



## Activity Overview

In this activity, students will make connections between the visual ways to find zeros of a parabola and algebraic ways. The quadratic formula is heavily emphasized in this activity, and is utilized in both a calculator program and in the Lists screen.

## Topic: Quadratic Formula

- Students will see the graph of a parabola, and identify its zeros (x-intercepts).
- Students will solve the quadratic by using the quadratic formula, with the discriminant being calculated in a formula in lists.
- Students will use a program to solve the quadratic completely.

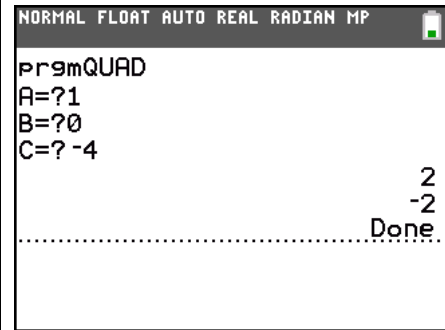
## Teacher Preparation and Notes

- Students will need to enter a formula into a list.
- Students will learn to store a formula in a list. The students will then use the same formula for several problems with different values for  $a$ ,  $b$ , and  $c$  (L1, L2, and L3).
- To download the calculator program (.8xp file) and the student worksheet, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter "12383" in the keyword search box.

## Suggested Related Activities

To download any activity listed, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter the number in the keyword search box.

- Bridge on the River Quad (TI-84 Plus family) — 9530
- Quadratic Functions (TI-84 Plus family and TI-Navigator) — 3512
- Connecting Factors and Zeros (TI-84 Plus family) — 1250
- Quadratic Intercepts (TI-84 Plus family and TI-Navigator™) — 2119



**This activity utilizes MathPrint™ functionality and includes screen captures taken from the TI-84 Plus C Silver Edition. It is also appropriate for use with the TI-83 Plus, TI-84 Plus, and TI-84 Plus Silver Edition but slight variances may be found within the directions.**

### Compatible Devices:

- TI-84 Plus Family
- TI-84 Plus C Silver Edition

### Lesson Files:

- QuadraticFormula\_Student.pdf
- QuadraticFormula\_Student.doc
- QUAD.8xp

Click [HERE](#) for Graphing Calculator Tutorials.

**Exercise 1**

Students are asked to graph the equation  $y = x^2 - 4$ , and identify the zeros by looking at the graph or the equation. Students may know the zero product property, and thus may be able to solve by that method on their papers.

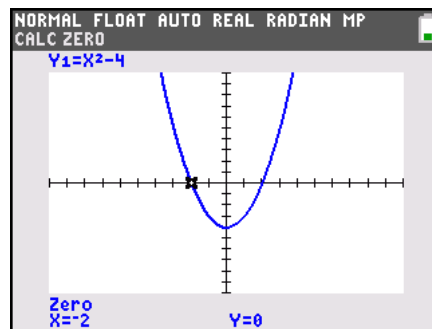
Students can also use the **zero** command, found under  $\boxed{2nd}$  [CALC]. When prompted for a “**Left Bound?**,” move the cursor to the left of the zero. For “**Right Bound?**,” move the cursor to the right of the zero. For “**Guess?**,” move the cursor near the zero. This process will be repeated if there is more than one zero.

The program *QUAD* has been provided to evaluate the quadratic formula, both the positive and negative solutions. If you would prefer to use this as a teaching opportunity for programming, you can have the students enter the program.

The program can be sent to student calculators using TI-Connect™.

**Solutions – Worksheet**

1 – 3.  $x = 2$  and  $x = -2$



```

NORMAL FLOAT AUTO REAL RADIAN MP
PROGRAM: QUAD
: Prompt A,B,C
: (-B+√(B²-(4*A*C)))/(2*A)→
D
: (-B-√(B²-(4*A*C)))/(2*A)→
E
: Disp D,E
:

```

```

NORMAL FLOAT AUTO REAL RADIAN MP
PrgmQUAD
A=?1
B=?0
C=? -4
                                     2
                                     -2
                                     Done

```

**Exercise 2**

The students again graph an equation, determine the zeros, and determine the factored form of the equation  $y = x^2 + x - 6$ .

Now, the procedure is familiar. The *QUAD* program can be used and the students only needs to enter in the correct values for  $a$ ,  $b$ , and  $c$ .

**Solutions – Worksheet**

4.  $(x + 3)(x - 2)$
5.  $x = -3$  and  $x = 2$

```

NORMAL FLOAT AUTO REAL RADIAN MP
PrgmQUAD
A=?1
B=?1
C=? -6
                                     2
                                     -3
                                     Done

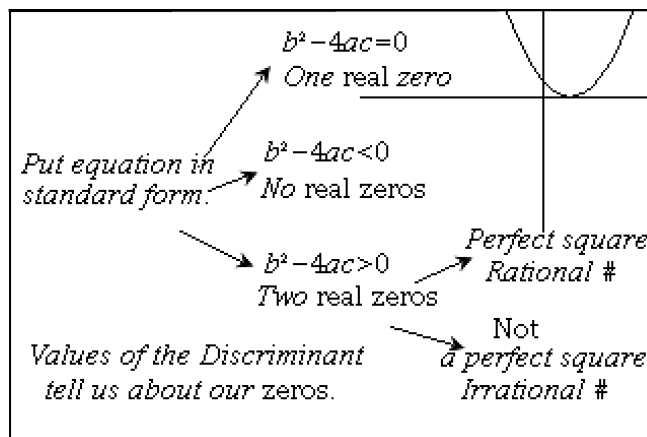
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**Extensions/Homework**

Students will use the formula provided in Question 10 to calculate the discriminant for several other quadratics.

Then, students are to examine the flow chart and discuss with students how to use it to answer their homework problems. Ask students to sketch a different graph for each scenario. One is already shown for them.



**Solutions – Worksheet**

1.  $x = 3$
2. no real zeros
3.  $x = -0.5$  and  $x = 1$
4.  $x = 1$  and  $x = -1.142857143$
5.  $x = 1.58113883$  and  $x = 1.58113883$
6. Check students' graphs.