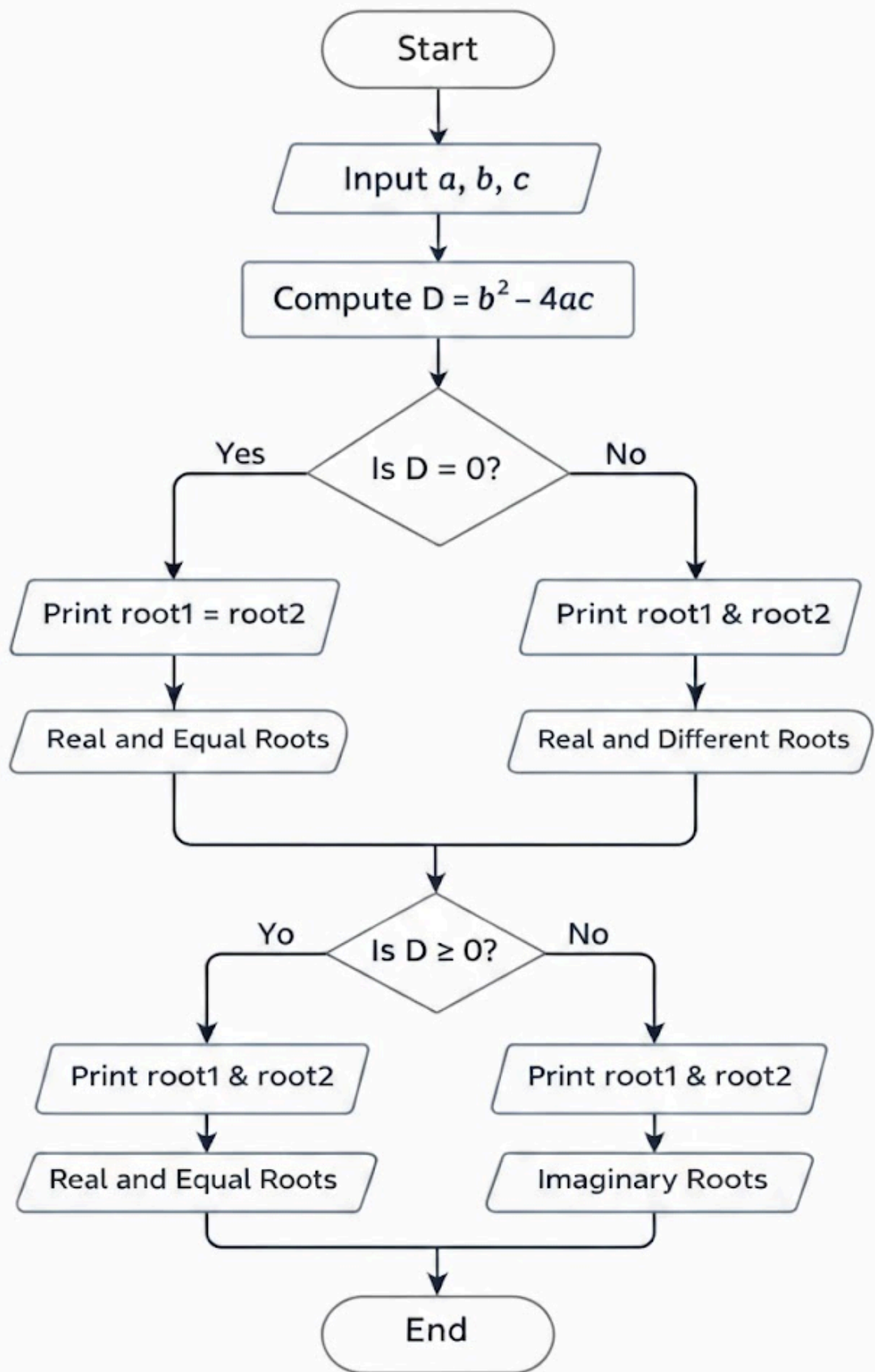## 2.1.1

Aim: To develop a Python program that accepts the coefficients of a quadratic equation and computes its roots by evaluating the discriminant, thereby identifying whether the roots are real and distinct, real and equal, or complex, and displaying the results accordingly.

Algorithm

1. Start

2. Read values of `a`, `b`, and `c`

3. Calculate discriminant `D` `=` `b²` `-` `4ac`

4. If `D` `>` `0`, calculate and print two real roots

5. If `D` `=` `0`, calculate and print equal roots

6. If `D` `<` `0`, calculate and print complex roots

7. Stop

```
                    ┌──────────┐
                    │  Start   │
                    └────┬─────┘
                         │
                         ▼
                 ┌───────────────┐
                /  Input a, b, c  /
                └───────┬───────┘
                        │
                        ▼
              ┌──────────────────────┐
              │ Compute D = $b^2 - 4ac$ │
              └──────────┬───────────┘
                         │
                         ▼
          Yes      ◇─────────────◇      No
        ┌──────────   Is D = 0?   ──────────┐
        │          ◇─────────────◇          │
        ▼                                    ▼
┌──────────────────┐              ┌──────────────────────┐
/ Print root1 = root2 /           /  Print root1 & root2   /
└────────┬─────────┘              └───────────┬──────────┘
         │                                    │
         ▼                                    ▼
┌──────────────────┐              ┌──────────────────────┐
/ Real and Equal Roots /          / Real and Different Roots /
└────────┬─────────┘              └───────────┬──────────┘
         │                                    │
         └─────────────────┬──────────────────┘
                           ▼
          Yo        ◇─────────────◇      No
        ┌──────────   Is D ≥ 0?   ──────────┐
        │          ◇─────────────◇          │
        ▼                                    ▼
┌──────────────────┐              ┌──────────────────────┐
/ Print root1 & root2 /           /  Print root1 & root2   /
└────────┬─────────┘              └───────────┬──────────┘
         │                                    │
         ▼                                    ▼
┌──────────────────┐              ┌──────────────────────┐
/ Real and Equal Roots /          /   Imaginary Roots     /
└────────┬─────────┘              └───────────┬──────────┘
         │                                    │
         └─────────────────┬──────────────────┘
                           ▼
                    ┌──────────┐
                    │   End    │
                    └──────────┘
```

Code:

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: $\dfrac{\left(-b \pm \sqrt{b^2 - 4ac}\right)}{2a}$

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   +

---

quadratic...   ⊙ Submit

```python
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_part = -b / (2*a)
    imaginary_part = math.sqrt(-D) / (2*a)
    print(f"root1 = {real_part:.2f}+{imaginary_part:.2f}i")
    print(f"root2 = {real_part:.2f}-{imaginary_part:.2f}i")

```

Terminal   Test cases