

(1) Quadratic Equations

```
import java.lang.Math;
import java.util.Scanner;
class Quad
```

```
{
```

```
    public static void main (String args[])
```

```
{
```

```
    Scanner s = new Scanner(System.in);
```

```
    System.out.println("Enter the coefficients a, b, c");
```

```
    double a = s.nextInt();
```

```
    double b = s.nextInt();
```

```
    double c = s.nextInt();
```

```
    double x1, x2, d;
```

```
    d = b*b - 4*a*c;
```

```
    double res = Math.sqrt(d);
```

```
    if (a == 0)
```

```
        System.out.println("Invalid input for a");
```

```
    else
```

```
{
```

```
        if (d > 0)
```

```
{
```

```
            System.out.println("The roots are real and distinct");
```

```
x1 = (-b + Math.sqrt(d)) / (2*a);
```

```
            x1 = (-b + res) / (2*a);
```

```
            x2 = (-b - res) / (2*a);
```

```
            System.out.println("The roots are: " + x1 + " " + x2);
```

```
        }
```

```
        else if (d == 0)
```

```
{
```

```

    x1 = x2 = (-b)/(2*a);
    System.out.println("The roots are equal");
}
else
{
    x1 = -b/(2*a);
    x2 = (Math.sqrt(Math.abs(d)))/(2*a);
    System.out.println("The roots have no real
        solution and are imaginary");
    System.out.println(x1+"+i"+x2+"-i"+x2);
}
}
}
}
}

```

Output:-

Enter the coefficients a, b, c

0

1

2

Invalid input for a

Enter the coefficients a, b, c

1

2

3

The roots have no real solution and are imaginary

-1.0 + i 1.41421356

1.41421356 - i 1.41421356

Enter the coefficients a, b, c

1

2

1

The roots are real and equal

Roots are $x_1 = x_2 = -1.0$

Enter the coefficients a, b, c

1

4

1

The roots are real and distinct

The roots are: 0.2679491924 -3.7320508075

Command Prompt

Enter the coefficients a,b,c

0

2

3

Invalid input for a

C:\Users\bmsce\Desktop\Aryan>java Quad

Enter the coefficients a,b,c

1

2

1

The roots are real and equal

Roots are $r_1=r_2=-1.0$

C:\Users\bmsce\Desktop\Aryan>java Quad

Enter the coefficients a,b,c

1

5

1

The roots are real and distinct

The roots are: -0.20871215252208009 -4.7912878474779195

C:\Users\bmsce\Desktop\Aryan>java Quad

Enter the coefficients a,b,c

1

2

3

The roots have no real solution and are imaginary