

- » Turning the calculator on and off
- » Using the keyboard
- » Utilizing the menus
- » Setting the mode of the calculator
- » Using the Catalog

Chapter 1

Starting with the Basics

The most popular calculator in the world just got a makeover! In this book, you find out how to take advantage of the improvements that have been made to the TI-84 Plus, as well as all of the built-in functionality that has not changed. The best way to use your calculator to the fullest is to read this book and start playing with the device.

The TI-84 Plus CE graphing calculator is loaded with many useful features. With it, you can solve equations of all types. You can graph and investigate functions, parametric equations, polar equations, and sequences. You can use it to analyze statistical data and to manipulate matrices.

What if you own the TI-84 Plus and not the TI-84 Plus CE? No worries! The vast majority of the steps will be exactly the same for both calculators. You'll see a difference in the appearance of the graph screen — the TI-84 Plus CE has a higher resolution color screen. If you own the TI-84 Plus, ignore any steps referencing color and skip Chapter 22 (about inserting color images) altogether.



TI-84+
TIP

Look for this TI-84 Plus Tip icon to point out differences between the TI-84 Plus and the TI-84 Plus CE.

If you've never used a graphing calculator before, you may at first find it a bit intimidating. After all, it contains about two dozen menus, many of which contain three or four submenus. But it's really not that hard to get used to using the

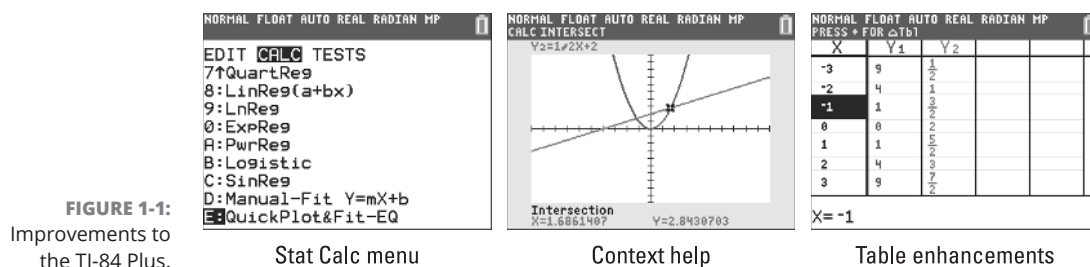
calculator. After you get familiar with what the calculator is capable of doing, finding the menu that houses the command you need is quite easy. And you have this book to help you along the way.

Why Didn't I Think of That?

You may have the same reaction that I did to some of the changes that have been made to the calculator: “Why didn't I think of that?” It's possible that you did actually! Many of the changes to the TI-84 Plus are a direct result of feedback received from teachers and students. After all, Texas Instruments is committed to providing the best tools for the teaching and learning of mathematics and science.

CE is short for color enhancement. Having a color screen is a game-changer! Say goodbye to having trouble distinguishing functions when you're graphing more than one function on the same screen. Although some of the improvements are subtle, you'll notice others the first time you pick up your new calculator. Here's a small sampling of the changes:

- » **New menu options:** I love that all additional menu options have been strategically placed at the end of menus. For example, a new option in the Stat CALC menu, QuickPlot & Fit-EQ, as illustrated in the first screen in Figure 1-1. Have you memorized keystrokes, like `zoom|6|` for ZStandard? No problem! The functionality you know hasn't changed.
- » **Status Bar:** A quick glance at the top of your screen informs you of the mode settings (like Radian or Degree) as well as a battery status icon. See the top of any of the screens in Figure 1-1. The Status Bar is always there whether you're working on the current line of the Home screen, graph, or table!



- » **Higher resolution LCD backlit screen:** Not quite HD quality, but the new screen has more than twelve times as many graph area pixels as the original (320×244 versus 96×64)! Plus, you can work on problems at night on a screen that's backlit.
- » **Sleek design:** 30 percent thinner and lighter than the TI-84 Plus. It measures 7.59×3.42 inches; similar dimensions to an oversized cell phone, which makes it easy to fit in your pocket. Is it ever a bad idea to have your calculator with you?
- » **More memory:** Gone are the days of worrying about whether you have enough memory to store your programs! TI-84 Plus CE has three times as much RAM and about six times as much ROM.
- » **Border on graph screen:** Helpful info like function names and coordinates of intersection points are kept separate from the graph, as shown in the second screen in Figure 1-1. Whoever thought of this is brilliant!
- » **Table enhancements:** Separator lines and color-coded lists (matching the functions) are more pleasing to the eye. Built-in tips called Context Help are located at the top of the screen, including hints like Press + for ΔTbl . Check out the new table look in the third screen in Figure 1-1.

Think you've seen it all? Not even close. I explain these improvements and much more — just keep reading.

Charging the Battery

The TI-84 Plus CE uses a Li-ion battery, similar to the one in your cellphone, which holds a charge for up to two weeks. Texas Instruments (TI) recommends charging your battery for at least four hours for peak performance. On the right side of your calculator, an LED light lights up during the recharging process. An amber color indicates your calculator is charging, and a green color indicates your calculator is fully charged. There are three ways to recharge your calculator battery:



TI-84+
TIP

The TI-84 Plus does not have a rechargeable battery. You must open the back panel and insert four new AAA batteries.

- » **TI Wall Adapter:** Simply plug in the adapter that came bundled with your calculator.



TIP

» **USB computer cable:** Use the USB computer cable that came with your calculator and a computer to charge your calculator. Plug the USB hub into the computer and plug the mini-USB hub into your calculator.

Your computer may not recognize the USB computer cable you are using to charge your calculator. If this happens, download TI-Connect software from <http://education.ti.com>. For more details on downloading and installing TI-Connect, see Chapter 18.

» **TI-84 CE Charging Station:** If your classroom has one of these, simply place your calculator in one of the slots of the charging station.

In the top-right part of the screen, a battery status icon indicates the battery level. There are four different battery levels plus a charging icon, as shown in Figure 1-2.

Battery Levels	
	75-100% charged
	50-75% charged
	25-50% charged
	5-25% charged
	charging

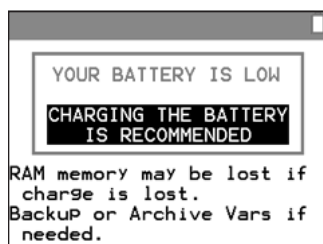
FIGURE 1-2: Battery status icon battery levels.



WARNING

If your battery loses its charge, the RAM memory on your calculator may be cleared. If you have programs or data that you don't want to lose, back up your calculator (see Chapter 21 for more details). Your calculator gives you a warning message, as shown in Figure 1-3.

FIGURE 1-3:
Battery level
warning screen.



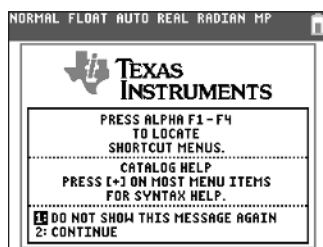
Turning the Calculator On and Off

Press **[on]** to turn the calculator on. To turn the calculator off, press **[2nd]** and then press **[on]**. These keys are in the left column of the keyboard. The **[on]** key is at the bottom of the column, and the **[2nd]** key is the second key from the top of this column.

To prolong the life of the batteries, the calculator automatically turns itself off after five minutes of inactivity. But don't worry — when you press **[on]**, all your work will appear on the calculator just as you left it before the calculator turned itself off.

The first time you turn on your calculator, you're greeted by an information screen, as shown in Figure 1-4. A few helpful reminders are displayed on the information screen. If you want to see this screen the next time you turn on your calculator, press **[2]**. Otherwise, press **[1]** or **[enter]**.

FIGURE 1-4:
Information
screen.



In some types of light, the screen can be hard to see. To increase the contrast, press and release **[2nd]** and then hold down **[<]** until you have the desired contrast. To decrease the contrast, press **[2nd]** and hold **[>]**.

Using the Keyboard

The row of keys under the calculator screen contains the keys you use when graphing. The next three rows, for the most part, contain editing keys, menu keys, and arrow keys. The arrow keys (   ) control the movement of the cursor. The remaining rows contain, among other things, the keys you typically find on a scientific calculator.



REMEMBER

Keys on the calculator are always pressed one at a time; they are *never* pressed simultaneously. In this book, an instruction such as **2nd****on** indicates that you should first press **2nd** and then press **on**.

Accessing the functions in blue

Above and to the left of most keys is a secondary key function written in blue. To access that function, first press **2nd** and then press the key. For example, π is in blue above the  key, so to use π in an expression, press **2nd** and then press .

Because hunting for the function in blue can be tedious, in this book I use only the actual keystrokes. For example, I make statements like, “ π is entered into the calculator by pressing **2nd**.

 Most other books would state, “ π is entered into the calculator by pressing **2nd**.

TIP

When the **2nd** key is active and the calculator is waiting for you to press the next key, the blinking  cursor symbol is replaced with the  symbol.

Using the **alpha** key to write words

Above and to the right of most keys is a letter written in green. To access these letters, first press **alpha** and then press the key. For example, because the letter O is in green above the  key, to enter this letter, press **alpha** and then press .

Because hunting for letters on the calculator can be tedious, I tell you the exact keystrokes needed to create them. For example, if I want you to enter the letter O, I say, “Press **alpha** to enter the letter O.” Most other books would say “Press **alpha** ” and leave it up to you to figure out where that letter is on the calculator.



TIP

You must press **alpha** before entering each letter. However, if you want to enter many letters, first press **2nd****alpha** to lock the calculator in Alpha mode. Then all you have to do is press the keys for the various letters. When you’re finished, press **alpha** to take the calculator out of Alpha mode. For example, to enter the word TEST into the calculator, press **2nd****alpha****sin** and then press **alpha** to tell the calculator that you’re no longer entering letters.



TIP

When the calculator is in Alpha mode, the blinking ■ cursor symbol is replaced with the  symbol. This symbol indicates that the next key you press will insert the green letter above that key. To take the calculator out of Alpha mode, press .

Using the key

The  key is used to evaluate expressions and to execute commands. After you have, for example, entered an arithmetic expression (such as $5 + 4$), press  to evaluate that expression. In this context, the  key functions as the equal sign. Entering arithmetic expressions is explained in Chapter 2.

Using the key

 is the key you use to enter the variable in the definition of a function, a parametric equation, a polar equation, or a sequence. In Function mode, this key produces the variable . In Parametric mode, it produces the variable **T**; and in Polar and Sequence modes, it produces the variables **θ** and **n**, respectively. For more information, see the “Setting the Mode” section later in this chapter.

Using the arrow keys

The arrow keys (, , , and ) control the movement of the cursor. These keys are in a circular pattern in the upper-right corner of the keyboard. As expected,  moves the cursor to the right,  moves it to the left, and so on. When I want you to use the arrow keys — but not in any specific order — I refer to them all together, as in “Use the  keys to place the cursor on the entry.”

Keys to remember



REMEMBER

The following keystroke and keys are invaluable:

- » : This is the equivalent of the Escape key on a computer. It gets you out of whatever you’re doing (or have finished doing) and returns you to the Home screen. See the next section for more about the Home screen.
- » : This key is used to execute commands and to evaluate expressions. When evaluating expressions, it’s the equivalent of the equal sign.
- » : This is the “erase” key. If you enter something into the calculator and then change your mind, press this key. If you want to erase the contents of the Home screen, repeatedly press this key until the Home screen is blank.
- » : If you only want to erase one character at a time and not the whole line, use this key.

What Is the Home Screen?

The Home screen is the screen that appears on the calculator when you first turn it on. This is the screen where most of the action takes place as you use the calculator — it's where you evaluate expressions and execute commands. This is also the screen you usually return to after you've completed a task such as entering a matrix in the Matrix editor or entering data in the Stat List editor.



REMEMBER

Press `[2nd][mode]` to return to the Home screen from any other screen. This combination of keystrokes, `[2nd][mode]`, is the equivalent of the Escape key on a computer. It always takes you back to the Home screen.



REMEMBER

If you want to clear the contents of the Home screen, repeatedly press `[clear]` until the Home screen is blank.

The Busy Indicator

If you see a moving dotted ellipse in the upper-right corner of the screen, this indicates that the calculator is busy graphing a function, evaluating an expression, or executing a command.



TIP

If it's taking too long for the calculator to graph a function, evaluate an expression, or execute a command, and you want to abort the process, press `[on]`. If you're then confronted with a menu that asks you to select either **Quit** or **Goto**, select **Quit** to abort the process.

Editing Entries

The calculator offers four ways to edit an entry:

» Deleting the entire entry:

Use the `[<][>][^][v]` keys to place the cursor anywhere in the entry and then press `[clear]` to delete the entry.

» Erasing part of an entry:

To erase a single character, use the `[<][>][^][v]` keys to place the cursor on the character you want to delete and then press `[del]` to delete that character.

» Inserting characters:

Because “typing over” is the default mode, to insert characters you must first press **2nd|del** to enter Insert mode. When you insert characters, the inserted characters are placed to the left of the cursor. For example, if you want to insert CD between B and E in the word ABEF, you would place the cursor on E to make the insertion.

To insert characters, use the **▶◀◂◃** keys to place the cursor at the location of the desired insertion, press **2nd|del**, and then key in the characters you want to insert. Notice, the cursor does not blink with the typical **█** you’re used to seeing; instead, it blinks with an underscore. When you’re finished inserting characters, press one of the arrow keys to take the calculator out of Insert mode.

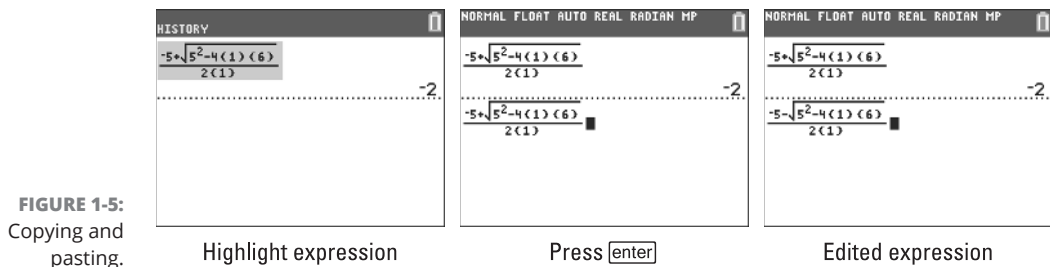
» Keying over existing characters:

“Type over” is the default mode of the calculator. So if you want to overwrite existing characters, just use the **▶◀◂◃** keys to put the cursor where you want to start, and then use the keyboard to enter new characters.

Copying and Pasting

Save time by not retyping similar expressions from scratch! Press **2nd|mode** to access the Home screen.

Press the **◀** key to scroll through your previous calculations. When a previous entry or answer is highlighted, press **enter** to paste it into your current entry line. See the first two screens in Figure 1–5.



After you have pasted the expression into the current entry line, you can edit the expression as much as you like. See the third screen in Figure 1–5.



REMEMBER

Press **2nd|del** to insert characters into a copied expression. The cursor changes to an underscore, and you can add characters in the middle of an expression instead of typing over the top of other characters.



TIP

If the answer is in the form of a list or matrix, it cannot be copied and pasted. Instead, copy and paste the expression. Also, notice that the mode settings don't display in the Status bar when you're scrolling through the calculator history.

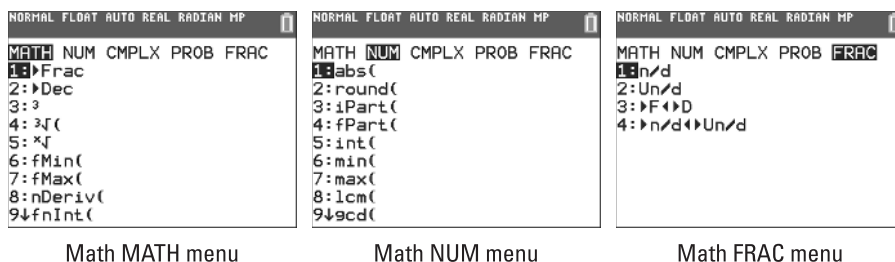
Using Menus

Most functions and commands that you use are found in the menus housed in the calculator — and just about every chapter in this book refers to them. This section is designed to give you an overview of how to find and select menu items.

Accessing a menu

Each menu has its own key or key combination. For example, to access the Math menu, press **|math|**; to access the Test menu, press **2nd|math|**. An example of a menu appears in the first screen in Figure 1-6. This is a picture of the Math menu.

FIGURE 1-6:
Submenus of the
Math menu.



Some menus, such as the Math menu, contain submenus. This is also illustrated in the first screen in Figure 1-6. This screen shows that the submenus in the Math menu are MATH, NUM, CMPLX, PROB, and FRAC (Math, Number, Complex, Probability, and Fraction). Use the **|>|<** keys to view the items on the other submenus. This is illustrated in the second and third screens in Figure 1-6.

Scrolling a menu

After the number 9 in the first two pictures in Figure 1-6, a down arrow indicates that more items are available in the menu than appear on-screen. There's no down arrow after the 4 in the third screen in Figure 1-6 because that menu has exactly four items.

To see menu items that don't appear on-screen, repeatedly press $\downarrow$.



TIP

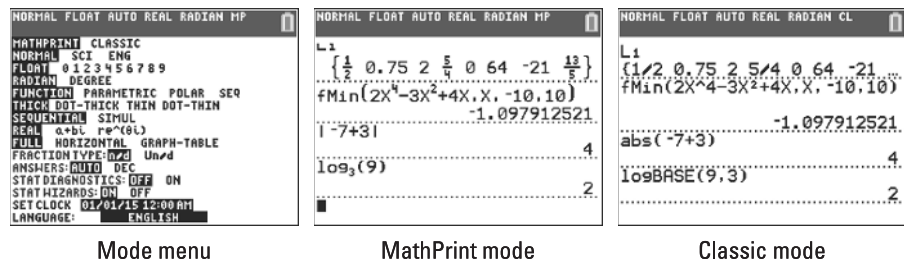
To get quickly to the bottom of a menu from the top of the menu, press $\downarrow$. Similarly, to quickly get from the bottom to the top, press $\uparrow$.

Selecting menu items

To select a menu item from a menu, key in the number (or letter) of the item or use the $\downarrow$ $\rightarrow$ keys to highlight the number (or letter) of the item and then press $\rightarrow$.

Some menus, such as the Mode menu shown in the first screen in the upcoming Figure 1-7, require that you select an item from a list of items by highlighting that item. The list of items usually appears in a single row and the calculator requires that one item in each row be highlighted. To highlight an item, use the $\rightarrow$ $\leftarrow$ $\rightarrow$ $\leftarrow$ keys to place the cursor on the item and then press $\rightarrow$ to highlight the item. The selections on the Mode menu are described in the next section.

FIGURE 1-7:
Mode, MathPrint,
and Classic
screens.



TIP

To access Catalog Help, scroll to the menu item you want to use and press $\rightarrow$. A screen showing the syntax of the command is displayed.

Setting the Mode

The Mode menu, which is accessed by pressing `[mode]`, is the most important menu on the calculator; it tells the calculator how you want numbers and graphs to be displayed. The Mode menu for the TI-84 Plus CE is pictured in the first screen in Figure 1-7.

MathPrint mode versus Classic mode

The first choice on the Mode menu will have a big impact on the way your calculator displays expressions and answers. Use Classic mode at your own peril; everything is better with MathPrint. Full disclosure: The only reason to use Classic mode is if you have a really long expression and want to see the whole expression without scrolling. MathPrint is the default mode, and I strongly endorse using MathPrint at all times.

» MathPrint mode:

Fractions display like fractions, exponents look like exponents, text doesn't wrap to the next line, and templates make it easier to enter commands. See the second screen in Figure 1-7.

» Classic mode:

Fractions use a forward slash (/) symbol, most exponents aren't elevated, text wraps to the next line, and templates aren't available. See the third screen in Figure 1-7.

One item in each row of this menu must be selected. Here are your choices:

» Normal, Sci, or Eng:

This setting controls how numbers are displayed on the calculator. In Normal mode, the calculator displays a number in the usual numeric fashion that you used in elementary school — provided it can display it using no more than ten digits. If the number requires more than ten digits, the calculator displays it using scientific notation.

In Scientific (**Sci**) mode, numbers are displayed using scientific notation; and in Engineering (**Eng**) mode, numbers are displayed in engineering notation. These three modes are illustrated in Figure 1-8. In this figure, the first answer is displayed in normal notation, the second in scientific notation, and the third in engineering notation.

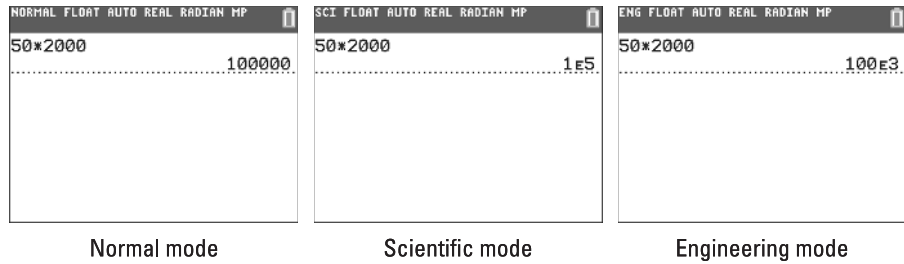


FIGURE 1-8: Normal, scientific, and engineering notations.



REMEMBER

In scientific and engineering notation, the calculator uses **En** to denote multiplication by 10^n .

» Float 0123456789:

Select **Float** if you want the calculator to display as many digits as possible. Select **0** if you want all numbers rounded to an integer. If you're dealing with money, select **2** so that all numbers will be rounded to two decimal places. Selecting **5** rounds all numbers to five decimal places, and, well, you get the idea.

» Radian or Degree:

If you select **Radian**, all angles entered in the calculator are interpreted as being in radian measure; all angular answers given by the calculator will also be in radian measure. Similarly, if you select **Degree**, any angle you enter must be in degree measure, and any angular answer given by the calculator is also in degree measure.

» Function, Parametric, Polar, or Seq:

This setting tells the calculator what type of functions you plan to graph. Select **Function** to graph plain old vanilla functions in the form $y = f(x)$. Select **Parametric** to graph parametric equations; **Polar** to graph polar equations; and **Seq** to graph sequences. (Sequences are also called *iterative equations*.)

» Thick, Dot-Thick, Thin, or Dot-Thin:

In **Dot-Thick or Dot-Thin** mode, the calculator produces a graph by plotting only the points it calculates. In **Thick or Thin** mode, the calculator joins consecutively plotted points with a line. Thick or Thin has to do with the thickness of the line style in the Y= editor.

My recommendation is to select the **Thick or Thin** mode because each of the graphing options (**Function**, **Parametric**, **Polar**, and **Seq**) enables you to select a graphing style with the options of **Dot-Thick** or **Dot-Thin** line style.



TIP

If you want to quickly change the line styles of all of your functions at once, choose **Thick**, **Dot-Thick**, **Thin**, or **Dot-Thin**.

» **Sequential or Simul:**

In **Sequential** mode, the calculator completes the graph of one function before it graphs the next function. In **Simultaneous (Simul)** mode, the calculator graphs all functions at the same time. It does so by plotting the values of all functions for one value of the independent variable, and then plotting the values of all functions for the next value of the independent variable.

Simul mode is useful if you want to see whether two functions intersect at the same value of the independent variable. You have to watch the functions as they are graphed in order to see if this happens.

» **Real, $a + bi$, or $re^{\theta i}$:**

If you're dealing with only real numbers, select the **Real** mode. If you're dealing with complex numbers, select **$a + bi$** if you want the complex numbers displayed in rectangular form. If you want complex numbers displayed in polar form, select the **$re^{\theta i}$** mode.

» **Full, Horizontal, or Graph-Table:**

The **Full** screen mode displays the screen as you see it when you turn the calculator on. The other screen modes are split-screens. The **Horizontal** mode is for when you want to display a graph and the Y= editor or the Home screen at the same time. Use the **Graph-Table** mode when you want to display a graph and a table at the same time. (The split-screen modes are explained in detail in Chapters 9 and 10.)

» **Fraction Type: n/d or Un/d:**

The results display as simple fractions or mixed numbers.

» **Answers: Auto, Dec:**

Changing this setting affects how the answers are displayed. Choosing **Auto** displays answers in a similar form as the input. **Dec** displays answers in decimal form.

» **Stat Diagnostics: OFF, ON:**

I recommend turning this ON so that r and r^2 display when you run a regression. See the first screen in Figure 1-9.

» **Stat Wizards: ON, OFF:**

If you have this set to ON, an input screen provides syntax help for entering the proper syntax of certain statistical commands. See the second screen in Figure 1-9.

FIGURE 1-9:
Linear regression
wizard and
setting the clock.



» Set Clock:

This is where you set the clock on the TI-84 Plus family of calculators. To do this, use the arrow keys to place the cursor on the **SET CLOCK** option and press **enter**. You see the third screen in Figure 1-9. You use the **▶◀◂◃** keys to move from item to item. To select items in the first, fifth, and eighth rows, place the cursor on the desired item and press **enter** to highlight that item. To enter numbers in the other options, edit the existing number or press **clear** and use the keypad to enter a new number. When you're finished setting the clock, save your settings by placing the cursor on **SAVE** and pressing **enter**.

» Language

Use the **▶◀** keys to choose the language: English, Espanol, Francais, Nederlands, Portuguese, Svenska, or Deutsch.



TI-84+
TIP

There are a few differences in the Mode menu on a TI-84+. There is no option for changing the language. There are additional options for Frac-Approx and a mode called "Go to 2nd Format Graph" (which you can still access on a TI-84 CE by pressing **2nd****zoom**.) The order of the items in the Mode menu also differs. Please keep this in mind when I give instructions later in the book to change the mode setting on a certain line number. Oh, and one last thing: Graph-Table is abbreviated as G-T. (Check out Chapter 10 for more on this epic feature).



REMEMBER

If you're planning on graphing trigonometric functions, put the calculator in Radian mode. Reason: Most trig functions are graphed for $-2\pi \leq x \leq 2\pi$. That's approximately $-6.28 \leq x \leq 6.28$. That's not a bad value for the limits on the x -axis. But if you graph in Degree mode, you will need $-360 \leq x \leq 360$ for the limits on the x -axis. This is doable . . . but trust me, it's easier to graph in Radian mode.



TIP

If your calculator is in Radian mode and you want to enter an angle in degrees, Chapter 3 tells you how to do so without resetting the mode.



You can quickly check some of the mode settings (like radian or degree) by glancing at the status bar at the top of the screen.

Using the Catalog

The calculator's Catalog houses every command and function used by the calculator. However, it's usually easier to use the keyboard and the menus to access these commands and functions than it is to use the Catalog. There are several exceptions; for example, the hyperbolic functions are found only in the Catalog. If you have to use the Catalog, here's how to do it:

1. If necessary, use the $\leftarrow$ $\rightarrow$ $\uparrow$ $\downarrow$ keys to place the cursor at the location where you want to insert a command or function found in the Catalog.

The command or function is usually inserted on the Home screen, or in the Y= editor when you're defining a function you plan to graph.

2. Press 2nd [0] to enter the Catalog.

This is illustrated in the first screen in Figure 1-10.

3. Enter the first letter in the name of the command or function.

Notice that the calculator is already in Alpha mode, as is indicated by the α in the upper-right part of the screen. To enter the letter, all you have to do is press the key corresponding to that letter. For example, if you're using the Catalog to access the function **seq**(, press [S] because the letter **S** is written in green above this key. Use the $\downarrow$ key to scroll down to **seq**(. This is illustrated in the second screen in Figure 1-10.

4. Repeatedly press $\downarrow$ to move the indicator to the desired command or function.

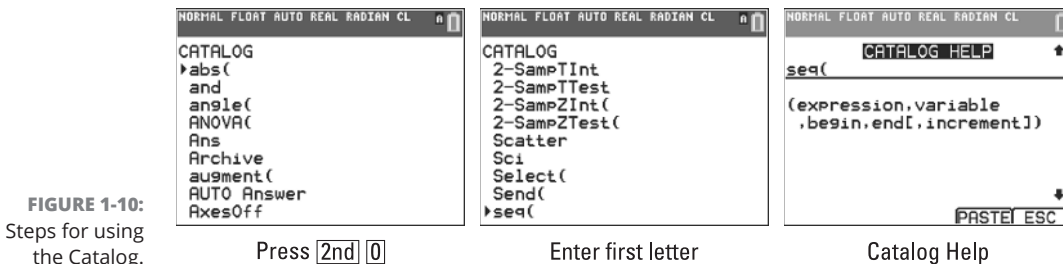


FIGURE 1-10:
Steps for using
the Catalog.

Press 2nd [0]

Enter first letter

Catalog Help

5. (Optional) Press to access Catalog Help for the listed command or function.

This is illustrated in the third screen in Figure 1-10. After pressing , the command or function is inserted at the cursor location.

6. Press to select the command or function.

After pressing , the command or function is inserted at the cursor location.

