

# Chapter 5

## Linear Regression Equations

### 5.1 Linking Calculators

This course comes with programs that store data to the graphing calculator. Once the data is stored to lists, you can create plots and find regression equations on the data. Your instructor will be able to download the programs from a computer to a calculator. Your calculator came with a cable that allows you to link calculators. Once linked, you can receive and send programs as well as data lists.

#### 5.1.1 Receiving Data

1. Attach the cable to both calculators. Be sure to push the cable **all** the way in.
2. Press **2nd** **LINK** **▷** to <RECEIVE>. Press **ENTER** (see Fig. 5.1).
3. The receiving calculator must say *Waiting...*



Figure 5. 1



Figure 5. 2



Figure 5. 3

#### 5.1.2 Sending data:

1. Press **2nd** **LINK** ; select [3:Select Current...].
2. **▽** to the programs or lists to be sent. Press **ENTER** to select. A small square indicates the selection has been made (see Fig. 5.2).
3. **▷** to <TRANSMIT> press **ENTER** (see Fig. 5.3).
4. Wait for the message *Done..* on the receiving calculator (see Fig. 5.4).



Figure 5. 4



Figure 5. 5

#### 5.1.3 Running a Program

Press **PRGM** , then select the program. Press **ENTER** (see Figs. 5.5 and 5.6). The program has stored the FAM1000 data to List1 though List6. Press **STAT** select [1:Edit] to see the data in the lists (see Fig. 5.7).

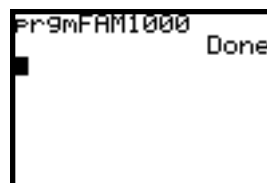


Figure 5. 6

To see the program press **PRGM** **▶** to <EDIT>. Select the program to view. Press **ENTER** (see Fig. 5.8).


The program will look like Figure 5.9. At the end of this chapter the complete FAM 1000 data sets will be listed with appropriate column headings.

**Trouble shooting:** If you get lost and don't know which menu you are in, press **2nd** **QUIT** and start over.

## 5.2 Linear Regression Equations

The FAM 1000A program stores the years of education in L1 and the mean personal income in L2. To plot the data press **2nd** **STATPLOT** **ENTER** (see Fig. 5.10).

### 5.2.1 Set up the plot

1. Select ON **ENTER**.
2. Select Type: scatterplot icon, **ENTER**.
3. Select Xlist: L1 **ENTER**.
4. Select Ylist: L2 **ENTER**.
5. Select Mark:  (see Fig. 5.11).

**Trouble shooting:**  
CLEAR **Y=** and turn off all other plots.

### 5.2.2 Draw a Scatter Plot

Press **ZOOM**; select [9:ZoomStat] (see Fig. 5.12 and 5.13). Review Chapter 2 Section 2.2.5 for selecting appropriate viewing windows.

### 5.2.3 Find the Equation

Press **STAT** **▶** to <CALC>, select [LinReg(ax+b)] **2nd** **L1** **,** **2nd** **L2** **ENTER** (see Figs 5.14 through 5.16).

L1	L2	L3
0	12200	0
1	15000	1
2	11134	2
3	8333	3
4	8583	4
5	15041	5
6	17112	6

L1(1)=0

Figure 5.7

```
EXEC [001] NEW
1:FAM1000
2:FAM1000A
3:FAM1000B
4:FAM1000C
```

Figure 5.8

```
PROGRAM:FAM1000
:PROGRAM:FAM1000
:ClrList L1,L2,L
3,L4,L5,L6
:(0,1,2,3,5,6,7,
8,9,10,11,12,13,
14,15,16,18,20)→
```

Figure 5.9

```
STAT PLOTS
1:Plot1...
  On L1 L2
2:Plot2...
  Off L2 L3
3:Plot3...
  Off L1 L2
4:PlotsOff
```

Figure 5.10

```
Plot1
Off
Type:    
Xlist: L1 L2 L3 L4 L5 L6
Ylist: L1 L2 L3 L4 L5 L6
Mark:  + .
```

Figure 5.11

```
ZOOM MEMORY
3:Zoom Out
4:ZDecimal
5:ZSquare
6:ZStandard
7:ZTrig
8:ZInteger
9:ZoomStat
```

Figure 5.12

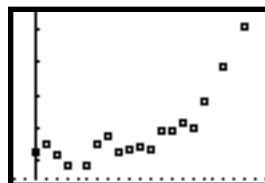


Figure 5.13

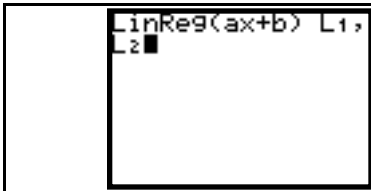


Figure 5. 14 TI-82

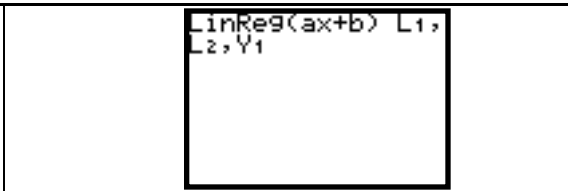


Figure 5. 15 The TI-83 stores the regression equation to Y1.

Enter the equation into Y1. For the TI-82 press **Y=** **VARΣ** ; select [5:statistics] **▶** **▶** to **<EQ>** ; select [RegEQ] (see Fig. 5.17).

**Note :** Figure 5.15 shows how the TI-83 stores the equation into Y1 and Figure 5.16 shows the TI-83 regression equation screen.

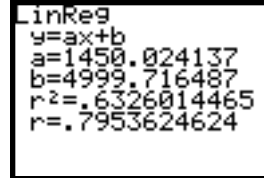


Figure 5. 16 TI-83 screen

The TI-83 linear regression equation. The r value tells how good of a fit you have. To see the r values: press **2nd** **CATALOGUE** choose DiagnosticsOn.

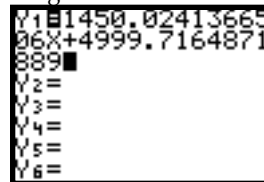


Figure 5. 17

Recall  $a = m$ , the slope or rate of change and  $b =$  the  $y$ -intercept.

Press **GRAPH** .

Figure 5.18 shows both the scatterplot and the graph of the regression equation.

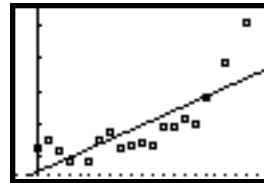


Figure 5. 18

The equation means that on average for every year of education a person earns an additional \$1450.02 and with no education a person earns only \$4999.72 . This corresponds to the slope of the equation, which is 1450.02, and the  $y$ -intercept which is 4999.72.

### 5.3 TI-83 Naming Lists

The TI-83 allows you to name lists and store them.

Press **2nd** **L1** **STO>** **2nd** **ALPHA**

then type no more that 5 letters. Repeat for list 2 , L2 (see Fig. 5.19). To place the list in the edit screen press **STAT** ; select

[5:SetUpEditor], **2nd** **LIST** then choose the names, **ENTER** (see Fig. 5.19). Press **STAT**

[1:Edit]to see the named lists (see Fig. 5.20).

Revert back to the L1-L6 edit screen; press

**STAT** ; select [5:SetUpEditor] **ENTER** .

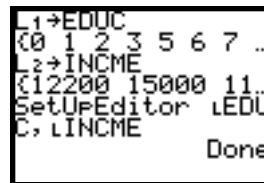


Figure 5. 19

EDUC	INCME	----	1
0	12200		
1	15000		
2	11134		
3	8333		
4	8583		
5	15041		
7	17112		
EDUC(1) = 0			

Figure 5. 20

<b>FAM 1000A: Mean Personal Wages</b>					
<b>Years of Education</b>	<b>Mean Personal Wages (\$)</b>	<b>Years of Education</b>	<b>Mean Personal Wages (\$)</b>	<b>Years of Education</b>	<b>Mean Personal Wages (\$)</b>
	<b>(all)</b>		<b>(men)</b>		<b>(women)</b>
<b>L1</b>	<b>L2</b>	<b>L3</b>	<b>L4</b>	<b>L5</b>	<b>L6</b>
1	\$10,811	1	\$10,811	4	\$10,400
4	\$10,600	4	\$11,000	6	\$6,846
6	\$12,095	6	\$15,011	8	\$6,395
8	\$5,664	8	\$5,225	9	\$5,652
9	\$6,817	9	\$8,111	10	\$8,941
10	\$12,883	10	\$17,876	11	\$6,471
11	\$9,834	11	\$11,596	12	\$16,154
12	\$20,001	12	\$23,848	14	\$18,736
14	\$23,031	14	\$27,103	16	\$21,224
16	\$33,840	16	\$46,607	18	\$27,058
18	\$36,913	18	\$49,042	20	\$25,500
20	\$45,635	20	\$49,137		

<b>FAM 1000B: Mean Personal Total Income</b>					
<b>Years of Education</b>	<b>Mean Personal Total Income (\$)</b>	<b>Years of Education</b>	<b>Mean Personal Total Income (\$)</b>	<b>Years of Education</b>	<b>Mean Personal Total Income (\$)</b>
	<b>(all)</b>		<b>(men)</b>		<b>(women)</b>
<b>L1</b>	<b>L2</b>	<b>L3</b>	<b>L4</b>	<b>L5</b>	<b>L6</b>
1	\$10,811	1	\$10,811	4	\$10,400
4	\$10,600	4	\$11,000	6	\$7,129
6	\$12,196	6	\$15,011	8	\$6,711
8	\$11,148	8	\$13,811	9	\$7,536
9	\$16,550	9	\$26,566	10	\$10,433
10	\$14,402	10	\$19,430	11	\$7,463
11	\$13,605	11	\$16,823	12	\$17,688
12	\$22,773	12	\$27,859	14	\$21,760
14	\$26,103	14	\$30,220	16	\$24,986
16	\$40,009	16	\$55,211	18	\$34,649
18	\$44,212	18	\$55,981	20	\$26,025
20	\$59,228	20	\$65,003		

<b>FAM 1000C: Mean Personal Total Income for White and Nonwhite Men</b>					
<b>Years of</b>	<b>Mean Personal</b>	<b>Years of</b>	<b>Mean Personal</b>	<b>Years of</b>	<b>Mean Personal</b>
<b>Education</b>	<b>Total Income (\$)</b>	<b>Education</b>	<b>Total Income (\$)</b>	<b>Education</b>	<b>Total Income (\$)</b>
	<b>All Men</b>		<b>All White Men</b>		<b>All Nonwhite Men</b>
<b>L1</b>	<b>L2</b>	<b>L3</b>	<b>L4</b>	<b>L5</b>	<b>L6</b>
1	\$10,811	1	\$10,811	8	\$11,880
4	\$11,000	4	\$11,000	9	\$19,256
6	\$15,011	6	\$15,011	10	\$25,277
8	\$13,811	8	\$14,025	11	\$8,727
9	\$26,566	9	\$28,655	12	\$35,808
10	\$19,430	10	\$19,012	14	\$29,007
11	\$16,823	11	\$18,172	16	\$29,809
12	\$27,859	12	\$26,872	18	\$19,530
14	\$30,220	14	\$30,351	20	\$40,250
16	\$55,211	16	\$56,152		
18	\$55,981	18	\$60,736		
20	\$65,003	20	\$67,360		

<b>FAM 1000D: Mean Personal Total Income for White and Nonwhite Women</b>					
<b>Years of</b>	<b>Mean Personal</b>	<b>Years of</b>	<b>Mean Personal</b>	<b>Years of</b>	<b>Mean Personal</b>
<b>Education</b>	<b>Total Income (\$)</b>	<b>Education</b>	<b>Total Income (\$)</b>	<b>Education</b>	<b>Total Income (\$)</b>
	<b>All Women</b>		<b>All White Women</b>		<b>All Nonwhite Women</b>
<b>L1</b>	<b>L2</b>	<b>L3</b>	<b>L4</b>	<b>L5</b>	<b>L6</b>
4	\$10,400	4	\$10,400	8	\$11,269
6	\$7,129	6	\$7,129	9	\$8,490
8	\$6,711	8	\$5,800	10	\$13,001
9	\$7,536	9	\$7,128	11	\$19,061
10	\$10,433	10	\$9,952	12	\$14,613
11	\$7,463	11	\$4,886	14	\$20,918
12	\$17,688	12	\$18,325	16	\$17,295
14	\$21,760	14	\$21,926	18	\$28,573
16	\$24,986	16	\$26,129		
18	\$34,649	18	\$35,775		
20	\$26,025	20	\$26,025		