

### Problem

Problem : Create a program to solve the quadratic equations and find the values of x by using the provided formula for every a,b,c the users input.

### Explanation

First, we initialize the essential variables to store the data values, then we start with output questions for the user to input a, b, c. After that, we have to calculate the discriminant and classify the solution based on the value of the discriminant. Furthermore, the program will solve the value of x based on the classified formula. At the end, the program will output the values of x.

### Formulas

The quadratic formula

$$ax^2 + bx + c = 0$$

Solving x

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

Solving discriminant

$$\Delta = b^2 - 4ac$$

If  $\Delta > 0$ ,

$$x_1 = \frac{-b + \sqrt{\Delta}}{2a}$$

$$x_2 = \frac{-b - \sqrt{\Delta}}{2a}$$

If  $\Delta = 0$ ,

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

If  $\Delta < 0$ ,

there are no real roots (the roots are complex).

### Benefit

By using this program, users would be able to solve and calculate the quadratic equation with flexible variables up to the user's input. This program would benefit them by solving quadratic equations more effectively, efficiently and accurately.

### The Code Explained

```
#include <iostream>
#include <cmath>
using namespace std;
```

```
int main() {
    // variables
    int a,b,c; ⇒ initialize integers to store the values of variables used in the equation
```

```

// input
cout << "Enter value of a : "; ⇒ output question for the user to input the value of a
cin >> a; ⇒ store the user's input of a to a integer called "a"
cout << "\nEnter value of b : "; ⇒ output question for the user to input the value of b
cin >> b; ⇒ store the user's input of b to a integer called "b"
cout << "\nEnter value of c : "; ⇒ output question for the user to input the value of c
cin >> c; ⇒ store the user's input of c to a integer called "c"

// operations
float disc = (b*b) - (4*a*c); ⇒ calculate the discriminant and store it in an integer called
"disc"

if (disc > 0) { ⇒ check if the value of the discriminant if more than zero
    float sqdisc = sqrt(disc); ⇒ calculate the root of discriminant and store it in an integer called
"sqdisc"
    float xa = (-b + sqdisc) / (2*a); ⇒ calculate the first x and store it in an integer called
"xa"
    float xb = (-b - sqdisc) / (2*a); ⇒ calculate the second x and store it in an integer called
"xb"
    cout << "\nThe first root is " << xa; ⇒ output the value of the first x
    cout << "\nThe second root is " << xb; ⇒ output the value of the second x
}
else if (disc == 0) { ⇒ check if the value of the discriminant if equal to zero
    float x = -b/(2*a); ⇒ calculate the value of x and store it in an integer called "x"
    cout << "\nThe root is " << x; ⇒ output the value of the x
}
else if (disc < 0) { ⇒ check if the value of the discriminant if less than zero
    cout << "\nThere are no real roots (the roots are complex)"; ⇒ output the value of the x
(imaginary number)
}

return 0;
}

```