

**2.4 FITTING LINES TO DATA**

We have spent the first few sections of this chapter writing equations of lines with given information. In this section you will find the equation of a line that goes through a set of data. The only real difference between what you did before and what you are going to do now is that YOU will pick the points.

*Finding a Line of Fit Without a Calculator*

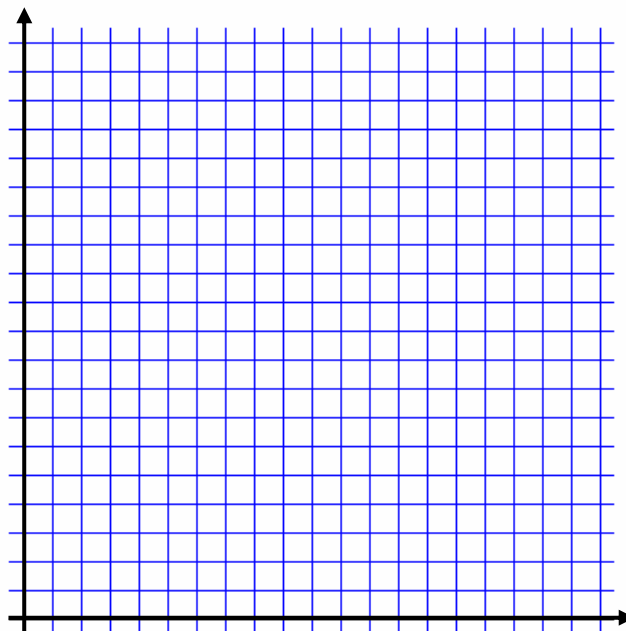
Here's the idea ...

1. You're going to graph the data you are given ... USE GRAPH PAPER and create an appropriate scale
2. Draw a line the "fits" the data ... USE A RULER!
3. Pick TWO points that are ON YOUR LINE ... any two will do ...  
HINT: Pick two points whose  $x$ -values differ by 1.
4. Write the equation of the line using those two points ... leaving it in point-slope form is the easiest way.

*Example:* The table below shows the heights and numbers of stories of some of the tallest buildings in the United States.

Name	Number of Stories	Height (ft)
Sears Tower, Chicago	110	1454
Empire State Building, N.Y.C.	102	1250
Amoco, Chicago	80	1136
Chrysler Building, N.Y.C.	77	1046
Allied Bank Plaza	71	972
Columbia Center, Seattle	76	954
InterFirst Plaza Tower, Dallas	71	921
Society Center, Cleveland	57	888
First Interstate Bank, L.A.	62	858
First National Bank	60	850
USK Tower, Pittsburgh	64	841
NCNB Corporation Center, Charlotte	60	830

- a) Make a scatter plot of the data using number of stories on the horizontal axis and height on the vertical axis.
- b) Draw a line of fit.
- c) Find the equation of the line of fit you drew in part *b*.



- d) Use your equation to predict the height of a building with 90 stories.

*Finding the Line of Best Fit With a TI-83+ Calculator*

The table below was taken from Example 1 on page 66 of your textbook. It shows the number of bicycles produced worldwide for various years between 1965 and 1990. For this example, we will let  $x = 0$  represent 1965.

Year	1965	1970	1975	1980	1985	1990
Number of bicycles (in millions)	21	36	43	62	79	95

**Step 1: Enter the data in your calculator.**

Press **[STAT]**, then press 1: Edit ... or just hit **[ENTER]**. If you happen to have data in L1 or L2, you need to clear it.

To clear the data in L1, highlight L1 with the cursor and press **[CLEAR]**. **DO NOT PRESS [DEL]**.

If you accidentally press **[DEL]**, or if for some reason L1 is missing, press **[STAT]**, then 5: SetUpEditor

Enter the  $x$ -values in L1 and the  $y$ -values in L2, be sure to press **[ENTER]** or **[↓]** after each value.

You should see this screen.

L1	L2	L3	2
0	21	-----	
5	36		
10	43		
15	62		
20	79		
25	95		
-----			
L2(?) =			

**Step 2: Find the Linear Regression Equation**

Press **[STAT]**, then **[▶]**, in order to highlight CALC, then select 4: LinReg(ax+b).

You should see this screen.

LinReg(ax+b)	L1,
L2	

You do not actually have to put L1, L2 after the LinReg(ax+b) ***IF*** your  $x$ -values are in L1 and  $y$ -values are in L2. However, if your  $x$ -values and  $y$ -values are not in L1 and L2 respectively, then you **MUST** enter the list number after LinReg(ax+b). Once you press **[ENTER]**, you should see this screen.

LinReg
y=ax+b
a=2.96
b=19
r <sup>2</sup> =.9879381443
r=.9939507756

If you do not see the last two lines, then turn your Diagnostics On.

Press **[2nd]** **[0]** (Catalog) **[x<sup>-1</sup>]** (D) **[↓]** **[↓]** **[↓]** **[↓]** **[↓]** **[↓]** **[↓]** (DiagnosticOn), and then press **[ENTER]** **[ENTER]**

Since you chose LinReg(ax+b), then the  $a$  in the list is the slope of your line and the  $b$  is the  $y$ -intercept.

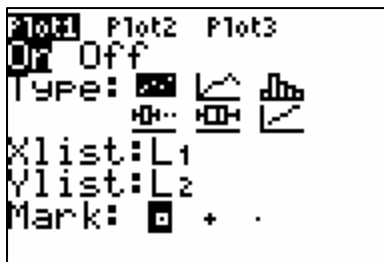
Therefore, the line of best fit is  $y = 2.96x + 19$ .

**Step 3: Graphing your data AND the line of best fit**

First, graph the data.

Press  $\text{2nd}$   $\text{Y=}$  (STAT PLOT). Select 1:Plot1...

You should see this screen.



- ✓ Highlight ON, and press  $\text{ENTER}$ .
- ✓ Select the scatter plot type:  $\text{Scatter}$ .
- ✓ Be sure the Xlist: is L1 (or whatever list your  $x$ -values are in),
- ✓ Be sure the Ylist: is L2 (or whatever list your  $y$ -values are in)
- ✓ The Mark: is a personal preference ... each point in your data will be represented by whichever mark you select.

To see the graph, examine your data and create an appropriate viewing window, or press  $\text{ZOOM}$  9:ZoomStat.

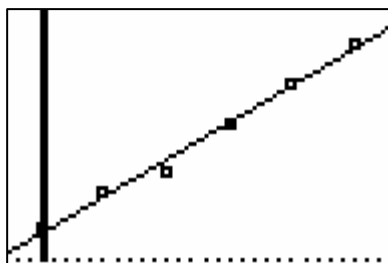
Second, enter the equation of the line.

(In this example, it would be very easy to just enter the equation, but your calculator has stored the regression equation you found, and you can have the calculator enter it for you).

Press  $\text{Y=}$  . From this screen, press  $\text{VAR}$ . Then select 5:Statistics...

Then press  $\text{EQ}$  and select 1:RegEQ

If you press  $\text{GRAPH}$  you should see the screen below (assuming you haven't changed the window from before).



*Just for Vocabulary Fun ... The Line of Best Fit that your calculator finds is called the “Least-Squares Line”. The process of finding a line that fits a set of data is called “Linear Regression”.*