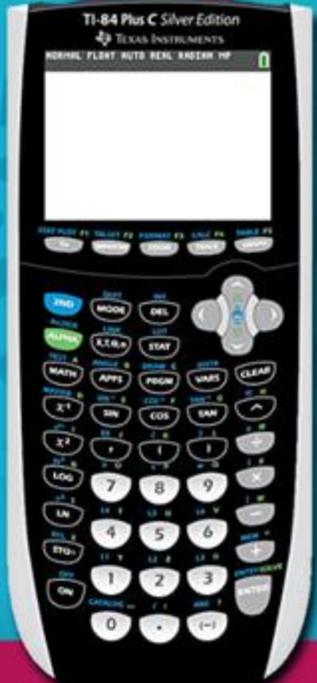
Now that you have cleared both L1 and L2, you can enter the appropriate values into each column. Enter the  $x$ -values into L1.

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



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

**Example 2 (continued)**



**Example 2**  
Determine the equation of the curve that best fits the data.

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

**Enter the  $y$ -values into L2.**

**Hint** **Next**

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Enter each corresponding  $y$ -value into L2.

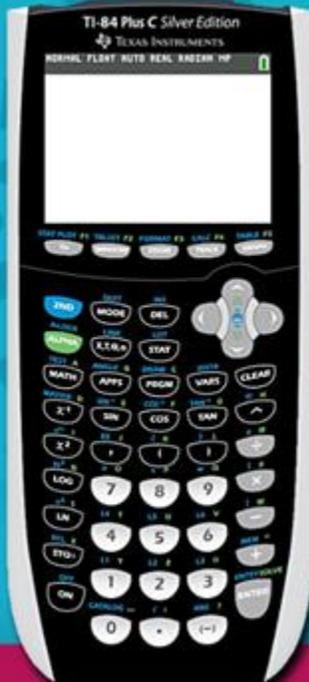
$$\{(-7, 110), (-6, 53), (-1, 28), (2, 35), (5, 79), (6, 104), (8, 156)\}$$



## Module 12: Statistics

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

#### Example 2 (continued)



The equation of the curve of best fit is

$$y = \boxed{\phantom{00}} x^2 + \boxed{\phantom{00}} x + \boxed{\phantom{00}}$$

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

[Hint](#) [Submit](#)

Images used with permission by Texas Instruments Incorporated.

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

The equation of the curve of best fit is  $y = \underline{\quad}x^2 + \underline{\quad}x + \underline{\quad}$ .

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

## Module 12: Statistics

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

#### Example 2 (continued)

**Hint**

Press **STAT**.

Press the right arrow to access the **CALC** functions.

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.

**Hide**

Images used with permission by Texas Instruments Incorporated.

**Hint:** Press STAT.

Press the right arrow to access the CALC functions.

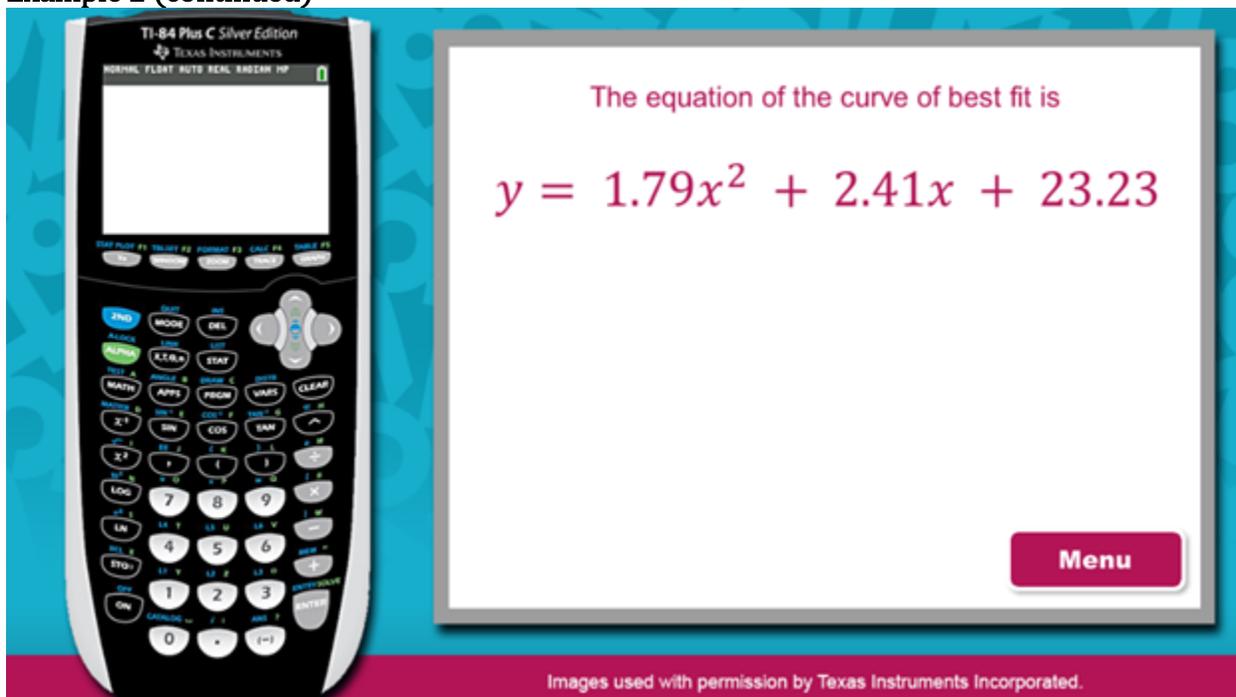
Then, choose the QuadReg option. Press ENTER to move through each prompt.

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

## Module 12: Statistics

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

#### Example 2 (continued)



The image shows a TI-84 Plus C Silver Edition calculator on the left and a whiteboard on the right. The whiteboard displays the equation of the curve of best fit in red text:  $y = 1.79x^2 + 2.41x + 23.23$ . A red button labeled "Menu" is located in the bottom right corner of the whiteboard. Below the whiteboard, there is a small text credit: "Images used with permission by Texas Instruments Incorporated."

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

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

Self-Check 1

## Self-Check

Which of the following equations best fits the data?

- $y = -2.96x^2 + 14.39x + 32.14$
- $y = -4.04x^2 + 18.61x + 40.07$
- $y = -3.11x^2 + 15.39x$
- $y = -0.14x^2 + 4.86x + 24.17$

**SUBMIT**

$x$	$y$
-1	17
0	31
1	44
2	53
3	50
4	41
5	32

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

## Module 12: Statistics

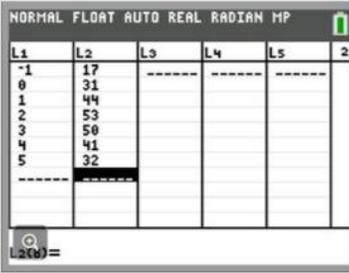
### Topic 2: Determining the Equation of the Curve of Best Fit

#### Self-Check 1: Answer

Self Check

Correct

That's correct!



Press **STAT**. Choose the **Edit** option. Clear the data in L1 and L2. Then, enter the current data.



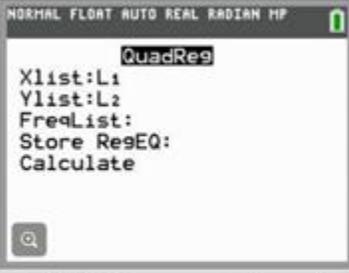
Press **STAT**. Press the right arrow key to access the **CALC** menu. Select the fifth option, **QuadReg**, and press **ENTER**.

Part One
Part Two
Continue

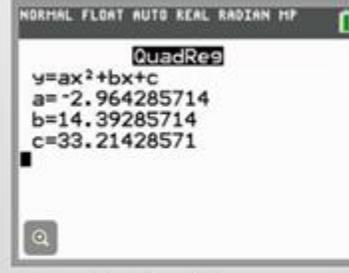
SUBMIT

Self Check

Correct



Press **ENTER** to progress through all of the prompts in the Quadratic Regression menu.



If the values of  $a$ ,  $b$ , and  $c$  are rounded to the nearest hundredths in the generated quadratic equation, it can be written as

$$y = -2.96x^2 + 14.39x + 32.14$$

Part One
Part Two
Continue

SUBMIT

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

## Module 12: Statistics

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

#### Conclusion



The image shows a digital interface for a lesson conclusion. On the left, a white box with a pink header titled "Today's Lesson" contains a checkmark and the text "Used the graphing calculator to determine the equation of the curve of best fit". Below this are two pink buttons labeled "Exit Lesson" and "Restart Lesson". On the right, a cartoon illustration of a woman with dark curly hair and a pink top is set against a blue background with faint mathematical symbols.

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.