The Calculator

The easiest way to improve your math score on the SAT is to learn how to use your calculator. If you practice with your calculator, you can get many more questions correct, all with less effort and in a shorter amount of time. I strongly recommend using the TI-83 or TI-84 calculator as as it has features, functions and programs that other calculators do not have.

Remember
If you don't have or don't learn to use a TI-83 or TI-84 calculator (or an equivalent graphing calculator), you will likely miss out on points that you could have scored.

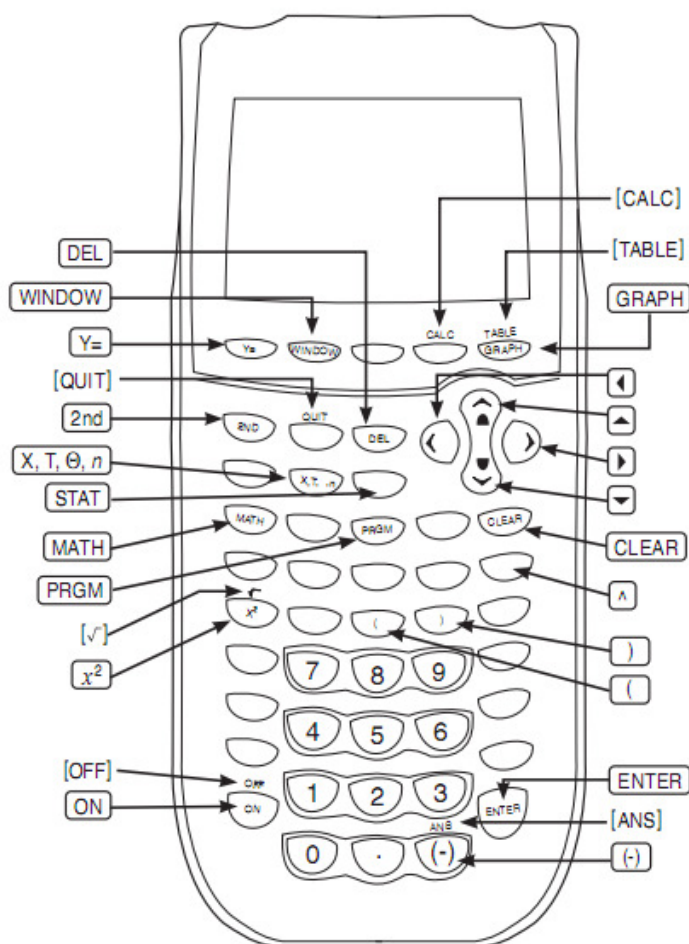## Learn Your Calculator, Use Your Calculator

It is not enough to own your calculator, or even to use it for only basic functions. You must learn how to use all of the features described in this chapter. I will give you step-by-step instructions on how to do everything, but, first and foremost, you must learn how to use your calculator.

For Your Information
There is much more instruction and information about using the calculator online at www.ldsatstudyguide.com.

The TI-83 and TI-84

If you are going to get a calculator, make sure it is a TI-84, as it is easier to connect to your computer. If you have a TI-83, it will work fine, but it might be harder to get many of the useful programs I have for you onto your computer. However, the instructions I give in this chapter will work equally well for both the TI-83 and the TI-84.

The TI-84.

When learning to use the TI-83/TI-84, refer to this diagram to find referenced keys.

The Basics of the TI-83/TI-84

Before you can get started using your calculator to solve math problems, you need to learn a few basics on how to use the calculator.

You may notice that each button has something printed on the button itself, and some other function printed just above the button. That function printed above any button is the 2nd function. Every button can perform two different functions. For example, the x^2 button has the symbol [√] above it. This means that this button can square a value, or it can square root a value. To get a button to perform the function printed above it, you must first hit the 2nd button, and then the button with the function you want.

Indicating the 2nd Function

If I want you to use the 2nd function of some button, I will indicate it by showing you the second button (2nd), and the image of the function that is above the button.

Example: Indicating the 2nd Function

Assume I wanted you to take the square root. I would do so with the keys 2nd [√].

Turning It On and Off

To turn the calculator on, press ON.
To turn the calculator off, press 2nd [OFF].

If you leave your calculator idle for too long, it will automatically shut off to preserve the battery life. If this happens, just press ON, to turn it back on again.

Darkening the Screen

To make the screen darker, press 2nd ▲

If you turn on your calculator, and the screen still seems to be blank, try pressing 2nd ▲ four or five times to darken the screen. Your calculator may be on, but it is so light that you cannot see anything on the screen.

Lightening the Screen

To make the screen lighter, press 2nd ▼

If you turn on your calculator and the entire screen is black, try hitting 2nd ▼ four or five times to lighten the screen. If the screen is all black, it means the screen is too dark.

Working With the Screen

Getting Back to the Home Screen
The TI-83/TI-84 can do many things which will require you to use various different menus and screens. To get back to the regular "home screen" where you can do regular math, just press 2nd [QUIT].

The Cursor
The cursor is the flashing black square on your calculator screen.

Clearing the Screen
Unlike most calculators, which only show you one line of text, the TI-83/TI-84 can show up to eight lines of text. In addition, just because you start a new problem doesn't mean that the old problem will be deleted. If you want a blank screen, you have to press CLEAR to erase everything else on the screen. At times, you may have to press CLEAR clear the entire screen.

Arrow Keys

You can move the cursor around a line of text with the arrow buttons [◀] and [▶]

Deleting

To delete a single character from the screen, use the arrow keys to position your cursor on the character you wish to delete and press [DEL]

EXAMPLE ## Screen Maintenance

Press [2nd] [1] [2] [3] [4] and you should see a screen like the one below.
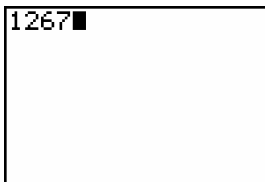
```
1234█
```

Press [◀][▶] and you should see a screen like the one below. You have moved the cursor left two places.

```
12█4
```

Press [6] [7] and you should see a screen like the one below. Notice that you have covered the 3 and 4 with the 6 and 7.

```
1267█
```

Press [◀][◀][DEL][DEL] and you should see a screen like the one below. Notice that you have deleted the 6 and 7.

```
12█
```

Navigating the Menu

A menu is a list from which you pick one of the items. The calculator will show you a numbered list of items to choose from. You can use the up and down arrow keys (⬆ and ⬇) to move up and down the list until the cursor is on the item you wish to select. Press ENTER to select the item your cursor is on.
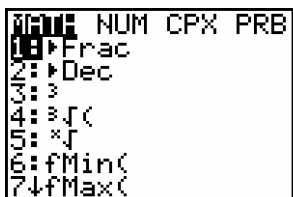
Math menu

EXAMPLE   Navigating the Math Menu

Press MATH to get to the Math menu.
Press ⬇⬇⬇⬇⬇ to move down to the sixth menu item. You should see something like the following screen, where the cursor is highlighting the 6.
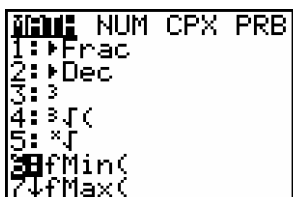
Press ⬆⬆ to move the cursor up two spaces. You should see something like the following screen, where the cursor is highlighting the 4.
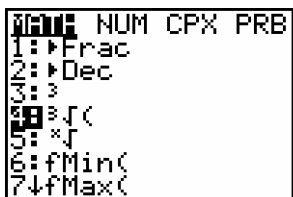
Press ENTER to select the item the cursor is on. You should see something like the following screen, with the selection you made on the screen.
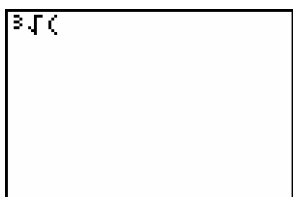
Check Your Understanding: Navigating a Menu

1. Select "SetUpEditor" from the Stat menu. (Press [STAT] to get to the STAT menu.)

ANSWERS

1. Press [2nd] [▲] [▲] [▲] [ENTER]

The screen should look like this:

Basic Math

The TI-83/TI-84 has a multitude of functions and can do amazing things. But you first must learn how to use it as a calculator to do your basic math.

Enter Button Is the = Button

For the TI-83/TI-84, [ENTER] is the same as the = button used on other calculators. So when you want to see the value of some operation, press [ENTER]

Adding, Subtracting, Dividing, and Multiplying

To perform the basic functions of math with the TI-83/TI-84, press the numbers and operations button (as you would with any other calculator), and then press [ENTER]

EXAMPLE   Basic Math with the TI-83/TI-84

Solve the following problems:

A. $4 + 3 =$
   WHAT YOU PRESS: [4] [+] [3] [ENTER]

```
4+3
              7
■
```
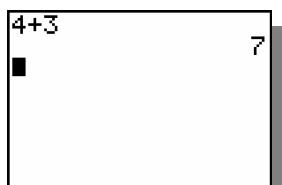
B. $8 - 2 =$
   WHAT YOU PRESS: [8] [−] [2] [ENTER]

```
4+3
              7
8-2
              6
```
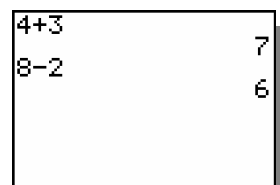
Notice that the calculator does not clear the screen when you hit enter. It simply puts the new information on a new line.

C. $7 \times 3 =$

WHAT YOU PRESS: [CLEAR] [7] [×] [3] [ENTER]

```
7*3
            21
■
```

D. $20 \div 4 =$

WHAT YOU PRESS: [2] [0] [÷] [4] [ENTER]

```
7*3
            21
20/4
             5
■
```

E. $(4 + 3) \times 7 =$

WHAT YOU PRESS: [(] [4] [+] [3] [)] [×] [7] [ENTER]

```
7*3
            21
20/4
             5
(4+3)*7
            49
```

Check Your Understanding: Basic Math

1. $16 + 27 =$

2. $347 - 94 =$

3. $264 \div 33 =$

4. $13 \times 28 =$

ANSWERS

1. 43   2. 253   3. 8   4. 364

PEMDAS

The TI-83/TI-84 knows the order of operations, and will follow it. So if you ask it to do 7 - 3 × 5, it will multiply the 3 and the 5 first, and then subtract it from 7.

> **For More Information**
> For more about PEMDAS, see PEMDAS on page XXX.

EXAMPLE **PEMDAS and the TI-83/TI-84**

Press the following keys:

[CLEAR] [CLEAR]

[(] [2] [4] [0] [−] [3] [0] [)] [÷] [3] [ENTER]

[2] [4] [0] [−] [3] [0] [÷] [3] [ENTER]

You should end up with the screen shown below.

```
(240-30)/3
              70
240-30/3
             230
```

Notice that in the second problem, the calculator divided 30 by 3 first, because that is the order of operations. If you type problems in exactly as they appear on the SAT, then the calculator will solve them in the correct order of operations.

Negative Isn't Minus

If you look at the TI-83/TI-84, you will notice that the there is a minus button [−] and a negative sign [(-)] .These are not the same. You use the minus button for subtraction, and you use the negative sign to make a number negative.

EXAMPLE **Using the Negative vs. Minus**

Here we will use the negative button correctly, and then try to use the minus button.

A. 4 + -3 =

WHAT YOU PRESS: [4] [+] [(-)] [3] [ENTER]

```
4+ -3
               1
```

Using the negative sign.

Do not clear the screen. Instead, do the same problem, but instead of using ⊡ , use ⊟.

B. 4 + -3 =

WHAT YOU PRESS: ④⊞⊟③ (Do not hit ENTER.) Your screen should look like the following screen.

```
4+ -3
              1
4+-3■
```
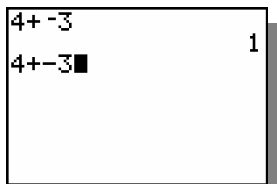
Notice that the minus sign is slightly longer than the negative sign.

Now hit ENTER. You should get an error like on the following Error screen.

```
ERR:SYNTAX
1■Quit
2:Goto
```
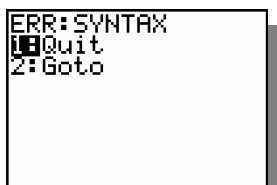
When you use a minus instead of a negative, you will get this Error screen message. Use the ▼ button to put the cursor on "2: Goto" and press ENTER. Now replace the minus with ⊡ and hit ENTER again. Now you get the right answer!

Check Your Understanding: Using Negative vs. Minus

Solve the following problems using your calculator. Do not do these in your head even though you probably can. You are practicing your ability to use the calculator's negative sign.

1. 8 + -3 =

2. -4 – 5 =

3. -3 + -8 =

4. -5 × -4 =

5. 72 ÷ -3 =

6. -(4 + 3) × 7 =

ANSWERS
1. 5   2. -9   3. -11   4. 20   5. -24   6. -49
If you get a Syntax Error, this means you are using the minus key instead of the negative key.

Using Your Answer

A lot of the time, you will want to use the answer from one calculation in another calculation. To do this, use the [2nd] [ANS] key. The [2nd] [ANS] key inserts the last answer you got into an equation.

EXAMPLE   **Using the Answer Key**

A. Find the result of 7 + 2 - 1.Then take that value and divide it by 4.

WHAT YOU PRESS: [CLEAR] [CLEAR]

[7] [+] [2] [-] [1] [ENTER]

[2nd] [ANS] [2] [÷] [4] [ENTER]

```
7+2-1
            8
Ans/4
            2
■
```

The "Ans" on this line is 8, because that was the answer of the previous calculation.

B. Find the result of 5 × 3 - 7.Then subtract that value from 9 (9 - value).

WHAT YOU PRESS: [CLEAR] [CLEAR]

[5] [×] [3] [-] [7] [ENTER]

[9] [-] [2nd] [ANS] [ENTER]

Notice that you are able to use [ANS] at any point in your calculations. It does not have to be the first value in your calculations.

```
5*3-7
            8
9-Ans
            1
■
```

Check Your Understanding: Using the Answer Key

1. Determine what 18 - 3 - 12 is. Then take 24 and divide it by the answer of the previous calculation.

ANSWERS

1. [1] [8] [-] [3] [-] [1] [2] [ENTER] [2] [4] [÷] [2nd] [ANS] [ENTER] 8

Math with Fractions

Unlike some calculators, the TI-83/TI-84 has no fraction button. In order to make a fraction, you must use the division button (÷).To create a mixed number, you have to add the integer to the fraction. Here is how you can create various values:

$\dfrac{3}{4}$ press ③ ÷ ④

$2\dfrac{1}{5}$ press ② ＋ ① ÷ ⑤

Decimals to Fractions and Fractions to Decimals

Fractions to Decimals

To convert a fraction to a decimal, all you need to do is the division. For example, to turn $\dfrac{3}{4}$ into a decimal, you 4 would press ③ ÷ ④ ENTER. You should end up with a screen like the one shown below.

```
3/4
            .75
```
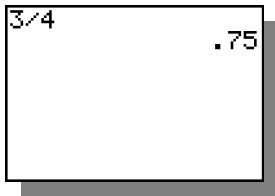
Decimals to Fractions

Your calculator will always give you answers in decimal form. If you want your answer written as a fraction, tell the calculator to put it in that form. In the Math menu, there is a "Frac" function that converts any decimal to a fraction. To access it, press:

MATH   (which gives you the following screen)

ENTER   (which indicates you want *** **KeyIcon frac** ***)

```
MATH NUM CPX PRB
1:▶Frac
2:▶Dec
3:3
4:3√(
5:×√
6:fMin(
7↓fMax(
```
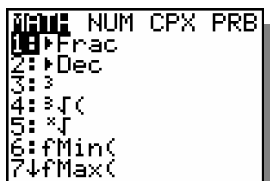
EXAMPLE   **Answer as a Fraction**

A. $24 \div 44 =$

(A) $\frac{1}{2}$

(B) $\frac{3}{5}$

(C) $\frac{4}{7}$

(D) $\frac{6}{11}$

(E) $\frac{7}{13}$

WHAT YOU THINK

My answer must be in the form of a fraction, not a decimal.

WHAT YOU PRESS: [CLEAR] [CLEAR]

[2] [4] [÷] [4] [4] [MATH] [1] [ENTER]

```
24/44▶Frac
            6/11
```

Mixed Numbers

The TI-83/TI-84 makes all fractions improper fractions. If you want your fraction to be a mixed number with an integer and a fraction, you either have to use the FRACCON program, which will be explained later in the chapter on page XXX, or you must follow these steps:

How Common Are They?
There will be 1 problem with mixed fractions per test.

1. Convert to a decimal.

2. Record the integer value of your decimal, which will be the integer value of your mixed number (for 2.35 that would be 2).

3. Subtract the integer value of the number (2.35 - 2 = .35).

4. Convert the decimal to a fraction using your calculator.

EXAMPLE **Converting Improper Fractions to Mixed Numbers**

A. $\frac{41}{7} =$

(A) $4\frac{1}{7}$

(B) $5\frac{4}{7}$

(C) $5\frac{6}{7}$

(D) $7\frac{1}{4}$

(E) $7\frac{4}{7}$

WHAT YOU THINK

1. Do the division.

2. Record the integer value.

3. Subtract the integer value from the whole value.

4. Convert the remaining decimal into a fraction.

WHAT YOU PRESS: [4] [1] [÷] [7] [ENTER]

[2nd] [ANS] [−] [5] [ENTER]

[2nd] [ANS] [MATH] [1] [ENTER]

Integer = 5

Fraction = $\frac{6}{7}$

Answer = $5\frac{6}{7}$ =

Powers and Roots

To square any value, type in the number and then hit $\boxed{x^2}$. So to find 7^2, you would press [7] $\boxed{x^2}$ [ENTER].

If you press $\boxed{(-)}$ [4] $\boxed{x^2}$ [ENTER] ,you would get the result -16 because the calculator does powers before negatives. The calculator sees $\boxed{(-)}$ [4] $\boxed{x^2}$ [ENTER] as -(4^2),where it does the power first, and then makes it negative. If you want the calculator to square -4, you must put -4 in parentheses like this [(] $\boxed{(-)}$ [4] [)] $\boxed{x^2}$ [ENTER].

Watch Out!

If you are trying to take the square of a negative number, you must put the negative inside of the parentheses and the square outside.

Square Roots

The Square Root button ([√]) is the 2nd function of the [x^2] button. To find the square root of a number, hit [2nd] [x^2] , then the value, and then [)] .The calculator puts the first parenthesis automatically, and you must close the parenthesis.

EXAMPLE   **Square Roots**

A. What is the square root of 16?

WHAT YOU PRESS: [2nd] [√] [1] [6] [)] [ENTER]

√(16)
                    4
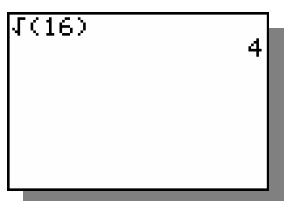
Notice the closed parenthesis.

Closing the Parenthesis

If you are going to do any calculations in addition to finding the square root of some value, it is essential that you close the parenthesis. Otherwise the calculator will take the square root of everything that you type.

Here, we have two examples, one with closed parenthesis and the other without closed parenthesis, to show you how each would calculate.

- [2nd] [√] [2] [5] [)] [+] [3] [ENTER] would calculate $\sqrt{25} + 3$.
- [2nd] [√] [2] [5] [+] [3] [ENTER] would calculate $\sqrt{25 + 3}$.

√(25)+3
                    8
√(25+3
         5.291502622
■
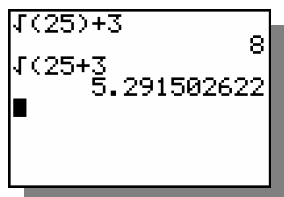
DEFINITION

Under the radical means everything that is being square rooted. In $\sqrt{13} + 4$, 13 is under the radical, but 4 is not.

Notice in the second example that because we did not close the parenthesis, the calculator assumed that everything on the line was *under the radical.*

Check Your Understanding: Squares and Square Roots

Use your calculator to solve the following problems. You could easily solve them without a calculator, but the point is to practice with your calculator.

1. 6^2

2. 3.5^2

3. What is -5 squared?

4. What is the square of $4 + 3$?

5. $\sqrt{36}$

6. $\sqrt{10}$

Other Roots and Powers

At times, you will have to put numbers to powers other than 2, and do roots other than square roots. You can still use your calculator for this, but the buttons are different.

Other Powers

To do a power, you use the $\boxed{\wedge}$ button. We call this the caret button. Place the caret between the number that is being put to the power, and the power itself. So, to find 7^4, you would press $\boxed{7}\boxed{\wedge}\boxed{4}$

- If you want to put something to the power of some expression, like $63 + 4$, you would have to use parentheses, like this: $\boxed{6}\boxed{\wedge}\boxed{(}\boxed{3}\boxed{+}\boxed{)}$.
- You can even put something to the power of a fraction using parenthesis. To find $4^{\frac{2}{3}}$, you would press $\boxed{4}\boxed{\wedge}\boxed{(}\boxed{2}\boxed{\div}\boxed{3}\boxed{)}$.

Other Roots

You can do any root you like, not just the square root. To find a root other than the square root, you have to go back into the Math menu, which is where the "Frac" command is. To get the "Any Root" command, press $\boxed{\text{MATH}}\boxed{5}$. To find $\sqrt[3]{8}$, press $\boxed{3}\boxed{\text{MATH}}\boxed{5}\boxed{8}\boxed{\text{ENTER}}$ and you will get the following screen.

```
3×√8
            2
■
```
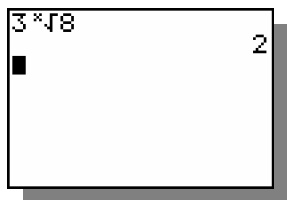
Notice that there are no parentheses when you choose your own root. This means that if you are trying to find $\sqrt[4]{80+1}$, you have to put in both the opening and closing parentheses: $\boxed{4}\boxed{\text{MATH}}\boxed{5}\boxed{(}\boxed{8}\boxed{0}\boxed{+}\boxed{1}\boxed{)}$

Check Your Understanding: Choose Your Own Roots

1. $\sqrt[5]{56}$

2. $\sqrt[3]{64}$

Graphing and Entering Equations

One of the most useful features of the TI-83/TI-84 is that it can graph equations. You can place an expression in a graph or in a table. Here are the steps for viewing the graph of an equation:

1. Enter the equation.
2. Set the window.
3. View the graph.
4. Find various values.

> **For More Information**
> For more on graphs and graphing, see xy Graphs on page XXX.

Entering an Equation

You must enter all equations in y = format, with x as the only other variable. This means that y must be the only thing on the left side of the equation.

Acceptable Equations

The following equations could be entered into the calculator:

- $y = 3x$
- $y = 4x - 2$
- $y = 4 + x2$
- $y = \dfrac{\sqrt{x} - 4}{3x^2}$

Unacceptable Equations

If an equation is not in y = format, it must be modified. To do this, get y on the left side of the equation, place everything else on the right side of the equation, and if the equation uses variables other than x and y, replace those variables with x and y.

The following equations need to be modified in order to enter them into the calculator:

- $2 \times 2 - 3 = y$ $y = 2 \times 2 - 3$
- $y - 4x = 7$ $y = 4x + 7$
- $u = 3w - 1$ $y = 3x - 1$
- $x = y + 1$ $y = x - 1$

> **For More Information**
>
> For more on using algebra to modify an equation, see Algebra on page XXX.

Check Your Understanding: Acceptable Equations

For each of the following equations, determine if the equation can be entered into the calculator. If it cannot, modify it into a format that can be entered.

1. y = 3 + x

2. w = 3v - 8

3. 8x = y

4. y = 4 - x2

5. 7y = x + 2

ANSWERS

5. $y = \dfrac{x+2}{7}$

4. acceptable

3. $y = 8x$

2. $y = 3x - 8$

1. acceptable

Entering an Equation into the Calculator

Once you have your equation in the correct format, you can enter it into the calculator. To enter an equation into the calculator, you must get to the equation screen by pressing [Y=].When you press [Y=], you should see a screen that looks like one of the following screens.

```
Plot1 Plot2 Plot3
\Y1=■
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```

```
Plot1 Plot2 Plot3
\Y1■3X-2■
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```
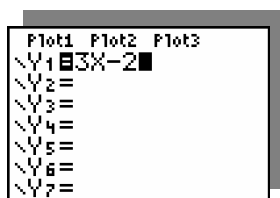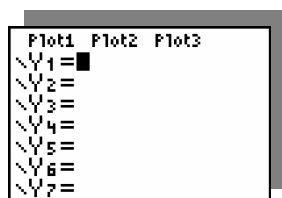
Deleting an Equation

If there is an equation already entered, you must clear it. Use the arrow keys to put the cursor on the line of the equation, and press [CLEAR]

Entering an Equation

To enter an equation, you press the keys just as you would to enter values to be calculated. To enter x, press the [X, T, Θ, n] button.

EXAMPLE   **Entering an Equation**

A. Enter $y = 2x - 1$

WHAT YOU PRESS: [Y=]

[CLEAR] (if necessary)

[2] [X, T, Θ, n] [−] [1]

Plot1 Plot2 Plot3
\Y1=2X-1■
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

B. Enter $y = 5 - 3x^2$

WHAT YOU PRESS: [Y=] [5] [−] [3] [X, T, Θ, n] [x²]

Plot1 Plot2 Plot3
\Y1=5-3X²■
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

Check Your Understanding: Entering an Equation

Enter the following equations into the calculator. Modify the equations if necessary.

1. $y = 4x$

2. $y = 5x^2 - 17$

3. $y - x = 4$

ANSWERS

1. [Y=] [4] [X, T, Θ, n]   2. [Y=] [5] [3] [X, T, Θ, n] [x²] [−] [1] [7]   3. $y = x + 4$; [Y=] [X, T, Θ, n] [+] [4]

Viewing a Graph

Once you have entered your equation into the calculator, you can see what the graph of your line looks like. To see the graph of the equation, press GRAPH.

Example: Viewing the Graph of y = x + 3

1. Enter the equation into the calculator.

   WHAT YOU PRESS: Y= X, T, Θ, n + 3

2. View the graph.

   WHAT YOU PRESS: GRAPH

3. You should see something like the following screen.
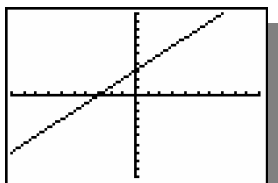
The Window: Seeing the Right Part of the Graph

The window is the size of the screen when you are looking at a graph. Normally the graph goes from -10 to 10 for the x-axis and for the y-axis, but you can change the size of each axis, and the distance between tick marks. To change these parameters, press WINDOW. Pressing will WINDOW take you to the Window screen.

```
WINDOW
 Xmin=-10
 Xmax=10
 Xscl=1
 Ymin=-10
 Ymax=10
 Yscl=1
 Xres=1
```

Window Screen
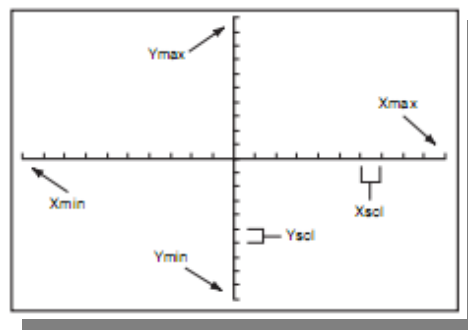
Understanding the Window screen.

The Window Elements

Xmin the left boundary of the graph
Xmax the right boundary of the graph
Xscl interval between tick marks on the x-axis
Ymin bottom boundary of the graph
Ymax top boundary of the graph
Yscl interval between marks on the y-axis
Xres leave this set at 1 (it will not affect your graph)

DEFINITION

An interval is the distance between two things.

Changing Window Values

To change a value in the window, press (WINDOW), use the up and down arrows (▲ and ▼) to go to the line you want to modify, and click on the new value that replaces the old value.

Non-Square Screen

Notice that the screen is not a square, but a rectangle. If you want your line to look like it would if you were drawing it, reset the following window values leaving the other values unchanged:

- Xmin = -9
- Xmax = 9
- Ymin = -6
- Ymax = 6

```
WINDOW
 Xmin=-9
 Xmax=9
 Xscl=1
 Ymin=-6
 Ymax=6
 Yscl=1
 Xres=1
```

Then press (GRAPH) to see the new graph:
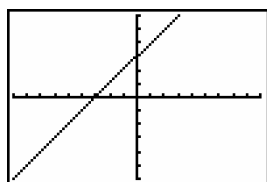
DEFINITION

A horizontal line goes from side to side, not up and down.

Notice how the line now looks like it has a slope of 1, which is how it should. When the graph window is set at -10 and 10 for both axes, everything gets stretched out *horizontally*.

Check Your Understanding: Graphing Lines

Graph the following lines.

1. $y = 4x - 3$

2. $y = -x + 2$

3. $y = \frac{1}{2}x^2 - x + 1$

ANSWERS

(The following answer text appears inverted/upside-down:)

3. Y= CLEAR X, T, Θ, n − x² X, T, Θ, n + 1 ÷ 2 ( ) GRAPH (Remember that you need parentheses for a fraction.)

2. Y= CLEAR (-) X, T, Θ, n + 2 (Notice that the negative sign, not the minus sign, is used.)

1. Y= CLEAR 4 X, T, Θ, n − 3

Graphing Multiple Lines

You can graph more than one line at the same time by entering more than one equation. Enter one equation as Y1 and the other as Y2 in the equation screen before pressing GRAPH .To move from one Y to the next in the equation screen, use the up and down arrow keys (▲ and ▼) To delete an equation, go to that line and press CLEAR

EXAMPLE   **Graphing Multiple Lines**

Graph the lines y = 2x − 3 and y = -x + 3.

WHAT YOU PRESS: Y=

2 X, T, Θ, n − 3

▼ (to move to the next function)

(-) X, T, Θ, n + 3

Your equation screen should look like the following:

After you press GRAPH your graph should look like the following:

Calculating Things on the Graph

The TI-83/TI-84 allows you to calculate various values of a line, including a particular point, a zero, a maximum or minimum, as well as an intersection of two lines.

Equation Must Be Entered First

Whatever equation you enter in the Y_1 = equation will be the equation the calculator uses to do its calculations. Be sure that the equation you wish to calculate is entered as Y_1.

The Calculate Menu

Calculate menu.

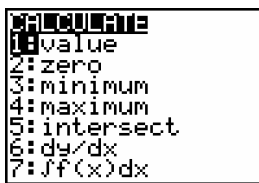To get to the Calculate menu, press [2nd] [CALC].From here you can choose which operation you want to perform by using the arrow keys ([▲] and [▼]) to move to the correct operation and then pressing [ENTER].

DEFINITION

The zeros of a line are the points where it crosses the x-axis, which is where y = 0.

Possible Calculations

Here are the calculations you might have to use on the SAT:

1. Value   Finds the y value for any x input
2. Zero   Finds the x value where the line crosses the x-axis
3. Minimum   The minimum value of a graph/equation
4. Maximum   The maximum value of a graph/equation
5. Intersection   Where two lines meet

Left Boundary, Right Boundary, and Guess

When you calculate some value on a graph, you will usually be asked for the left boundary, the right boundary, and a guess. The calculator asks for this so that it knows where to look. Here is a brief explanation of each:

• Left boundary   Any x value to the left of the thing you are looking for.
• Right boundary   Any x value to the right of the thing you are looking for.
• Guess   About the x value of the thing you are looking for. This does not have to b that close.
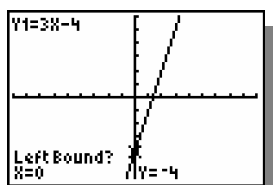
EXAMPLE   **Calculating**

A. At what x value does y = 3x – 4 cross the y-axis?

WHAT YOU PRESS: [Y=] [CLEAR] (to get to the equation screen and clear the Y₁ equation)

[3] [X, T, Θ, n] [–] [4]

[2nd] [CALC] (gets you to the Calculate screen like the one below)

[▼] [ENTER] (move to zero and select it)

```
CALCULATE
1:value
2:zero
3:minimum
4:maximum
5:intersect
6:dy/dx
7:∫f(x)dx
```

WHAT YOU THINK

Need to find the zero of
y = 3x – 4

WHAT YOU THINK

The line crosses somewhere between 1 and 2

Left boundary: any number less than 1: 0

Right boundary: any number greater than 2: 3

Guess: any number around the crossing: 2

WHAT YOU PRESS: [0] [ENTER] (enter the left boundary)

[3] [ENTER] (enter the right boundary)

[2] [ENTER] (enter your guess)

```
Y1=3X-4



Left Bound?
X=0        Y=-4
```

The Zero

Notice that at the bottom of the screen you are given the x value and the y value of the point where the line crosses the y-axis.
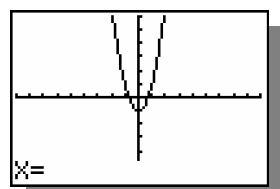
x = 1.33333

B. If $y = 2x^2 - 1$, then what is the value of y when x = 3?

WHAT YOU PRESS: [Y=] [CLEAR] (to get to the equation screen and clear the Y_1 equation)

[2] [X, T, Θ, n] [x^2] [−] [1]
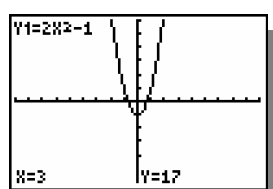
[2nd] [CALC] [ENTER] (select Value from the Calculate screen)

[3] [ENTER] (enter the x value)

Calculate value.

Result of value.

Notice that at the bottom of the screen they give you the x value and the y value of the point where the line crosses the y-axis.

y = 17

Notice that you do not have to enter a left and right boundary when you calculate the value, you only need to enter the x value.

Check Online for More Information

The TI-83/TI-84 can do more with graphs and equations. It can calculate the intersection of two lines or find the maximum or minimum of a line. It can also make an xy-table based on an equation. To learn how to do this and more, log on to www.ldsatstudyguide.com.

Programs

While the TI-83/TI-84 does not come with any programs preloaded, it can be loaded with many programs.

You will find lots of helpful programs on our website, www.ldsatstudyguide.com. Here is a partial list of some of the programs you will find online:

- Greater   puts numbers in order of least to greatest
- Sqreduce reduces a square root ($\sqrt{20} = 2\sqrt{5}$)
- Points   Given two points, it tells the distance, midpoint, slope, and y = mx + b formula
- Factors   Finds all of the factors of a number

- SERIES   Given the pattern of a series, it gives you any term in the series
- NGON   Finds area, perimeter, and interior angle measurement of a shape with any number of sides.
- SYSOFEQ   Finds the x and y values that work for two equations
- FOIL   Will FOIL any two binomials (ax − h)(bx − k)
- FRACCON   Converts between decimals, mixed numbers, and improper fractions $\left(A\dfrac{B}{C} \leftrightarrow \dfrac{N}{C} \leftrightarrow A.D \right)$
- PERCHNG   Finds the change in percent gained or lost
- REMNDR   Finds the quotient and remainder for any division problem
- SLICEARC   Finds the area of slice and arc length based on the central angle and radius of the slice.
- QUADRAT   Finds the points where a quadratic equation (ax^2 + bx + c) crosses the y-axis

Calculator Programs = 20 to 50 Points

These programs will be incredibly helpful for the SAT. It is quite likely that they will save you time, and increase your score. It is essential that you go to the website (www.ldsatstudyguide.com) and download them to your calculator. Instructions for getting the programs onto your calculator and how to use each program are available online, too.

Watch Out!
If you do not get the calculator programs you will lose points.

Running a Program

To run a program, follow these steps:

1. Press ⌈PRGM⌉ to get to the Program screen.

```
EXEC EDIT NEW
1:FACTORS
2:FOIL
3:FRACRED
4:GREATEST
5:NGON
6:POINTS
7↓QUADRAT
```
Program Screen

2. Press ⌈▲⌉ or ⌈▼⌉ to navigate to the program you wish to run.
3. 3. Press ENTER to select the program (you should see a screen like the following, with "prgmXXXXXX," where XXXXXX represents the name of the program).

```
prgmFRACRED
```

4. Press ⌈ENTER⌉ again to run the program.

Notice that when you select a program from the program screen, it only puts the name of the program up on the screen. You have to press ENTER again to run the program.

A Sample of Programs

I cannot show you how to use all of the programs here, but I will show you a sampling of two: FACTORS and SQREDUCE. To download these programs and to see all the rest, be sure to log on to www.ldsatstudyguide.com.

FACTORS

FACTORS will give you all of the factors of any number. First you will be given the factors as a list, and then they will be given to you as pairs of values, which multiply to equal your value.

EXAMPLE   **Finding Factors**

A. Find the factors of 32.

WHAT YOU PRESS: PRGM

⯆ (to put the cursor on FACTORS)

ENTER ENTER (to run the program)

```
FACTOR: ■
```

Factor what number?

3 2 ENTER (tell the calculator to find the factors of 32)

```
FACTOR: 32

1,2,4,8,16,32,


PRESS ENTER TO
TO SEE PAIRS
```

List of factors.

```
              {1 32}
              {2 16}
              {4 8}
               Done
```

Factor pairs.

Note that each pair multiplies to equal 32.

Check Your Understanding: Finding Factors

1. Find all of the factors of 42.

2. List all of the factors of 30 that are less than 10.

SQREDUCE

Often you need to reduce a square root, as opposed to simply finding the decimal value. The program SQREDUCE will reduce any square root for you. If the radical cannot be reduced, it will show you the same square root. For example, $\sqrt{13}$ cannot be reduced, so SQREDUCE would give you the value $\sqrt{13}$ if you tried to reduce it.

EXAMPLE   **Reducing a Square Root**

A. Reduce $\sqrt{96}$

WHAT YOU PRESS: [PRGM] ([▼] as needed) [ENTER] [ENTER]

```
REDUCE √R
R=?
```
SQREDUCE intro screen.

[9] [6] [ENTER] (tell the calculator to reduce the square root of 96)

```
REDUCE √R
R=?96

4√6
```
SQREDUCE solution screen.

$4\sqrt{6}$