Section 8.5: Linear Functions and Models

MATH 102 Course Outline Unit IV

Objective: Determine appropriate window settings on a graphing utility.

Instructor Notes:

You may want to do one or more of the even problems from **Exercises 57-70** as in-class examples.

1. Use the questions about implied domain and independent/dependent variables to discuss a reasonable viewing window on the graphing calculator.

    a. For example in **Exercise 64**, miles driven and rental cost must be greater than or equal to zero, so our **Xmin** and **Ymin** need not be less than zero.

    b. Thus, in part (c) the implied domain is $[0, \infty)$.

2. Then graph the function on the calculator to

    a. Check and verify the equation from part (a).

    b. Check and verify the answer to (d) by evaluating the function at m=860. (See Graphing Calculator Guide Section 8.3.)

MATH 102 Course Outline Unit III

Objective: Model data using the linear regression feature on the graphing calculator.

In **Exercises 77-80**, students will use the graphing calculator to

a) Draw a scatter diagram

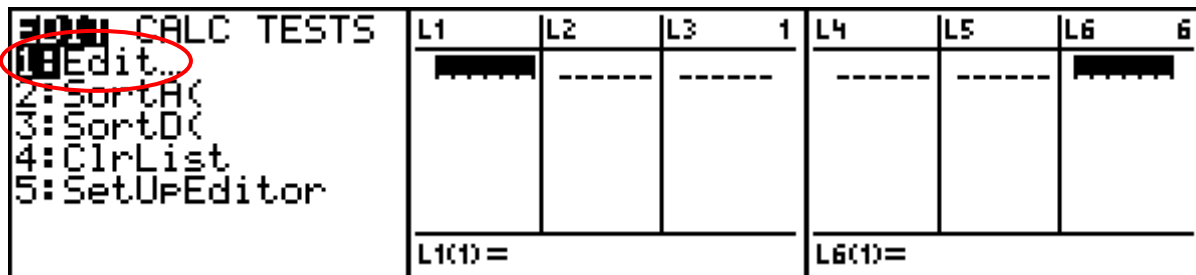b) Find the line of best fit using the Linear Regression feature

On the following pages you will find step-by-step instructions for you and your students. You may want to distribute these to your students as a handout and let them practice in class or at home.

DRAWING A SCATTER DIAGRAM AND USING LINEAR REGRESSION TO FIND A LINE OF BEST FIT

STEP 1: Enter the data into lists.

Press [STAT] and then select **1: Edit**.

You will now see the data screen with six possible lists, **L₁** through **L₆**.

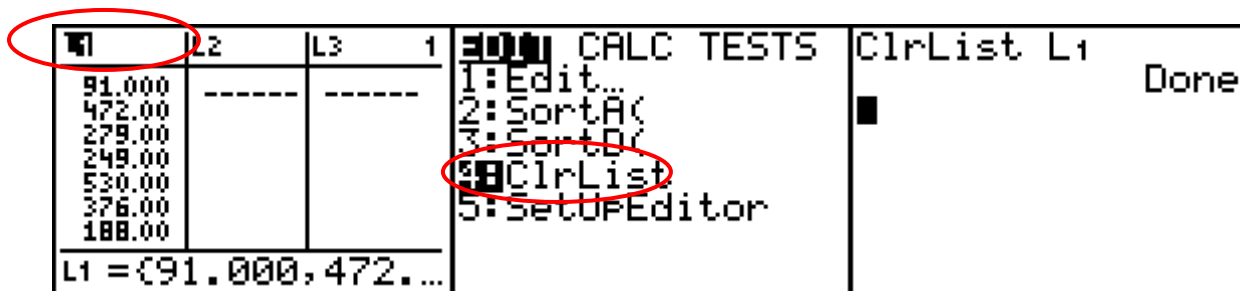| EDIT CALC TESTS	L1	L2	L3	1	L4	L5	L6	6
1:Edit…	�	------	------		------	------	▬	
2:SortA(								
3:SortD(								
4:ClrList								
5:SetUpEditor								
	L1(1)=				L6(1)=			

Note: If there is already data in any of the lists, you need to clear the lists. Do this by placing your cursor at the top of the list you wish to clear and then press [CLEAR] and [ENTER]. **Do not** press [DEL]! This will delete the list from your calculator.

Another way to clear a list is to press [STAT], select **4: ClrList**. Then type in the list you want cleared ([2nd] [1] for list **L₁**) and press [ENTER].

▶1	L2	L3	1	EDIT CALC TESTS	ClrList L1	
91.000	------	------		1:Edit…		Done
472.00				2:SortA(	▮	
279.00				3:SortD(		
249.00				4:ClrList		
530.00				5:SetUpEditor		
376.00						
188.00						
L1 =(91.000,472.…						

We are now ready to enter the data into the lists. Let's enter the numbers:

2	5	7	9	11	(x-values)
3	6	9	11	12	(y-values)

Note: It is common practice to enter the first list of numbers (x-values) into L_1 and the second list of numbers (y-values) into L_2.)

Press [ENTER] after each number, and use the arrow keys [ )] and [( ] to move between L_1 and L_2. To correct a data entry, highlight the entry that is wrong and enter the c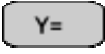orrect data value. To delete a data entry, highlight the data value you wish to delete and press [DEL]. To insert a new entry into a list, highlight the position directly below the place you wish to insert the new value and then select **INS**([2nd] [DEL]) and then enter the data value.

Once completed, your lists should look like this:


**STEP 2: Plot the data points.**

To construct a scatter plot of the points, select **STAT PLOT**([2nd] [Y=]).

Select **1: Plot1** and press [ENTER]. Then on the next screen select **On** (put cursor on **On** and press [ENTER]) and the scatter plot (first graph on the first row). Set **Xlist** to L_1 and set **Ylist** to L_2. Set your mark for each point by selecting a box, cross, or dot.
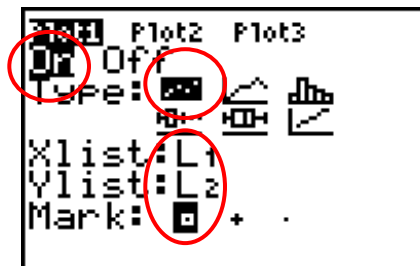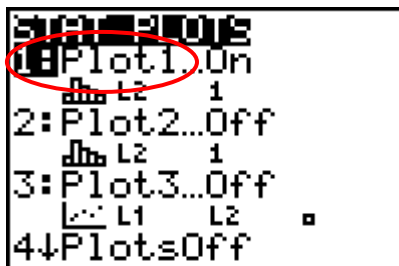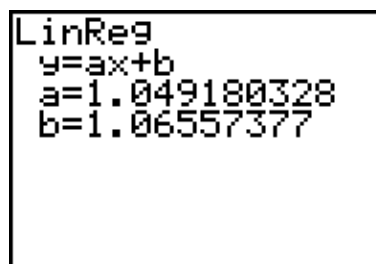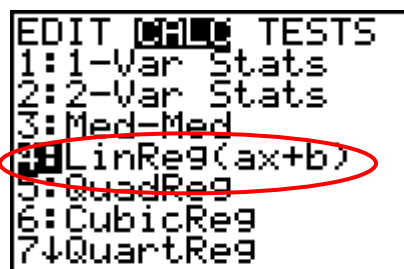
Next press [ZOOM] , select **9:ZoomStat** to set the graphing window and see the scatter plot. You can also use [WINDOW] to set your window, but **9:ZoomStat** may be easier.

```
ZOOM MEMORY
4↑ZDecimal
5:ZSquare
6:ZStandard
7:ZTrig
8:ZInteger
9█ZoomStat
0:ZoomFit
```
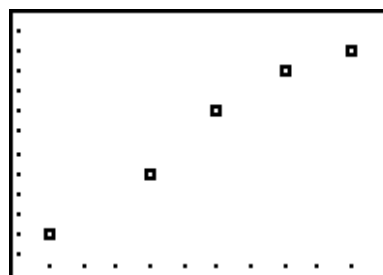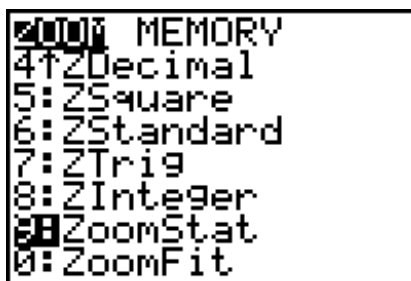
STEP 3: Find the regression equation

To leave the data screen, press [2nd] [MODE] . Press [Y=] and clear out any pre-existing equations.

Press [STAT] [>] to select the **CALC** menu and then press [⌄] to select **4: LinReg(ax+b)** by pressing [ENTER] so that command comes up on your screen. When you press [ENTER] again, the equation is displayed (second screen):

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

```
LinReg
 y=ax+b
 a=1.049180328
 b=1.06557377
```
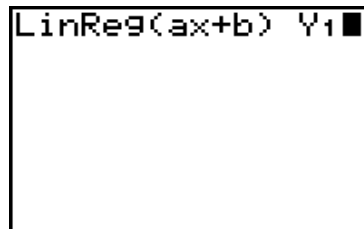
From the second screen above, you see that the linear regression equation is

$$y \approx 1.049x + 1.066.$$

To paste the regression equation into the [Y=] editor, repeat the process above ([STAT] ,**CALC**, **4: LinReg(ax+b)**), but **do not** press [ENTER] to compute the equation values just yet….
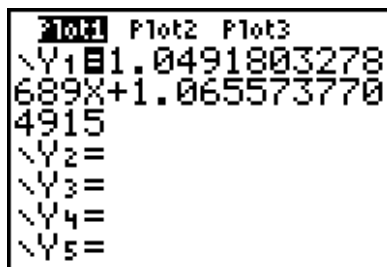
Instead, press [VARS] [ )] to select **Y-VARS**, select **1: Function** by

pressing [ENTER], and finally select **Y₁** by pressing [ENTER].

Right now, your screen should look like this:

```
LinReg(ax+b) Y1█
```

Then, press [ENTER]. The regression equation will be displayed like before,

but the equation should also be pasted in your [Y=] screen! If you press

[GRAPH], you will now see the scatter plot with the regression equation's line.

```
Plot1 Plot2 Plot3
\Y1=1.0491803278
689X+1.065573770
4915
\Y2=
\Y3=
\Y4=
\Y5=
```