

TI-83/83 Plus: Finding a Logistic Model

The following pages contain some instructions on the usage of the TI-83/83 Plus graphing calculator.

The example used below is taken out of the text titled “Calculus Concepts - An Informal Approach to the Mathematics of Change, 1st Edition” by LaTorre, Kenelly, Fetta, and et al.

Example#2 Swimsuit Sales p. 81: Table 2.5 on page 81 shows the total number of swimsuits that a department store sold during the first three quarters of last year.

Month: Jan. Feb. Mar. Apr. May. Jun. Jul. Aug. Sep.

Total number of swimsuits: 4 12 25 58 230 439 648 748 769

Use a calculator to find a logistic model for these data. What is the limiting value of the model?

Press **[STAT]**. Press **[ENTER]** to select **1:Edit** from the STAT EDIT menu. At this point, your screen will display all the list names and their contents stored in memory. Press **[↑]** to move the cursor to the top line where the list names are located and then press **[→]** until you reach the unnamed column. The cursor is in alpha mode as it is indicated by the highlighted capital A in the upper right hand corner of your display. Type in the name MO short for Month. Press **[ENTER]** to store the list name. Press **[↓]** to begin entering the data set.

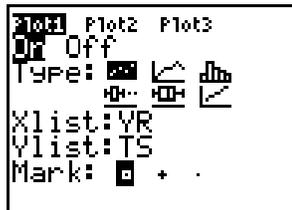
In this example, the input variable Month values must be aligned as x=1 in January, x=2 in February, and so on. Therefore, the first input value must be typed in as 1 instead of the actual month. Start typing in the numbers 1, 2, 3, 4, 5, 6, 7, 8 and 9 for the Month data set, pressing **[ENTER]** after each data point. When you have finished entering the last month value, your screen should look like the screen on the left given below.

YR	TS	MO	10
12	107	4	
16	179	5	
20	299	6	
24	499	7	
28	833	8	
---	---	9	
MO(10) =			

TS	MO	SS	11
107	4	58	
179	5	230	
299	6	439	
499	7	648	
833	8	748	
---	9	769	
SS(10) =			

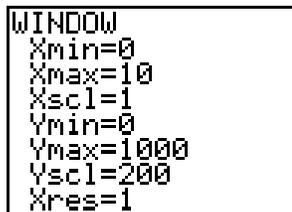
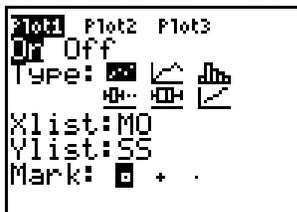
To enter the data for the swimsuit sales, press **[STAT]**. Press **[ENTER]** to select **1:Edit** from the STAT EDIT menu. Press **[↑]** to move the cursor to the top line where the list names are located and then press **[→]** until you reach the unnamed column. The cursor is in alpha mode as it is indicated by the highlighted capital A in the upper right hand corner of your display. Type in the name SS short for Swimsuit Sales. Press **[ENTER]** to store the list name. Press **[↓]** to begin entering the data set. Start typing in the numbers from the Swimsuit Sales data set, pressing **[ENTER]** after each data point. When you have finished entering the last data value, your screen should look like the screen on the right given above.

The scatterplot is obtained by using the STAT PLOTS menu. Press **2nd** and **Y=** to access the STAT PLOTS menu. Your screen should look like the screen on the left given below with possibly different names.

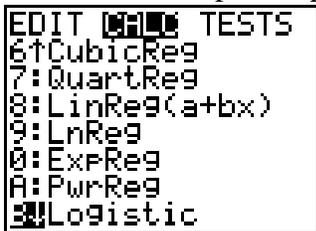
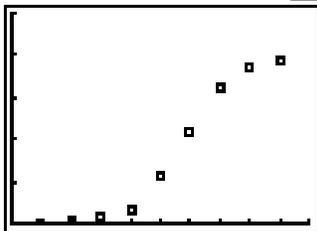


Press **ENTER** to get to the settings screen for **Plot1**. Your screen should look like the screen on the right above with possibly different names for **Xlist:** and **Ylist:**

While the cursor blinking over the **On** option press **ENTER** to turn on **Plot1**. Press **↓** to scroll down to **Type:**, while the blinking cursor over the first type (scatterplot) press **ENTER** to make the selection. Press **↓** to scroll down to **Xlist:** The list name **MO**, which had been already stored, must be assigned to **Xlist:** Press **2nd** and **STAT** to access the LIST menu. Press **↓** till you move the cursor by the name **MO** and press **ENTER** to paste the name by **Xlist:** Press **↓** to scroll down to **Ylist:** The list name **SS**, which had been already stored, must be assigned to **Ylist:** Press **2nd** and **STAT** to access the LIST menu. Press **↓** till you move the cursor by the name **SS** and press **ENTER** to paste the name by **Ylist:** Your screen should look like the screen on the left below.



Press **WINDOW** to select the WINDOW menu. The appropriate WINDOW menu settings used for this scatterplot are displayed on the right given above. Be sure to clear off the function Editor. Press **GRAPH** to see the scatterplot displayed on the left given below.



The equation of the logistic model can be obtained by using the STAT menu. Press **STAT** to access the STAT menu. Press **↓** to display the choices for the STAT CALC menu. Press **↓** several times to move the cursor down to **B:Logistic**. At this point, your screen should look like the screen in the middle given above. Press **ENTER** to select **B:Logistic** from the STAT CALC menu and paste it onto the Home screen. At this point, your screen should look like the screen on the right given above with the cursor blinking by the **Logistic** command.

Now the list names **MO** and **SS** need to be pasted, as they are separated by a coma, where the blinking cursor is on the Home screen. To accomplish this, the LIST menu is accessed by pressing **2nd** and **STAT**. Press **↓** till you move the cursor by the name **MO**

and press **[ENTER]** to paste the list name MO by the **Logistic** command on the Home screen. Press **[,]**. Press **[2nd]** and **[STAT]** to access the LIST menu. Press **[↓]** till you move the cursor by the name SS and press **[ENTER]** to paste the list name SS by the coma on your screen. Press **[,]**. To store the equation of the logistic model into the function editor **[Y=]** as Y_1 , press **[VARS]**, press **[↓]** to move the cursor to VARS Y-VARS menu. Press **[ENTER]** to select **1:Function**. Press **[ENTER]** to select **1:Y₁** from the FUNCTION menu and paste it onto the Home. At this point, your screen should look like the screen on the left given below.

```
Logistic LMO, LSS
,Y1
```

```
Logistic
y=c/(1+ae^(-bx))
a=1464.701613
b=1.261096608
c=786.7044459
```

Press **[ENTER]** to have the calculator display the equation of the logistic model. Your screen should look like the screen on the right given above.

The equation of the logistic model, up to four decimal places, is given as follows:

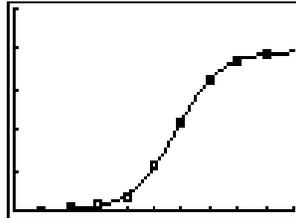
$$y = \frac{786.7044}{1 + 1464.7016e^{-1.2611x}}$$

The complete logistic model for this example is as follows:

$$y = \frac{786.7044}{1 + 1464.7016e^{-1.2611x}}$$

swimsuits where x is the number of months with $x=1$ by the end of January.

In order for the graph of the logistic model of this data set to be superimposed over the scatterplot, press **[GRAPH]**. Your screen should look like the screen given below.



The limiting value of this logistic model is 786.7044. The interpretation of this result in the context of the problem is given as follows. The total number of swimsuits sold at the end of September of last year was approximately 787.