Programming the Quadratic Formula into a TI-83/84+ Calculator

Mike Pierce · Last tended 14 July 2023 · Hosted at coloradomesa.edu/~mapierce2/quadratic

Once you know the quadratic formula, you can save time computing the roots (zeros) of quadratic polynomials by programming it into your calculator once-and-for-all.

To create a new program in a TI-83/84+, press PRGM, navigate over to the NEW menu, and select Create New. You'll be asked to name your new program; the one in this guide is named QUAD, but you can name it whatever you desire. Once you enter the name you should see a Program Editor screen like this where you'll write the program. That lonely colon : indicates the beginning of a line of code.

TI-83+ Screenshot: the QUAD program, empty for now.

If you exit the Program Editor screen and would like to return to it you can do so by pressing PRGM, navigating over to the EDIT menu, and selecting your program.

For a quadratic equation $ax^2 + bx + c$ your program will need to do three things: first *prompt* you to input the coefficients a and b and c, then calculate the roots using the quadratic formula, and then *display* those roots.

1. **Prompting for the Coefficients** · While in the Program Editor, pressing PRGM will present you with menus of programming-related keywords. We're interested in input/output keywords, so press PRGM and navigate over to the I/O menu. Select Prompt and enter Prompt A,B,C as the first line of your program. Now when the program is executed, it will prompt for values of A and B and C to be entered. Note that the comma , button is above the 7 button.

2. **Calculating the Roots** · The roots x of a quadratic polynomial are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

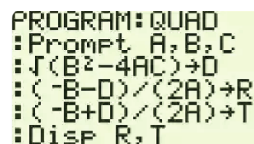It'll make for a cleaner program if you only compute that square root once, and store it to a variable, say D.

$$x = \frac{-b \pm D}{2a} \quad \text{where } D = \sqrt{b^2 - 4ac}$$

The syntax for *sto*ring this value to D is √(B²-4AC)→D, where you can enter that arrow → by pressing the STO→ button. It would be similarly convenient to calculate then store the roots to variables. Store the first

root to R for "Root", and store the other root to T for "The other root" with the lines (-B-D)/(2A)→R and (-B+D)/(2A)→T.

3. **Displaying the Roots** · Finally to display the roots, return to the menu of input/output keywords by pressing PRGM and selecting the I/O menu. Select Disp then enter the line Disp R,T to display the roots.

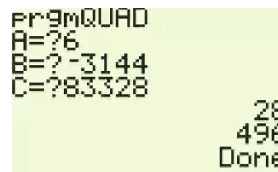Once finished your program should look like this:

TI-83+ Screenshot: the QUAD program

```
: Prompt A,B,C
: √(B²-4AC)→D
: (-B-D)/(2A)→R
: (-B+D)/(2A)→T
: Disp R,T
```

Before wrapping up, you should test your program on a quadratic polynomial with roots that you know, just to make sure the program works. To run your freshly written program, press PRGM and find QUAD under the EXEC menu. Selecting it will place a prgmQUAD on the home screen; press ENTER to run it. Referring to the quadratic polynomial

$$6(x - 28)(x - 496) \;=\; 6x^2 - 3144x + 83328$$

enter A = 6, B = −3144, and C = 83328.

TI-83+ Screenshot: testing the QUAD program

Delightful! Note that if you ever run this program and receive the error ERR:NONREAL ANS, this indicates that the roots of the quadratic are not real. I.e. $ax^2 + bx + c$ does not factor over the real numbers. Algebraically speaking, this is because $b^2 - 4ac < 0$.

For more information on programming in your TI calculator, consult the programming section in your calculator's guidebook.