

### 2.1.1 Roots of Quadratic Equation

#### ALGORITHM

Step 1:- Start

Step 2:- Import the math library.

Step 3:- Read three integers a, b, and c (coefficients of the quadratic equation).

Step 4:- Calculate the discriminant

$$D = b^2 - 4ac$$

Step 5:- If  $D > 0$ :

Calculate two real and different roots using:

$$\frac{-b+\sqrt{D}}{2a}, \frac{-b-\sqrt{D}}{2a}$$

Print both roots up to 2 decimal places.

Step 6:- Else if  $D == 0$ :

Calculate the single repeated root:

$$\frac{-b}{2a}$$

Print the root twice up to 2 decimal places.

Step 7:- Else ( $D < 0$ ):

Calculate real part:

$$\frac{-b}{2a}$$

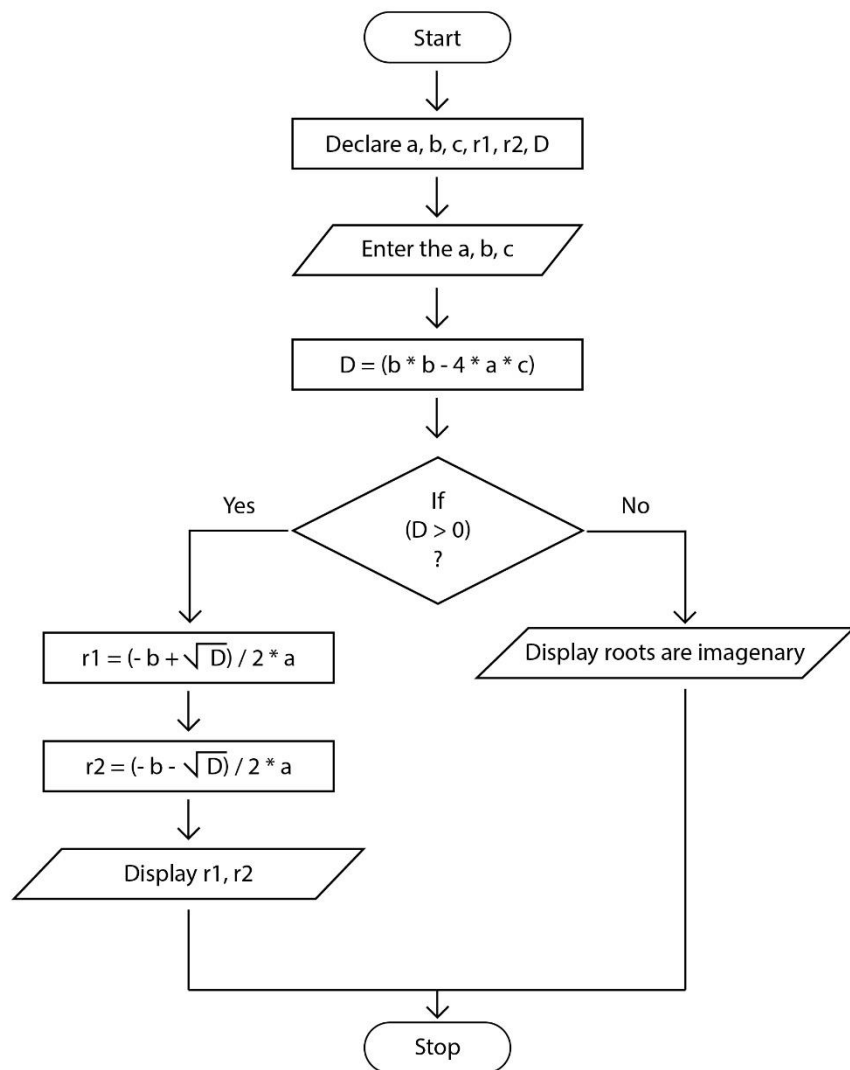
Calculate imaginary part:

$$\frac{\sqrt{-D}}{2a}$$

Print both complex roots up to 2 decimal places.

Step 8:- Stop

#### FLOWCHART



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## PHYTHON CODE

```
import math
```

```
a, b, c = map(int, input().split())
```

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

```
if D > 0:
```

```
    root1 = (-b + math.sqrt(D)) / (2*a)
```

```
root2 = (-b - math.sqrt(D)) / (2*a)
```

```
print(f"root1 = {root1:.2f}")
```

```
print(f"root2 = {root2:.2f}")
```

elif D == 0:

```
root = (-b) / (2*a)
```

```
print(f"root1 = root2 = {root:.2f}")
```

else:

```
real = (-b) / (2*a)
```

```
imag = math.sqrt(-D) / (2*a)
```

```
print(f"root1 = {real:.2f}+{imag:.2f}i")
```

```
print(f"root2 = {real:.2f}-{imag:.2f}i")
```

## EXECUTION

**2.1.1. Roots of a Quadratic Equation**

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**

**quadratic...**

```
1 a, b, c = map(float, input().split())
2 D = (b*b) - (4* a* c)
3 sqrtD = D ** 0.5
4 root1 = (-b+sqrtD)/(2*a)
5 root2 = (-b-sqrtD)/(2*a)
6 if D > 0:
7     print(f"root1 = {root1:.2f}")
8     print(f"root2 = {root2:.2f}")
9 elif D == 0:
10    print(f"root1 = root2 = {root1:.2f}")
11 else:
12    print(f"root1 = {root1.real:.2f}{root1.imag:+.2f}i")
13    print(f"root2 = {root2.real:.2f}{root2.imag:+.2f}i")
14
```

Average time: 0.006 s  
Maximum time: 0.014 s  
6.17 ms 14.00 ms

3 out of 3 shown test case(s) passed  
3 out of 3 hidden test case(s) passed

Test case 1 14 ms

Expected output: 1 -5 6  
Actual output: 1 -5 6

root1 → 3.00  
root2 → 2.00

Terminal Test cases

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