

→ WAP that prints all real solutions to the quadratic equation  $ax^2 + bx + c = 0$ . Read in  $a, b, c$  and use the quadratic formula. If the discriminant  $b^2 - 4ac$  is negative, display a message stating that there are no real solutions.

```
→ import java.util.Scanner;
import static java.lang.Math.sqrt;
import static java.lang.Math.abs;
public class Quadratic {
    public static void main (String[] args)
    {
        float a, b, c, d;
        double double x1, x2;
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter coefficients:");
        a = sc.nextFloat();
        b = sc.nextFloat();
        c = sc.nextFloat();
        if (a == 0)
            System.out.println("Invalid input");
    }
}
```

else {

$$d = b^2 - 4 * a * c;$$

if (d > 0)

{ System.out.println("Roots are real and distinct");

$$x_1 = \frac{-b + \text{Math.sqrt}(d)}{2 * a};$$

$$x_2 = \frac{-b - \text{Math.sqrt}(d)}{2 * a};$$

System.out.println("root1 = " + x1 + " root2 = " + x2);

} else if (d == 0)

{ System.out.println("Roots are real and equal");

$$x_1 = x_2 = -b / (2 * a);$$

System.out.println("root1 = " + x1 + " root2 = " + x2);

} else {

System.out.println("Roots are imaginary");

$$x_1 = -b / (2 * a);$$

$$x_2 = \text{Math.sqrt}(\text{abs}(d)) / (2 * a);$$

System.out.println("root1 = " + x1 + "i" + x2 +  
" root2 = " + x1 + "-i" + x2);

}

}

}

}



# - Flow chart

Start

Initialise a, b, c, d, x1, x2

Read a, b, c from user

if a = 0

True → Print Invalid input

False

$d = b^2 - 4ac$

if d > 0

True → Print roots are real and distinct

False

$x_1 = \frac{-b + \sqrt{d}}{2a}$   $x_2 = \frac{-b - \sqrt{d}}{2a}$

if d = 0

True → Print roots are real & equal

False

$x_1 = x_2 = -b/2a$

else d < 0

True → Print roots are imaginary

$x_1 = \frac{-b + i\sqrt{d}}{2a}$   $x_2 = \frac{-b - i\sqrt{d}}{2a}$

Stop

Output:

2 4 2

roots are real and equal

$$\text{root 1} = -1.0 \quad \text{root 2} = -1.0$$

0 3 5

Invalid input

2 5 4

roots are imaginary

$$\text{root 1} = -1.25 + i0.6614 \quad \text{root 2} = -1.25 - i0.6614$$

1 3 2

roots are real and distinct

$$\text{root 1} = -1.0 \quad \text{root 2} = -2.0$$

~~Ans~~  
22/12/23

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```
C:\Users\bmsce\Desktop\1bm22cs027 ooj>javac Quadratic.java
```

```
C:\Users\bmsce\Desktop\1bm22cs027 ooj>java Quadratic
```

```
AKANKSHA SINGA
```

```
1BM22CS027
```

```
2
```

```
4
```

```
2
```

```
roots are real and equal
```

```
root1= -1.0 root2= -1.0
```

```
C:\Users\bmsce\Desktop\1bm22cs027 ooj>javac Quadratic.java
```

```
C:\Users\bmsce\Desktop\1bm22cs027 ooj>java Quadratic
```

```
AKANKSHA SINGA
```

```
1BM22CS027
```

```
0
```

```
3
```

```
5
```

```
Invalid input
```

```
C:\Users\bmsce\Desktop\1bm22cs027 ooj>javac Quadratic.java
```

```
C:\Users\bmsce\Desktop\1bm22cs027 ooj>java Quadratic
```

```
AKANKSHA SINGA
```

```
1BM22CS027
```

```
2
```

```
5
```

```
4
```

```
roots are imaginary
```

```
root1= -1.25+ i0.6614378277661477 root2= -1.25- i0.6614378277661477
```

```
C:\Users\bmsce\Desktop\1bm22cs027 ooj>javac Quadratic.java
```

```
C:\Users\bmsce\Desktop\1bm22cs027 ooj>java Quadratic
```

```
AKANKSHA SINGA
```

```
1BM22CS027
```

```
1
```

```
3
```

```
2
```

```
roots are real and distinct
```

```
root1= -1.0 root2= -2.0
```