Rational Quadratic Zeros

In this lesson, you will extend the code from **Integer Quadratic Zeros**. If you didn't complete the activity, complete that activity first or obtain the base code from your teacher.

In this lesson, you will create a game that lets you practice finding x-intercepts for equations in the form $y = ax^2 + bx + c$. These solutions will have one rational and one integer solution.

In the challenge, you will apply what you have learned to create a third game. This game will let you practice finding x-intercepts for equations in the form $y = ax^2 + bx + c$ where both x-intercepts are rational numbers.

Objectives:

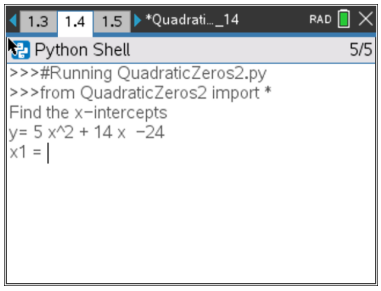
Programming Objectives:

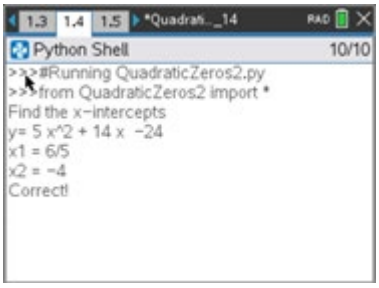
- Use the input function and a variable to collect and store data from a user
- Use the randint() function to generate random integers.
- Use a while loop to repeat code
- Use if..elif..else statements to make decisions.

Math Objectives:

- Explore how x-intercepts are related to factored quadratic equations
- Explore how to factor equation in standard form
- Factor quadratic equations with rational solutions

In this lesson, you will create a game that lets you practice finding x-intercepts for equations in the form $y = ax^2 + bx + c$. These solutions will have one rational and one integer solution.





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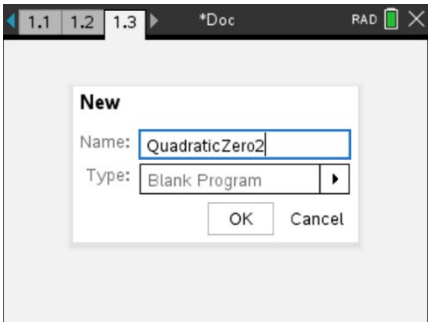
1. Insert a third page into the Integer Quadratic Zeros document.

   Add a python page.

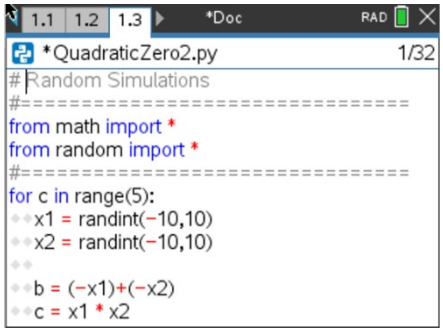
   Name the project **QuadraticZero2**



2. This project will be a modification of QuadraticZero.

   Go back to page 1.1.
   Select all the code (ctrl -> a)
   Copy the code (ctrl -> c)

   Go to page 1.3, QuadraticZero2
   Paste the code (**ctrl -> v)**



3. The factored equations in this problem will be of the type:

   y = (m*x – x1)(x – x2)

   In the first project, the line

   x2 = randint(-10,10)

   creates and stores random integer value from -10 to 10 in the variable x2

   Similarily, we will let m be an integer value from two to seven.

   Add a line of code after the x2 = randint(-10,10) to generate and store the value of m.

4. How does the addition of the cofficient m change the values of b and c in the code?

   Use distribution to solve and rewrite the equation in standard form.

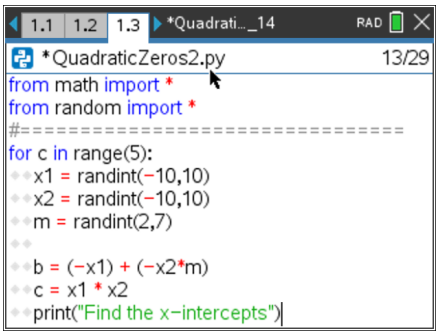
   y = (m*x – x1)(x – x2)

   b = _____

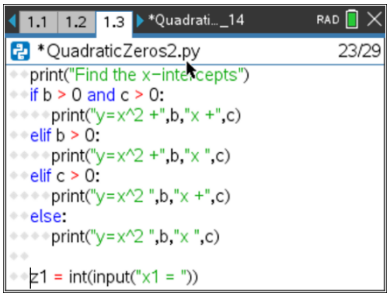
   c = _____

   Modify the values for b and c in the code if necessary.

5. Does your code match the code to the right?



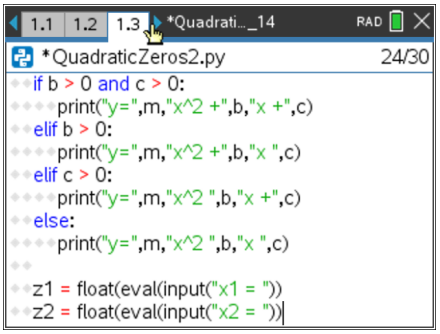
6. When distributing m in step 4, your final equation started with mx^2 instead of x^2.
How can you modify the print statements to show mx^2 instead of x^2?
Be careful. You want the value of m to display not the letter m.



Original

Modified

7. How does the user input change?



Let's look at a sample problem:

$4x^2 + 25x - 21 = 0$

$(4x - 3)(x + 7) = 0$

$4x - 3 = 0 \qquad x + 7 = 0$

$x = 3/4 \qquad x = -7$

Not all of the answers will be fractions, but some will be fractions.
The original code:

z1 = float(input("x1 = "))

will not allow the user to enter the division sign.

To preform a calculation then store as a float, use the eval() function.

Modify the two input lines to:

z1 = float(eval(input("x1 = "))

z2 = float(eval(input("x2 = "))

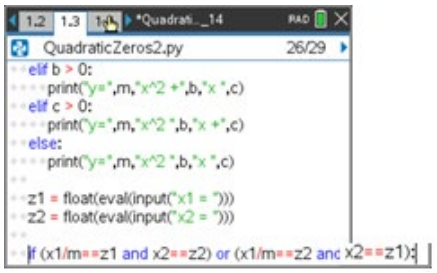
8. You have one more modification to make. The original project had the line:

   if (x1 == z1 and x2== z2) or (x1 == z2 and z1== x2):

   Modify the if statement so it include the new coefficient m.

   Execute your program. Verify your if statement works.

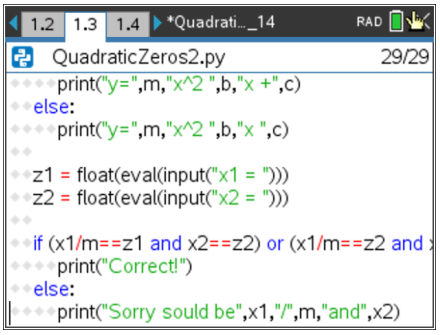
9. Did you change the code to:
   if (x1/m==z1 and x2==z2) or (x1/m==z2 and x2==z1):



10. Lastly, modify your print statement if the user input is incorrect.

    Original:
    print("Sorry sould be",x1,"and",x2)

    Change To:
    print("Sorry sould be",x1,"/",m,"and",x2)



Challenge:

Create a **QuadraticZero3** program that generates equations with two fractional x-intercepts.

For example, $6x^2 - 11x - 35 = 0$ factors to $(3x + 5)(2x - 7) = 0$.

The x-intercepts would be x = -5/3 and x = 7/2.