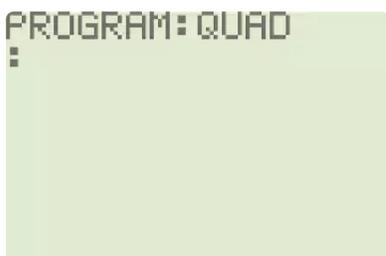


Programming the Quadratic Formula into a TI-83/84+ Calculator

Mike Pierce · Tended 4 January 2024 · 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 on the home screen.

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

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

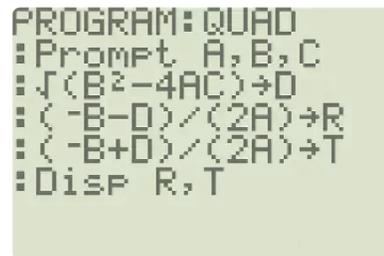
It'll make for a cleaner program if you only compute that square root once, and store it to a variable, say D .

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

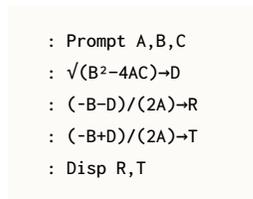
The syntax for storing this value to D is $\sqrt{(B^2-4AC)}\rightarrow D$, where you can enter that arrow \rightarrow by pressing the `STO→` button. It will be convenient to store the two roots to variables after calculating them. We'll store the first root to R and the other root to T , which stand for "Root" and "The other root" respectively. Do this with the lines $(-B-D)/(2A)\rightarrow R$ and $(-B+D)/(2A)\rightarrow T$.

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:



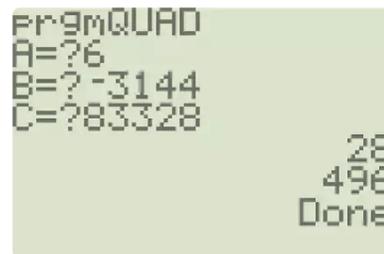
TI-83+ Screenshot: the QUAD program



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 to 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.