

question1. Develop a Java program 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.

Java program

```
import java.util.*;
import java.lang.Math;

class root {
    public static void main(String args[]){
        Scanner sc = new Scanner(System.in);
        System.out.println("enter the values a,b,c:");
        int a=sc.nextInt();
        int b=sc.nextInt();
        int c=sc.nextInt();
        int d=(b*b)-(4*a*c);
        double r1,r2;
        if(d==0)
        {
            r1=r2=(-b)/(2*a);
            System.out.println("the roots are real and equal");
            System.out.println("the roots are r1="+r1);
            System.out.println("r2="+r2);
        }
        else if(d>0)
        {
            System.out.println("the roots are real and distinct:");
            r1=(-b)+Math.sqrt(d)/(2*a);
            r2=(-b)-Math.sqrt(d)/(2*a);
            System.out.println("the roots are r1="+r1);
            System.out.println("r2="+r2);
        }
        else
        {
            System.out.println("the roots are imaginary and distinct:");
            double x=(-b)/(2*a);
            double y=(Math.sqrt(-d)/2*a);
            System.out.println("the roots are r1="+x+" +i" + y );
            System.out.println("the roots are r2="+x+" -i" + y);
        }
    }
}
```

Output:

1. Imaginary and distinct

```
Command Prompt
C:\Users\STUDENT\Desktop\vishal5>set path ="C:\Program Files\Java\jdk-19\bin"

C:\Users\STUDENT\Desktop\vishal5>javac root.java

C:\Users\STUDENT\Desktop\vishal5>java root
enter the values a,b,c:
2 4 7
the roots are imaginary and distinct:
the roots are r1=-1.0+i6.324555320336759
the roots are r2=-1.0-i6.324555320336759

C:\Users\STUDENT\Desktop\vishal5>javac root.java

C:\Users\STUDENT\Desktop\vishal5>java root
enter the values a,b,c:
3 6 3
the roots are real and equal
the roots are r1=-1.0
r2=-1.0

C:\Users\STUDENT\Desktop\vishal5>javac root.java

C:\Users\STUDENT\Desktop\vishal5>java root
enter the values a,b,c:
1 4 5
the roots are imaginary and distinct:
the roots are r1=-2.0+i1.0
the roots are r2=-2.0-i1.0

C:\Users\STUDENT\Desktop\vishal5>
```

2. Real and equal

```
Command Prompt
Microsoft Windows [Version 10.0.22000.1219]
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C:\Users\STUDENT>cd C:\Users\STUDENT\Desktop\vishal5

C:\Users\STUDENT\Desktop\vishal5>set path = "C:\Program Files\Java\jdk-19\bin"

C:\Users\STUDENT\Desktop\vishal5> javac root.java

C:\Users\STUDENT\Desktop\vishal5>java root
enter the values a,b,c:
3 6 3
the roots are real and equal
the roots are r1=-1.0
r2=-1.0

C:\Users\STUDENT\Desktop\vishal5>
```

3. Real And Distinct

```
C:\Users\STUDENT\Desktop\vishal5>java root
enter the values a,b,c:
1 3 -4
the roots are real and distinct:
the roots are r1=1.0
r2=-4.0
```