

## Using the TI-83/84 to Create a Scatterplot and Perform a Linear Regression

(By Sean Rule)

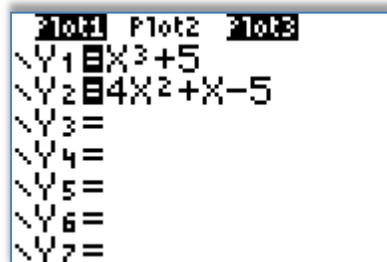
Here is a series of steps to assist you in entering data with your graphing calculator, viewing the data graphically in a scatterplot, and then performing a linear regression<sup>a</sup> of the data. Suppose you have the data at right. We'll start by entering that data into your TI.

$x$	$y$
2	35
4	38
6	39
8	41
10	44

### 1. Entering Data

a) These first few steps will help you get your TI set up for data entry.

i) Clearing all equations in the equation editor...start by pressing  $\boxed{Y=}$ . You might have at least one equation in this screen, like I do at right. You want to make sure any equations are cleared, as you'll be placing new ones in here soon. To clear an equation, use your arrow keys to place your cursor somewhere in line with the equation, then press  $\boxed{\text{CLEAR}}$ .

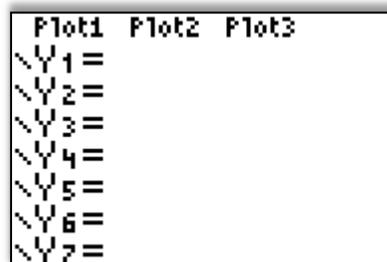


ii) Turning off plots... once your equations are cleared, your screen may look like the one at right. Do you see how Plot1 and Plot3 are highlighted? This means they are "on". To turn plots off (and on) you use the "Up Arrow" button. Place your cursor on top of the plot you wish to turn off (or on), and press  $\boxed{\text{ENTER}}$ . You can "toggle" plots on and off in this way.

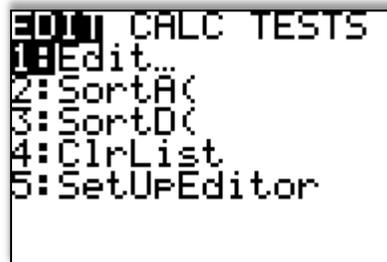


iii)  $\boxed{Y=}$  **screen ready to go!**

Once you have an empty  $\boxed{Y=}$  screen, and your plots are turned off, you're ready to enter some data.



b) Entering data...press  $\boxed{\text{STAT}}$  to see the Stat Edit screen.



<sup>a</sup> There are other regressions; this project only deals with linear regression. You will likely see others in MTH 111.

c) Press 1:Edit to see the list editor. You may have data already in some of your lists. If this is the case (like mine at right), we need to clear out this data to make room for new data. To clear data, place your cursor on top of the column header (that's L1, L2, L3, etc.) and press **CLEAR** **ENTER**.

L1	L2	L3	3
1	742	████████	
2	417		
3	308.67		
4	254.5		
5	222		
6	200.33		
7	184.86		

L3(1)=

d) At this point, your screen should look like the one at right. If you are missing a list (which happens if you press the delete button in step c) above, instead of **CLEAR** ), you can get the list back. Press the following sequence: **STAT** select 5:SetUpEditor **ENTER**.**ENTER** Now, you'll have all of your lists. You may have to repeat step c) to clear data, but, eventually, your screen will look like the one at right.

L1	L2	L3	1
████████	-----	-----	

L1(1)=

e) To enter the data from the table above, type each data value into its corresponding list. For simplicity, place the  $x$  values in L1, and the  $y$  values in L2. Press **ENTER** after each value. To move between lists, use the arrow keys.

L1	L2	L3	2
2	35	-----	
4	38		
6	39		
8	41		
10	44	████████	

L2(6) =

Note: if you make a mistake entering your data, you can simply overwrite any number you've already entered.

However, if you find you've forgotten to enter a number in a list, you can go to the place in the list where the number needs to be, press **2<sup>nd</sup>** **DEL**, and a "0" will appear as a placeholder (the other values below the 0 will be moved down). You can then overwrite the 0 with the needed data value.

Congratulations! Your data's in! Let's do the regression!

## 2. Creating a Scatterplot

A scatterplot, as you've seen, is a very handy way of viewing two – dimensional data. While not necessary for all problems, I'm including the steps here for your reference.

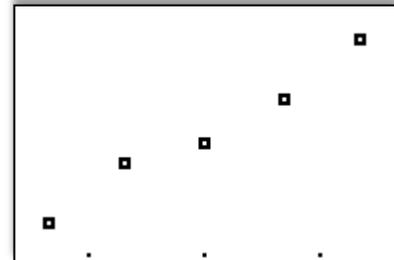
a) Start by pressing **2<sup>nd</sup>** **Y=**. This is the STAT PLOTS menu. Your screen probably looks like the one at right. Right now, make sure that all of the plots are Off. If not, select 4:PlotsOff **ENTER**

STAT PLOTS		
1:Plot1...Off		
<input checked="" type="checkbox"/> L1	L2	<input type="checkbox"/>
2:Plot2...Off		
<input checked="" type="checkbox"/> L1	L2	<input type="checkbox"/>
3:Plot3...Off		
<input checked="" type="checkbox"/> L1	L2	<input type="checkbox"/>
4↓PlotsOff		

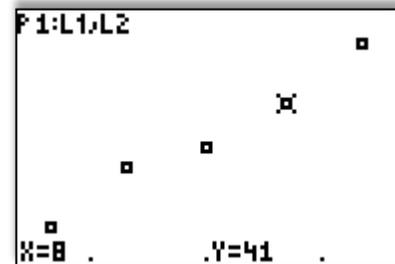
- b) Turning the plot on...select 1: from the STAT PLOT window . This is the editor screen for Plot1. Turn the plot on by pressing **ENTER**. Then, ensure that the rest of your screen looks like the one at right. Move from option to option by pressing the arrow keys and choose an option by pressing **ENTER**. To get L1, press **2<sup>nd</sup>** **1**. To get L2, press **2<sup>nd</sup>** **2**.



- c) Looking at your scatterplot...the easiest way to view your scatterplot is to use the TI-defined ZoomStat feature. To access it, press **ZOOM** select 9:Stat. You'll see the screen at right.



- d) Tracing your scatterplot...you might notice that your scatterplot is pretty lame: there are no axes, so there's no way to know which points are which. To (partially) remedy this, you can press **TRACE**, and then the right or left arrow to jump from point to point. An example is shown at right.

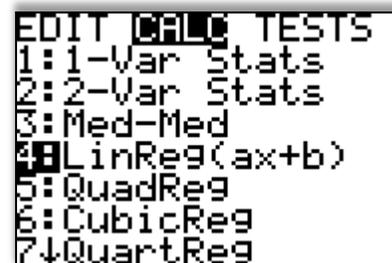


Now that you see your data, you can see that it appears to be somewhat linear...that is, it looks like it could lie pretty close to a straight line. The TI has a feature that finds *the* best line for the job.

### 3) Performing a Linear Regression

If we “perform a linear regression” on data, we are finding the best – fitting line for the data. The calculation for this line is long and tiresome, and involves calculus. Nonetheless, it is interesting, and you might see it in later classes. For now, however, let's leave the calculus to the TI!

- a) Press **STAT** “right arrow” to access the STAT CALC menu. There are many, many functions in this menu, but right now, we only need one. Press **4** to select LinReg (ax+b) .



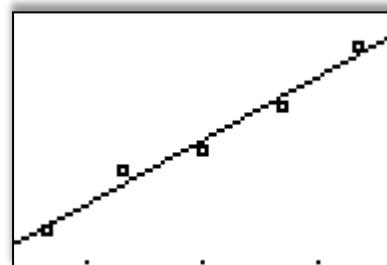
b) You will now be on the home screen...however, to make our lives easier, we're going to tell the TI to place the linear equation it's about to "regress" into the  $Y=$  editor. We'll place it in  $Y_1$ , by pressing  $\overline{\text{VARS}}$ , right arrow to  $Y\text{-VARS}$ , select 1:Function, select 1: $Y_1$ . At this point, your screen should look like the one at right.

LinReg(ax+b)  $Y_1$

c) Now, press  $\overline{\text{ENTER}}$ . Your screen should look like the one at right. This information tells you that the slope of your best fit line is 1.05, and the  $y$  – intercept is 33.1. Note that the TI uses  $a$  for slope, instead of  $m$ .

LinReg  
 $y=ax+b$   
 $a=1.05$   
 $b=33.1$

d) If you now press  $\overline{Y=}$ , you will see that your equation has been stored into  $Y_1$ . If you then press  $\overline{\text{GRAPH}}$ , you will see your equation with your scatterplot. Neat!



Now...the line you just found is called the best – fit regression line. The meaning of this is outside the scope of this course, but rest assured that it's the absolutely best possible line that comes as close as possible to all of the data points.

A helpful note: It's very easy to forget to turn your plots off when finished doing regressions. If you're ever trying to  $\overline{\text{GRAPH}}$  something in the  $\overline{Y=}$  screen, and get a screen like the one at right<sup>b</sup>, the problem lies in your STAT PLOT-ter. To fix this problem, press  $\overline{\text{ENTER}}$  to Quit, then press  $\overline{Y=}$  and turn your plot(s) off. Problem solved.

ERR:INVALID DIM  
 1Quit

<sup>b</sup> "INVALID DIM" stands for invalid dimension. The dimension of a list is the number of elements in that list; if the TI thinks a dimension is invalid, any of the following might be the case: 1) the lists the TI is trying to  $\overline{\text{GRAPH}}$  are different in length (dimension); make sure that you have the same number of items in both lists; 2) The lists the TI is trying to  $\overline{\text{GRAPH}}$  are different than the ones your data is in.