

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

```

import java.util.Scanner;
class quad {
    public static void main(String args[])
    {
        System.out.println("Enter the coefficients
                           a & b & c of quadratic equation
                           ax2 + bx + c = 0 & where a != 0");
        Scanner sc = new Scanner(System.in);
        double a = sc.nextInt();
        if (a == 0)
        {
            System.out.println("a can't be zero");
        }
        else
        {
            double b = sc.nextInt();
            double c = sc.nextInt();
            double z = b * b - 4 * a * c;
            Equation eq = new Equation();

```

```
if (z < 0)
{
    System.out.println("There are no real
solutions");
}
else if (z == 0)
{
    System.out.println("The solutions are
real & equal");
    eq.check(a,b,c);
    eq.display();
}
else
{
    System.out.println("The Solutions are
real and distinct");
    eq.check(a,b,c);
    eq.display();
}
```

}

class Equation

{

```
double a;
double b;
double c;
double m1;
double m2;
```

```
void check (double a, double b, double c)
```

{

```
this.a = a;  
this.b = b;  
this.c = c;  
double z = Math.pow(b*b - 4*a*c, 0.5);
```

$$\alpha_1 = (-b - z) / (2 * a);$$

$$\alpha_2 = (-b + z) / (2 * a);$$

{

```
void display()
```

{

```
System.out.println(\alpha_1);
```

```
System.out.println(\alpha_2);
```

}

{

LAB - 2

→ Develop a java program to create a class Student with members USN, name, credits an array of credits and an array marks. Include methods to access & display details and a method to calculate SGPA of a student.

```
import java.util.Scanner;  
class Student  
{  
    private String USN;  
    private String name;  
    private int n;  
    private double SGPA = 0;  
    private int totalCredits = 0;  
    Scanner ss = new Scanner(System.in);  
  
    void Details()  
    {  
        System.out.print("Enter USN of the student");  
        USN = ss.nextLine();  
        System.out.print("Enter Name of student");  
        name = ss.nextLine();  
        System.out.print("Enter no. of Subjects ");  
        n = ss.nextInt();  
        int credits[] = new int[n];  
        double marks[] = new double[n];
```

$$SLPA = SLPA + (4 * \text{card}(t))$$

else if (work <= 60 && work >= 69)

$$SLPA = SLPA + (8 * \text{card}(t))$$

else if (work <= 60 && work <= 99)

$$SLPA = SLPA + (9 * \text{card}(t))$$

else if (work <= 80 && work <= 89)

$$SLPA = SLPA + (10 * \text{card}(t))$$

if (work <= 90 && work <= 100)

total credits = total(credits + credits);

}

No i calculate (int credits, double work, int j)

}

}

(calculate (credits[i], work[i], i))

$$works[i] = ss \cdot nextInt();$$

((i+1)+, " zu sujet " +

system.out.println (" Es ist work in

$$credits[i] = ss \cdot nextInt();$$

((i+1)+, " zu sujet " +

system.out.println (" Es ist credits added

)

$$for (int i = 1; i < n; i++)$$

system.out.println (" *** Es ist detail of student " +

```
else if (marks >= 80 & & mark <= 59)
    SGPA = SGPA + ( 6 * credit );
else if ( mark >= 40 & & mark <= 49)
    SGPA = SGPA + ( 5 * credit );
else
    System.out.println(" Failed in Subject"
        ,(j+1));
}
```

```
void Display()
```

```
{
```

```
    System.out.println(" Details of the Student ");
    System.out.println(" USN: " + USN );
    System.out.println(" Name: " + name );
    System.out.println(" SGPA of student " +(SGPA/
        totalcredit));
}
```

```
}
```

```
class Main
```

```
{
```

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

```
{
```

```
    Student s1 = new Student();
```

```
    s1.Details();
```

```
    s1.Display();
```

```
}
```

>Create a class Book with which contains four members : name, author, price, num-pages. Include a constructor to set the values for the student members. Include methods to set & get the details of the objects. Include toString() method that could display the complete details of the book. Develop a Java prog. to create n books objects.

```
import java.util.Scanner;  
class book{  
    String author;  
    String name;  
    int num_page;  
    double price;  
    Scanner sc = new Scanner(System.in);  
    void getDetails(){  
        System.out.println("Enter Name of Author:");  
        author = sc.next();  
        System.out.println("Enter the Title of Book:");  
        name = sc.next();  
        System.out.println("Enter the No. of Pages:");  
        num_page = sc.nextInt();  
        System.out.println("Enter Cost of book:");  
        price = sc.nextDouble();  
    }  
}
```

```
    public String toString () {
```

```
        return (" Author : " + author + " In Book : " +  
                " Title : " + name + " In Page : " +  
                " + num - pages + " In Price : " +  
                price);
```

```
}
```

```
book () {
```

```
    author = " Hector Garcia , Albert  
            Lieberman ";
```

```
    name = " Ikigai : The Japanese Secret  
            to a Long & Happy Life ";
```

```
    num - pages = 143;
```

```
    price = 362.00;
```

```
}
```

```
void display () {
```

```
    System.out.println(" Author : " + author);
```

```
    System.out.println(" Book title : " + name);
```

```
    System.out.println(" Number of Pages : "  
                        + num - pages);
```

```
    System.out.println(" Price : " + price);
```

```
}
```

```
}
```

```
class booklib {
```

```
    public static void main (String ss[]) {
```

```
Scanner sc = new Scanner (System.in);
int n;
Book b1 = new Book();
System.out.println("It ****");
a s1.display();
System.out.println("It ****");
System.out.println("Enter the Number
of books: ");
n = sc.nextInt();
Book b[] = new Book[n];
for(int i=0; i<n; i++) {
    System.out.println("It ****");
    System.out.println("Enter the details of
book: " + (i+1));
    b[i] = new Book();
    n = sc.nextInt();
    b[i].getDetails();
    Book b[] = new Book[n];
}
System.out.println("All the
Books we have **");
for(int i=0; i<n; i++) {
    System.out.println("In book **");
    System.out.println("Book :" + (i+1));
    System.out.println(b[i]);
}
}
```

LAB - 4

► Abstract Class named Shape

```
abstract class shape {
```

```
    int a = 3, b = 4;
```

```
    abstract public void print-area();
```

```
}
```

```
class rectangle extends Shape {
```

```
    public int area-rect;
```

```
    @Override
```

```
    public void print-area() {
```

```
        area-rect = a * b;
```

```
        System.out.println("The area of rectangle  
is : " + area-rect);
```

```
}
```

```
class triangle extends Shape
```

```
{
```

```
    int area-tri;
```

```
    @Override
```

```
    public void print-area()
```

```
{
```

```
    area-tri = (int) (0.5 * a * b);
```

```
    System.out.println("The area of triangle  
is : " + area-tri);
```

```
}
```

```
}
```

```
class circle extends Shape
{
    int area-circle;
    @override
    public static void print-area()
    {
        area-circle = (int) (3.14 * a * a);
        System.out.println("The area of circle
                           is : " + area-circle);
    }
}
```

```
class abs {
    public static void main ( String[] args )
    {
        rectangle rec = new rectangle();
        rec.print-area();
        triangle tri = new triangle();
        tri.print-area();
        circle cir = new circle();
        cir.print-area();
    }
}
```

LAB - 4

Q)

Class BANK for two acc. Saving & Current

```
import java.util.Scanner;  
class account {  
    private String name;  
    private long account-number;  
    private int account-type;  
    double balance;  
  
    void set-data() {  
        Scanner sc = new Scanner(System.in);  
        System.out.println("Enter Acc. holder name");  
        name = sc.next();  
        System.out.println("Enter the acc.no.");  
        account-number = sc.nextLong();  
        System.out.println("Enter the choose  
the account type: 1. In.  
Saving acc 2. Current acc");  
        account-type = sc.nextInt();  
    }  
  
    void get-data() {  
        System.out.println("Acc. holder : " + name);  
        System.out.println("Acc. no. : " + account-number);  
    }  
}
```

```
int return-account-type () {
    return account-type;
}

}

class Saving extends account
{
    Scanner ss = new Scanner (System.in);
    double amount;

    void get-sav-balance ()
    {
        System.out.println ("Enter the Amnt. to be
                           placed in your Saving Acc.");
        amount = ss.nextDouble();
        balance += amount;
    }

    void display-sav-balance ()
    {
        System.out.println ("balance = " + balance);
    }

    void Compute-sav-interest ()
    {
        System.out.println ("*** Calculating
                           Compound Interest ***");
        System.out.println ("Enter annual interest
                           rate.");
    }
}
```

```
float rate = ss.nextDouble();
System.out.println("Enter time in years:");
float time = ss.nextDouble();
System.out.println("Enter principal:");
float principle = ss.nextDouble();
float CI = (float)((principle * (Math.pow((1+rate/(12*100)),(12*time)) - principle));
```

```
System.out.println("The Compound Interest is:
" + CI);
```

```
balance = balance + CI;
```

```
System.out.println("Balance after adding
Interest: " + balance);
```

```
}
```

```
void withdraw_sav()
```

```
{
```

```
System.out.println("Enter the amount to
be withdrawn");
```

```
amount = ss.nextDouble();
```

```
balance = balance - amount;
```

```
}
```

```
}
```

Class Current extends account

{

Scanner ss = new Scanner (System.in);

double amount;

final double min-balance = 500;

void get-curr-balance()

{

System.out.println ("Enter the amount
to be placed in your
current account");

account = ss.nextDouble();

balance += amount;

}

void display-curr-balance()

{

System.out.println ("Balance = " + balance);

}

Void compute-curr-service-charges()

{ if (balance < min-balance)

{ {

System.out.println ("Service tax of

Rs. 100 shall be
levied");

balance = balance - 100;

}

```
else
{
    System.out.println("Minimum balance
is maintained");
}

void withdraw - cur()
{
    System.out.println("Enter the amount to
be withdrawn");
    amount = ss.nextDouble();
    balance = balance - amount;
}

class Bank
{
    public static void main (String args[])
    {
        Scanner ss = new Scanner (System.in);
        int type;
        System.out.println("Enter the bank
details");
        account acc = new account();
        acc . get - data();
        type = acc . return - account - type();
        if (type == 1)
        {
            System.out.println(" SAVINGS
acc - get - data());
        }
    }
}
```

```
Saving sav = new Saving();
```

```
sav.get-sav-balance();
```

```
sav.get-sav-display-sav-balance();
```

```
System.out.println("Do you want to calculate  
Interest or not in  
int ch = ss.nextt If yes press 1 else 0");
```

```
int ch = ss.nextInt();
```

```
if(ch == 1)
```

```
{
```

```
sav.compute-sav-interest();
```

```
}
```

```
sav.display-sav-displaybalance();
```

```
sav.withdraw-sav();
```

```
sav.display-sav-balance();
```

```
}
```

```
if(type == 2)
```

```
{
```

```
System.out.println("Current Account");
```

```
acc.get-data();
```

```
current cur = new Current();
```

```
cur.get-cur-balance();
```

```
cur.display-cur-balance();
```

```
cur.compute-cur-services-charges();
```

```
cur.display-cur-balance();
```

```
cur.withdraw-cur();
```

```
cur.display-cur-balance();
```

```
} } }
```

LAB - 6

HEMANG SINGH
IBM19CS061

➤ Packages

Student.java

```
package CIE;
import java.util.Scanner;
public class Student
{
    public String name;
    public String USN;
    public int sem;
    public void display()
    {
        Scanner s = new Scanner (System.in);
        System.out.println(" Name:");
        name = s.next();
        System.out.println(" USN:");
        USN = s.next();
        System.out.println(" Semester:");
        sem = s.nextInt();
    }
}
```

Internals.java

```
package CIE;
import java.util.Scanner;
public class Internals extends Student
{
    public double ciem[];
    public void display(){
        ciem = new double[5];
        Scanner t = new Scanner (System.in);
        System.out.println ("CIE Marks for 5 Subjects (out of 50):");
        for(int i=0; i<5; i++)
            ciem[i] = t.nextDouble();
    }
}
```

Externals.java

```
package SEE;
import java.util.*;
import CIE.*;
public class Externals extends CIE.Student
```

```
{  
    public double seem[];  
    public void display() {  
        seem = new double[5];  
        Scanner s = new Scanner(System.in);  
        System.out.println("SEE Marks for  
        5 subjects (out of 100):");  
        for(int i=0; i<5; i++)  
            seem[i] = s.nextDouble();  
    }  
}
```

Main.java

```
import CIF.*;  
import SEE.*;  
import java.util.Scanner;  
public class Main  
{  
    public static void main (String args[])  
    {  
        int n;  
        Scanner s = new Scanner (System.in);  
        System.out.println("Enter the number of  
        Students : ");  
        n = s.nextInt();  
    }  
}
```


➤ Demonstration Generics

```
Class myGen<a,b>{
    a obj1;
    b obj2;
```

```
myGen(a obj1, b obj2){
    this.obj1 = obj1;
    this.obj2 = obj2;
}
```

```
Void Display () {
    System.out.println("obj1");
    System.out.println(obj2);
}
```

```
g
class Genericsmain
public static void main (String args[])
{
    myGen<String, Integer> myG1
        = new myGen<String, Integer>
            ("Mike", 56);
```

```
myGen<Character, Double> myG2
    = new myGen<

```

```
<Character, Double> ('A', 84.848);
```

my G1. Display();

my G2. Display();

}

}

1) Demonstrate handling of exceptions

```
import java.util.Scanner;  
class WrongAge extends Exception{  
    public WrongAge (String s){  
        super(s);  
    }  
}  
class Father{  
    int fatherAge;  
    int sonAge;  
    Father (int fAge, int sAge) throws WrongAge{  
        if (fAge == sAge){  
            throw new WrongAge ("father's  
age is equal to  
son's age");  
        }  
        else {  
            this.fatherAge = fAge;  
            this.sonAge = sAge;  
        }  
    }  
}
```

```
class Son extends Father{
```

```
    Son( int fAge, int sAge ) throws WrongAge{
```

```
        super( fAge, sAge );
```

```
        if ( sAge >= fAge ) {
```

```
            throw new WrongAge( "Son's age" );
```

```
            is equal to or  
            greater than father's
```

```
            age" );
```

```
}
```

```
{
```

```
void Display(){
```

```
    System.out.println( "Father's age:" + fatherAge );
```

```
    System.out.println( "Son's age :" + sonAge );
```

```
8
```

```
{
```

```
Class wrongage wrongage_main{
```

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

```
        int fAge , sAge ;
```

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

```
        System.out.println( "Enter Father's age:" );
```

```
        fAge = sc.nextInt();
```

```
        System.out.println( "Enter Son's age:" );
```

```
        sAge = sc.nextInt();
```

```
try {  
    Son son = new Son(fAge, $Age);  
    son.Display();  
} Catch (WrongAge err) {  
    System.out.println("Exception " + err);  
}  
}  
}
```

> Threads

```
import java.util.Scanner;  
class BMS extends Thread {  
    int time;  
    String str;  
    BMS(int t, String str) {  
        time = t;  
        str = str;  
    }  
    public void run() {  
        try {  
            int i = 0;  
            while (i < 5) {  
                sleep(time);  
                System.out.println(str);  
                i++;  
            }  
        } catch (Exception e) {}  
    }  
}  
class MultiThreadDemo {  
    public static void main (String args[]) {  
        Scanner ss = new Scanner (System.in);  
    }  
}
```

```
int[] t = new int[3];
for(int i = 0; i < 2; i++) {
    System.out.println("Enter the time delay:");
    t[i] = ss.nextInt();
    System.out.println("Enter the string to
be displayed:");
    s[i] = ss.next();
}
BMS t1 = new BMS(t[0], s[0]);
BMS t2 = new BMS(t[1], s[1]);
t1.start();
t2.start();
}
```

LAB - 10

HEMANG SINGH
IBMI9CS061

▷ Divide two no. and print result.

```
import java.awt.*;
import java.awt.event.*;
class Tab10 extends Frame implements ActionListener
{
    Textfield Num1, Num2;
    Button divide = new Button("Divide");
    float res = 0;
    String error = "";
    public Tab10()
    {
        setLayout(new FlowLayout());
        Num1 = new Textfield(1);
        Num2 = new Textfield(1);
        Label Num1L = new Label("Num1:", Label.RIGHT);
        Label Num2L = new Label("Num2:", Label.RIGHT);
        add(Num1); add(Num1L);
        add(Num2); add(Num2L);
        add(divide);
        divide.addActionListener(this);
        addWindowListener(new WinAdapter());
    }
}
```

```
public void actionPerformed (ActionEvent ae) {  
    if (ae.getSource() == divide) {  
        try {  
            int n1 = Integer.parseInt (Num1.getText());  
            int n2 = Integer.parseInt (Num2.getText());  
            if (n2 <= 0)  
                throw new ArithmeticException ("Final  
                res = (float) n1/n2;  
            }  
        catch (NumberFormatException exception) {  
            res = 0;  
            error = "Please enter an integer!!";  
        }  
        catch (ArithmeticException exception) {  
            res = 0;  
            error = "Can not divide by zero!!";  
        }  
        repaint();  
    }  
}
```

```
public void paint (Graphics g) {  
    g.drawString ("Result" + String.valueOf (res), 20, 100);  
    g.drawString ("Error:" + error, 20, 150);  
}
```

```
public static void main (String [] args) {  
    Lab10 p = new Lab10();  
    p.setSize(new Dimension(400,250));  
    p.setTitle(" Divide");  
    p.setVisible(true);
```

{

{

```
class WinAdapter extends WindowAdapter {
```

```
    public void windowClosing (WindowEvent wef)  
        System.exit(0);
```

{

{