

Experiment - 2.1.1. Roots of a Quadratic Equation

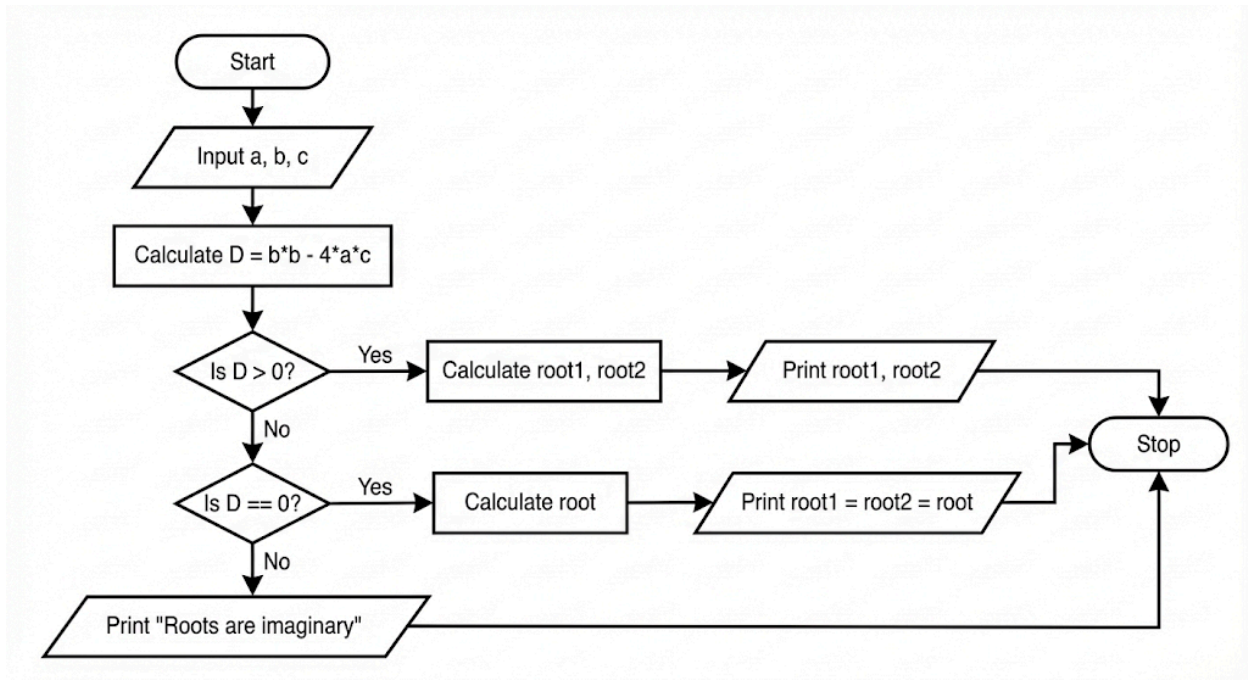
1. Aim

To design and implement a Python program that finds the roots of a quadratic equation $ax^2 + bx + c = 0$ using the quadratic formula. The program determines the nature of the roots (real and distinct, real and equal, or imaginary) based on the discriminant and formats $D = b^2 - 4ac$ the results to two decimal places.

2. Pseudocode

1. **START**
2. **READ** three space-separated integers a, b, and c.
3. **CALCULATE** the discriminant: $D = b^2 - 4ac$.
4. **IF** $D > 0$:
 - Calculate $root1 = \frac{-b + \sqrt{D}}{2a}$
 - Calculate $root2 = \frac{-b - \sqrt{D}}{2a}$
 - **PRINT** "root1 = [value]" and "root2 = [value]" formatted to 2 decimal places.
5. **ELSE IF** $D == 0$:
 - Calculate $root = \frac{-b}{2a}$
 - **PRINT** "root1 = root2 = [value]" formatted to 2 decimal places.
6. **ELSE** (if $D < 0$):
 - **PRINT** "Roots are imaginary".
7. **END**

3. Flowchart



4. Python Program

Program to find the roots of a quadratic equation
 # Input: Space-separated coefficients a, b, and c
 # Output: Roots formatted to 2 decimal places or nature of roots

```
import math
```

```
# Taking coefficients as input
a, b, c = map(int, input().split())
```

```
# Calculating the discriminant
D = b*b - 4*a*c
```

```
if D > 0:
    # Real and different roots
    sqrt_D = D ** 0.5
    root1 = (-b + sqrt_D) / (2 * a)
    root2 = (-b - sqrt_D) / (2 * a)
    print(f"root1 = {root1:.2f}")
    print(f"root2 = {root2:.2f}")
```

```
elif D == 0:
```

```
# Real and same roots
root = -b / (2 * a)
print(f"root1 = root2 = {root:.2f}")
```

else:

```
# Imaginary roots
print("Roots are imaginary")
```

5. Experiment Screenshot

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>
```
- If roots are imaginary, print:

Sample Test Cases

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

Average time: 0.004 s (4.17 ms) | Maximum time: 0.005 s (5.00 ms)

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

Test case 1 (5 ms)

Expected output:
1 -5 6
root1 ~ 3.00
root2 ~ 2.00

Actual output:
1 -5 6
root1 ~ 3.00

Terminal | Test cases

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