

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

Mike Pierce · Tended 25 November 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 Texas Instruments (TI) graphing calculator once-and-for-all.

To create a new program in your 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 yours whatever you want. 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 you can return to it by pressing `PRGM`, navigating over to the `EDIT` menu, and selecting your program.

Given a quadratic polynomial $ax^2 + bx + c$ 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

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

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 storing this value to D is `√(B²-4AC)→D`, where you can enter that arrow `→` by pressing the `STO→` button. It will be convenient to store the two roots to variables after calculating them. We'll store the first root to R and the other root to T , which stand for "R oot" and "T he other root" respectively. Do this 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:

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

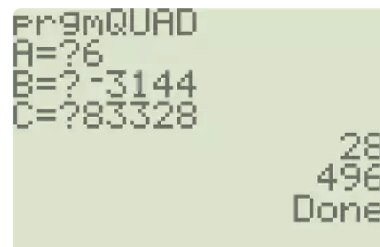
TI-83+ Screenshot: the `QUAD` program

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

To finish up, you should test your program on a quadratic polynomial with roots that you know to make sure you've entered the code correctly. To run your freshly written program, press `PRGM` and find `QUAD` under the `EXEC` menu. Selecting it will show `prgmQUAD` on the home screen; press `ENTER` to run `prgmQUAD`. 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. If you'd like change the mode of your calculator to display complex numbers rather than report an error, press `MODE` and select `a+bi`.

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