

TI-83 & TI-84: Scatterplots and Least-Squares Regression Analysis

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

The examples used below are taken out of David Moore's text titled "The Basic Practice of Statistics, 2nd Edition".

Example#2.4 p. 85: Table 2.1 on page 85 gives the natural gas consumption versus heating degree-days data for the Sanchez household for a period of 16 months. The response variable y is the average amount of natural gas consumption (in hundreds of cubic feet) for each month. The explanatory variable x is the average number of heating degree-days (in °F) during the month.

<u>Degree-Days</u>	<u>Gas (100 cu ft)</u>	<u>Degree-Days</u>	<u>Gas (100 cu ft)</u>
24	6.3	0	1.2
51	10.9	1	1.2
43	8.9	6	2.1
33	7.5	12	3.1
26	5.3	30	6.4
13	4.0	32	7.2
4	1.7	52	11.0
0	1.2	30	6.9

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 DEGD short for heating Degree-Days. Press **ENTER** to store the list name. Press **↓** to begin entering the data set. Start typing in the numbers from the Degree-Days data set, pressing **ENTER** after each data point. When you have finished entering the last Degree-Days value, your screen should look like the screen on the left below.

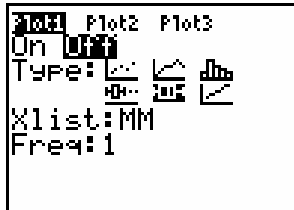
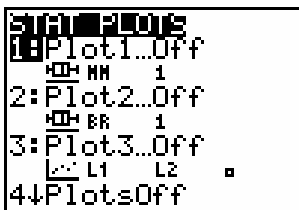
MM	ER	DEGD	11
58	49	6	
70	54	12	
-----	54	30	
	59	32	
	60	52	
	-----	30	
DEGD(17)=			

ER	DEGD	GAS	12
49	6	2.1	
54	12	3.1	
54	30	6.4	
59	32	7.2	
60	52	11	
-----	30	6.9	
GAS(17) =			

To enter the numbers for the natural gas consumption data set 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 GAS short for natural gas consumption. Press **ENTER** to store the list name. Press **↓** to begin entering the data set.

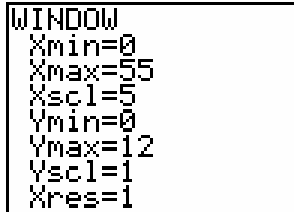
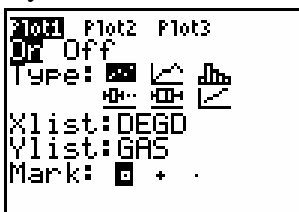
Start typing in the numbers from the Gas data set, pressing **ENTER** after each data point. When you have finished entering the last Gas value, your screen should look like the screen on the right above.

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.

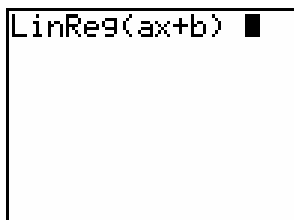
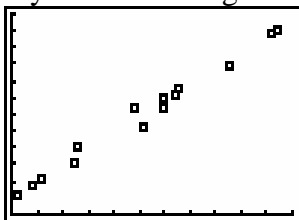


Press **ENTER** to get to the settings screen for **Plot1**. Your screen should look like the screen on the right above.

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 DEGD, 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 DEGD and press **ENTER** to paste the name by **Xlist:** Press **↓** to scroll down to **Ylist:** The list name GAS, 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 GAS 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. Press **GRAPH** to see the scatterplot displayed on the left given below.



Example#2.9 p. 109: The equation of the Least-Squares Regression line 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 **↓** three times to move the cursor down to **4:LinReg(ax+b)**. Press **ENTER** to select **4:LinReg(ax+b)** 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 **LinReg(ax+b)** command.

Now the list names DEGD and GAS 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 DEGD and press **ENTER** to paste the list name DEGD by the **LinReg(ax+b)** command on the Home screen. Press **,**. Press **2nd** and **STAT** to access the LIST menu. Press **↓** till you move the cursor by the name GAS and press **ENTER** to paste the list name GAS by the coma on your screen. Press **,**. To store the LSR equation into the function editor **Y=** as **Y₁**, press **VAR**, 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 below.

```
LinReg(ax+b) LDE
GD, LGAS, Y1
```

```
LinReg
y=ax+b
a=.1889989538
b=1.089210843
r2=.9905504416
r=.995264006
```

Press **ENTER** to have the calculator display the equation of the LSR line along with the correlation coefficient, *r*, and the coefficient of determination, *r*². Your screen should look like the screen on the right given above. Caution: If your calculator does not display the *r* and *r*² values, the **DiagnosticOn** command from the CATALOG menu must be executed first.

The equation of the LSR line, up to four decimal places, is given as follows: $\hat{y} = 0.1890x + 1.0892$. The slope of the LSR line represents the amount of change in \hat{y} when *x* increases by one unit. The slope 0.1890 in this example says that, on the average, each additional degree-day predicts consumption of 0.1890 more hundreds of cubic feet of natural gas per day. The correlation coefficient measures the strength and direction of the relationship between two quantitative variables. The correlation coefficient of 0.9953 in this example shows a very strong positive linear relationship between degree-days and natural gas consumption. The square of the correlation, *r*², is the fraction of the variation in the response variable that is explained by the linear relationship with the explanatory variable. In this example *r*²=0.9906 which means over 99% of the variation in natural gas consumption is accounted for by the linear relationship with degree-days.

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

