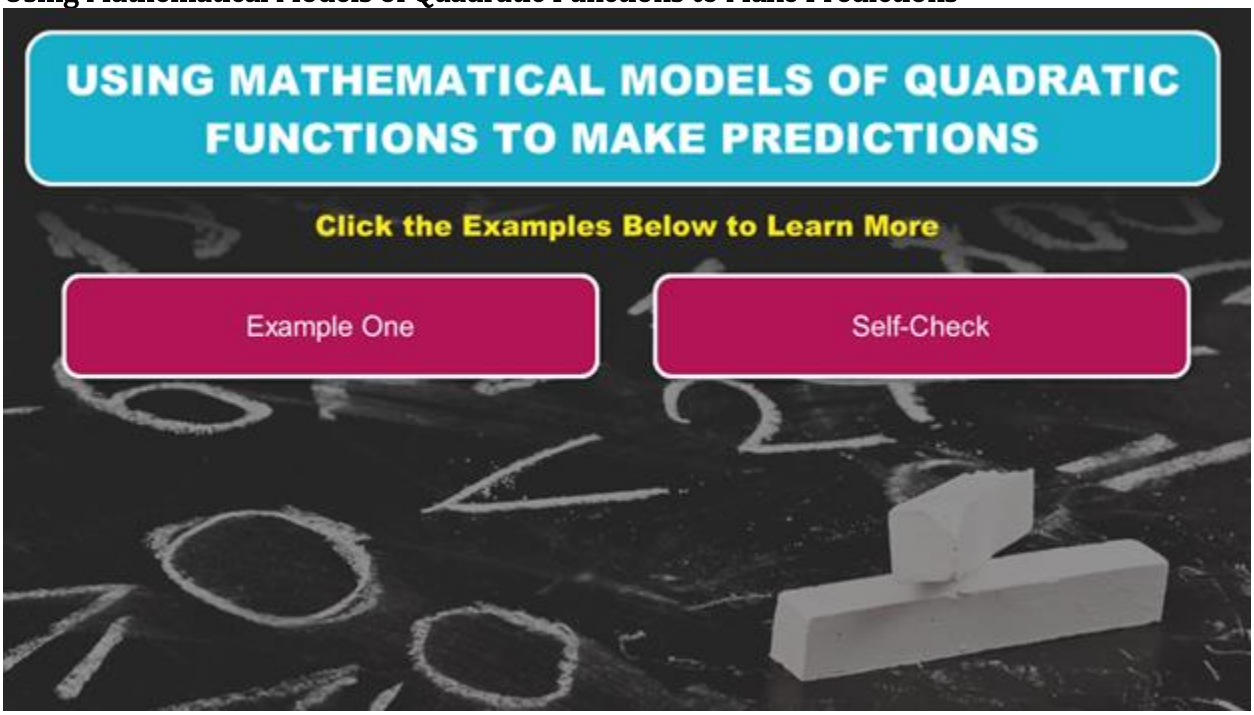
Module 12: Statistics

Topic 2: Using Mathematical Models of Quadratic Functions to Make Predictions

Introduction

Hello and welcome! I'm so glad to have you here for this lesson in Algebra I, where you will learn how to use mathematical models of quadratic functions to make predictions.

Using Mathematical Models of Quadratic Functions to Make Predictions

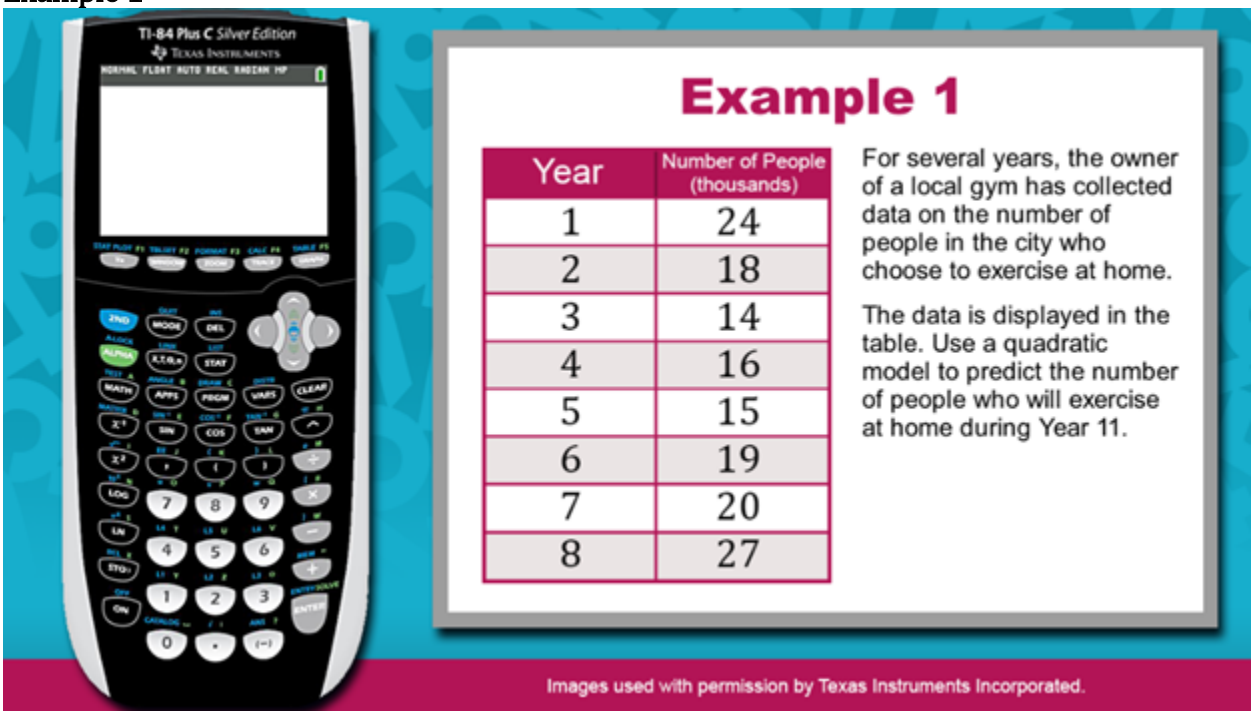


Click the examples below to learn more.

Module 12: Statistics

Topic 2: Using Mathematical Models of Quadratic Functions to Make Predictions

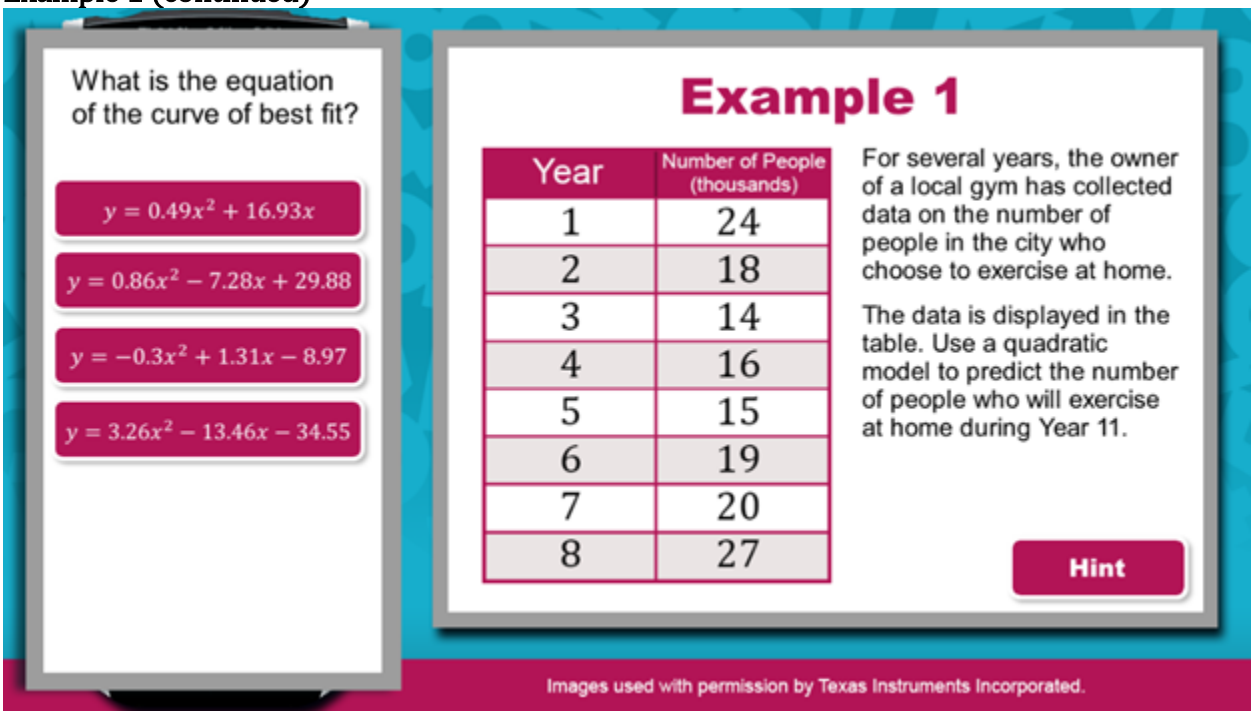
Example 1



For several years, the owner of a local gym has collected data on the number of people in the city who choose to exercise at home. The data is displayed in the table. Use a quadratic model to predict the number of people who will exercise at home during Year 11.

Year	Number of People (thousands)
1	24
2	18
3	16
4	14
5	15
6	19
7	20
8	27

Example 1 (continued)

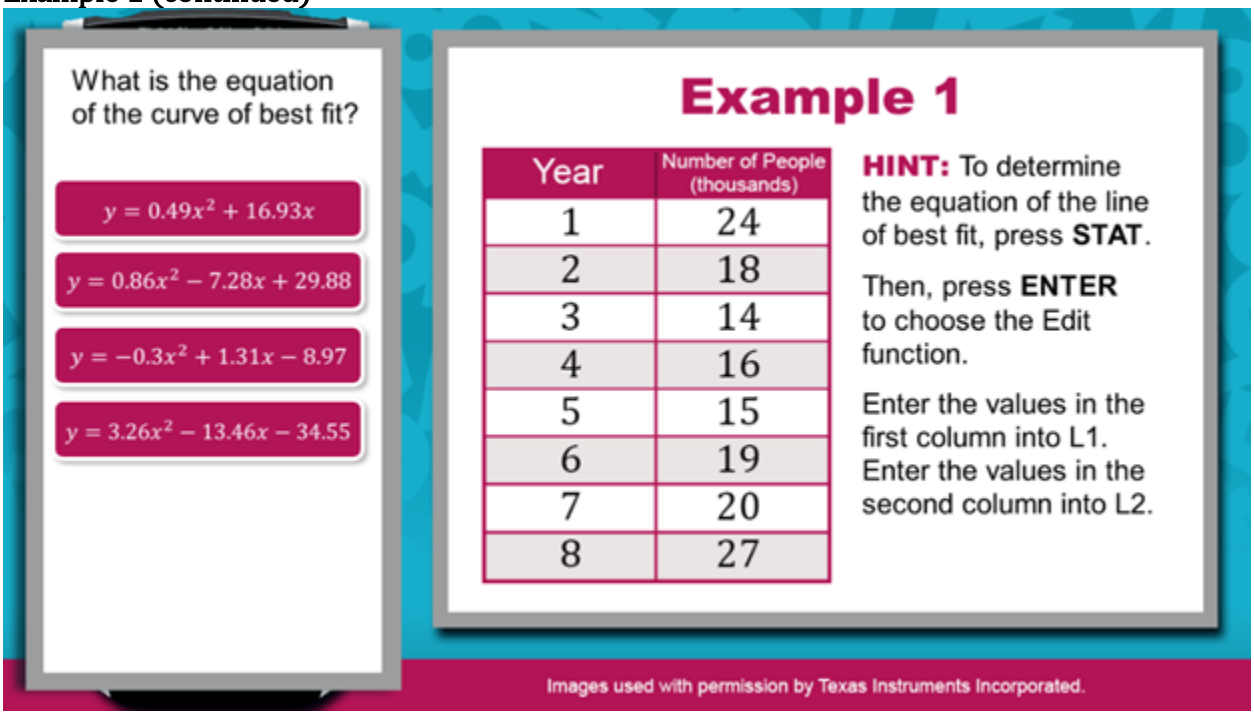


To predict the number of people who will exercise at home during Year 11, begin by using the graphing calculator to determine the equation of the curve of best fit. The year number is the independent variable. Enter these values into L1. The number of people is the dependent variable. Enter these values into L2.

What is the equation of the curve of best fit?

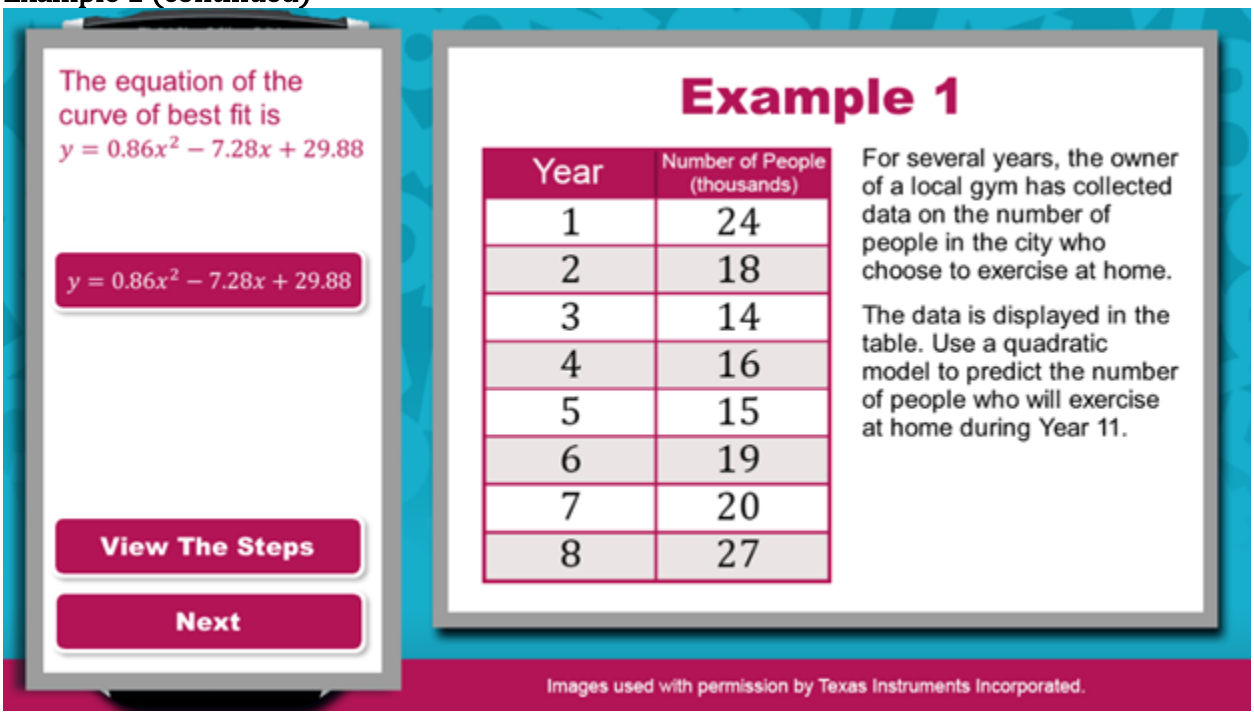
A) $y = 0.49x^2 + 16.93x$
B) $y = 0.86x^2 - 7.28x + 29.88$
C) $y = -0.3x^2 + 1.31x - 8.97$
D) $y = 3.26x^2 - 13.46x + 34.55$

Example 1 (continued)



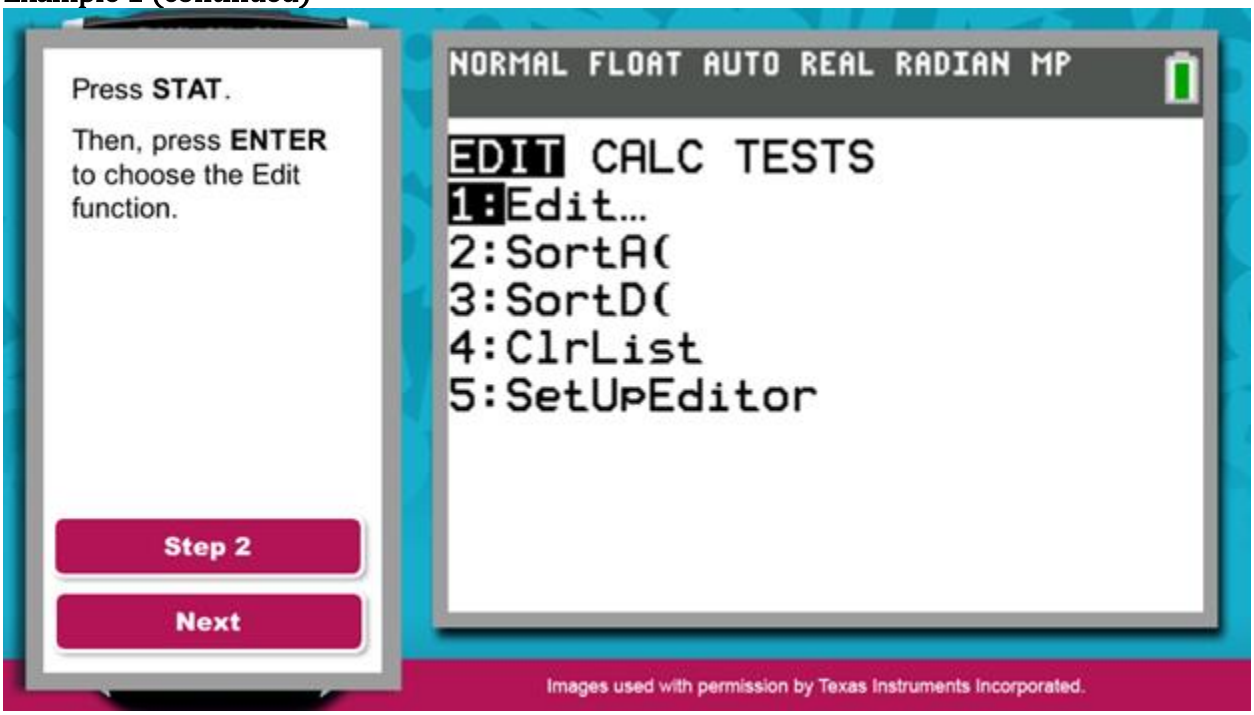
Hint: To determine the equation of the line of best fit, press STAT. Then, press ENTER to choose the Edit function. Enter the values in the first column into L1. Enter the values in the second column into L2.

Example 1 (continued)



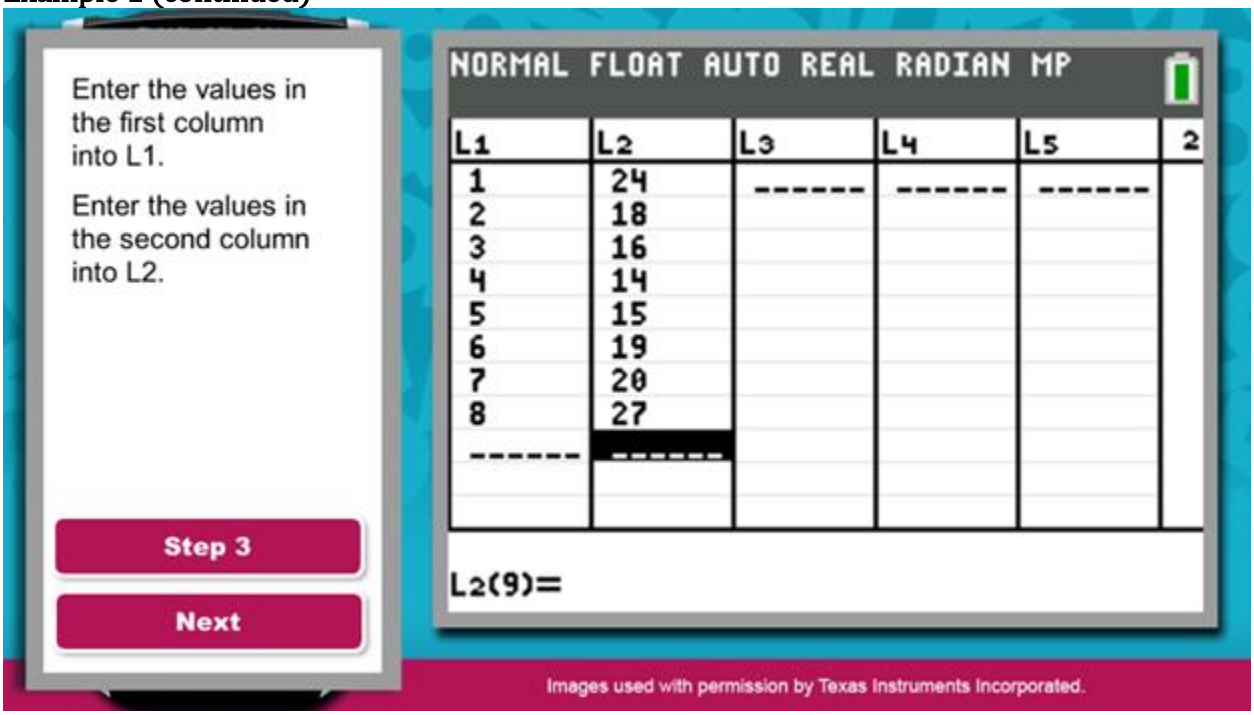
The equation of the line of best fit is $y = 0.86x^2 - 7.28x + 29.88$.

Example 1 (continued)



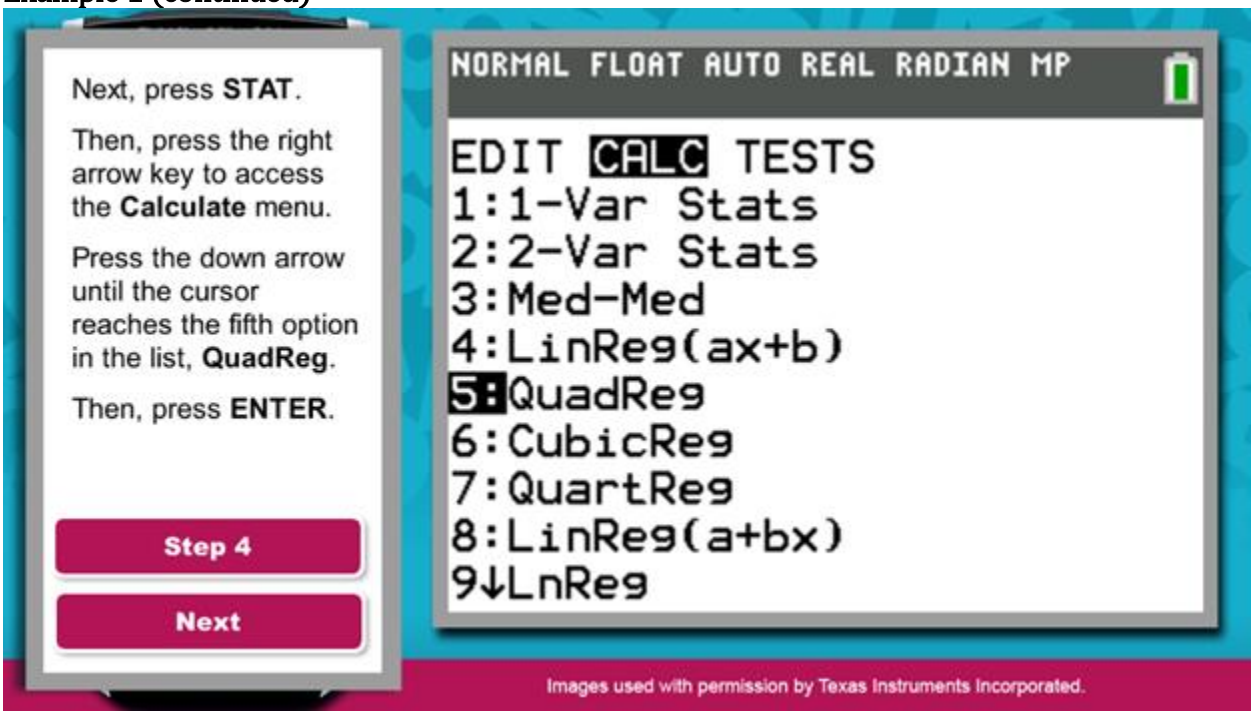
Press STAT. Then, press ENTER to choose the Edit function.

Example 1 (continued)



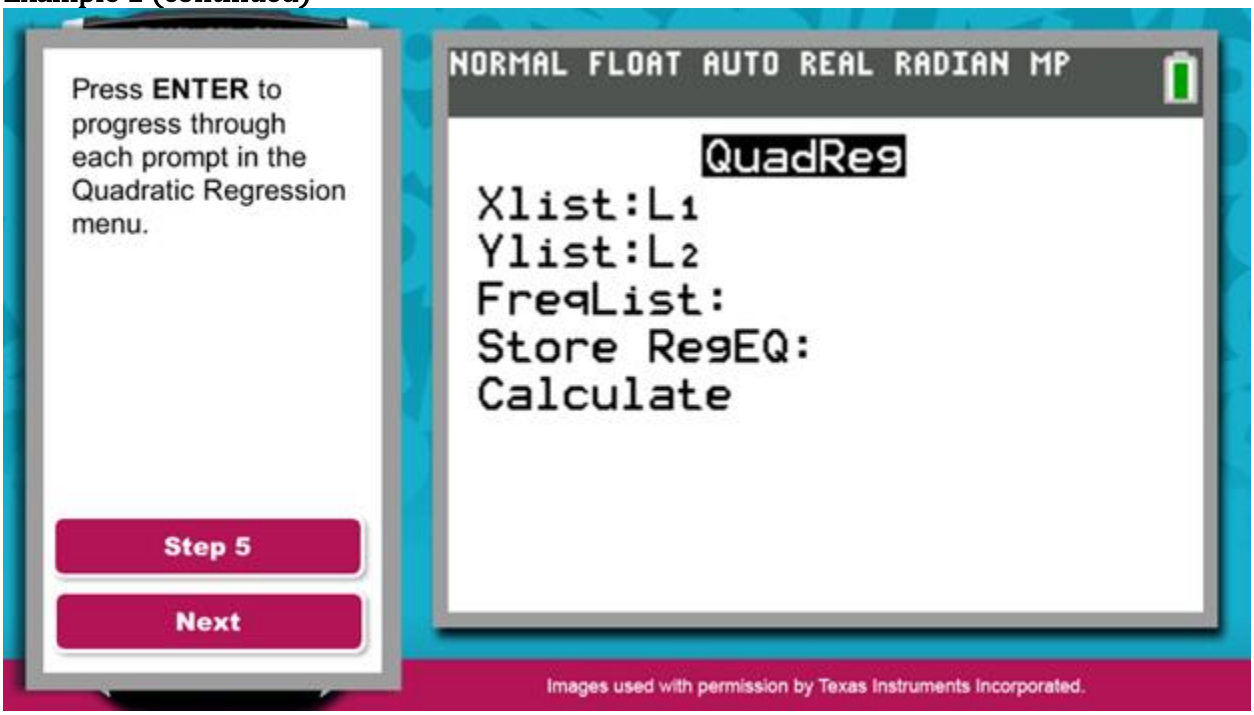
Enter the values in the first column into L1. Enter the values in the second column into L2.

Example 1 (continued)



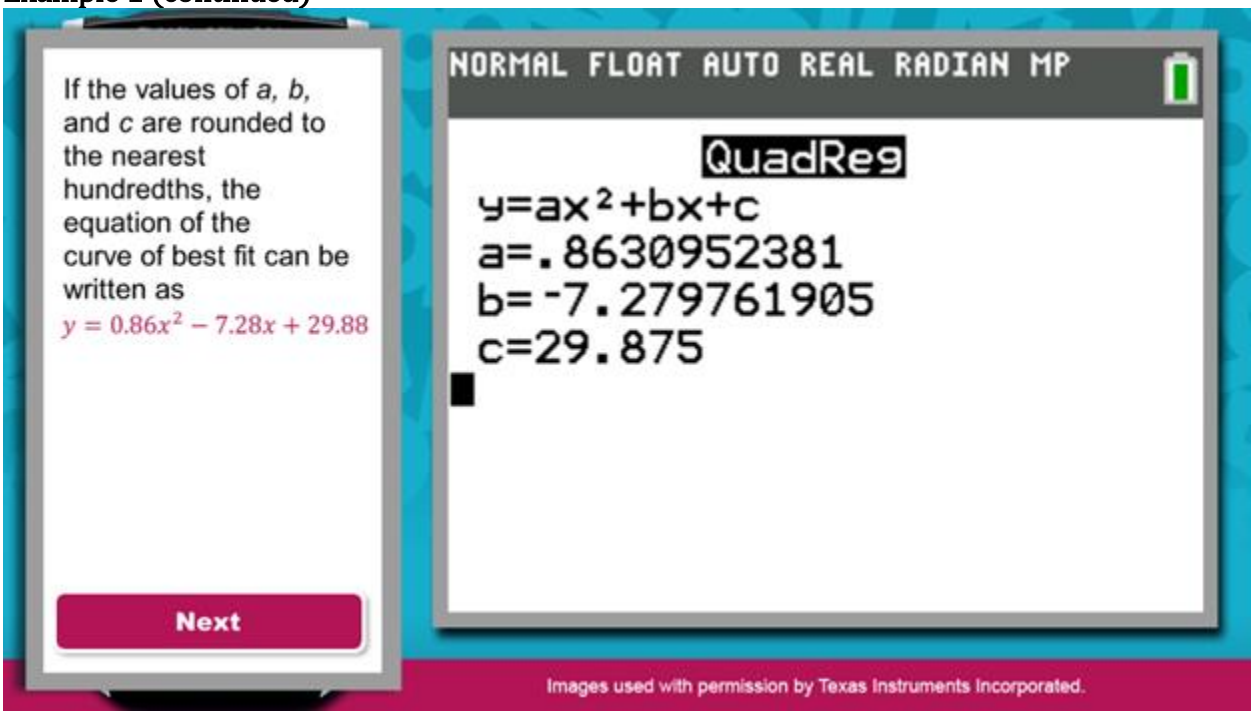
Next, press STAT. Then, press the right arrow key to access the Calculate menu. Press the down arrow until the cursor reaches the fifth option in the list, QuadReg. Then, press ENTER.

Example 1 (continued)



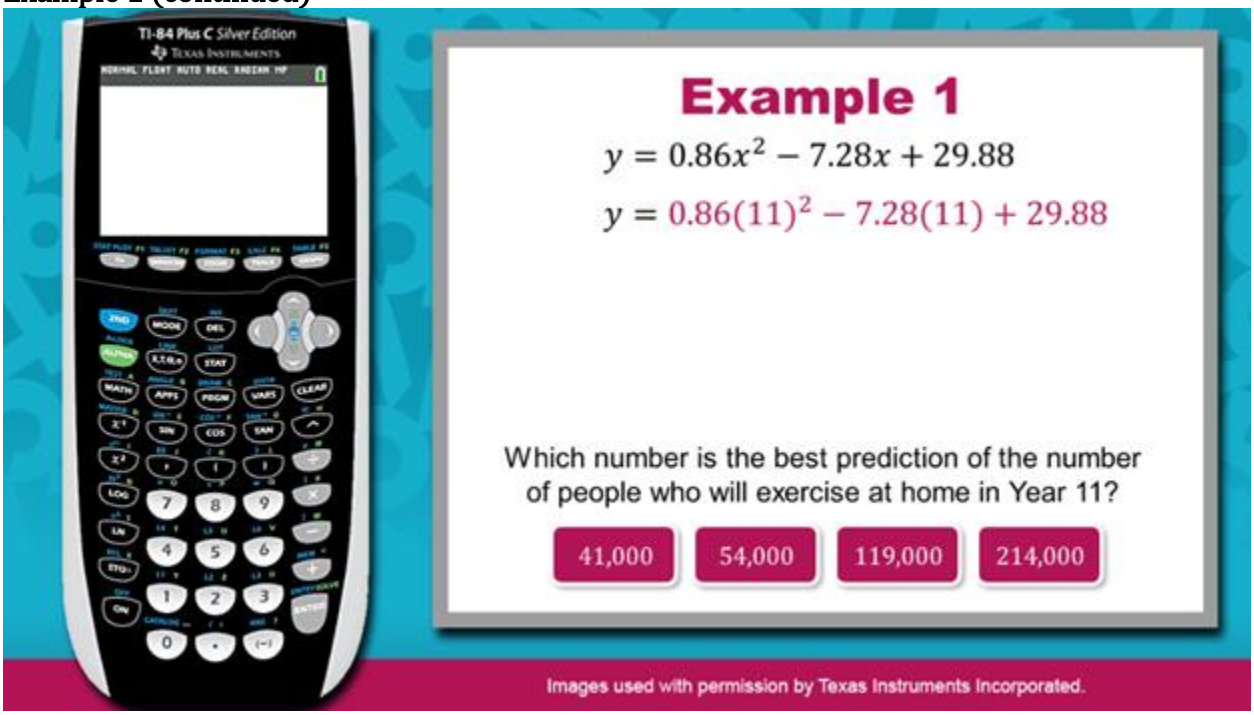
Press ENTER to progress through each prompt in the Quadratic Regression menu.

Example 1 (continued)



If the values of a, b, and c are rounded to the nearest hundredths, the equation of the curve of best fit can be written as $y = 0.86x^2 - 7.28x + 29.88$.

Example 1 (continued)



Now that you have determined the equation of the curve of best fit, you can use it to predict the number of people who will exercise at home in Year 11.

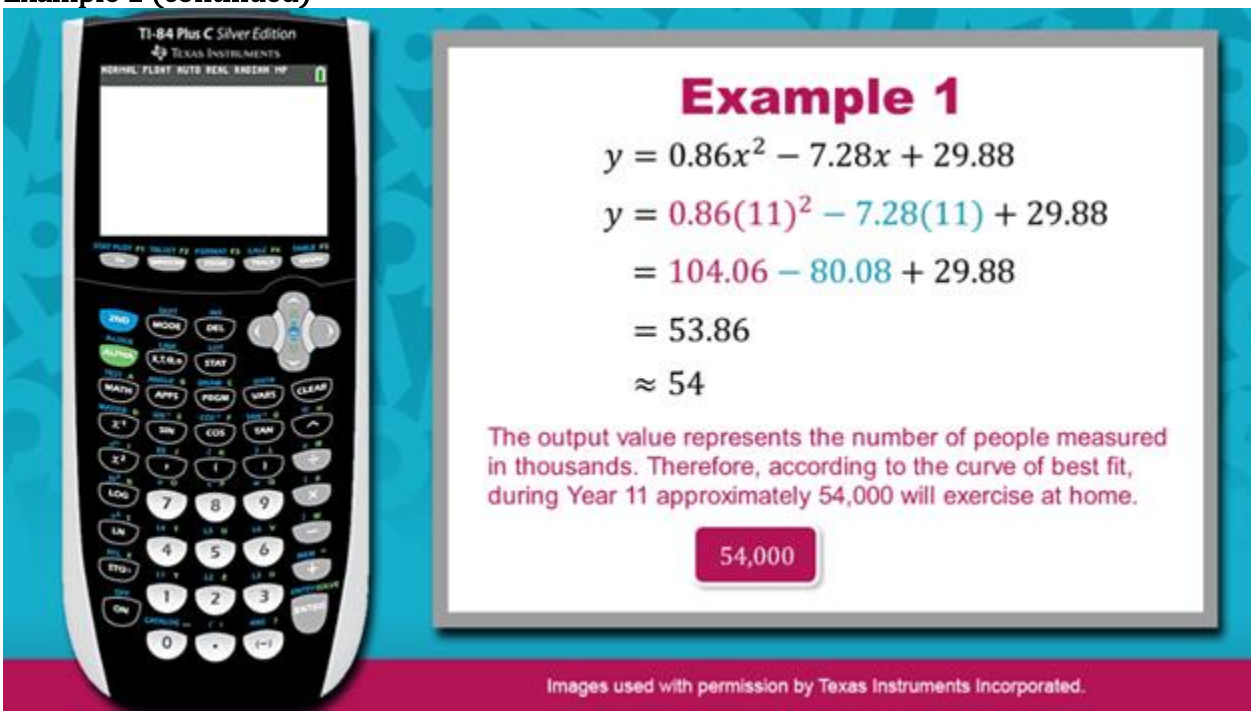
Substitute 11 for x. Then, evaluate the expression on the right side of the equation.

$$y = 0.86x^2 - 7.28x + 29.88$$
$$y = 0.86(11)^2 - 7.28(11) + 29.88$$

Which number is the best prediction of the number of people who will exercise at home in Year 11?

A) 41,000
B) 54,000
C) 119,000
D) 214,000

Example 1 (continued)



Substitute 11 for x.

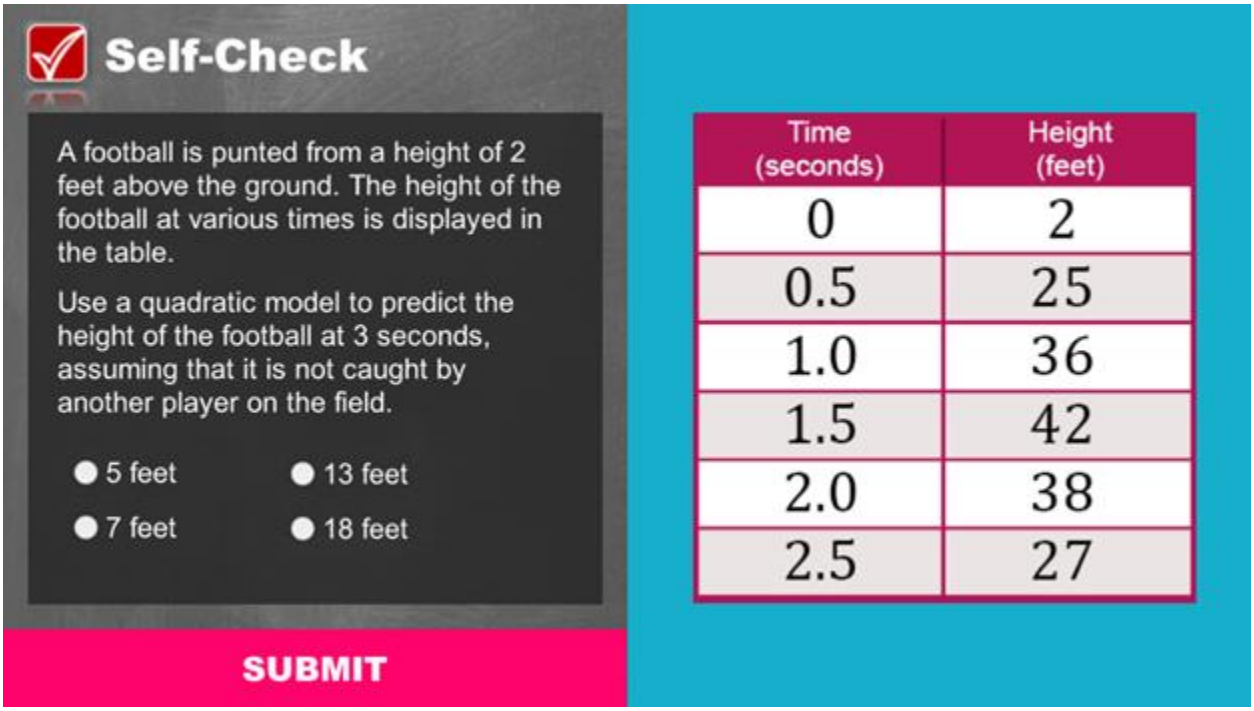
$$y = 0.86x^2 - 7.28x + 29.88$$
$$y = 0.86(11)^2 - 7.28(11) + 29.88$$

Then, evaluate the expression on the right side of the equation.

$$\begin{aligned} y &= 0.86(11)^2 - 7.28(11) + 29.88 \\ &= 104.06 - 80.08 + 29.88 \\ &= 53.86 \\ &\approx 54 \end{aligned}$$

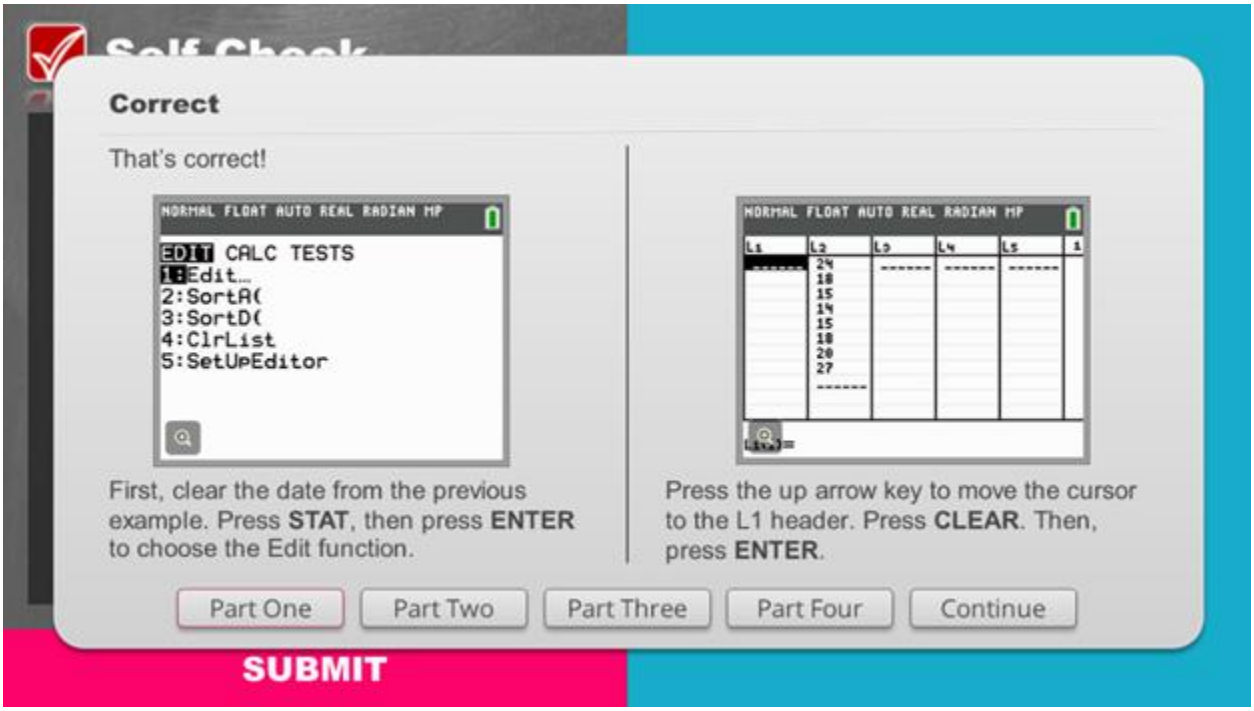
The output value represents the number of people measured in thousands. Therefore, according to the curve of best fit, during Year 11 approximately 54,000 will exercise at home.

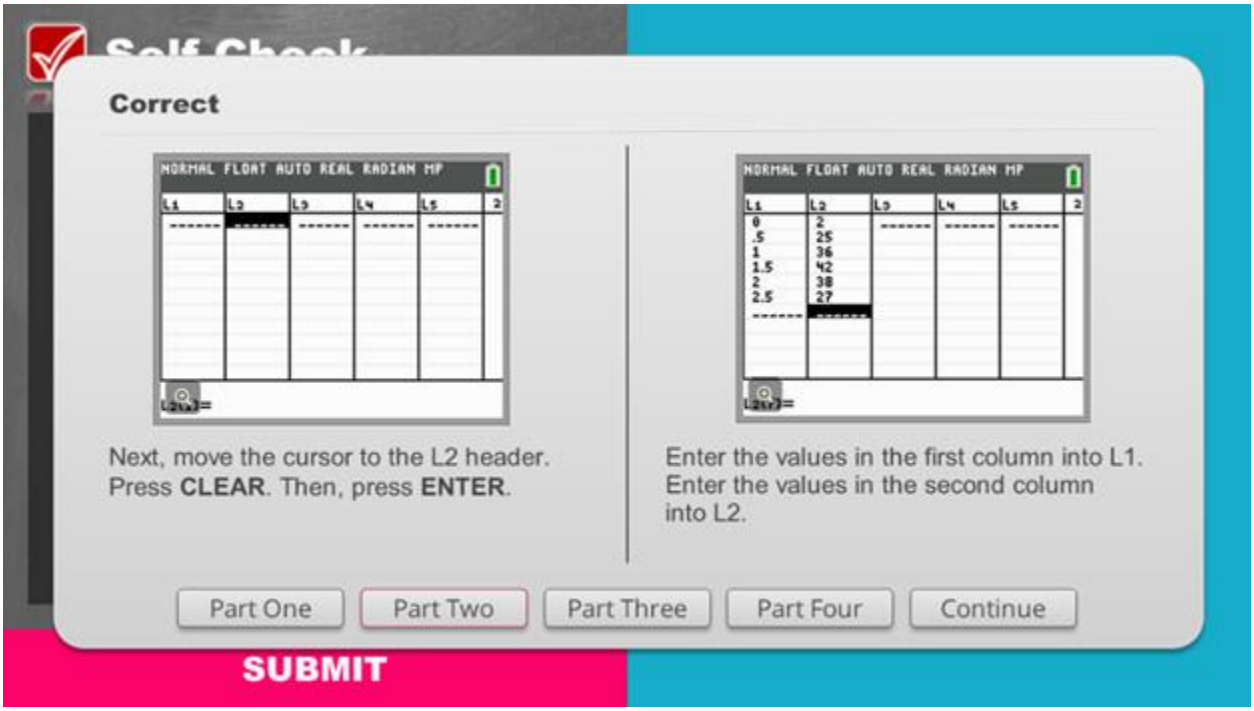
Self-Check 1



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

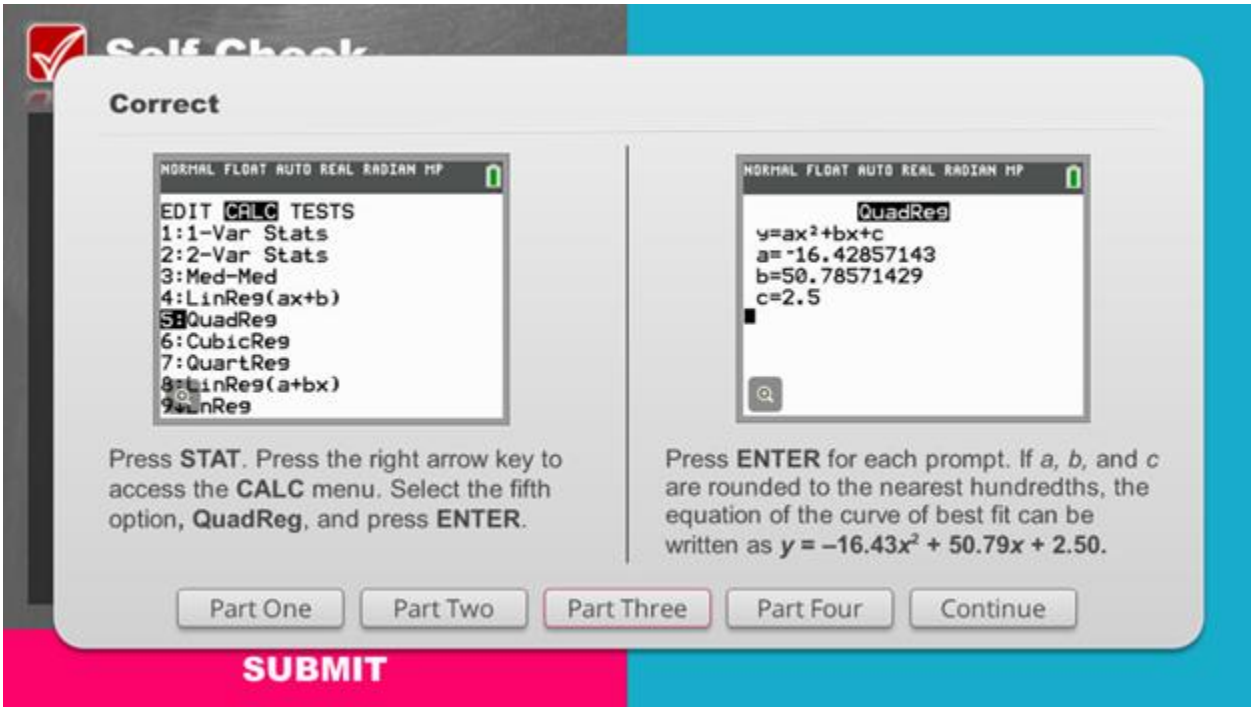
Self-Check 1: Answer

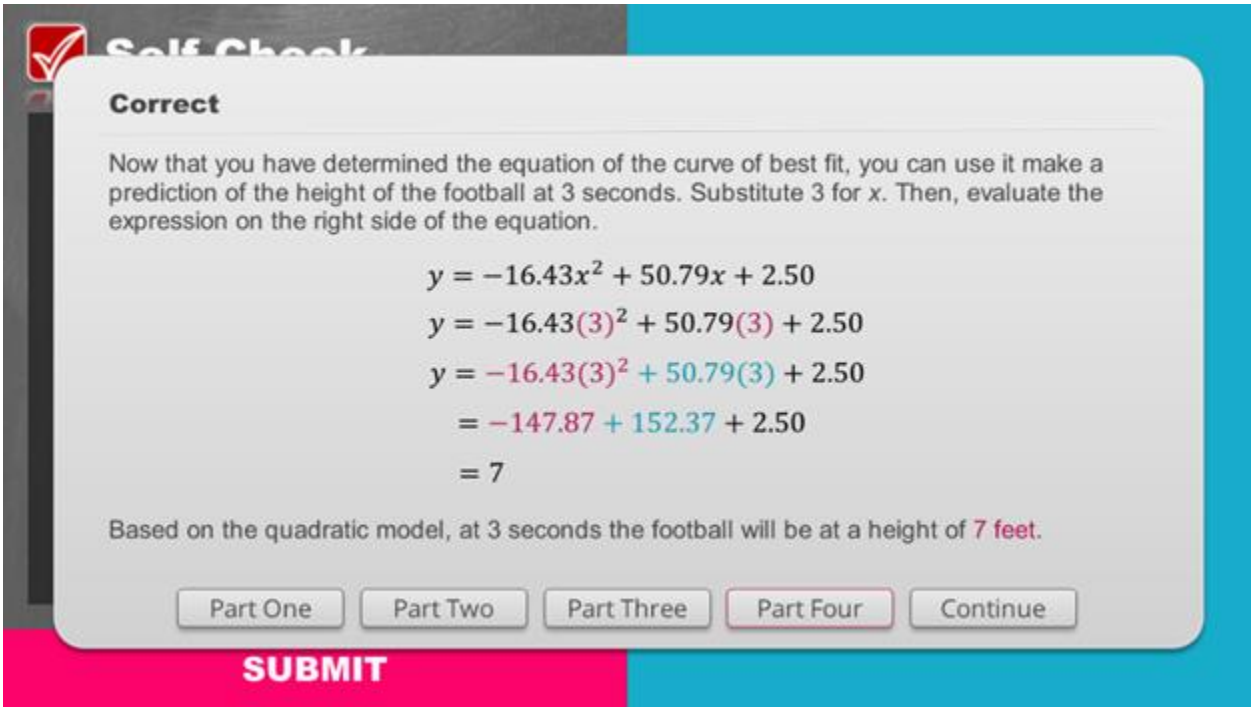




For your reference, the images above show the correct solution to the self-check problem.

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 mathematical models of quadratic functions to make predictions.