B.M.S. COLLEGE OF ENGINEERING

Basavanagudi, Bengaluru- 560019

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LAB REPORT

On

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted By:

AASTHA PRIYA

1BM22CS003

In partial fulfilment of

BACHELOR OF ENGINEERING

In

COMPUTER SCIENCE AND ENGINEERING

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Faculty-In-Charge

Swathi Sridharan

Assistant Professor

Department of Computer Science and Engineering

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Lab Program 1:

Develop a Java program that prints all real solutions to the quadratic equation ax2+bx+c= 0. Read in a, b, c and use the quadratic formula. If the discriminate b2-4ac is negative, display a message stating that there are no real solutions.

Code:

```
import java.util.Scanner;
import java.lang.Math;
class prog1
{
public static void main(String xx[])
{
float a,b,c,d,r1,r2;
Scanner s1=new Scanner(System.in);
System.out.println("enter the coefficients");
a=s1.nextFloat();
b=s1.nextFloat();
c=s1.nextFloat();
d=b*b-(4*a*c);
if(d>0)
{
r1=(-b+(float)Math.sqrt(d))/(2*a);
r2=(-b-(float)Math.sqrt(d))/(2*a);
System.out.println("r1="+r1);
System.out.println("r2="+r2);
}
else if(d==0)
{
r1=(-b)/(2*a);
r2=(-b)/(2*a);
System.out.println("r1="+r1);
System.out.println("r2="+r2);
}
else
{
r1=(float)Math.sqrt(-d)/(2*a);
r2=-1*r1;
System.out.println("roots:\n"+"r1="+(-b/(2*a))+"+"+r1+"i"+"\nr2="+(-b/(2*a))+r2+"i");
}
}
```

}

Ouput:

```
PS C:\Users\aasth\OneDrive\Desktop\java>  c:; cd 'c:\Users\aasth\OneDrive\Desktop\java'; & 'C:\
view' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\aasth\AppData\Roaming\Code\User
dhat.java\jdt_ws\java_d99af839\bin' 'program1'
Enter coefficient a:
1
Enter coefficient b:
1
Enter coefficient c:
1
No real solutions. Discriminant is negative.
Name: Aastha Priya  USN: 1BM22CS003
PS C:\Users\aasth\OneDrive\Desktop\java>  c:; cd 'c:\Users\aasth\OneDrive\Desktop\java'; & 'C:\
view' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\aasth\AppData\Roaming\Code\User
dhat.java\jdt_ws\java_d99af839\bin' 'program1'
Enter coefficient a:
1
Enter coefficient b:
3
Enter coefficient c:
2
Two real solutions: -1.0 and -2.0
Name: Aastha Priya  USN: 1BM22CS003
PS C:\Users\aasth\OneDrive\Desktop\java>  c:; cd 'c:\Users\aasth\OneDrive\Desktop\java'; & 'C:\
view' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\aasth\AppData\Roaming\Code\User
dhat.java\jdt_ws\java_d99af839\bin' 'program1'
Enter coefficient a:
0
Enter coefficient b:
2
Enter coefficient c:
4
invalid input
Name: Aastha Priya  USN: 1BM22CS003
PS C:\Users\aasth\OneDrive\Desktop\java>
```

Lab Program 2:

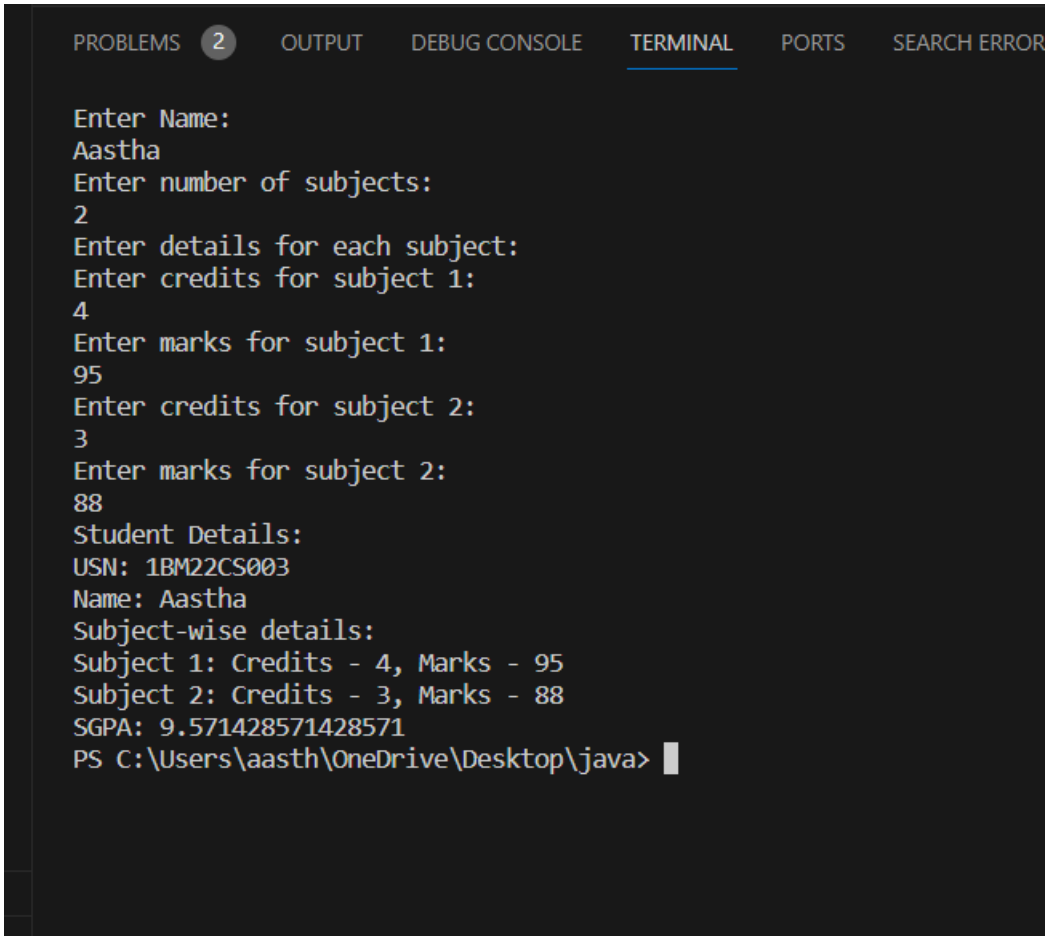
Develop a Java program to create a class Student with members usn, name, an array credits and an array marks. Include methods to accept and display details and a method to calculate SGPA of a student.

Code:

```
import java.util.*;
class Student{
	private String usn;
	private int [] marks;
	private int [] credits;
	private String name;

	public void accept(){
		Scanner in = new Scanner(System.in);
		System.out.println("Enter your name: ");
		name=in.nextLine();
		System.out.println("Enter your usn: ");
		usn=in.nextLine();
		System.out.println("Enter the number of subject: ");
		int n;
		n=in.nextInt();
		marks = new int[n];
		credits = new int[n];
		for(int i=0;i<n;i++){
			System.out.println("Enter the marks of subject "+(i+1)+" : ");
			marks[i]=in.nextInt();
			System.out.println("Enter credits of subject "+(i+1)+" : ");
			credits[i]=in.nextInt();
		}
	}
	public void display(){
		System.out.println("Name: "+name+" USN: "+usn);
		for(int i=0;i<marks.length;i++){
			System.out.println("The marks of a subject "+(i+1)+" : "+marks[i]);
			System.out.println("The credits of the subject : "+credits[i]);
		};
	}
	public void sgpa(){
		double score=0;
		double sum=0;

		for(int i=0;i<marks.length;i++){
			double grade;
```

```
                        if(marks[i]>=90)grade=10;
                        else if(marks[i]>=80 && marks[i]<90)grade=9;
                        else if(marks[i]>=70 && marks[i]<80)grade=8;
                        else if(marks[i]>=60 && marks[i]<70)grade=7;
                        else if(marks[i]>=50 && marks[i]<60)grade=6;
                        else if(marks[i]>=40 && marks[i]<50)grade=5;
                        else grade=4;
                        sum=sum+credits[i];
                        score=score+credits[i]*grade;
                }
                score=score/sum;
                System.out.println("The SGPA of USN: "+usn+" Name: "+name+" is :
"+score);
        }
}

public class Prog2{
        public static void main(String[]args){
                Student s= new Student();
                s.accept();
                s.display();
    s.sgpa();
        }
}
```

Output:



Lab Program 3:

Create a class Book which contains four members: name, author, price, num_pages. Include a constructor to set the values for the members.

Include methods to set and get the details of the objects. Include a toString( ) method that could display the complete details of the book. Develop a Java program to create n book objects.

```
import java.util.Scanner;
class book
{
    String name;
    String author;
    float price;
    int num_pages;

    void set_details()
    {
        Scanner sc=new Scanner(System.in);
        System.out.println("enter bookname,author,price,num_pages");
        name=sc.next();
        author=sc.next();
        price=sc.nextFloat();
        num_pages=sc.nextInt();
    }
    void get_details()
    {
        String details=toString();
        System.out.println(details);

    }

    public String toString()
    {
        return "the book "+name+" was written by "+author+" it consists of
"+num_pages+" pages and costs around "+price;
    }
    public static void main(String []args)
    {
        Scanner scan=new Scanner(System.in);
        System.out.println("enter no of books you want to generate");
        int n=scan.nextInt();
        book b[]=new book[n];
        for(int i=0;i<n;i++)
        {
            b[i]=new book();
            b[i].set_details();

        }
        System.out.println("book details");
        System.out.println();
        for(int i=0;i<n;i++)
        {
```

```
            b[i].get_details();
        }
        System.out.println("Name: Aastha Priya  USN:1BM22CS003");
        scan.close();
    }

}
```

Output:

```
Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\aasth\OneDrive\Desktop\java>  & 'C:\Program Files\Java\jdk-21\bin\java.exe' '--enable-previe
 '-cp' 'C:\Users\aasth\AppData\Roaming\Code\User\workspaceStorage\04990894a46cbebcadaccceca5f0266d\redha
enter no of books you want to generate
2
enter bookname,author,price,num_pages
Chemistry
Shakespear
450
3455
enter bookname,author,price,num_pages
Nature
Priya
560
2365
book details

the book Chemistry was written by Shakespear it consists of 3455 pages and costs around 450.0
the book Nature was written by Priya it consists of 2365 pages and costs around 560.0
Name: Aastha Priya  USN:1BM22CS003
PS C:\Users\aasth\OneDrive\Desktop\java>
```

Lab Program 4:

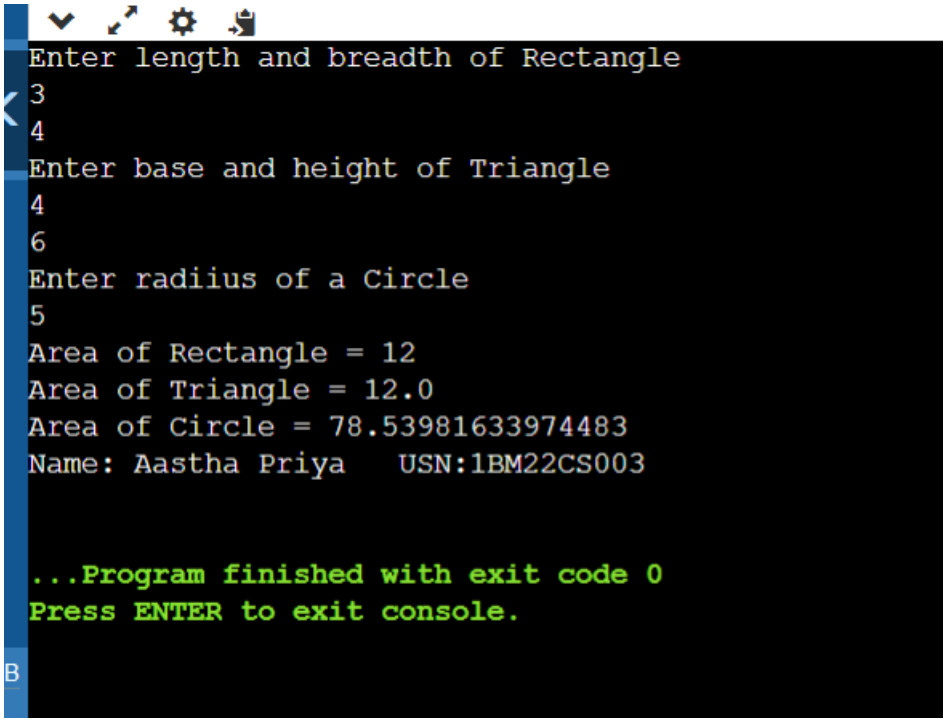
Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea( ). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.

Code:

```
abstract class Shape{
   private int a,b;
   Shape(){
   }
   abstract void printArea();
}

class Rectangle extends Shape{
   private int a, b;
      Rectangle(int a, int b)
   {
      this.a=a;
      this.b=b;
   }
   void printArea()
   {
      System.out.println("The area of rectangle is: "+(a*b));
   }
}

class Triangle extends Shape{
```

```
    private int a, b;
    Triangle(int a, int b)
    {
        this.a=a;
        this.b=b;
    }
    void printArea()
    {
        System.out.println("The area of triangle is: "+(0.5*a*b));
    }
}

class Circle extends Shape{
    private int a;
    Circle(int a)
    {
        this.a=a;
    }
    void printArea()
    {
        System.out.println("The area of circle is: "+(3.14*a*a));
    }
}

public class Prog4{
    public static void main(String[]args)
    {
        Shape rectangle=new Rectangle(3,6);
        Shape triangle=new Triangle(4,6);
        Shape circle=new Circle(5);
        rectangle.printArea();
        triangle.printArea();
        circle.printArea();

    }
}
```

Output:



Lab Program 5:

Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other current account. The savings account provides compound interest and withdrawal facilities but no cheque book
facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class Account that stores customer name, account number and type of account. From this derive the classes Cur-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following
tasks:

a) Accept deposit from customer and update the balance.
b) Display the balance.
c) Compute and deposit interest
d) Permit withdrawal and update the balance
Check for the minimum balance, impose penalty if necessary and update the balance.

Code:

```
import java.util.Scanner;
```

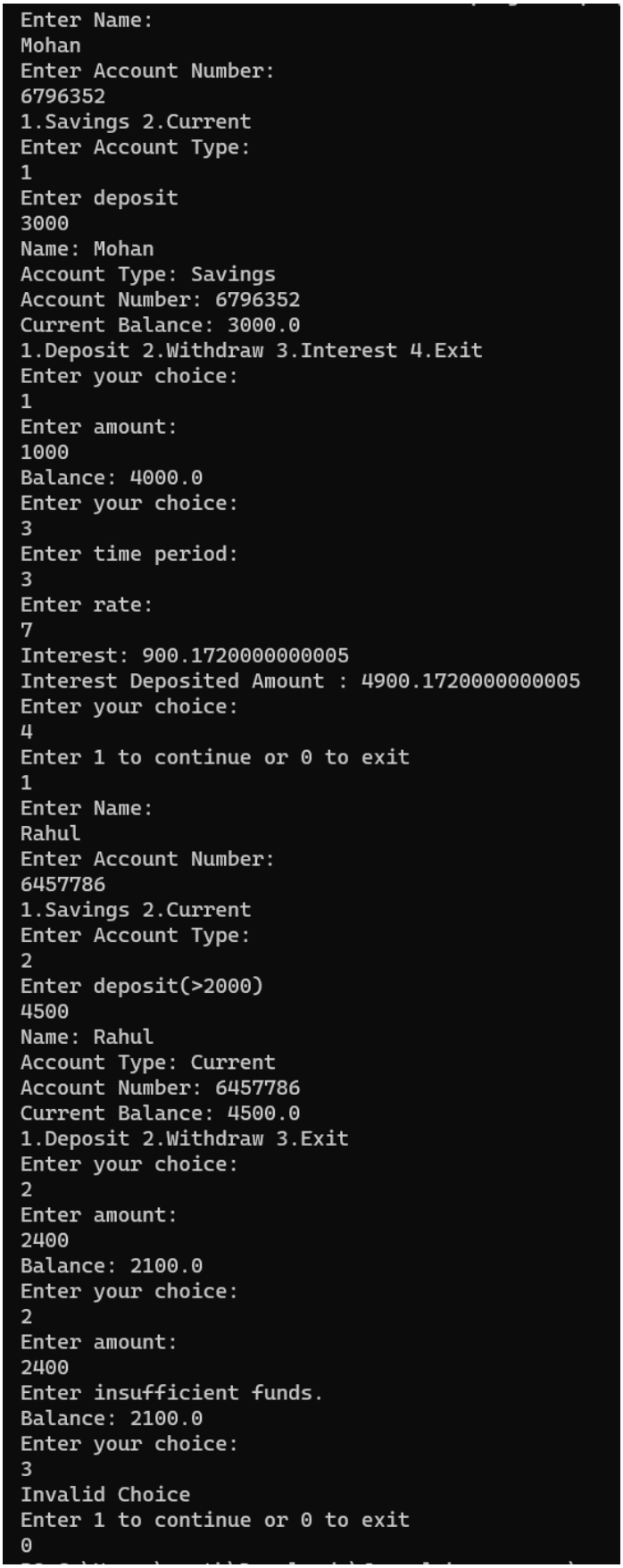
```
class Account{
   String name;
   String type;
   int acc_num;
   double dep;

   public void info(String name,String type,int acc_num, double dep){
      this.name=name;
      this.type=type;
      this.acc_num=acc_num;
      this.dep=dep;
   }

   public void details(){
      System.out.println("Name: "+name);
      System.out.println("Account Type: "+type);
      System.out.println("Account Number: "+acc_num);
      System.out.println("Current Balance: "+dep);
   }

}

class Savings extends Account{
   public void deposit(double amount){
      dep=dep+amount;
      System.out.println("Balance: "+dep);

   }
   public void withdraw(double amount)
   {
      if(dep<amount)
      {
         System.out.println("Enter insufficient funds.");
      }
      else{
         dep=dep-amount;
      }
      System.out.println("Balance: "+dep);
   }
   public void interest(double t, double r){
      double dep1=dep*Math.pow((1+r/100.0),t);
      System.out.println("Interest: "+(dep1-dep));dep=dep1;
      System.out.println("Interest Deposited Amount : "+dep);
   }
```

```
}

class Current extends Account{
   public void deposit(double amount){
      dep=dep+amount;
      System.out.println("Balance: "+dep);
   }
   public void withdraw(double amount)
   {
      if(dep<amount)
      {
         System.out.println("Enter insufficient funds.");
      }
      else{
         dep=dep-amount;
      }
      check(dep);
   }

   public void check(double amount)
   {
      if(dep<2000)
      {
         if(dep<500)
         {
            dep=0;
         }
         else
         {
            dep=dep-500;
         }
         System.out.println("Insufficient Balance!!!! Amount less than Rs. 2000.
Rs. 500 deducted. Rs.");
      }
      System.out.println("Balance: "+dep);
   }
}

public class Prog5
{
   public static void main(String[]args)
   {
      Scanner in = new Scanner(System.in);
      int c1=1;
```

```
        while(c1==1)
        {
           System.out.println("Enter Name: ");
           String name=in.next();
           in.nextLine();
           System.out.println("Enter Account Number: ");
           int acc_no=in.nextInt();
           int choice1;
           System.out.println("1.Savings 2.Current");
           System.out.println("Enter Account Type: ");
           choice1=in.nextInt();
           switch (choice1){
              case 1:
                 Savings s = new Savings();
                 System.out.println("Enter deposit");
                 double balance=in.nextDouble();
                 s.info(name,"Savings",acc_no,balance);
                 s.details();
                 System.out.println("1.Deposit 2.Withdraw 3.Interest 4.Exit");int
choice2;
                 do{
                 System.out.println("Enter your choice: ");
                 choice2=in.nextInt();
                 switch (choice2){
                    case 1:
                       System.out.println("Enter amount: ");
                       double amount1 = in.nextDouble();
                       s.deposit(amount1);
                       break;
                    case 2:
                       System.out.println("Enter amount: ");
                       double amount2 = in.nextDouble();
                       s.withdraw(amount2);
                       break;
                    case 3:
                       System.out.println("Enter time period: ");
                       double time=in.nextDouble();
                       System.out.println("Enter rate: ");
                       double rate=in.nextDouble();
                       s.interest(time,rate);
                       break;
                    case 4:
                       break;
                    default:
```

```
                System.out.println("Invalid choice.");
            }}while(choice2>=1&&choice2<=3);
            break;
          case 2:
            Current c=new Current();
            do{
              System.out.println("Enter deposit(>2000)");
              balance=in.nextDouble();
            }while(balance<2000);
            c.info(name,"Current",acc_no,balance);
            c.details();
            System.out.println("1.Deposit 2.Withdraw 3.Exit");
            int choice3;
            do{
            System.out.println("Enter your choice: ");
            choice3=in.nextInt();
            switch (choice3){
              case 1:
                System.out.println("Enter amount: ");
                double amount1 = in.nextDouble();
                c.deposit(amount1);
                break;
              case 2:
                System.out.println("Enter amount: ");
                double amount2 = in.nextDouble();
                c.withdraw(amount2);
                break;
              case 3:
                break;
              default:
                System.out.println("Invalid choice.");
            }}while(choice3>=1&&choice3<=2);
          default:
            System.out.println("Invalid Choice");
        }
        System.out.println("Enter 1 to continue or 0 to exit");
        int c2 =in.nextInt();c1=c2;
      }
      in.close();
    }
}
```

Output:



Lab Program 6:

Create a package CIE which has two classes- Student and Internals. The class Personal has members like usn, name, sem. The class internals has an array that stores the internal marks scored in five courses of the current semester of the student. Create another package SEE which has the class External which is a derived class of Student. This class has an array that stores the SEE marks scored in five courses of the current semester of the student. Import the two packages in a file that declares the final marks of n students in all five courses.

Code:

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

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

package SEE;
```

```
import CIE.*;
import java.util.*;
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();
		}
	}
}

import CIE.*;
import SEE.*;
import java.util.*;
public class Main{
	public static void main(String[] args){
		int n;
		Scanner sc = new Scanner(System.in);
		System.out.println("Enter no. of students:");
		n = sc.nextInt();
		CIE.Student st[] = new CIE.Student[n];
		CIE.Internals in[] = new CIE.Internals[n];
		SEE.Externals ex[] = new SEE.Externals[n];
		for(int i=0;i<n;i++){
			st[i] = new CIE.Student();
			in[i] = new CIE.Internals();
			ex[i] = new SEE.Externals();
			st[i].display();
			in[i].display();
			ex[i].display();
			System.out.println("Total Marks of "+st[i].name+"\n");
			for(int j=0;j<5;j++){
				System.out.println(in[i].ciem[j]+ex[i].seem[j]/2);
			}
		}
	}
}
```

Output:

```
Enter no. of students:
2
Name:
A
USN:
1BM17CS005
Sem:
2
Eneter cie marks out of 50:
48
47
46
48
44
SEE marks for 5 subjects out of 100:
84
88
86
82
80
Total Marks of A

90.0
91.0
89.0
89.0
84.0
Name:
B
USN:
1BM19CS192
Sem:
5
Eneter cie marks out of 50:
43
41
39
37
45
SEE marks for 5 subjects out of 100:
78
80
84
86
82
Total Marks of B

82.0
81.0
81.0
80.0
86.0
```

Lab Program 7:

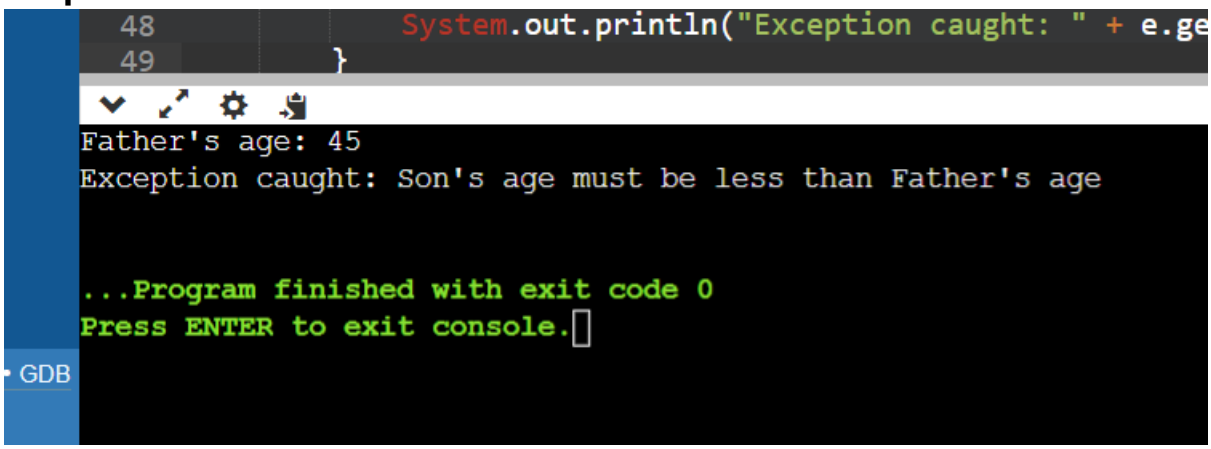
Write a program that demonstrates handling of exceptions in inheritance tree. Create a base class called “Father” and derived class called “Son” which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge( ) when the input age<0. In Son class, implement a constructor that cases both father and son’s age and throws an exception if son’s age is >=father’s age.

Code:

```
import java.util.Scanner;
class WrongAge extends Exception {
   public WrongAge(String message) {
      super(message);
   }
}
class Father {
   int fatherAge;
   public Father(int fatherAge) throws WrongAge {
      if (fatherAge < 0) {
         throw new WrongAge("Age cannot be negative");
      }
      this.fatherAge = fatherAge;
   }
}
class Son extends Father {
   int sonAge;
   public Son(int fatherAge, int sonAge) throws WrongAge {
      super(fatherAge);
      if (sonAge >= fatherAge) {
         throw new WrongAge("Son's age must be less than Father's age");
      }
      this.sonAge = sonAge;
   }
}
public class fatherson {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter father's age and son's age: ");
      int fa=sc.nextInt();
      int sa=sc.nextInt();
      try {
```

```
            Son s = new Son(fa, sa);
            System.out.println("Father's age: " + s.fatherAge);
            System.out.println("Son's age: " + s.sonAge);
        } catch (WrongAge e) {
            System.out.println("Error: " + e.getMessage());
        }
    }
}
```

Output:



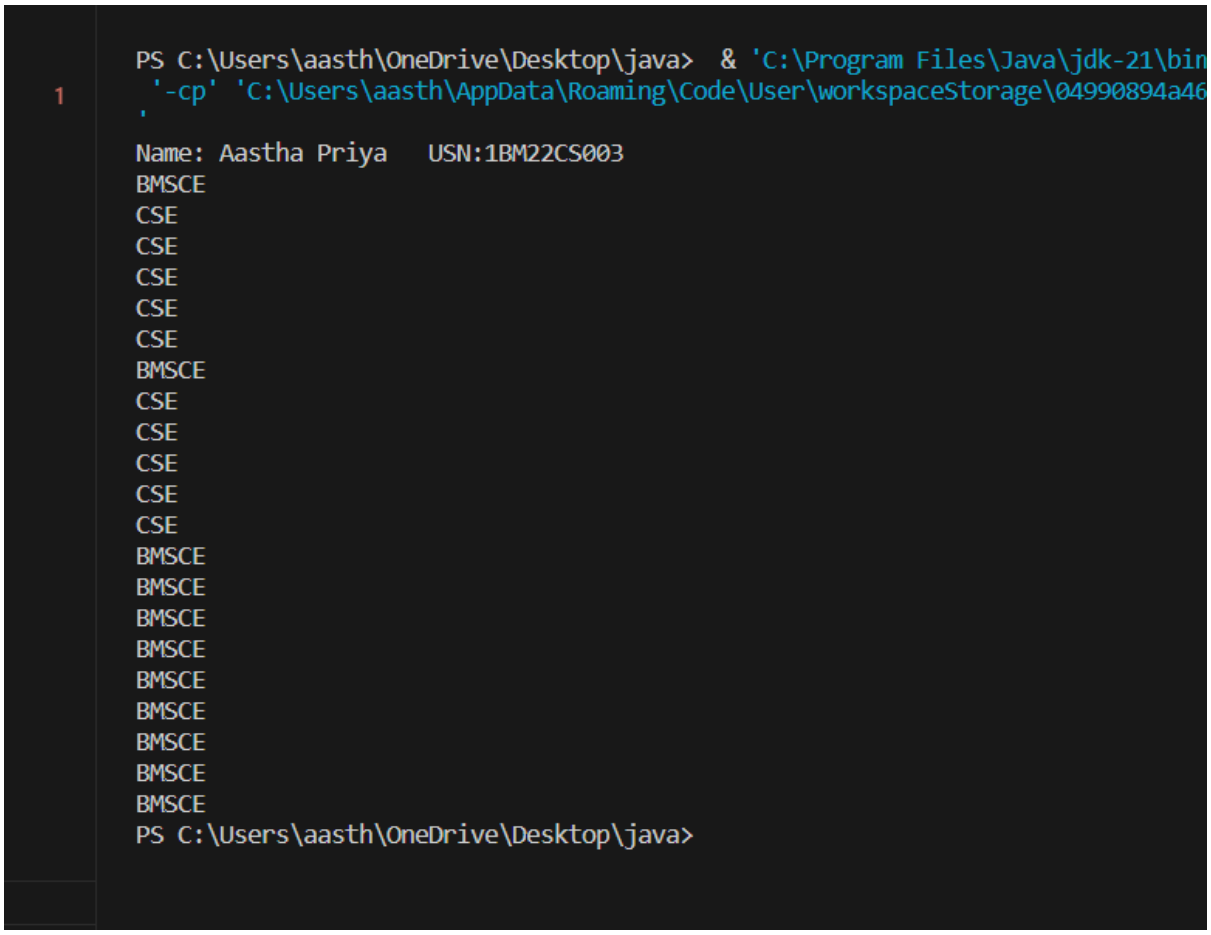
Lab Program 8:

Write a program which creates two threads, one thread displaying “BMS College of Engineering” once every ten seconds and another displaying “CSE” once every two seconds.

Code:

```
class Firstthread extends Thread{
    String message;
    Firstthread(String message){
        this.message=message;
    }
    public void run(){
        try{
            for(int i=0; i<=10;i++){
                System.out.println(message);
                Thread.sleep(10000);
            }
        }
        catch (InterruptedException e){
            System.out.println("exception caught");
        }
    }

    }
class secondthread extends Thread{
    String message;
    secondthread(String message){
        this.message=message;
    }
    public void run(){
        try{
            for (int i=0;i<10;i++){
                System.out.println(message);
                Thread.sleep(2000);
            }
        }
        catch (InterruptedException e){
            System.out.println("exception caught");
        }
    }

}

public class DemoString {
    public static void main(String[] args) {
        Firstthread t1 = new Firstthread("BMSCE");
        secondthread t2 = new secondthread("CSE");
        t1.start();
        t2.start();
        System.out.println("Name: Aastha Priya   USN:1BM22CS003");
}
}
```

Output:


PS C:\Users\aasth\OneDrive\Desktop\java> & 'C:\Program Files\Java\jdk-21\bin
'-cp' 'C:\Users\aasth\AppData\Roaming\Code\User\workspaceStorage\04990894a46
'
Name: Aastha Priya USN:1BM22CS003
BMSCE
CSE
CSE
CSE
CSE
CSE
BMSCE
CSE
CSE
CSE
CSE
CSE
BMSCE
BMSCE
BMSCE
BMSCE
BMSCE
BMSCE
BMSCE
BMSCE
BMSCE
PS C:\Users\aasth\OneDrive\Desktop\java>

Lab Program 9:

Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

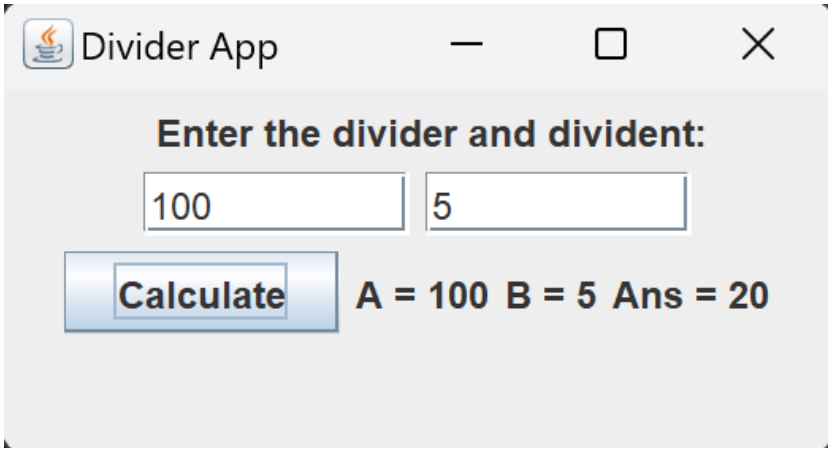
Code:

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;

class SwingDemo{
   SwingDemo(){
      JFrame jfrm = new JFrame("Divider App");
      jfrm.setSize(275, 150);
      jfrm.setLayout(new FlowLayout());
      jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
      JLabel jlab = new JLabel("Enter the divider and divident:");
      JTextField ajtf = new JTextField(8);
      JTextField bjtf = new JTextField(8);
      JButton button = new JButton("Calculate");
      JLabel err = new JLabel();
      JLabel alab = new JLabel();
      JLabel blab = new JLabel();
      JLabel anslab = new JLabel();
      jfrm.add(err);
```

```
    jfrm.add(jlab);
    jfrm.add(ajtf);
    jfrm.add(bjtf);
    jfrm.add(button);
    jfrm.add(alab);
    jfrm.add(blab);
    jfrm.add(anslab);
    ActionListener l = new ActionListener() {
      public void actionPerformed(ActionEvent evt) {
        System.out.println("Action event from a text field");
      }
    };
    ajtf.addActionListener(l);
    bjtf.addActionListener(l);
    button.addActionListener(new ActionListener() {
      public void actionPerformed(ActionEvent evt) {
        try{
          int a = Integer.parseInt(ajtf.getText());
          int b = Integer.parseInt(bjtf.getText());
          int ans = a/b;
          alab.setText("\nA = " + a);
          blab.setText("\nB = " + b);
          anslab.setText("\nAns = "+ ans);
        }
        catch(NumberFormatException e){
          alab.setText("");
          blab.setText("");
          anslab.setText("");
          err.setText("Enter Only Integers!");
        }
        catch(ArithmeticException e){
          alab.setText("");
          blab.setText("");
          anslab.setText("");
          err.setText("B should be NON zero!");
        }
      }
    });
    jfrm.setVisible(true);
  }
  public static void main(String args[]){
    SwingUtilities.invokeLater(new Runnable(){
      public void run(){
        new SwingDemo();
```

```
        }
    });
  }
}
```

Output:


Divider App
Enter the divider and divident:
100
5
Calculate
A = 100 B = 5 Ans = 20