

## Chapter 1

# Coping with the Basics

### *In This Chapter*

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

**T**he TI-83 and TI-83 Plus graphics calculators are loaded with many useful features. With them, you can graph and investigate functions, parametric equations, polar equations, and sequences. You can use them to analyze statistical data and to manipulate matrices. You can even use them to calculate mortgage payments.

But if you've never used a graphics 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.

## *When to Change the Batteries*

The convenience of battery power has a traditional downside: What if the batteries run out of juice at a crucial moment, say during a final exam? Fortunately, the calculator gives you some leeway. When your batteries are low, the calculator displays a "Your batteries are low" warning message. After you see this message for the first time, the calculator should, according to the manufacturer, continue to function just fine for at least one week. There is one exception: If you attempt to download an application when the batteries are low, the calculator displays a "Batteries are low —

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Change is required” warning message and refuses to download the application until after you’ve changed the batteries. (Chapter 27 explains how to download applications.)

Because you’ve likely put batteries into countless toys, you should have no trouble opening the cover on the back of the calculator and popping in four AAA batteries. Above the AAA battery chamber is a panel that opens to the compartment containing the backup battery. The type of battery housed in this compartment is indicated on the lid of the panel. The manufacturer recommends that you replace this battery every three or four years. So mark your calendar!

### *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.

In some types of light, the screen can be hard to see. To increase the contrast, repeatedly press **2nd****▲**. Because the keys on the calculator must be pressed one at a time, press **2nd** and then press **▲**. Continue pressing this combination of keystrokes until you have the desired contrast.

To decrease the contrast, repeatedly press **2nd****▼**.

### *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.



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 yellow

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

Because hunting for the function in yellow can be tedious, in this book I use only the actual keystrokes. For example, I will make statements like, “ $\pi$  is entered into the calculator by pressing **2nd** **^**.” Most other books would state, “ $\pi$  is entered into the calculator by pressing **2nd** [ $\pi$ ].”



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 **7** key, to enter this letter, press **ALPHA** and then press **7**.

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** **7** to enter the letter O.” Most other books would say “Press **ALPHA** [O]” and leave it up to you to figure out where that letter is on the calculator.



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** **4** **SIN** **LN** **4** and then press **ALPHA** to tell the calculator that you’re no longer entering letters.



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 **ALPHA**.

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### Using the **ENTER** key

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

### Using the **X,T,Θ,n** key

**X,T,Θ,n** 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 **X**. In Parametric mode it produces the variable **T**; and in Polar and Sequence modes it produces the variables  $\theta$  and **n**, respectively. Setting the mode is explained 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 **▶◀▲▼** to place the cursor on the entry.”

### Keys to remember

The following keystrokes are invaluable:

- ✓ **2nd|MODE**: 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. The Home screen is where the action takes place. This is where you execute commands and evaluate expressions.
- ✓ **ENTER**: This key is used to execute commands and to evaluate expressions. When evaluating expressions, it’s the equivalent of the equal sign.
- ✓ **CLEAR**: This is the “erase” key. If you’re entering something into the calculator and 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.

## 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.



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.



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 vertical line 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.



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 **▸****◀****⬅****➡** 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 **▸****◀****⬅****➡** to place the cursor on the character you want to delete and then press **DEL** to delete that character.

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### ✓ 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 **▶◀◂◃** to place the cursor at the location of the desired insertion, press **2nd|DEL**, and then key in the characters you want to insert. 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 **▶◀◂◃** to put the cursor where you want to start, and then use the keyboard to enter new characters.



**TIP** On the Home screen, the calculator doesn’t allow you to directly edit an already-evaluated expression or an already-executed command. But you *can* recall that expression or command if it was the last entry you made in the calculator — and when it’s recalled, you can edit it. To recall the last expression or command, press **2nd|ENTER**. This makes the calculator paste a copy of the desired expression or command on the Home screen so you can edit it.

## Using Menus

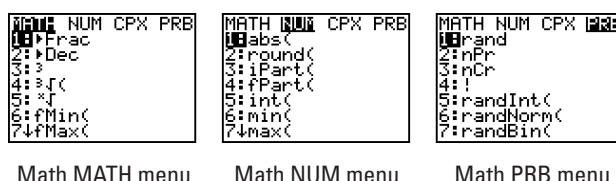
Most functions and commands you use are found in the menus housed in the calculator — and just about every chapter in this book refers to them. This section is designed to give you an overview of how to find and select menu items.

### 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 picture in Figure 1-1. This is a picture of the Math menu.

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Some menus, such as the Math menu, contain submenus. This is also illustrated in the first picture in Figure 1-1. This picture shows that the submenus in the Math menu are **MATH**, **NUM**, **CPX**, and **PRB** (Math, Number, Complex, and Probability). Repeatedly press  $\blacktriangleright$  to view the items on the other submenus; repeatedly press  $\blacktriangleleft$  to return to the Math MATH submenu. This is illustrated in the second and third pictures in Figure 1-1.



Math MATH menu

Math NUM menu

Math PRB menu

**Figure 1-1:** Submenus of the Math menu.

### *Scrolling a menu*

After the number 7 in the first two pictures in Figure 1-1, a down arrow indicates that more items are available in the menu than appear on-screen. There's no down arrow after the 7 in the third picture in Figure 1-1 because that menu has exactly seven items.

To see menu items that don't appear on-screen, repeatedly press  $\blacktriangledown$ . To get quickly to the bottom of a menu from the top of the menu, press  $\blacktriangle$ . Similarly, to quickly get from the bottom to the top, press  $\blacktriangledown$ .

### *Selecting menu items*

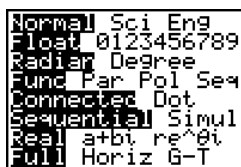
To select a menu item from a menu, key in the number (or letter) of the item or use  $\blacktriangledown$  to highlight the number (or letter) of the item and then press  $\text{ENTER}$ .

Some menus, such as the Mode menu that is pictured in Figure 1-2, require that you select an item from a list of items by highlighting that item. The list of items usually appear in a single row and the calculator requires that one item in each row be highlighted. To highlight an item, use  $\blacktriangleright\blacktriangleleft\blacktriangleup\blacktriangledown$  to place the cursor on the item and then press  $\text{ENTER}$  to highlight the item. The selections on the Mode menu are described in the next section.

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### 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 is pictured in Figure 1-2.



**Figure 1-2:** The Mode menu.

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 numbers 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 1-3. In this figure, the first answer is displayed in normal notation, the second in scientific notation, and the third in engineering notation.

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



50*2000	100000	Normal
50*2000	1E5	Scientific
50*2000	100E3	Engineering

**Figure 1-3:** Normal, scientific, and engineering notations.



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### ✓ **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.

### ✓ **Func, Par, Pol, or Seq:**

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

### ✓ **Connected or Dot:**

In **Dot** mode, the calculator produces a graph by plotting only the points it calculates. In **Connected** mode, the calculator joins consecutively plotted points with a line.

My recommendation is to select the **Connected** mode because each of the graphing options (**Func**, **Par**, **Pol**, and **Seq**) allows you to select a graphing style, one of which is the dot style.

### ✓ **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.

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### ✓ 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, Horiz, or G-T:

The **Full** screen mode displays the screen as you see it when you turn the calculator on. The other screen modes are split-screen modes. The **Horiz** mode is for when you want to display a graph and the Y= editor or the Home screen at the same time. Use the **G-T** 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, 10, 14, 15, and 16.)



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 is 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 would 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.



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.

## Using the Catalog

The calculator's Catalog houses every command and function used by the calculator. However, it's 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  $\leftarrow \rightarrow \uparrow \downarrow$  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.

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

This is illustrated in the first picture in Figure 1-4.

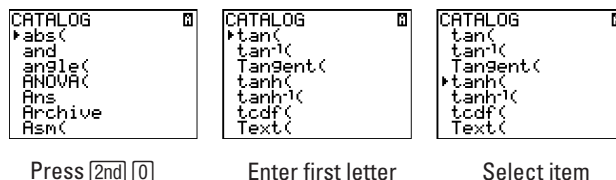
### 3. Enter the first letter in the name of the command or function.

Notice that the calculator is already in Alpha Mode, as is indicated by the **A** 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 hyperbolic function **tanh**, press **[4]** because the letter **T** is written in green above this key. This is illustrated in the second picture in Figure 1-4.

### 4. Repeatedly press **▼** to move the indicator to the desired command or function.

### 5. Press **ENTER** to select the command or function.

This is illustrated in the third picture in Figure 1-4. After pressing **ENTER**, the command or function is inserted at the cursor location.



Press **2nd****[0]**

Enter first letter

Select item

**Figure 1-4:** Steps for using the Catalog.

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