

[ON] is in the lower left corner. [Off] is [2nd][ON]. [2nd] is the green key in the upper left corner.

This calculator has a **two-line display mode**, essentially the same as a graphing calculator, and a **four-line display mode**, which allows you to enter formulas – like the quadratic formula – just as you would write them.

The four line display is the default mode. To change modes, press [Mode], right of [2nd], select **Classic** (two-line) or **Mathprint** (four-line), and press [Enter] to confirm that selection. [2nd] [Mode] is **Quit**, which returns you to the home screen, or main screen.

The **four-line display** offers students more of a crutch than the two-line display mode. To try it, press [Mode], select **Mathprint** in the bottom row, by using the **arrow keys** in the upper right corner of the keypad. Press [Enter] to implement that selection. Press [2nd] [Mode], i.e. **Quit**, to return to the main screen, or *home screen*.

To solve $3x^2 + 13x - 7 = 0$ using $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ with $a = 3, b = 13, c = -7$, you

begin to enter the fraction by pressing $\left[\frac{n}{d} \right]$ in the third row of keys, second column. Then type

[(-)] 13 [+] [^{square root} 2nd] [x²] 13 [x²] [-] 4 [*] 3 [*] [(-)] 7

The *short raised negative*, indicating *negative or opposite* of a number, is the white key [(-)] on the bottom row. [√] is [2nd][x²]. The *long minus sign*, indicating *subtraction*, is the dark gray key [-] on the right side of the keypad.

This much gives you the numerator $\frac{-13 + \sqrt{13^2 - 4 * 3 * -7}}{2 * 3}$.

You can add parentheses around -7, if you feel the need. You have to be sure to balance any extra parentheses. The calculator does not need more than what I indicate.

The cursor is still under the radical in the numerator. [RightArrow] takes the cursor outside the radical. [DownArrow] takes the cursor into the denominator where you can type 2 [*] 3

Compare with the Classic Mode below

$$(-13 + \sqrt{(13^2 - 4*3*-7)})/(2*3) = 0.4843...$$

Mathprint mode saves typing three sets of parentheses and gives the expression

$$\frac{-13 + \sqrt{13^2 - 4 * 3 * -7}}{2 * 3}$$

almost exactly as you would write it.

To **execute** the command above, press [**ENTER**] in the lower right corner of the keypad. See that one solution is 0.4843...

If your answer looks like $\frac{\sqrt{253} - 13}{6}$, you can convert it to a decimal

approximation by using the **Toggle** key [< >] just above [**Enter**] in the lower right corner of the keypad. You can also convert back into the exact form

$$\frac{\sqrt{253} - 13}{6}.$$

For my tests you need to know the difference between exact and precise values of numbers.

To **find the second root**, press [**UpArrow**] twice. (You can actually go up many lines.) Press [**Enter**] and arrow keys to move the cursor over the + in front of the radical. Type [-]. The second root is -4.8176....

You can **edit a line with errors** similarly, either before or after you execute the command line. [**LeftArrow**] and [**RightArrow**] will take you to any parts of the command line that run off the end of the screen. Graphing calculators have a text wrapping feature, but they cost \$80 - 90.

Another convenient form, maybe more familiar, would be $\frac{-13 + \sqrt{13^2 - 4(3)(-7)}}{2 * 3}$

The **two-line display** (Classic mode) is my preference. To apply the quadratic formula to

$$3x^2 + 13x - 7 = 0$$

we type

$$(-13 + \sqrt{(13^2 - 4*3*-7)})/(2*3) = 0.4843...$$

It is important that you understand why all those parentheses are necessary. It is because of the order of operations given by PREMDAS. Sometimes you also need to remember that -13^2 is a negative number, equivalent to $-(13^2)$, *not* $(-13)^2$.

You should *never* tell me the calculator gave you the wrong answer. It does precisely what you tell it to. You are responsible for giving your calculator a correct command.

The **DELe**te key is left of the ARROW keys. To **INS**ert characters instead of overwriting, position the cursor and press [2^{nd}][DEL]. You can return to overwrite mode by using [**LeftArrow**] or [**RightArrow**]

There is a key for **squares** in the left column, and its second feature is square root. Other exponents need to be expressed with the **hat** key, [^]. Its proper name is *circumflex*. For example, $2^3 = 8$. There is a feature for **other roots**, but they are easier to express using fractional exponents. So $\sqrt[3]{7} = 7^{1/3} = 7^{(1/3)}$. Note that $7^{1/3}$ is the same as $(7^1)/3 = 7/3$ which is not what we want.

ANS is [2nd][(-)]. It is the *value* of the last command executed. Execute $2*4$ to get 8. Then press [÷][2][**ENTER**] to get 4. Then press [÷][2][**ENTER**] to get 2, not the same result, because **Ans** is a variable whose value keeps changing. **Ans** is useful in calculating function values with minimal typing and **maximum accuracy**.