Plotting Data and Finding the Least Squares Regression Line With the TI-83 Graphing Calculator

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Note: Other Texas Instruments graphing calculators will work in a similar way. Consult your owner’s manual for the details.

We will use the following example of data that gives the average annual salaries of professional football players (in thousands of dollars) from 1987 to 1992 (Source: National Football League Players Association).

<table>
<thead>
<tr>
<th>Year</th>
<th>Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>203</td>
</tr>
<tr>
<td>1988</td>
<td>239</td>
</tr>
<tr>
<td>1989</td>
<td>295</td>
</tr>
<tr>
<td>1990</td>
<td>352</td>
</tr>
<tr>
<td>1991</td>
<td>415</td>
</tr>
<tr>
<td>1992</td>
<td>488</td>
</tr>
</tbody>
</table>

First, we want to plot the data. The List Editor is found under the STAT key. Hit STAT. Choose EDIT (by highlighting 1:Edit and pressing ENTER or by pressing 1 on your keypad).

The lists L1, L2, etc., are where we enter data into the calculator.

NOTE: If your lists already have data in them, you must clear them before starting a new problem. To do this, hit STAT, choose option 4:ClrList, and enter the names of all lists you wish to clear (L1, L2, etc). The list names are in yellow above the corresponding number keys.

For this data we will enter the years in L1, and the salaries in L2.

Position the cursor in L1 (as in above picture), and enter the years, pressing ENTER after each one. Then move the cursor over to L2, and enter the corresponding salaries.

To get out of the statistics application (back to your HomeScreen), press 2nd, QUIT.

To prepare to graph a scatterplot of the data, first make sure all graphs in the Y= menu are either cleared or turned off (no highlight on the =). You can turn off a graph in the Y= menu by positioning the cursor over the = and hitting ENTER.
Now hit 2nd, STAT PLOT (above the Y= key).

If any of the Plots are on, choose 4: PlotsOff, ENTER, and then get back into the StatPlot menu.

Choose 1: Plot1.

Type: (Which kind of statistical plot do we want?)
Xlist: (Which list contains the data we are using for the x-coordinate?)
Ylist: (Which list contains the data we are using for the y-coordinate?)
Mark: (What type of mark do you want the calculator to use on-screen?)

Hit ENTER to turn Plot 1 on.

For our problem, The years 1987-1992 we stored in L1 will be the Xlist, and the salaries we stored in L2 will be the Ylist.

Set your screen up so it looks like the one above. Use the arrow keys to move from option to option, hitting ENTER when you have the cursor over the option you want.

Now we are almost ready to have the calculator graph the data. We need to think about good WINDOW settings for our graph. The years range from 1987 to 1992, so the x-values should go from 1985 to 1995 (your choice may be different, but choose values that allow you to see the data.) The salaries range from 203 to 488, so the y-values should go from 150 to 500.

Press WINDOW, and change the settings to match those to the right.

Now press GRAPH

The note at the top of the graph screen tells you which graph is currently being traced, and the information at the bottom of the screen tells you the coordinates of the cursor.

Notice that the data looks roughly linear. We can find the equation of the “best fit” line through the data by performing a Linear Regression.
Move over to the CALC menu.

Choose option 4:LinReg(ax+b)

Hit ENTER.

This command is waiting for information on the location of our x-data (in L1) and our y-data (in L2).

We tell the calculator this, separating the list names with a comma. (The list names are above the number keys)

Hit ENTER.

The equation of the “best fit” line is \( y = 57.43x - 113922.14 \) (rounding to 2 decimal places) Go to the Y= menu, and enter this function in Y1 (Note that Plot1 is highlighted at the top of the screen, telling us that we have a scatterplot turned on)*

Hit TRACE.

Suppose you wish to know what the average football player’s salary might be in 1993.

While in the TRACE function, enter 1993 for x.

The y-value of 535.85 is the corresponding y-value for \( x = 1993 \) on the regression line, and we can conclude that the average salary in 1993 was near $535,000. Notice that if you hit 1990, ENTER
The y-value of 363.56 doesn’t agree with the y-value of 352 in our data table. The line we found is the “best fit,” not a perfect fit, for the data in the table. For years in which we have the actual data, we would use the data, and we generally only use the regression line as a predictor for values relatively close to those we have in the data.

*NOTE: To have the calculator automatically store the equation of the regression line in the Y= editor, use the command

LinReg(ax+b) L1, L2, Y1

(The Y1 can be found under VARS, Y-Vars, Function.)