Basic Setup

When beginning a new problem, it is a good idea to delete information from any previous problem(s) and reset some of the screens on the calculator to prepare for your new problem.

1. Reset the MODE screen

Press the MODE key and make sure all the choices on the left are selected. To do this, use the arrow keys to position the cursor on the choice you want and then press ENTER to select it. **See Figure 1.** The last line, **SET CLOCK**, is a new feature on the TI-84 Plus that was not on the TI-83. If the correct date and time are displayed you may leave them highlighted. If not, highlight the **SET CLOCK** and press ENTER. Set the current date and time using the arrow keys to navigate through the choices.
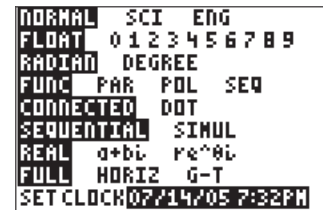

Figure 1

2. Reset the Y= screen

Press Y= and delete any equations that may be listed. Position the cursor on the first character behind the equal sign and then press CLEAR, to erase the entire equation. Repeat for each equation listed. **See Figure 2.** Pressing the DEL key will erase only one character at a time.
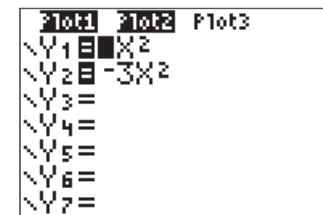

Figure 2

If any of the numbered plots are turned on, they will be highlighted at the top of the Y= screen. Use the arrow keys to position the cursor on the name of the highlighted plot and then press ENTER. The highlighting will be gone and the plot will be prevented from being graphed. This is also referred to as turning the plot off. Repeat for each highlighted plot. **See Figure 3.**
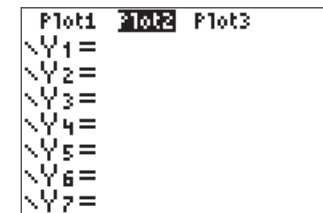

Figure 3

3. Reset the Stat List Editor

Press the STAT key. **1:Edit** will be highlighted. **See Figure 4.** Press ENTER and you will probably see **L1, L2,** and **L3** displayed.
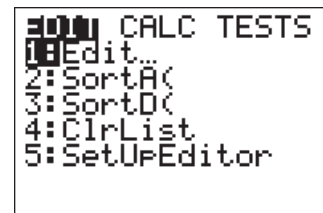
If you see other lists, press the STAT key again and then select **5:SetUpEditor** by pressing 5. Press ENTER to execute the command. The word **Done** will appear on the screen as a confirmation. **See Figure 5.**

Figure 4

Now, if you press the STAT key and then ENTER, you will definitely see **L1, L2,** and **L3**. If they are not empty, see *Appendix B* for help in clearing lists and entering data into lists.

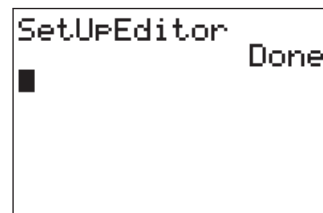**Figure 5**

Working with Lists

1. Clearing Lists

To access the Stat List Editor window, press the �STAT key and then press ENTER. You will probably see **L1, L2,** and **L3.** (If not, refer to *Appendix A*, *section* 3.) If the lists are not empty, you will want to clear them of all entries before working with them. To clear all entries from a list, use the arrow keys to highlight the name of the list at the top of the screen. Notice that when the name of the list is highlighted, the elements of the list are displayed at the bottom of the screen to the right of the list name. **See Figure 1.**

Press CLEAR. At first it appears that nothing has happened, but if you look closely, you should notice that the list elements are no longer displayed at the bottom of the screen. **See Figure 2.**

After pressing CLEAR, press ENTER (or the down arrow key) to erase all the entries from the list. **See Figure 3.** This will position the cursor in the first space of the list. Repeat this process to clear each list.

2. Entering Data into Lists

After each list has been cleared, highlight the first line of the list where you wish to enter data. Begin entering the desired number. As you enter the number, you will see it displayed at the bottom of the screen. **See Figure 4.**

Press ENTER when you have finished entering the number. You will see the number displayed in the list, and the cursor will have moved to the next position. If you look at the bottom of the screen, you will see a number that tells you the position of the cursor. **L1(2)** means the cursor is in the position of the second entry of List 1. **See Figure 5.**

Each number must be entered individually. When using paper and pencil, we use commas to write large numbers. The calculator does not use commas. Do **NOT** use commas when entering numbers into lists. **See Figure 6.**

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

The calculator can only display 6 characters for each entry in a list, so when a number that is one million or more is entered, it appears the calculator is rounding it off and using its own form of scientific notation. Although the number is written in the list using the calculator's shortened form, you can highlight any one of these entries to see the full value displayed at the bottom of the screen. The calculator stores the full value in its memory and uses the full value for any computations that it needs to do. **See Figure 7.**

Figure 7

3. **Filling a List with a Formula**

Let's say you have a list that can be defined in terms of another list. We'll say **L1** contains numbers that represent the widths of a rectangle. If the perimeter of the rectangle is 40, then we could say $L + W = 20$ and $L = 20 - W$.

Rather than having to type in all the lengths, you can let the calculator do the work for you by defining **L2** with the formula **20–L1.** Use the arrow keys to highlight **L2** at the top of the screen, and then type 2 0 – 2nd 1 to enter **20–L1. See Figure 8.**

Figure 8

When you have the name of a list highlighted, the command you enter will be applied to the entire list. What you type will appear at the bottom of the screen, and when you press ENTER, the list will be filled in. **See Figure 9.**

Figure 9

Enclosing the formula in quotation marks will make the calculator automatically upgrade **L2** whenever you make a change to **L1.** Clear **L2** of its entries. Highlight the list name and retype the formula as **"20–L1".** **See Figure 10.**

Figure 10

Press ENTER to fill in **L2**. When a list's formula has been entered with the quotation marks, there will be a mark behind the name of the list as shown in **Figure 11.** If you were to change the 4 in **L1** to a 2, the calculator would automatically change the 16 in **L2** to an 18. **See Figures 11–12**.

Figure 11

Another advantage to using the quotation marks is that you can always go back, highlight the name of the list, and the formula will be displayed for you. **See Figure 12**. Without the quotes, you will have no reminder of the formula entered.

Figure 12

You can also define a list with a formula that links it to more than one other list. Let the calculator also find the perimeter and area for you. With the cursor, highlight **L3**, type **"2L1+2L2"**. Press ENTER . This will confirm that perimeter of each rectangle is 40. **See Figure 13.**

Figure 13

Highlight **L4** and then type **"L1L2"**. Press ENTER to see the areas of the rectangles displayed in **L4. See Figure 14.**

Figure 14

4. Controlling the List Display

You can control which lists and in which order they appear in the Stat List Editor window. In the sample above, it is clear that all the perimeters are the same. Therefore you don't really need **L3.** Since you can only see three lists at a time, you might want to see **L1, L2,** and **L4.** Put the cursor on **L3** and press the DEL key. **See Figure 15.**

Figure 15

This will delete the list from being shown in the display but it does not erase the values in the list. **L4** just moves over to the left, one column, replacing **L3** in the display. **See Figure 16.**

Figure 16

Now let's say you want to bring up a blank list (or any list) and have it displayed between **L1** and **L2.** Position the cursor so that **L2** is highlighted and press 2nd DEL to access the INS (insert) command. This will create a blank column to the left of **L2. See Figure 17.**

Figure 17

Enter the name of the list you want to fill in the column. For this example, press 2nd 5 to enter **L5.** You will see the name of the list at the bottom of the screen. **See Figure 18.**

🍎 **NOTE** If the list you wanted was a named list, press 2nd STAT to access the LIST menu and use the arrow keys to scroll until the list you want is highlighted. Press ENTER to have the name displayed at the bottom of the screen.

Figure 18

When you can see the name at the bottom of the Stat List Editor screen, pressing ENTER will complete the command. If the list has data, that data will be displayed. If it is empty, a blank column will be displayed with that list name at the top. Press the down arrow key to position the cursor on the first element and begin entering data. **See Figure 19.**

Figure 19

Clearing a List with a Formula

1. When a list is created by using quotation marks around a formula, we say the list is locked. You can tell when a list has been created this way by the small icon to the right of its name in the Stat List Editor window. The icon is a "lock." In **Figure 1,** it is clear both **L2** and **L3** were created this way.

Figure 1

2. One of the advantages of creating a list by using quotation marks is that you can go back to it, highlight the name of the list, and the formula will be displayed at the bottom of the screen. Another advantage is that if you were to add a new element to **L1,** both **L2** and **L3** would automatically be updated with the corresponding elements computed from the formula. This is also true if you edit an existing element. When the 3 in **L1** is replaced with a 7, both **L2** and **L3** are automatically updated. **See Figure 2.**

Figure 2

3. Clearing a list made this way is slightly different than clearing a list where you have not used quotation marks. It actually takes two steps. The first step removes the formula, and the second step removes the elements. To clear the formula, first use the arrow keys to highlight the name of the list that was created with the formula. **See Figure 3.**

Figure 3

4. Press $\boxed{\text{ENTER}}$. This will put the cursor down at the bottom of the screen blinking on and off on the quotation mark in front of the formula. **See Figure 4.**

Figure 4

5. Press $\boxed{\text{CLEAR}}$. You will see the formula has been cleared from the bottom of the screen. **See Figure 5.**

Figure 5

6. Press $\boxed{\text{ENTER}}$ again and the cursor will be placed in the first element of the list you were working with, and the lock icon will be gone. From here you can clear the list in the usual way. **See Figure 6.**

Figure 6

7. Move the cursor so it highlights **L2.** Press `CLEAR` and then press `ENTER`. The elements in **L2** will be deleted, but you will get an error screen because **L3** is defined in terms of **L2,** which you have just deleted. **See Figure 7.** If you choose **1:Quit,** you will be taken to the home screen. You can continue to do computations on the home screen and use any other features that do not use the lists.
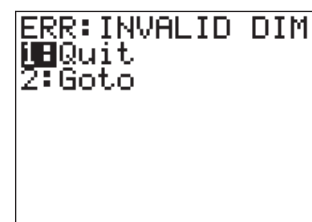

Figure 7

8. If you press `STAT` `ENTER` to access the lists, you will, however, get the same error message as before. You will also get this error message if you try to set up a scatter plot using **L3. See Figure 8.** Choose **2:Goto.**
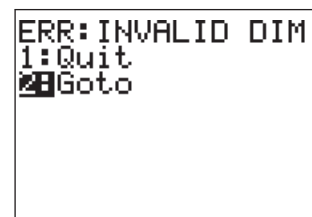

Figure 8

9. Press `ENTER` and you will be taken to the list display. The cursor will be blinking on and off on the quotation mark in front of the formula used to define **L3. See Figure 9.** Basically, it is telling you this is where the problem is. You have defined **L3** in terms of **L1** and **L2,** but **L2** no longer has any elements in it, so the calculator cannot fill **L3.** This only happens when you have locked the formula by using the quotation marks. If you had not used the quotation marks, the calculator would allow you to empty **L2,** and the elements would remain in **L3** with no problems.
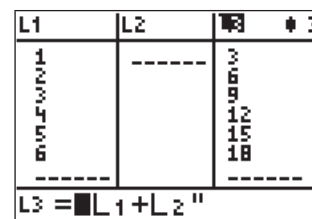

Figure 9

10. To keep using the calculator and stop getting the error message, follow the same procedure for **L3** as you used to clear the formula from **L2.** The cursor is already on the quotation mark at the bottom of the screen. Press `CLEAR` and the formula will be cleared from the bottom of the screen. **See Figure 10.**
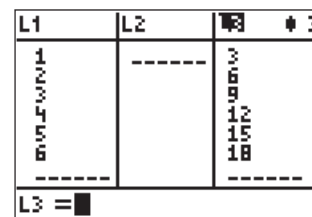

Figure 10

11. Press `ENTER` and the cursor will be placed on the first element of **L3.** The lock icon will be gone. From here, you can clear the list in the usual way, or you can leave the elements filled in. **See Figure 11.**
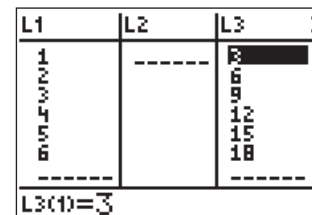

Figure 11

12. You will now be able to fully use your calculator without getting the error message.

APPENDIX D
Filling a List with a Sequence

From the Stat List Editor

1. After a list has been cleared in the Stat List Editor, as shown in *Appendix B,* use the arrow keys to highlight the name of the list where you wish to enter the sequence. **See Figure 1.** Now any command you give will be not for just one element, but for the entire list.
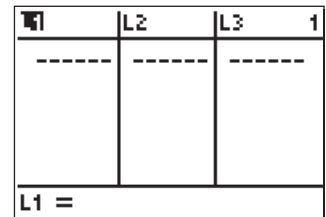

Figure 1

2. Let's create a sequence of the first 10 positive even integers, {2, 4, 6,..., 20}. Press 2nd STAT to access the [LIST] menu. Scroll over until **OPS** is highlighted, and then choose **5:seq(** by either pressing 5, or by scrolling down until **5:seq(** is highlighted and then pressing ENTER. **See Figure 2.**
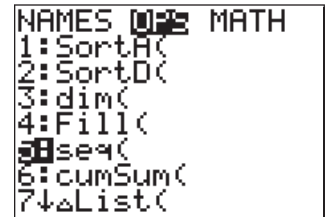

Figure 2

3. The command for a sequence involves 5 arguments: **seq(expression, variable, starting value for the variable, ending value for the variable, incremental change of the variable)**. Fill in the arguments with **seq(2X,X,1,10,1).** As you type this in, you will see your command displayed across the bottom of the screen. **See Figure 3.**
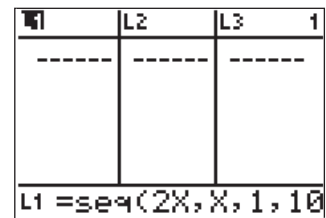

Figure 3

4. Press ENTER when finished typing and **L1** will be filled in with the desired sequence. **See Figure 4.**
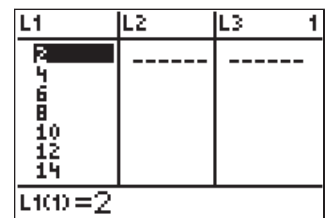

Figure 4

From the Home Screen

1. You can also generate a sequence from the home screen and use it to fill in a list. Let's create a sequence of the first 10 positive odd integers, {1, 3, 5,…,19}. From the home screen, press 2nd STAT to access the [LIST] menu. Scroll over until **OPS** is highlighted, and then choose **5:seq(.** You will see your command on the home screen. Fill in the arguments with **seq(2X–1,X,1,10,1),** but do **NOT** press ENTER yet. Instead, press STO▸ 2nd 2 to fill in **L2**. Then press ENTER. **See Figure 5.**
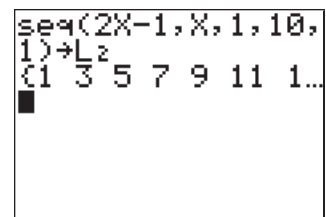

Figure 5

2. You will see the first few numbers of the sequence displayed across the screen. You can use the right arrow key to scroll through the numbers on this screen, or you can press STAT ENTER to view the list in the Stat List Editor window. **See Figure 6.**
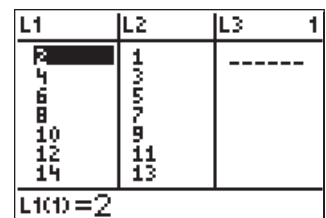

Figure 6

Working with Named Lists

The EasyData application, and also other applications and programs, often store data in the pre-named lists of the calculator, **L1–L6**, and sometimes in other lists commonly named in the same format such as **L7**, **L8**, **L9**, up to **L13**. Running the EasyData App will erase any data that you had previously stored in these lists, whether you entered it manually or from running another application or program. These directions will show you how to create a new list where you can store data to protect it from being over-written when you run an application or program.

1. Let's say you just ran the EasyData App with the CBR 2 to do **Activity 12: Bouncing Ball**. When you exited the App, you were told the data was stored in **L1, L6, L7,** and **L8.** Press ⟨STAT⟩ ⟨ENTER⟩ to see the Stat List Editor. The two lists that were used to display the distance vs. time graph were **L1** and **L6.** The goal here is to rename both lists. **See Figure 1.**

Figure 1

2. To do this, use the up arrow keys to highlight the name of the list to the right of **L1** and then press ⟨2nd⟩ ⟨DEL⟩ to access ⟨INS⟩ (insert). A blank column is inserted to the right of **L1.** At the bottom of the screen you can see the ⟨Ⓐ⟩ cursor indicating the Alpha feature has been accessed. You can now begin typing in a name for your list. **See Figure 2.**

Figure 2

3. The data in **L1** is the time so let's name the list **BTIME** for Ball Time. You may use a maximum of 5 characters for a list name. If you forget this, you will be reminded by the cursor. When you have used all 5 characters, the cursor will change from the ⟨Ⓐ⟩ cursor to a checkered cursor indicating you have reached the maximum number of characters. **See Figure 3.**

Figure 3

4. Press ⟨ENTER⟩ to put the name at the top of the blank column. **See Figure 4.**

Figure 4

5. To have the data from **L1** stored in this new list, use the arrow keys to highlight the name of the list and then press ⟨2nd⟩ ⟨1⟩ to access **L1**. You will see the **L1** at the bottom of the screen. **See Figure 5.**

Figure 5

6. Press [ENTER] to have the new list filled in with the data from **L1**. **See Figure 6.**

Figure 6

7. It would be nice to have **L6** beside the new **BTIME** list. You can accomplish this in a couple of different ways. One of the easiest ways is to use the arrow keys to highlight the name of the list to the right of **BTIME**. **See Figure 7.**

Figure 7

8. Press [2nd] [DEL] to access [INS] (insert). A blank column is inserted to the right of **BTIME**. Press [2nd] [6] to access **L6.** You will see the **L6** at the bottom of the screen. **See Figure 8.**

Figure 8

9. Press [ENTER] to have the blank column filled in with the data from **L6**. **See Figure 9.**

Figure 9

10. Repeat the procedure above to name a list **BDIST** and have it filled in with the data from **L6**. Use the arrow keys to highlight the name of the list to the right of **L6** and then press [2nd] [DEL] to access [INS] (insert). A blank column is inserted. At the bottom of the screen, enter a name for your list. The data in **L6** is the distance for the ball, so let's name the list **BDIST** for Ball Distance. **See Figure 10.**

Figure 10

11. Press [ENTER] to put the name at the top of the blank column. **See Figure 11.**

Figure 11

12. To have the data from **L6** stored in this new list, use the arrow keys to highlight the name of the list and then press [2nd] [6] to access **L6.** You will see the **L6** at the bottom of the screen. **See Figure 12.**

Figure 12

13. Press ENTER to have the new list filled in with the data from **L6.** Next, use the arrow keys to highlight the name **L6** at the top of the screen. **See Figure 13.**

Figure 13

14. Press DEL to erase **L6** from the display. The two named lists will be displayed next to each other. At this point, the data is still in **L6.** Pressing DEL did not clear the elements from the list; it just took the list out of the display. **See Figure 14.**

Figure 14

15. Let's explore a little more before leaving this topic. Press STAT and choose **5:SetUpEditor**. **See Figure 15.**

Figure 15

16. After choosing **5:SetUpEditor**, you will be taken to the home screen. Press ENTER to execute the command. When you see the word **Done**, press STAT ENTER and you will see the lists displayed back in their original L1–L6 order. You could clear the lists here, but you would have to do it one at a time. **See Figure 16.**

Figure 16

17. Instead, press 2nd MODE to access [QUIT] and return to the home screen. Press STAT and select **4:ClrList**. **See Figure 17.**

Figure 17

18. After choosing **4:ClrList**, you will be taken to the home screen. Press 2nd 1 , 2nd 2 , 2nd 6 and then ENTER . This will fill in the arguments **L1, L2,** and **L6.** You will see the word **Done** as a confirmation. **See Figure 18.**

Figure 18

19. Press STAT ENTER and you will see the lists have been cleared. Use the arrow keys to highlight the name of **L1** and then press 2nd DEL to access [INS] (insert). A blank column is inserted to the left of **L1**. **See Figure 19.**

Figure 19

20. Press [2nd] [STAT] to access [LIST]. In this screen, you will see lists **L1–L6** followed by an alphabetical listing of all the lists in the calculator. Use the arrow keys to highlight the name of the list you want. **See Figure 20.**
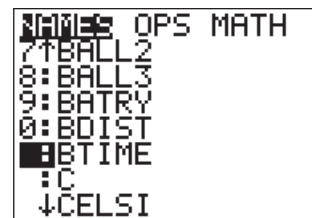
Figure 20

21. Press [ENTER] to select your list. The list name will be displayed at the bottom of the screen. **See Figure 21.**
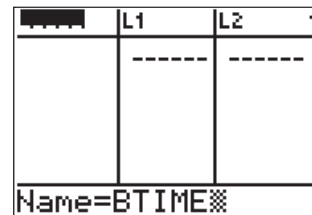
Figure 21

22. Press [ENTER] to see the list in the display. Repeat the process to display the **BDIST** list next to the **BTIME** list. **See Figure 22.**
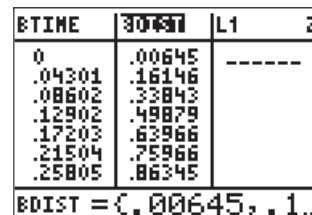
Figure 22

23. You can also control the order of the list display from the home screen. Press [STAT] and choose **5:SetUpEditor**. See **Figure 23.** When the command is on the home screen, enter the names of the lists, separated by commas, in the order you want to have them displayed. You do not type in the names of the lists. You press [2nd] [STAT] to access [LIST], use the arrow keys to highlight the name of the list you want, and then press [ENTER] to select it. If you wanted one of the pre-named lists, **L1–L6,** you can access it from the home screen by pressing [2nd] followed by the key for the desired list. **See Figure 23.**
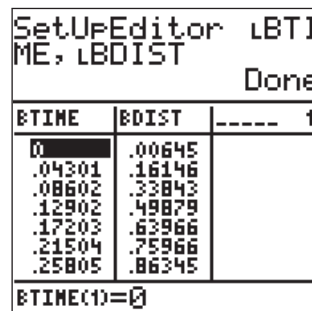
Figure 23

24. You can use the named lists to set up a scatter plot. Press [2nd] [Y=] and then press [ENTER] to access the **Plot1** setup window. Position the cursor behind the **Xlist** and then press [2nd] [STAT] to access [LIST]. From the alphabetical listing, highlight the name of the list you want and press [ENTER] to select it. Repeat the process for the **Ylist**. **See Figure 24.**

Figure 24

25. Now press the [ZOOM] key. Use the arrow keys to highlight **9:ZoomStat**, and then press [ENTER]. Your graph is displayed. If you press [TRACE], you can use the right and left arrow keys to see the coordinates of each point displayed below the graph. Notice the **P1** in the upper left corner. This tells you it is tracing the points from **Plot1** and displays the named lists you are using for **Xlist** and **Ylist**. **See Figure 25.**

Figure 25

F

Creating a STAT PLOT

The , feature of the calculator is used to graph a variety of plots for data that you have entered into lists. This is essentially how the Vernier EasyData™ application creates the plots for the data collection activities.

1. Press [2nd] [Y=] to access **Stat Plot**. **1:Plot1** will be highlighted. Press [ENTER]. If the plot is not being used, the **Off** choice will be highlighted. Use the arrow keys to highlight the **On** choice and then press [ENTER] to select **On**. Continue using the arrow keys to navigate through this screen and adjust it as needed for your particular problem. **See Figure 1.**

Figure 1

2. The **Type:** choice you select will set up what type of graph will be displayed. Your choices are (from left to right), Scatter Plot, xyLine, Histogram, Modified BoxPlot (without outliers), BoxPlot, and Norm ProbPlot. For most of our activities, we want a scatter plot, which is the first choice. If this choice is not highlighted, use the arrow keys to highlight it, and then press [ENTER]. This choice will graph a single point for each ordered pair. **See Figure 2.**

Figure 2

3. Select which lists to use for the **Xlist** and the **Ylist**. Position the cursor behind the **Xlist:** choice. If your values for the **Xlist** are in one of the predefined lists, **L1–L6**, you can simply type in that list by pressing [2nd] followed by the number key for your desired list. **See Figure 3.**
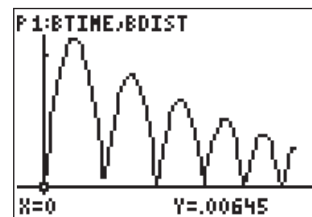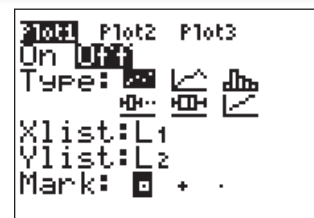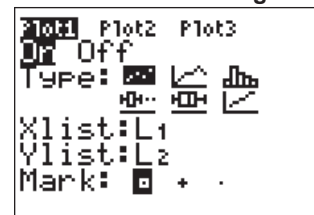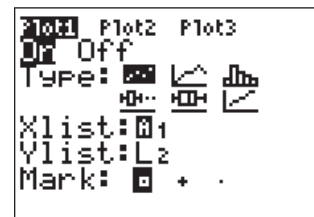
Figure 3

4. If your values for the **Xlist** are in a list that you created and named, press [2nd] [STAT] to access [LIST]. In this screen, you will see lists **L1–L6** followed by an alphabetical listing of all the lists in the calculator. Use the arrow keys to highlight the name of the list you want and then press [ENTER] to select it. **See Figure 4.**

Figure 4

5. The **Mark:** choice allows you to select what type of symbol will be used to plot each point. You can choose a small box, a cross, or a dot. **See Figure 5.**
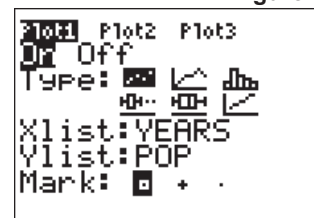
6. Now press [ZOOM]. Use the arrow keys to highlight **9:ZoomStat** and then press [ENTER]. Your graph will be displayed. **9:ZoomStat** tells the calculator to adjust the window size automatically to include all the data points in the selected lists. If you press [TRACE], you can use the right and left arrow keys to see the coordinates of each point displayed below the graph. Notice the **P1** in the upper left corner. This tells you the calculator is tracing the points from **Plot1** and displays the lists you are using for the **Xlist** and the **Ylist**. **See Figure 6.**
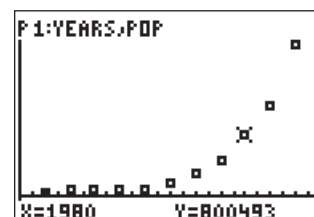
Figure 5

Figure 6

Fitting an Equation to the Data

🍎 **NOTE** It is generally recommended that students be encouraged to not use the built-in regression methods until they can fit the same type of curve with other methods, and they understand (or at least have discussed) how the graphing handheld does each fit.

1. Press [STAT] [▶] to display the **STAT CALC** menu. This menu shows the types of curves the calculator can fit to data sets. Select the choice for the type of curve you want to fit to the data. **See Figure 1.**

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

2. For example, if you want to fit a linear equation to the data, you would select **4:LinReg(ax+b)**. This will return you to the home screen with **LinReg(ax+b)** showing. The cursor will be blinking, waiting for more input. **See Figure 2.**
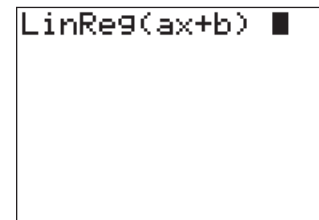
```
LinReg(ax+b) ■
```
Figure 2

3. You need to tell the calculator which two lists you would like to fit an equation to, and where you want to store the equation. If you want to let **x = L1** and **y = L2,** and you want and the equation to be placed in **Y1,** then you would press the following: [2nd][1][,] [2nd][2][,] [VARS][▶]. Choose **1:Function** and then **1:Y1**. Press [ENTER]. **See Figure 3.**
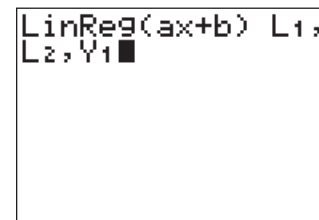
🍎 **NOTE** [2nd][1] is used to access **L1** and [2nd][2] will access **L2**.

```
LinReg(ax+b) L₁,
L₂,Y₁■
```
Figure 3

4. Press [ENTER] again to execute the command. The screen will show the linear equation that best fits the data. If the **DiagnosticOn** feature has been turned on, when you execute some regression models, the **TI-84 Plus** computes and stores diagnostic values for **r** (correlation coefficient) and **r²** (coefficient of determination). **See Figure 4.**
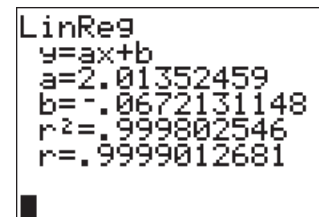
⭐ **NOTE** *To turn on the **DiagnosticOn** feature, see Appendix I.*

```
LinReg
 y=ax+b
 a=2.01352459
 b=-.0672131148
 r²=.999802546
 r=.9999012681
■
```
Figure 4

5. Assuming the scatter plot for **L2** vs. **L1** has already been turned on, press [ZOOM] and choose **9:ZoomStat.** The data plot will be displayed with the curve superimposed on the plot. **See Figure 5.**

6. Items 3 through C in the **STAT CALC** menu work similarly. There is a new choice on this menu on the TI-84 Plus that was not available on the TI-83. It is called **Manual-Fit**. Details of how to use this are in *Appendix H*.

Figure 5

Manual Linear Fit

The **Manual Linear Fit** feature allows you to visually fit a linear function to a scatter plot.
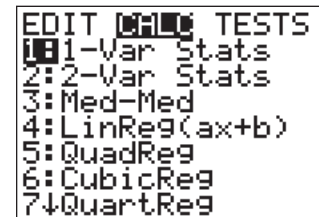
1. Enter some approximately linear data into two lists. Set up a **StatPlot**, and then press ZOOM . Use the arrow keys to select **9:ZoomStat**, and then press ENTER . You should see your points plotted.

2. Press STAT ▶ to display the **STAT CALC** menu. Use the arrow keys to select **D:Manual-Fit**. **See Figure 1.**

🍎 **NOTE** Most of the menus on the calculator are "wrap around" menus. **D:Manual-Fit** is the last entry in the **STAT CALC** menu. Instead of starting at the top of the list and having to press the down arrow multiple times, you can also press the up arrow once and be taken to the bottom of the list, where **D:Manual-Fit** will be selected.
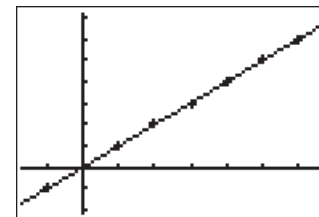
Figure 1

3. Once you have **D:Manual-Fit** selected, press ENTER . You will be taken back to the graph. A free-floating cursor is displayed at the center of the screen. Use the arrow keys to move the cursor to the desired location (usually as close as possible to one of the points on the left side of the graph). When there, press ENTER to select the point. Then begin to move the cursor to your next point. As you move the cursor, a line segment will be traced across the screen. **See Figure 2.**

4. Move the cursor to one of the points on the right side of the screen. The order in which you choose the points, whether left to right or right to left, is arbitrary. **See Figure 3.**

Figure 2

Figure 3

5. Press ENTER to select the second point. You will see the entire line fill in, and its equation written across the top of the screen with the slope highlighted. **See Figure 4.**

Figure 4

6. If you start typing now, what you type will be displayed along the bottom left side of the screen as being a new slope. **See Figure 5.** When you have entered a slope with which you are satisfied, press ENTER to see it entered into the equation. The graph will be refreshed using the new value.
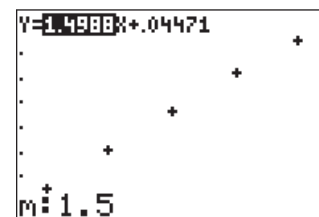
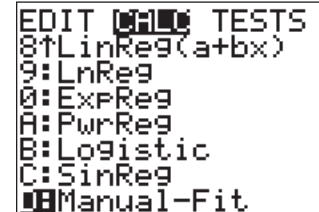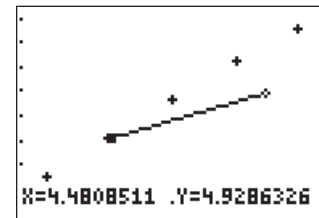**Figure 5**

7. Press the right arrow key to highlight the **Y**-intercept. Repeat the process above to change it to a number you want. The number typed here is 0. **See Figure 6.**

Y=1.5X+.04471

b:0
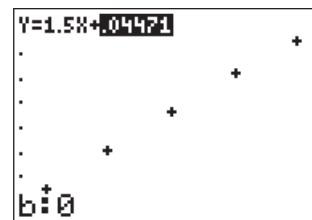
Figure 6

8. When you have entered a **Y**-intercept with which you are satisfied, press ENTER to see it entered into the equation. The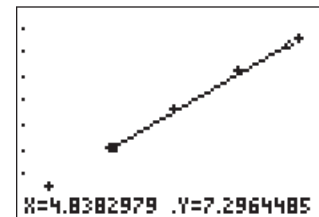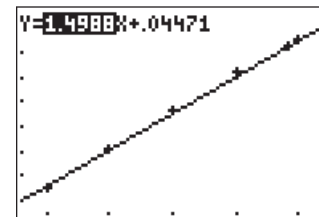 graph will be refreshed using the new value. **See Figure 7.** After the screen refreshes, if you decide you want to edit the value you had entered for the slope, you can use the arrow keys to highlight it again and repeat the process.

Y=1.5X+0
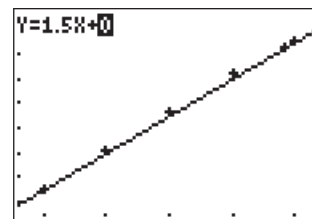
Figure 7

9. Pressing 2nd MODE to access [QUIT] will take you out of the **Manual-Fit** program, but will put your line of best fit in **Y1**. **Y1** is the default location for the **Manual-Fit** feature. If you would like to have this equation put somewhere other than **Y1**, input the **Manual-Fit** command from the home screen rather than the graph screen. **See Figure 8.**

Manual-Fit ■
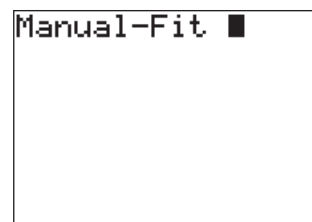
Figure 8

10. When the cursor is blinking, press VARS ▶. Choose **1:Function** and then select **2:Y2**. **See Figure 9.** Press ENTER to execute the command. You will be taken to the graph screen and the free floating cursor will be in the center of the screen as before. From there, it operates the same as described earlier, but the equation will be displayed in **Y2**.

Manual-Fit Y₂■
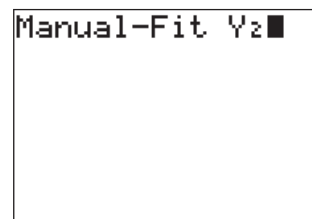
Figure 9

DiagnosticOn Feature

The calculator has a feature that will display the diagnostic values for **r** (correlation coefficient) and **r**^{2} or **R**^{2} (coefficient of determination) for some regression equations. This feature will allow you to use the calculator to determine how closely the regression equation fits the data. Even if students are not studying statistics, they can easily tell which correlation coefficient has an absolute value closest to 1.

1. To have the correlation coefficient displayed, you need a feature called **DiagnosticOn**. It can be found in the catalog. Press `2nd` `0` to access the **CATALOG** menu. When you first access the catalog, notice the **A** cursor in the upper right corner. This signifies the Alpha feature is on. The catalog is an alphabetical listing of most functions, instructions, and symbols in the calculator. You need to find **DiagnosticOn.** **See Figure 1.**


CATALOG
▸abs(
 and
 angle(
 ANOVA(
 Ans
 Archive
 Asm(

Figure 1

2. Instead of scrolling down to the **Ds**, you can simply type in the letter **D**. Since the Alpha feature is on, just press the `x⁻¹` key. You will be taken to the options that begin with **D** without having to scroll through the **As**, **Bs**, and **Cs**. **See Figure 2.**

CATALOG
▸dayOfWk(
 dbd(
 ▸Dec
 Degree
 DelVar
 DependAsk
 DependAuto

Figure 2

3. When you see the list of options that begin with **D**, scroll down until you see the small triangle marker in front of **DiagnosticOn**. Press `ENTER`. **See Figure 3.**

CATALOG
 DelVar
 DependAsk
 DependAuto
 det(
 DiagnosticOff
▸DiagnosticOn
 dim(

Figure 3

4. You will be taken to the home screen where you will see the **DiagnosticOn** command. Notice the regression equation in this screen shot before the **DiagnosticOn** command was turned on. Press `ENTER` again to execute the command. You will see the word **Done** as verification. **See Figure 4.**

🍎 **NOTE** When you execute some regression models, the TI-84 Plus computes and stores diagnostic values for r (correlation coefficient) and **r**^{2} or **R**^{2}(coefficient of determination).

ExpReg
 y=a*b^x
 a=1.350366781
 b=.7074769927

DiagnosticOn

DiagnosticOn
               Done
■

Figure 4

5. The next time you enter a command to find a regression equation, you will see the display differs from what it was before. Now, the calculator will give you the regression equation along with the correlation coefficient, **r**. The closer the absolute value of **r** is to 1, the better the equation fits the data. **See Figure 5.**
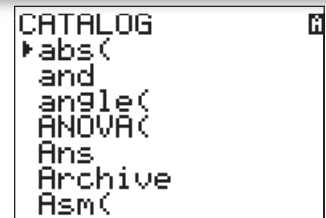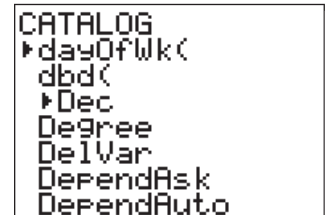

QuadReg L₁,L₂,Y₂
■
ExpReg
 y=a*b^x
 a=1.350366781
 b=.7074769927
 r²=.9944600429
 r=-.9972261744

■

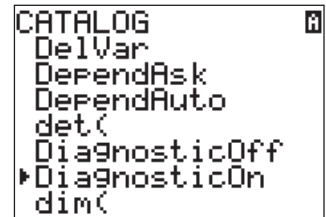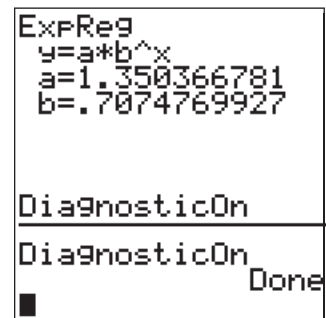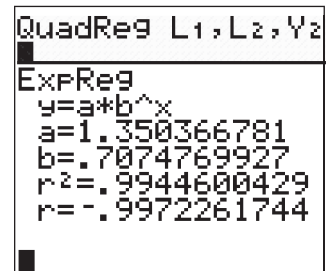**Figure 5**

Linking Two Calculators

1. Connect the two calculators with the link cable. You may use either the mini-USB unit-to-unit cable or the I/O unit-to-unit cable. *Push both ends of the cable in firmly.*

2. On the RECEIVING calculator, press 2nd X,T,Θ,*n* to access the ⎣LINK⎦ menu. Press the right arrow to display the **RECEIVE** menu. **See Figure 1.** Press **1** to select **1:Receive.** The message **Waiting…** will be displayed.

3. On the SENDING calculator, press 2nd X,T,Θ,*n* to access ⎣LINK⎦ and display the **SEND** menu. Use the arrow keys to select the type of object you want to send. For this example, assume you want to send **L1** and **L2**. To do this, press 4 or use the arrow keys to select **4:List** and then press ENTER . **See Figure 2.**

Figure 1

Figure 2

4. Use the arrow keys to move down the list, pressing ENTER when you are in front of each item you want to send. In this example, you would press ENTER in front of **L1** and **L2.** The selected items will have a small square in front of them when they have been selected. **See Figure 3.**

Figure 3

5. Once you have marked the items you want to send, press the right arrow key to display the **TRANSMIT** menu. **See Figure 4.**

Figure 4

6. Press ENTER to start the transmission. Watch the screen of the receiving calculator. If there is already an object with the same name, you will get a message saying **DuplicateName**. **See Figure 5.** Select **2:Overwrite** and press ENTER to overwrite the list and receive the new list. This will erase the old list with that name.

Figure 5

7. If you need to keep the old list, select **1:Rename** instead. A line reading **Name=** will appear at the bottom of the screen. The cursor will be in alphabet mode, which allows you to enter a new name for the list you are receiving. This will leave your current **L1** intact. **See Figure 6.**

8. When you have entered a new name for the list, press ENTER . Once the lists are transferred, you will see a **Done** message.

★ **NOTE** *See Appendix E, steps 19-22, for help in displaying your list in the Stat List Editor screen.*
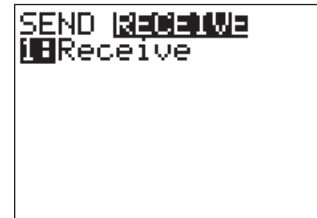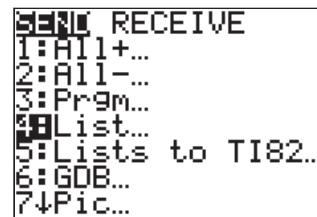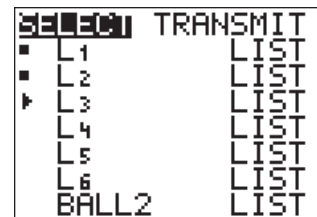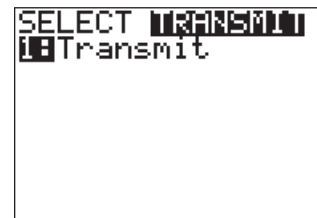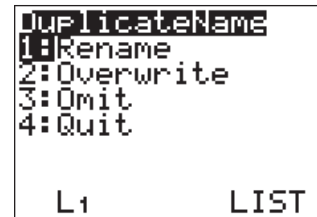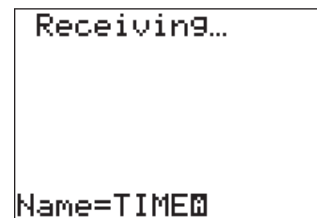

Figure 6

Memory Management on the TI-84 Plus

Overview

The TI-84 Plus graphing calculator is equipped with FLASH memory: special hardware that allows you to upgrade the operating system, install special software called Apps, and utilize additional memory features. This extends the useful life of the device and expands its functionality. This document explains two ways in which you can use the memory of the calculator for backing up your work: **Archiving** and **Grouping**.

The memory of the TI-84 Plus is divided into two sections: RAM and Archive. RAM (an acronym for Random Access Memory) is the "working memory" for most of the things that you do on the calculator. Programs, lists, matrices, functions, and other data are kept in RAM. Each of these "things" that you work with in RAM is called a variable. Each variable has three properties: a name, a type, and a value. Archive memory is a separate, but connected, portion of memory used for Apps, Groups, and "safe" storage (archiving) of your RAM variables.

Memory management is important because you may need to "free up" RAM in order to store data, run programs, or perform calculations.

Notes:

- Archiving protects your files from intentional or inadvertent resets.

- Archiving frees up RAM for something else without losing the original variable.

- When a variable is in RAM, it is "usable." The variable is available for general use as a "normal" variable.

- When a variable is in Archive memory, it is not available for general use.

Archiving

1. Press [2nd] [+] to access [MEM], the **MEMORY** menu. Select **2:Mem Mgmt/Del** for deleting variables and for moving variables between the RAM and Archive areas of memory. **See Figure 1.**
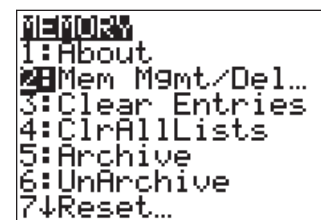
Figure 1

2. You can select **1:All** to see all of the variables in the TI-84 Plus in one long list, or you can choose one specific category for faster access to particular variables. For this example **1:All** was selected. **See Figure 2**.
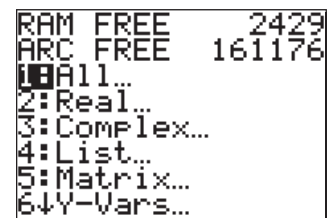
Figure 2

3. In either case, you will get a list of variables. The two numbers at the top, **RAM FREE** and **ARC FREE,** are the numbers of bytes available in each portion of memory, RAM and Archive. On the left side of the screen you can see the "selection pointer" pointing to a particular variable. Use the up and down arrow keys to move the selection pointer. The second column, just to the left of the variable names, tells you whether a variable is in RAM or Archive memory. A blank space in this column indicates that it is in RAM, and an asterisk (*) indicates that it is in Archive memory. The number on the right of the screen is the size of the variable in bytes. Pressing ENTER when the selection pointer is pointing to the variable switches the location of the variable. If it is in RAM, pressing ENTER will switch it to Archive memory; if it is already archived, pressing ENTER will put it back in RAM**. See Figure 3.**

Figure 3

4. Archiving is the act of moving a variable from RAM to Archive memory. **Unarchiving** is the opposite process. As you move a variable between RAM and Archive memory, notice the numbers at the top of the screen change to indicate new memory-free values. When you move a variable from RAM to Archive, the RAM FREE value increases and the ARC FREE value decreases by the approximate size of the variable.

🍎 **NOTE** The Memory Management variable list screen is also used for deleting variables from the TI-84 Plus. To delete a variable, make sure the selection pointer is pointing to it, and then press DEL . Some variables (programs and anything in Archive memory) provide you with one last chance to change your mind: **Are You Sure?** To finally delete the variable, select **2:Yes**. If you decide not to delete the variable, select **1:No**. Be careful here. In general, if the variable is not a program and is not archived, it will be deleted as soon as you press the DEL key. There is no undo command available. **See Figure 4.**

Figure 4

5. When a variable is in Archive memory, an asterisk appears to the left of its name in its own menu too. Here is a List menu with one archived list, **L3. See Figure 5.**

Figure 5

⬦ **CAUTION** Since **L3** is in Archive memory, it is not available for regular use. If you try to make a Stat Plot using **L3** while it is in Archive, you get an error message: **ERR:ARCHIVED.** This error message will appear whenever you try to use an archived variable. If you need to use an archived variable, you must move it back from Archive memory to RAM using the Memory Management tool, [MEM] . **See Figure 6.**

Figure 6

Grouping

1. Another useful memory management tool on the TI-84 Plus is the ability to "group" variables into a Group file. Grouping allows you to make a copy of two or more variables in RAM and store them as a group in Archive memory. Suppose you just ran an activity that stored data in **L1** and **L2**, and then you found the regression equation for the data and stored it in **Y1**. Grouping **L1**, **L2**, and **Y1** would allow you to store that data safely in Archive memory so that another student could clear those lists in RAM and use the calculator for a different activity without losing the current data. When you wanted to use the data again, you would Ungroup it.

2. The Group file resides in Archive memory, so it does not use any RAM. This is a very handy tool for backing up your TI-84 Plus variables, especially programs and lists.

3. Press 2nd + to access MEM and select **8:Group**. **See Figure 7.**
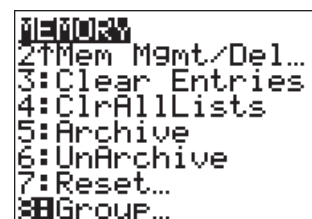
Figure 7

4. Select **1: Create New** and enter any name up to eight characters long for the Group file. The data being stored in this example is from the ball bounce activity, so it is being named **BALL**. Press ENTER . **See Figure 8.**
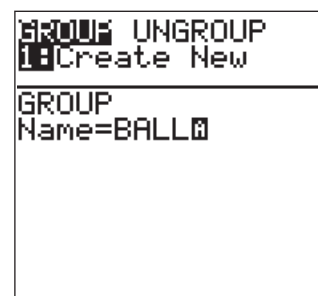
Figure 8

5. After naming the Group file, the next screen works like the LINK-selection screen. Because two different types of objects (list and equation) will be stored in this Group file, select **2:All–** to get a list of all variables in the TI-84 Plus that can be put into a Group file. **See Figure 9.**
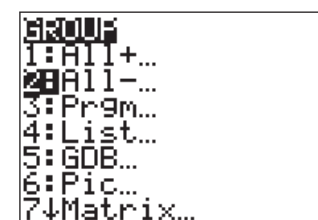
Figure 9

6. Move down the list, pressing ENTER beside any object you want stored in this Group file. When an object is selected, a square will appear beside it. **See Figure 10.**
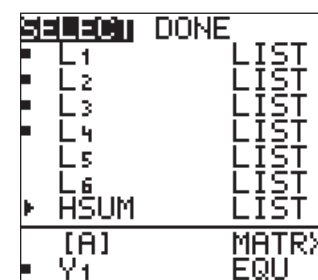
Figure 10

7. When you have selected all your variables, press ▶ to select **DONE**. Press ENTER to finish making the Group file. **See Figure 11.**
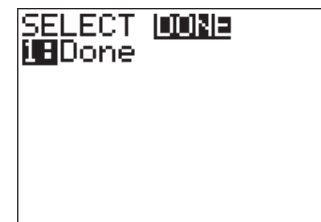
Figure 11

8. The Home Screen displays the message **Copying Variables to Group:**, along with the name you chose below it. When finished, the screen displays **Done** on the right side of the screen. The key word here is **Copying**. Your variables are undisturbed in RAM. The Group file contains copies of the selected variables, just as linking transmits copies of your variables to another TI-84 Plus. **See Figure 12.**
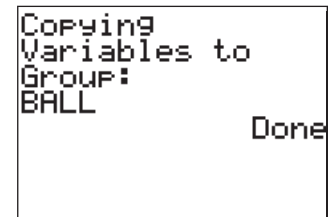
Figure 12

9. The Group files reside in Archive memory, so a "normal" Reset ([MEM] **7: Reset 1:AllRam, 2:Reset**) will not disturb any Group files. These Group files can be linked (sent) to other TI-84 Plus units, and they can be stored on a computer using TI Connect software.

Ungrouping

1. Ungrouping is the act of copying variables in a Group file back into RAM. The Group file remains intact, and the variables are copied back into RAM.

2. Press 2nd + to access [MEM] and select **8:Group.**

3. Press ▶ to select **UNGROUP**. The asterisk next to the names shows that these files are in Archive memory, not in RAM. **See Figure 13.**
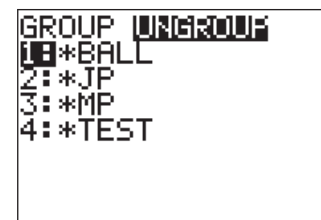
Figure 13

4. Select your Group file from the list and press ENTER. If any of the variables in the Group file are already in RAM, you will get the **DuplicateName** message. Choose **3:Overwrite All** to overwrite the variables in RAM with the ones from the Group file. **See Figure 14.**
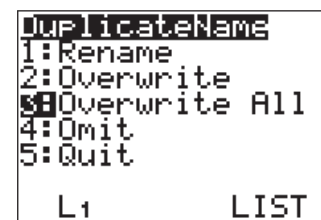
Figure 14

Group Notes

1. You cannot put an Archive variable into a Group file. Unarchive it first, then make the Group file.

2. Once a Group file is established, it cannot be modified, only Ungrouped or Deleted. Thus you cannot add variables to a Group file after creating it.

Deleting a Group

1. Press [2nd] [+] to access [MEM] and then select **2:Mem Mgmt/Del**. Highlight **C:Group** and press [ENTER] to view the list of Group files. Press [DEL] when the selection pointer is next to the Group file that you want to delete. Select the appropriate choice at the **Are You Sure?** menu.

2. After pressing [2nd] [+] to access [MEM], **8:Group** is for Grouping and Ungrouping, while **2:Mem Mgmt/Del, C:Group** is for viewing the size of and deleting Group files. When the Archive memory gets full, consider putting your large Group files on a computer, and then deleting them from the TI-84 Plus.

```
RAM FREE      7048
ARC FREE    154816
▶*BALL        2230
 *JP          1665
 *MP          2591
 *TEST        3926
```
Figure 15

Summary of Memory Management

1. There are two sections of memory on the TI-84 Plus: RAM and Archive.

2. Archiving/Unarchiving moves variables.

3. Grouping/Ungrouping copies variables.

4. Archive variables are unavailable for general use. They must be Unarchived before you can use them.

5. Grouped variables are still available for general use.

6. You cannot put an Archived variable into a Group file.

7. Archive variables and Group files can be transferred to other compatible calculators or a computer.

8. Ungrouping leaves the Group file intact.

9. Rather than deleting a variable to free up RAM, consider moving it to Archive memory first.

10. Normal Reset ([MEM] 7:Reset 1:All RAM 2:Reset) leaves Archive variables and Group files intact.

Downloading, Installing, and Using TI Connect™

> To download applications and programs to your calculator, upgrade the operating system, create backup files, or capture screen images, you will need to attach your calculator to your computer using a connectivity cable. Then you can use the TI Connect™ Software, which is free to download.

1. Download TI Connect

a. Go to TI's Web site, http://education.ti.com.

b. Click on "**DOWNLOADS**" in the upper right corner of the webpage.

c. From the Computer Software drop-down list, select TI Connect™ Software.

d. From the Download TI Connect drop-down list, select either TI Connect for Windows or Macintosh and follow the prompts to save the software to your computer.

2. Install TI Connect

a. Double click on the installer icon and follow the onscreen directions.

b. Launch TI Connect. The application will open to the TI Connect Desktop screen.

3. Use TI Connect

a. Connect the calculator to the computer using one of the various connectivity cables.

b. Click on the TI DeviceExplorer icon. A new screen will open with a display of everything currently in your calculator's memory.

c. Clicking on one of the plus signs will open that category and display a listing of the items within it. To save a program to the computer, click on and hold the program, and then drag and drop it into a folder. This same procedure works with any type of file you want to save: pictures, Apps, AppVars, etc.

d. A transferring screen will appear, keeping you updated on the progress. To transfer data from a folder on your computer to your calculator, just drag and drop the file(s) from the folder to the open TI DeviceExplorer window. The window will refresh after the download, showing the new data. You can also drag and drop the file onto the TI Connect icon.
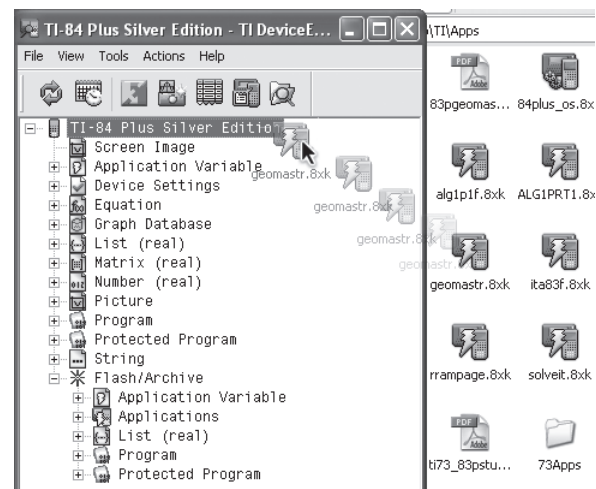
Downloading and Installing TI Graphing Calculator Software Applications (Apps)

1. Go to TI's Web site, http://education.ti.com. Click on "**DOWNLOADS**" in the upper right corner of the webpage.

2. From the **Calculator Software Applications (Apps)** section, click the link "Download Apps and OS."

3. Select your calculator model (TI-84 Plus) from the list of calculators under the **Latest** section (left side of webpage).

4. Select the APP you want to download by clicking on the name of the APP. The APP Summary page will either say DOWNLOAD or PURCHASE.

DOWNLOAD

Follow the link and save the App file on your desktop. If necessary, download TI Connect™ and/or upgrade your calculator's OS (see *Appendix L and N*).

PURCHASE

If the App requires a purchase, follow the purchase link to the *TI Online Store to buy the App. After your transaction is complete, select "**My Pick Up Window**" to retrieve your App from the "**My Collection**" tab.
*This will require that you create a Username and Password.

Installing Apps on your calculator
Connect your calculator to your computer using a TI Connectivity cable. Browse for the location of the App file(s) that you saved.

For TI Connect for Windows® Users:
Drag and drop the App file(s) onto the TI Connect icon or the open TI Device Explorer™ window.

For TI Connect for Macintosh® Users:
Launch TI Connect for Macintosh.
On the menu bar, select "**Connection**" and then select your calculator.
Select the port to which the TI Connectivity cable is connected and click "**Connect.**" (The TI Device Explorer window will open.)
Drag and drop the App file(s) into the TI Device Explorer window.

For TI Connect for Mac OS X Users:
Launch TI Device Explorer from within TI Connect. A device window will open listing the connected calculator.
Drag and drop the App file(s) on the name of the calculator upon which you would like the App file(s) installed.

How many Apps can you download to your calculator?
That depends on which calculator you have and which App titles you choose.

Your TI-83 Plus, TI-83 Plus Silver Edition, TI-84 Plus or TI-84 Plus Silver Edition calculator has "App spaces" that are chunks of memory into which you can load Apps. Some Apps take up only one space and other Apps take up to four. The number of App spaces available for each calculator is listed below.
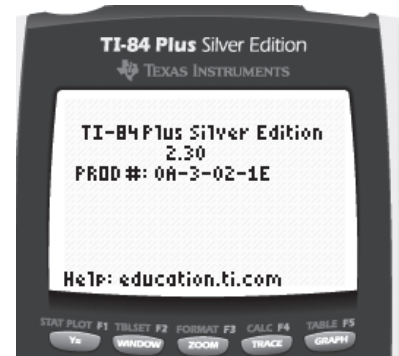
TI-83 Plus—10 App spaces	TI-84 Plus—30 App spaces
TI-83 Plus Silver Edition—94 App spaces	TI-84 Plus Silver Edition—94 App spaces

Upgrade the Calculator Operating System

1. To check your calculator's current OS, press 2nd + to access the **MEMORY** menu.

2. **1:About** will be highlighted. Press ENTER .

```
MEMORY
1:About
2:Mem Mgmt/Del…
3:Clear Entries
4:ClrAllLists
5:Archive
6:UnArchive
7↓Reset…
```

3. The OS version will be displayed on the line below the name of your calculator. The screen on the right is from a calculator running version 2.30, the latest version when this book was published.

4. It is recommended that you check TI's Web site often and download and run the latest version available. There is no charge to upgrade your calculator's OS.

TI-84 Plus Silver Edition
TEXAS INSTRUMENTS

TI-84 Plus Silver Edition
2.30
PROD #: 0A-3-02-1E

Help: education.ti.com

STAT PLOT F1 TBLSET F2 FORMAT F3 CALC F4 TABLE F5
Y= WINDOW ZOOM TRACE GRAPH

Downloading a New OS

1. Go to TI's Web site, http://education.ti.com. Click on **"DOWNLOADS"** in the upper right corner of the webpage.

2. From the **Calculator Software Application (Apps)** section, click the link "Download Apps and OS."

3. Select your calculator model (TI-84 Plus) from the list of calculators under the **Latest** section (left side of webpage).

4. Select the OS you wish to download by clicking on the name of the OS.

5. Follow the prompts to download the latest OS.

Before you begin to install any new Apps or update your OS, be sure you have a new set of batteries in your TI calculator for optimum performance.

Transferring the OS from Calculator to Calculator

You can also get the latest OS from another TI-83 Plus or TI-84 Plus that is running it by linking the two calculators to each other. Although many applications can be run on both the TI-83 Plus and the TI-84 Plus, the OS is unique to each calculator. Do not try to download the TI-84 Plus OS to a TI-83 Plus or vice versa. Upgrading the OS may erase the memory, so be sure to back up any files before doing so.