

Question-3.

Write a program to solve the quadratic equation

$$ax^2 + bx + c = 0$$

by the following quadratic formula:

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

Please note that

- 1) when a is 0, the equation becomes a linear equation which has only one root;
- 2) you can use sqrt function to compute the square root of a number (e.g., sqrt(16) gives you 4 and sqrt(4)==2);
- 3) you need to understand what is a complex number;
https://en.wikipedia.org/wiki/Complex_number.

For example, if we want to calculate $\sqrt{-4}$, which is illegal in the square root operation, we may apply the techniques of complex number.

$$\sqrt{-4} = \sqrt{-1 \times 4} = \sqrt{-1} \times \sqrt{4} = 2 \times \sqrt{-1}$$

And from the definition of complex number, we define that $\sqrt{-1} = i$. So the result of the expression is $2i$.

- a) If $a = 0$, the equation is linear, and only has one root.
- b) If $b^2 - 4ac = 0$, one real root.
- c) If $b^2 - 4ac > 0$, two real roots.
- d) If $b^2 - 4ac < 0$, two complex roots are computed (Note: for this case, we do integer conversion on both the real part and imaginary part of the complex roots)

Expected Outcomes

Example 1
Enter the value of a, b and c for quadratic equation: 1 -8 16 The Quadratic Equation has one real root. The root is 4
Example 2
Enter the value of a, b and c for quadratic equation: 1 -5 -6 The Quadratic Equation has two real roots. The roots are 6 and -1
Example 3
Enter the value of a, b and c for quadratic equation: 5 8 5 The Quadratic Equation has two Complex roots. The roots are -0.8+0.6i and -0.8-0.6i

Example 4

Enter the value of a, b and c for quadratic equation:

0

5

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The linear equation has one real root.

The root is -1.8