

### **2.1.1. Roots of a Quadratic Equation**

#### **Algorithm: To Find the Roots of a Quadratic Equation**

Step 1: Start

Step 2: Read the values of a, b and c

Step 3: Calculate the discriminant

$$D = b * b - 4 * a * c$$

Step 4: Check the value of D

If  $D > 0$ , then

$$\text{root1} = (-b + \sqrt{D}) / (2 * a)$$

$$\text{root2} = (-b - \sqrt{D}) / (2 * a)$$

Print root1 and root2

Else if  $D = 0$ , then

$$\text{root} = -b / (2 * a)$$

Print  $\text{root1} = \text{root2} = \text{root}$

Else

$$\text{real\_part} = -b / (2 * a)$$

$$\text{imaginary\_part} = \sqrt{-D} / (2 * a)$$

Print

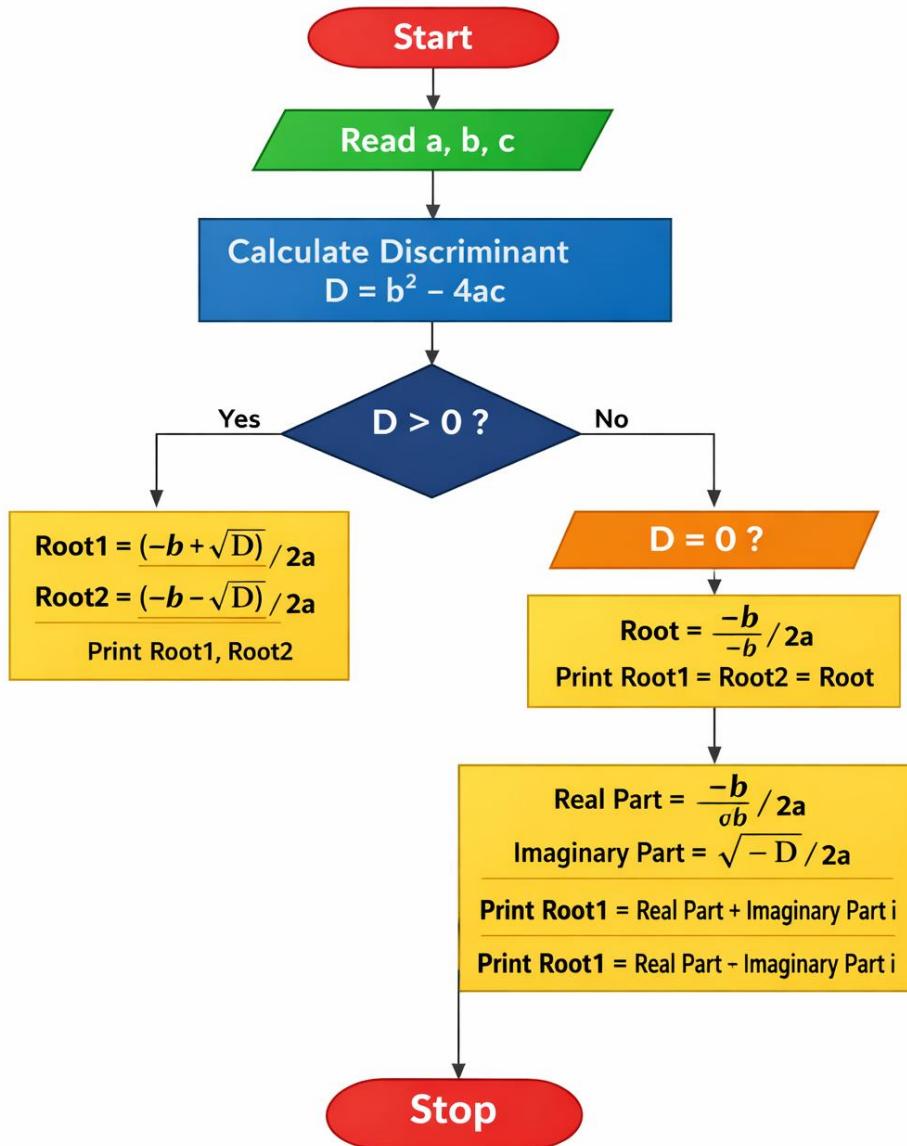
$$\text{root1} = \text{real\_part} + \text{imaginary\_part} i$$

$$\text{root2} = \text{real\_part} - \text{imaginary\_part} i$$

Step 5: Stop

**Flowchart:-**

## To Find the Roots of a Quadratic Equation



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### 2.1.1. Roots of a Quadratic Equation

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Write a program to find the roots of a quadratic equation, given its coefficients  $a$ ,  $b$ , and  $c$ . Use the quadratic formula: 
$$\frac{(-b \pm \sqrt{b^2 - 4ac})}{2a}$$

The discriminant  $D = b^2 - 4ac$  determines the nature of the roots:

- If  $D > 0$ : Roots are real and different
- If  $D = 0$ : Roots are real and the same
- If  $D < 0$ : Roots are imaginary

**Input Format:**

- Three space-separated integers representing the coefficients  $a$ ,  $b$ , and  $c$ , respectively.

**Output Format:**

- If roots are real and different, print:  

```
root1 = <Root1>
root2 = <Root2>
```

  - If roots are the same, print:  

```
root1 = root2 = <Root1>
```

Sample Test Cases +

Explorer quadratic...

```
1 import math
2
3 a, b, c = map(int, input().split())
4
5 D = b * b - 4 * a * c
6
7 if D > 0:
8     root1 = (-b + math.sqrt(D)) / (2 * a)
9     root2 = (-b - math.sqrt(D)) / (2 * a)
10    print(f"root1={root1:.2f}")
11    print(f"root2={root2:.2f}")
12
13 elif D == 0:
14     root = -b / (2 * a)
15     print(f"root1={root} = {root:.2f}")
16 else:
17     real_part = -b / (2 * a)
18     imaginary_part = math.sqrt(-D) / (2 * a)
19     print(f"root1={real_part:.2f}+{imaginary_part:.2f}i")
20     print(f"root2={real_part:.2f}-{imaginary_part:.2f}i")
21
22
```

Terminal Test cases