

# Drawing a Scatterplot and Finding the Line of Best Fit (Linear Regression Equation)\*

Instructions for the TI-84 Plus

\*Before working this problem be sure to work through the worksheet, *Preparing the Calculator for Regression*. **Plot1** must be turned on.

The following example is taken from the textbook “College Algebra Graphs & Models, Third Edition” by Bittinger, Beecher, Ellenbogen, and Penna.

Example: Problem #81 on page 119. “*Maximum Heart Rate*” A person who is exercising should not exceed his or her maximum heart rate, which is determined on the basis of that person’s sex, age, and resting heart rate. The following table relates resting heart rate and maximum heart rate for a 20-year-old man.

- a) Use a graphing calculator to model the data with a linear function.
- b) Estimate the maximum heart rate if the resting heart rate is 40.

Fig. 1

Resting Heart Rate, H (In Beats Per Minute)	Maximum Heart Rate, M (In Beats Per Minute)
50	166
60	168
70	170
80	172

First, we need to enter the data into the calculator. We are working with statistics, so press **STAT** to enter the statistics menu. You will see the screen that is shown in figure 2.

We want to EDIT the data, so press **ENTER** for Edit. The result will be the screen shown in figure 3.

Fig. 2

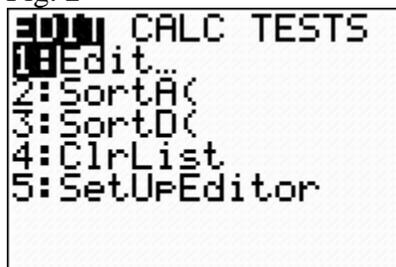
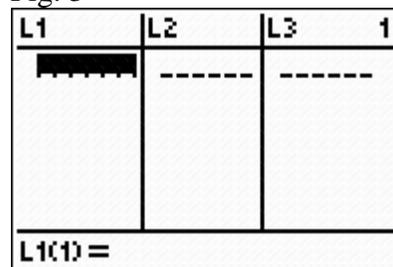


Fig. 3



(If there are any numbers in **L1** or **L2** use **↑** to highlight **L1** or **L2**, then press **CLEAR**, then **ENTER**. This will clear out any previous data. Press **→** and **←** to move between columns.)

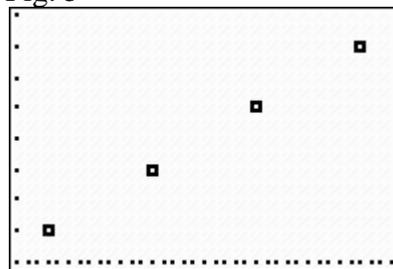
Once the **L1** and **L2** columns are cleared out, you are ready to input the data. Place the cursor in the **L1** column. Type in **5** **0** **ENTER**, **6** **0** **ENTER**, **7** **0** **ENTER**, then **8** **0** **ENTER**.

Place the cursor in the **L2** column. Type in **1** **6** **6** **ENTER**, **1** **6** **8** **ENTER**, **1** **7** **0** **ENTER**, and **1** **7** **2** **ENTER**. This will result in the screen in figure 4.

Fig. 4

L1	L2	L3	2
50	166		
60	168		
70	170		
80	172		
-----			
L2(5) =			

Fig. 5



To plot these points on a graphing window that contains these values, Zoom Statistics by pressing **ZOOM** **9**. This will result in the scatterplot shown in figure 5.

Now we want to **CALCULATE** the equation of the line that fits this data the best. This line of best fit can be found using linear regression. To calculate with statistics, we enter the statistics menu by pressing **STAT**. Then enter the calculate menu by pressing **▸**. You should have the screen shown in figure 6.

Fig. 6

EDIT	▸	TESTS
1	1-Var Stats	
2	2-Var Stats	
3	Med-Med	
4	LinReg(ax+b)	
5	QuadReg	
6	CubicReg	
7	↓QuartReg	

Fig. 7

VAR	Y-VARS
1	Function...
2	Parametric...
3	Polar...
4	On/Off...

We want to calculate a Linear Regression, so select **LinReg(ax+b)**. You can do this by pressing **4** to select LinReg(ax+b) or press **▾** to 4 then press **ENTER**. Now we want to tell the calculator where to store this answer. We want to store it in **Y1** of the equation editor. **Y1** is a y-variable, so press **VAR** to access the variables menu. Then press **▸** to access the **Y-VARS** menu, as shown in figure 7.

**Y1** is a function, so press **ENTER** to get the screen shown in figure 8. Press **ENTER** again to select **Y1**. The screen should look like figure 9.

Fig. 8

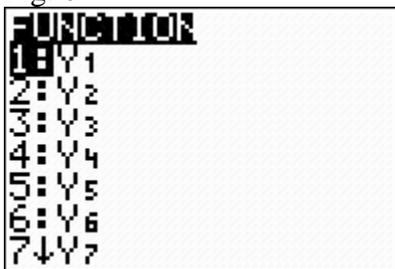
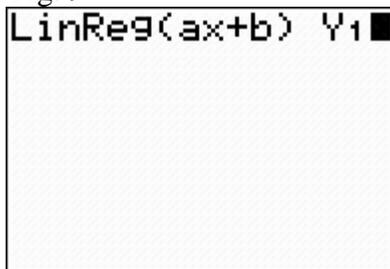


Fig. 9



Press **ENTER** to calculate the Linear Regression values. This will result in figure 10. From this, we see that the linear function is  $f(x) = 0.2x + 156$ .

Fig. 10

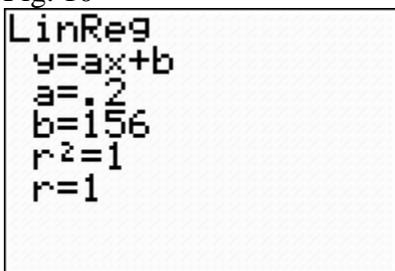
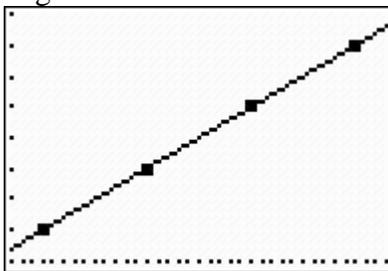


Fig. 11



The  $Y_1$  from our previous instruction will paste the regression equation into the equation editor. Press **GRAPH** to graph the regression equation on top of your scatterplot. The result is shown in figure 11.

To estimate the maximum heart rate if the resting heart rate is 40, we need to evaluate  $f(40)$ . However, in the calculator, we called this function  $Y_1$ , so we need to evaluate

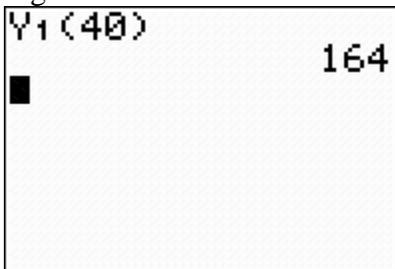
$Y_1(40)$ . Return to the home screen by pressing **2nd** **MODE**.  $Y_1$  is a y-variable that is a

function, so we need to access Variables (press **VARS**), Y-variables (press **)**),

Function (press **ENTER**), and  $Y_1$  (press **ENTER** again). Then we need to tell the calculator

to evaluate  $Y_1$  at 40, so press **(** **4** **0** **)**. Press **ENTER** to tell the calculator to evaluate the expression. This will result in figure 12.

Fig. 12



When the resting heart rate is 40 beats per minute, the maximum heart rate is 164 beats per minute.