

INTRODUCTION TO THE TI-83 AND TI-83 PLUS

Basics

Keyboard

Each key on the TI-83 and TI-83 Plus accesses up to three objects, operations, or menus. The primary object, operation, or menu is written on the key. Above each key are other objects, operations, and menus written in yellow or green.

Press the yellow **2nd** key before any other key to access the object, operation, or menu that is written in yellow above the respective key. For example, to access the List menu, press **2nd** followed by **STAT**. Because the 2nd command for the **STAT** key is LIST, this Calculator Guide will refer to these keystrokes as **2nd** [LIST]. That is, the command above the key will be set in brackets, [].

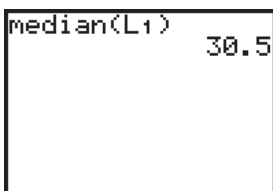
Press the green **ALPHA** key before any other key to access the object or operation that is written in green above the respective key. In general, **ALPHA** is used to type letters, double quotation marks, spaces, question marks, and colons. For example, to type the letter E, press **ALPHA** followed by **SIN**, which will be denoted as **ALPHA** [E] in this Calculator Guide.

Menus



Objects and operations that are not written on the keyboard can usually be found within menus. Many menus, such as the List menu, have multiple submenus. Use the left and right arrow keys to move among submenus. Use the up and down arrow keys to select an item from the menu, or press the number or letter associated with the item. For example, to select the median(function, press **2nd** [LIST]; arrow to the MATH submenu; and arrow down to 4:median(and press **ENTER**, or simply press **4**. This Calculator Guide will refer to this sequence of keystrokes as **2nd** [LIST] MATH 4:median(.

Home Screen **2nd** [QUIT]

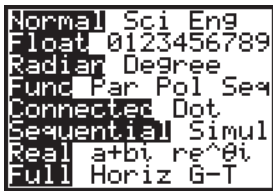


The Home screen is where you'll do most of your calculations. You access the Home screen from any other screen by pressing **2nd** [QUIT]. The screen at left shows a calculation on the Home screen.

Mode Screen **MODE**

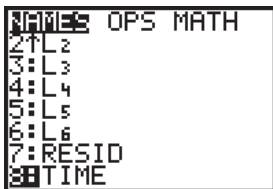
The Mode screen is where you set operating modes for the calculator. You access the Mode screen by pressing **MODE**. Among the settings you can change are the numeric notation, the number of decimal places displayed, the unit of angle measurements, and several graphing modes. This Calculator Guide generally refers to these settings as "modes." For example, the screen on next page shows

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the calculator in Normal mode, Radian mode, Function mode, Connected mode, Sequential mode, Real mode, and Full mode. It also shows the number of decimal places as floating. For a statistics course, it will be most beneficial for the calculator to be set in Function mode (Func) and Connected mode (Connected). Alternative settings will be discussed when necessary.

Lists

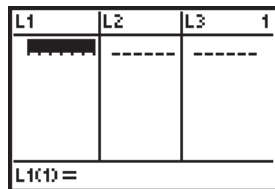


The TI-83 and TI-83 Plus use lists to store and manipulate sets of data. The calculator has six default lists, L₁ through L₆. Other lists can be named and created. To use lists L₁ through L₆ on the Home screen, press $\boxed{2nd}$ [L₁] through $\boxed{2nd}$ [L₆]. To see and use all lists, including user-created lists, press $\boxed{2nd}$ [LIST] and look at the NAMES submenu.

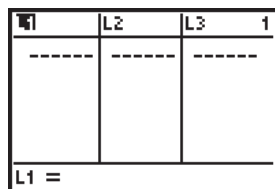
Creating Other Lists

Lists other than L₁ through L₆ can be named and created by following these steps:

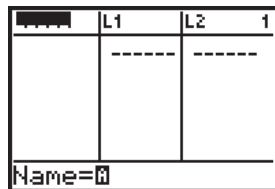
- a. Press \boxed{STAT} 1:Edit to enter the List Editor screen.



- b. Arrow up and highlight the name of a list.

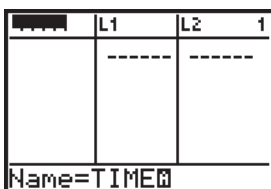


- c. To insert the new list before any preexisting list, press insert, $\boxed{2nd}$ [INS]. To place the new list after all preexisting lists, arrow right past the last list.



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- d. Enter the name of your list, for example, TIME. Press **[ENTER]** to accept the new list name.

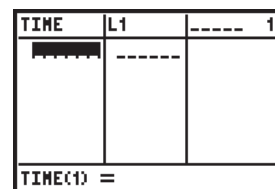
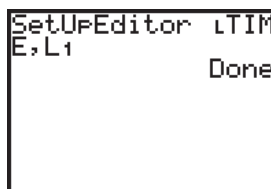
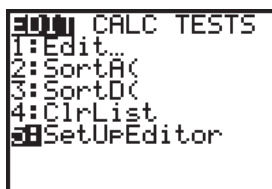


- e. Arrow down and begin entering data.

The new list, TIME, is now listed under the NAMES submenu when you press **[2nd]** **[LIST]**.

Manipulating the List Editor Screen

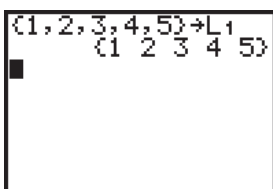
The default List Editor screen displays lists L1 through L6. To change it to any combination of lists, press **[STAT]** 5:SetUpEditor. Enter the names of the desired lists, separated by commas. (Press **[2nd]** **[LIST]** and use the NAMES submenu to select user-defined lists.) Then press **[ENTER]**. The List Editor screen will now contain only the lists specified.



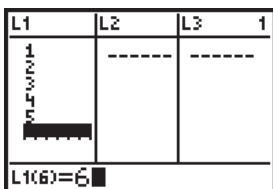
To return to the default, lists L1 through L6, execute the SetUpEditor command with no lists specified.

Entering Data into Lists

There are two ways to enter data into lists.



- a. Enter the elements into the Home screen, separated by commas and enclosed in braces. Then press the store key, (**[STO→]**), enter the name of the list, and press **[ENTER]**.

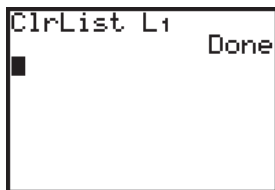


- b. Alternatively, press **[STAT]** 1:Edit and enter the elements directly into the List Editor screen. Place the cursor in the desired cell, type the value, and press **[ENTER]**.

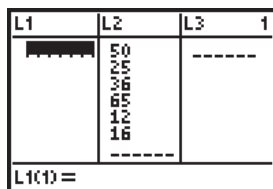
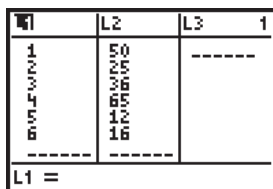
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Clearing a List of Its Elements

There are three ways to clear lists.



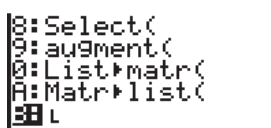
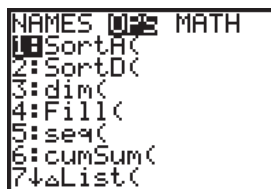
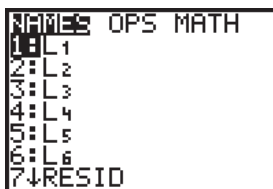
- Press **[STAT]** 4:ClrList, enter the names of the lists separated by commas, and press **[ENTER]**. For example, to clear list L1, enter ClrList L1 into the Home screen.
- Alternatively, enter the List Editor screen, arrow up and left or right to highlight the name of the list, and press **[CLEAR]** **[ENTER]**.



- To clear all lists, press **[2nd]** **[CATALOG]**, scroll down to ClrAllLists, and press **[ENTER]** **[ENTER]**.

List Submenus **[2nd]** **[LIST]**

When you press **[2nd]** **[LIST]**, there are three major submenus used for manipulating lists: list names (NAMES), list operations (OPS), and mathematical functions (MATH).



While you will use several of these functions for a statistics course, you do not need all of them. Pertinent functions will be discussed in more detail when appropriate.

Graphing

Before detailing the substantial graphing powers of the TI-83 and TI-83 Plus, let's discuss some of the foundational issues that underlie all graphing.

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Window Settings

WINDOW

```

WINDOW
Xmin=-9.4
Xmax=9.4
Xscl=1
Ymin=-6.2
Ymax=6.2
Yscl=1
Xres=1
    
```

This Window screen controls the section of the rectangular coordinate system that is viewed when a function plot or a statistical plot is graphed. Press **WINDOW** and enter these values:

- Xmin = the minimum x -value you want to display
- Xmax = the maximum x -value you want to display
- Xscl = the number of units between tick marks on the x -axis
- Ymin = the minimum y -value you want to display
- Ymax = the maximum y -value you want to display
- Yscl = the number of units between tick marks on the y -axis
- Xres = 1

In this Calculator Guide, window settings for a graph are listed in the form [Xmin, Xmax, Xscl, Ymin, Ymax, Yscl]. For example, the window settings above would be listed as $[-9.4, 9.4, 1, -6.2, 6.2, 1]$.

Zoom Commands

ZOOM

Zoom commands allow you to zoom in or out, or to set the Window screen to pre-set settings. You access the Zoom menu by pressing **ZOOM**.

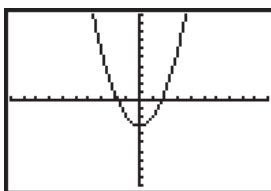
```

ZOOM MEMORY
1:ZBox
2:Zoom In
3:Zoom Out
4:ZDecimal
5:ZSquare
6:ZStandard
7↓ZTrig

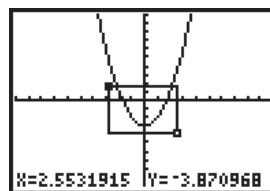
8:ZInteger
9:ZoomStat
▣ZoomFit
    
```

There are three zoom commands that allow you to zoom in and out: 1:ZBox, 2:Zoom In, and 3:Zoom Out.

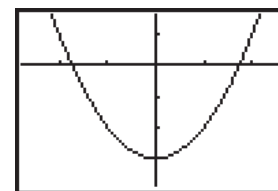
1. ZBox lets you draw a box around the region of interest. When you press **ENTER**, this region fills the screen.



$[-10, 10, 1, -10, 10, 1]$



$[-10, 10, 1, -10, 10, 1]$

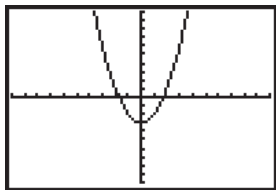


$[-2.77, -2.55, 1, -3.87, 1.61, 1]$

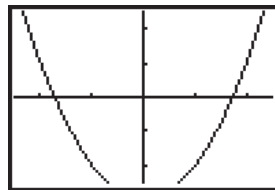
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Introduction ■ Graphing (continued)

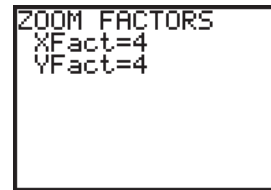
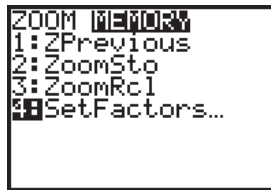
2. Zoom In lets you position the cursor at a center point for the zoom. When you press **ENTER**, the graph will be magnified about the center by factors defined by XFact and YFact. To change the factors, press **ZOOM** Memory 4:SetFactors.



$[-10, 10, 1, -10, 10, 1]$



$[-2.5, 2.5, 1, -2.5, 2.5, 1]$



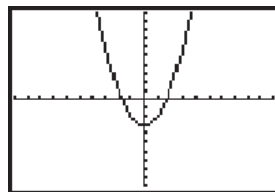
3. Zoom Out behaves similar to Zoom In, but the graph reduces about the center by factors defined by XFact and YFact.

There are three pre-set window settings: 4:ZDecimal, 6:ZStandard, and 7:ZTrig.

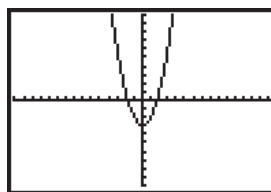
4. ZDecimal uses the settings $[-4.7, 4.7, 1, -3.1, 3.1, 1]$.
5. ZStandard uses $[-10, 10, 1, -10, 10, 1]$.
6. ZTrig uses a window that is approximately $[-2\pi, 2\pi, \pi/2, -4, 4, 1]$.

Lastly, there are four zoom commands that reformat the window settings to match specific criteria: 5:ZSquare, 8:ZInteger, 9:ZoomStat, and 0:ZoomFit.

7. ZSquare adjusts either Xmin and Xmax or Ymin and Ymax such that the coordinate axes are square.

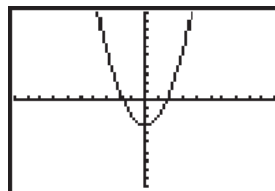


$[-10, 10, 1, -10, 10, 1]$

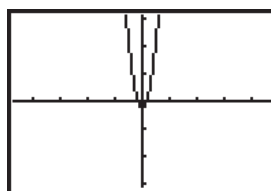


$[-15.16, 15.16, 1, -10, 10, 1]$

8. ZInteger adjusts the window settings such that the cursor moves in integer increments.



$[-10, 10, 1, -10, 10, 1]$

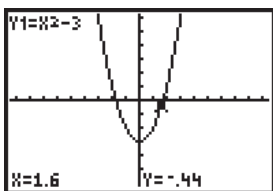


$[-47, 47, 10, -31, 31, 10]$

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9. ZoomStat is of particular interest for a statistics course. It adjusts the window settings to contain the data used for all active statistical plots. (See the following section “Statistical Plots” for more information about defining statistical plots.)
10. ZoomFit adjusts Ymin and Ymax to include the minimum and maximum within the current domain of all active function plots. It does not change Xmin and Xmax.

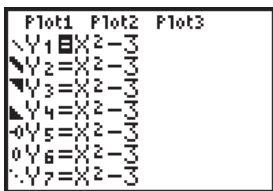
Tracing TRACE



[-9.4, 9.4, 1, 6.2, 6.2, 1]

Pressing TRACE takes you to the Graph screen and gives you a trace cursor on the function plot or statistical plot. The plot being traced is shown in the upper-left corner, and the approximate coordinates of the trace point are shown at the bottom of the screen. Pressing the right or left arrow keys moves the trace cursor along the plot. If multiple plots are turned on, pressing the up or down arrow keys moves the trace cursor to another plot.

Function Plots Y=



In Function mode, the TI-83 and TI-83 Plus can graph up to ten rectangular functions, Y_1 through Y_0 . To enter a function, press Y= and enter the equation in $y=$ form. When you enter a new function, the = symbol becomes highlighted, which means it will graph when you press GRAPH. You can turn off the graph of a function without clearing it from the $Y=$ screen by arrowing left to its = symbol and pressing ENTER. When the = symbol is not highlighted, the equation is turned off and will not graph. In the screen at left, only Y_1 is turned on.

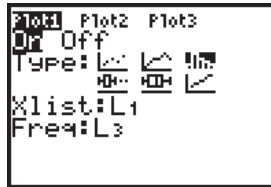
Graph Styles

The calculator provides seven graphing styles: thin line, thick line, shade above, shade below, ball with path, ball without path, and dotted line. These styles are selected by arrowing left to the segment beside each Y and pressing ENTER to cycle through the styles. The screen above shows all seven styles selected for functions Y_1 through Y_7 , respectively.

In Connected mode, the default style is the thin line. In Dot mode, the default is the dotted line. You can change this mode setting by pressing MODE and changing the fifth line. It is recommended, however, that you leave the calculator in Connected mode.

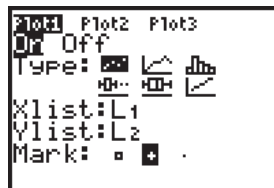
Statistical Plots 2nd [STAT PLOT]

In any mode, the calculator allows you to graph up to three statistical plots, or stat plots. Press 2nd [STAT PLOT] and select the number of the plot to define. Follow these steps:

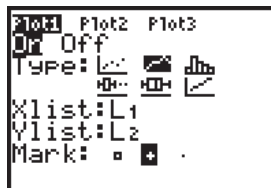


- Select On.
- Select one of the six plot forms: scatterplot, xyline plot, histogram, modified boxplot with outliers, boxplot, or normal probability plot.
- Enter the lists and frequencies to be used into the stat plot. The information required depends on the type of plot. Scatterplots and xyline plots require two lists; histograms, modified boxplots, and boxplots require one list, and a number or list for frequencies. Normal probability plots require one list and a data axis. (*Note:* For plots that require frequencies, the frequencies can be entered into one of the lists.)

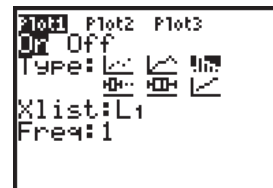
Scatterplot



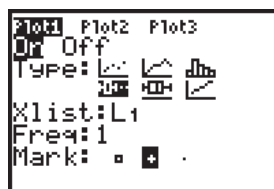
xyline Plot



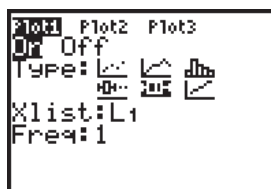
Histogram



Modified Boxplot



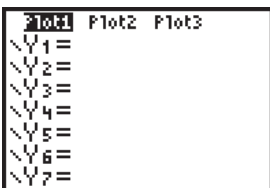
Boxplot



Normal Probability Plot



- For scatterplots, xyline plots, and modified boxplots, select the mark to use in the plot. If you graph several plots at once, it is wise to use a different mark for each plot.
- Set a window and press GRAPH, or press ZOOM 9:ZoomStat to see the plot.



After you have a stat plot defined, you can turn it on or off from the Y= menu. Press Y= and arrow up to the line of plot names; arrow left or right to select the plot and press ENTER to turn it on or off. When the plot name is highlighted, it is turned on.

Statistics Submenus STAT

When you press STAT, there are three submenus used for critical statistical capabilities: EDIT, CALC, and TESTS.

```

EDIT CALC TESTS
1:Edit...
2:SortA(
3:SortD(
4:ClrList
5:SetUPEditor
  
```

The EDIT submenu allows you to enter the List Editor screen in order to edit lists, sort a list (or lists) in ascending or descending order, clear the contents of lists, or set up the List Editor screen.

Pertinent functions in the CALC and TESTS submenu will be discussed in more detail when appropriate.

```

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

```

EDIT CALC TESTS
1:Z-Test...
2:T-Test...
3:2-SampZTest...
4:2-SampTTest...
5:1-PropZTest...
6:2-PropZTest...
7:ZInterval...
  
```

```

8:LinReg(a+bx)
9:LnReg
0:ExpReg
A:PwrReg
B:Logistic
C:SinReg
  
```

```

8:TInterval...
9:2-SampZInt...
0:2-SampTInt...
A:1-PropZInt...
B:2-PropZInt...
C:X2-Test...
  
```

```

D:2-SampFTest...
E:LinRegTTest...
F:ANOVA(
  
```

Variables Submenus VARS

The Variables submenus allow you to reference all of the variables that the calculator uses. For example, if you wish to reference Xmax for a graph, you can access its current value by pressing VARS 1:Window 2:Xmax. There are two submenus: VARS (generally single-value variables) and Y-VARS (equation and function definitions that would be entered into the Y= screen).

```

VARS Y-VARS
1:Window...
2:Zoom...
3:GDB...
4:Picture...
5:Statistics...
6:Table...
7:String...
  
```

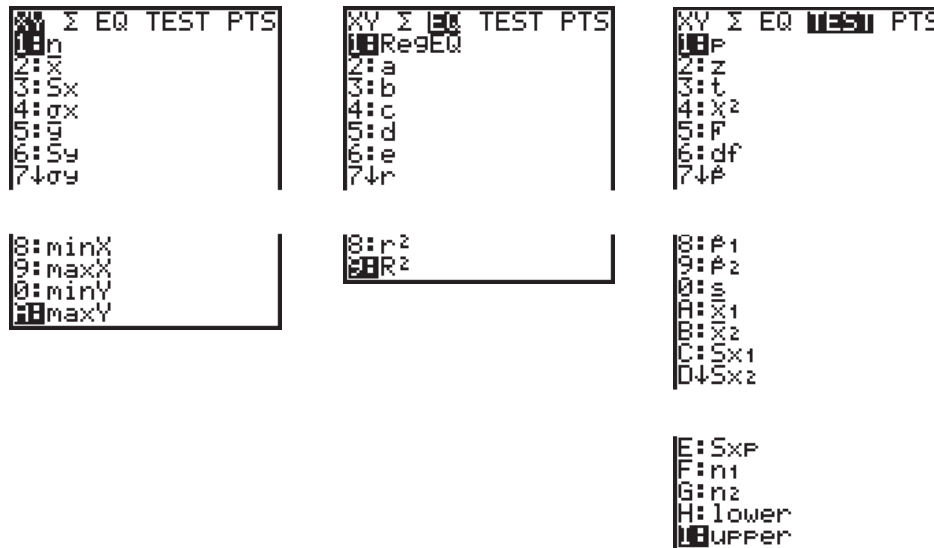
```

VARS V-VARS
1:Function...
2:Parametric...
3:Polar...
4:On/Off...
  
```

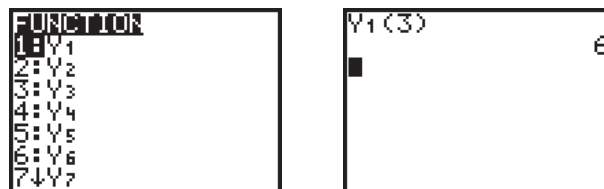
For a statistics course, the variables accessed by pressing VARS 5:Statistics are of particular importance and will be discussed in more detail when appropriate. The variables are stored under five submenus. Here are the summary statistic

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variables (XY), the regression variables (EQ), and the test variables (TEST) submenus.



The rectangular function variables, **[VAR] Y-VARS 1:Function**, are also valuable to any course. For example, to evaluate the function stored in Y₁, when $x = 3$, enter Y₁(3) into the Home screen.



Distribution Menus **[2nd] [DISTR]**

When you press **[2nd] [DISTR]**, there are two submenus that contain a wealth of functions regarding important statistical distributions. The distribution submenu, **DISTR**, contains probability density functions (pdf) and cumulative distribution functions (cdf) for the following distributions: normal, *t*, chi-square, F, binomial, Poisson, and geometric. (*Note: F and Poisson distributions are not covered in Statistics in Action.*)

For discrete random variables, the pdf functions return either the probability of $X = c$ or the distribution for all X . The cdf functions return the cumulative sum of the probabilities between a lower bound and an upper bound.

For continuous random variables, the pdf functions provide the distribution curve (for graphing purposes). The cdf functions return the area under the pdf curve between a lower bound and an upper bound.

(continued)

These functions will be discussed in more detail when appropriate.

```

DISTR DRAW
1:normalPdf(
2:normalcdf(
3:invNorm(
4:tPdf(
5:tcdf(
6:χ²pdf(
7:χ²cdf(
    
```

```

8:Fpdf(
9:Fcdf(
0:binompdf(
A:binomcdf(
B:poissonpdf(
C:poissoncdf(
D:geometpdf(
E:geometcdf(
    
```

```

DISTR DRAW
1:ShadeNorm(
2:Shade_t(
3:Shadeχ²(
4:ShadeF(
    
```

The DRAW submenu provides commands to draw distributions with shaded areas. For example, `ShadeNorm(10,20,18,5)` graphs a normal curve with mean 18 and standard deviation 5, and shades the area under the curve between x -values 10 and 20. (*Note:* These commands do *not* adjust the window settings. You must manually set the window before using these commands.)

Math Submenus

MATH

```

MATH NUM CPX PRB
1:rand
2:nPr
3:nCr
4:!
5:randInt(
6:randNorm(
7:randBin(
    
```

Pressing **MATH** gives you four submenus of mathematical functions, such as cube roots, the absolute value function, and converting rectangular coordinates to polar coordinates. For statistics, the Probability submenu, **PRB**, contains frequently used counting commands and random number generators. The counting commands include permutations (`nPr`), combinations (`nCr`), and factorial (`!`). The random number generators include `rand`, which generates random numbers between 0 and 1; `randInt`, which generates a random integer within a specified interval; `randNorm`, which generates a random number from a specified normal distribution; and `randBin`, which generates a random integer from a specified binomial distribution.

Programs

PRGM

The TI-83 and TI-83 Plus are programmable calculators. To run a program, you press **PRGM** and choose the program name from the execute submenu, **EXEC**. You similarly edit a program by choosing its name from the **EDIT** submenu. You can also enter a new program by pressing **PRGM** **NEW** 1:Create New. Once a program

(continued)

capabilities of the TI-83 and TI-83 Plus, including the programming code, refer to your calculator's *Graphing Calculator Guidebook*.



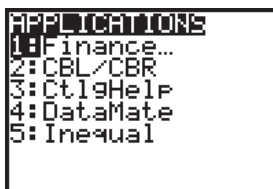
Other programs are available through many sources, including Texas Instruments' website, <http://education.ti.com>. You may want to search the Internet for programs that could be worthwhile to your statistics course. (*Note:* Students planning to take the AP Statistics examination should not become dependent on programs. Some programs that surpass the standard commands on the calculator may be considered as "unacceptable enhancements" and may not be allowed during the examination.)

PROGRAM:FREQTABL	L1(1)→L2(1)
ClrHome:FnOff :PlotsOff	sum(L1=L2(1))→L3(1)
Disp "FREQUENCY TABLE"	For(I,2,dim(L1),1)
Disp ""	If L1(I)=L1(I-1)
Disp "DATA MUST BE	Goto A
Disp "ENTERED INTO L1"	N+1→N
Disp "PRESS ENTER"	L1(I)→L2(N)
Pause	sum(L1=L2(N))→L3(N)
Disp ""	Lbl A
Disp "PROCESSING..."	End
ClrList L2,L3	Disp ""
SortA(L1)	Disp "TABLE IN L2, L3"
1→N	

Applications APPS

Many Texas Instruments calculators—including the TI-83 Plus—allow you to add Handheld Software Applications (Apps) that increase the calculator's functionality, in much the same way that you add software to a computer. (*Note:* You cannot add Apps to a TI-83.) An App is different from a program because you can neither edit nor modify an App. Also, an App is often registered to a specific calculator, so you cannot share it by linking calculators.

New TI-83 Pluses may come with some Apps pre-installed. You can view the calculator's list of applications by pressing APPS.



(continued)

A variety of sources provide Apps. Some Apps are free while others require that you purchase them. You may find a few Apps that are beneficial to your statistics course. Again, Texas Instruments' website, <http://education.ti.com>, is a good place to begin searching.

Catalog Help Application

Catalog Help (CtlgHelp) is an App that provides the necessary syntax for every calculator command. Catalog Help is preloaded on many newer-model TI-83 Pluses, and it is available free-of-charge through Texas Instruments' website. This application is helpful for a statistics course because it reminds you of the parameters required for statistical functions.

To begin running Catalog Help, press **[APPS]** and select it from the Applications menu. Now, from any menu or the catalog, you can press **[+]** to see the syntax of any command. For example, pressing **[MATH]** NUM 2:round **[+]** shows that the round command requires a value and the number of decimal places. The number of decimal places is optional, however, because this parameter is in square brackets.

```
APPLICATIONS
1: Finance...
2: CBL/CBR
3: CtlgHelp
4: DataMate
5: Inequal
```

```
round(
(value [, #decimal
s])
PASTE | ESC
```

```
CTLGHELP RUNNING
1: Continue
2: Quit CtlgHelp
3: About
```

Once you know the syntax, you can press **[GRAPH]** to escape or you can enter the parameters on the Catalog Help screen and press **[TRACE]** to paste. To quit using Catalog Help, press **[APPS]**, choose CtlgHelp, and select 2:Quit CtlgHelp.