New York University
Computer Science Department
Introduction to Software Development
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Homework 5
Deadline: *See NYUclasses for the deadline, 5% off per day after the deadline (3 days maximum).*

Java Program to Solve Quadratic Equation

Background

In algebra, a quadratic equation is an equation that can be reordered in standard form. The standard form of a quadratic equation is **$ax^2+bx+c=0$**. It is also known as the second-degree equation.

In the equation $ax^2+bx+c=0$,

- a, b, and c are unknown values and a cannot be 0.
- x is an unknown variable.
- The formula to find the roots of the quadratic equation is known as the quadratic formula.

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

A quadratic equation has two roots and the roots depend on the discriminant. In the above formula, ($\sqrt{b^2-4ac}$) is called discriminant (d). The value of d may be positive, negative, or zero.

If the value of d is **positive**, both roots are real and different. It means there are two real solutions.

$$x1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$x2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

EQUATION(1)

If the value of d is **zero**, both roots are real and the same. It means we get one real solution.

$$x1 = x2 = \frac{-b}{2a}$$

EQUATION(2)

If the value of d is **negative**, both roots are distinct and imaginary or complex. It means that there are two complex solutions.

$$x1 = \frac{-b}{2a} + i\frac{\sqrt{-(b^2 - 4ac)}}{2a}$$

$$x2 = \frac{-b}{2a} - i\frac{\sqrt{-(b^2 - 4ac)}}{2a}$$

EQUATION(3)

Problem

Create a java program call it assignment5.java to calculate the roots of a given quadratic equation. Your program should ask the user to input the values of a, b and c, calculates the value of d then based on that does the following

i. If the value of d is positive, your program prints the following message where x_1 & x_2 are the roots of the equation calculated via equation 1

roots are real and distinct, first root r1 second root r2

ii. if d=0 , your program prints the following message where x1=x2 are the root of the equation calculated via equation 2

roots are real and equal, -x

iii. if d <0, then d=-d, your program prints the following message where r1,x2 are the roots of the equation calculated via equation 3

roots are imaginary, first root x1, and the second root is x2

Note:

- a,b,c are of type int
- Assume the user will enter the correct data type