VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in

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Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "Object Oriented Java Programming (23CS3PCOOJ)" carried out by **SIDDHARTH SHUKLA (1BF24CS289),** who is bonafide student of **B.M.S. College of Engineering.** It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements in respect of an Object-Oriented Java Programming (23CS3PCOOJ) work prescribed for the said degree.

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Github Link:
https://github.com/siddharthshuklacs24/sem-3-java

Program 1
Implement Quadratic Equation

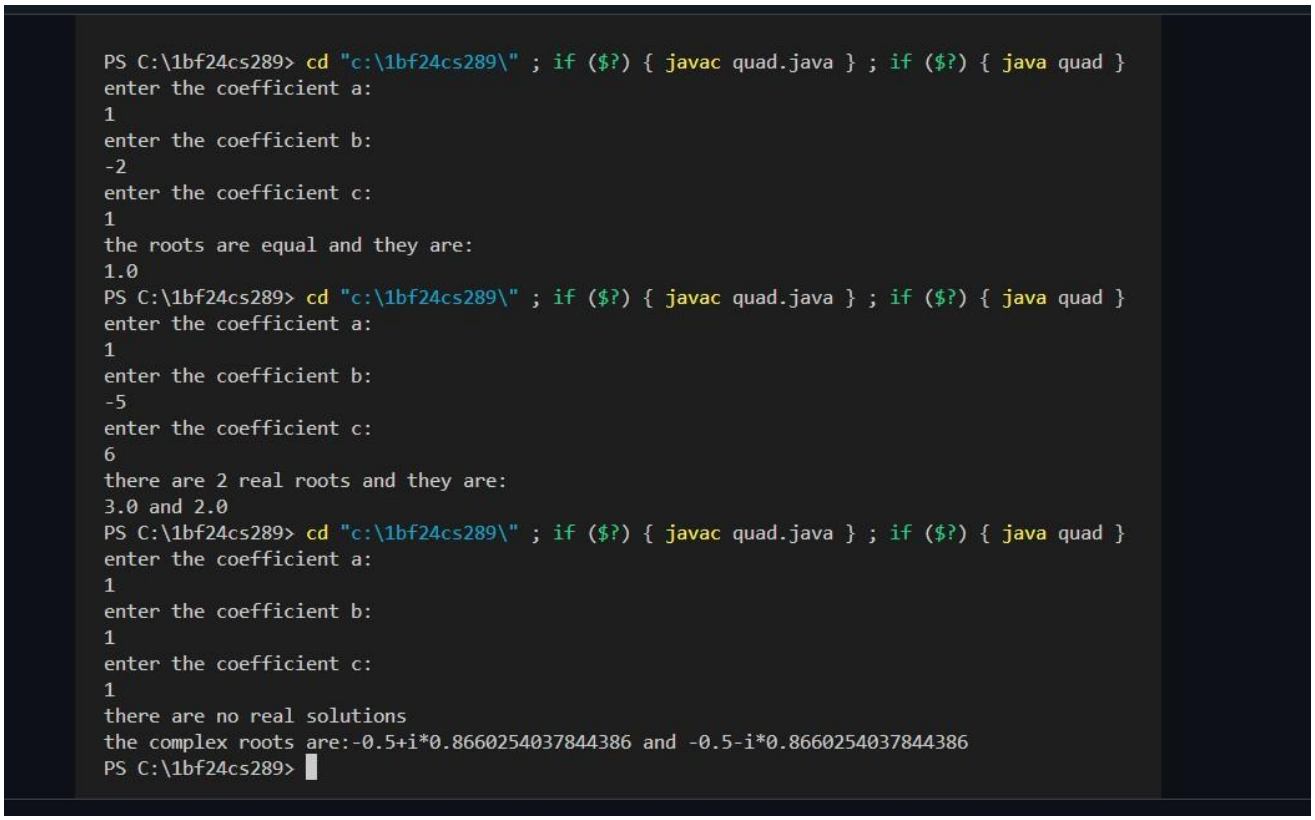
CODE:

/*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.*/

```
import java.util.Scanner;       //SIDDHARTH SHUKLA 1BF24CS289
public class quad
{
   public static void main(String args[])
   {
      Scanner sc=new Scanner(System.in);
      System.out.println("enter the coefficient a: ");
      double a=sc.nextDouble();
      System.out.println("enter the coefficient b: ");
      double b=sc.nextDouble();
      System.out.println("enter the coefficient c: ");
      double c=sc.nextDouble();
      double D=(b*b)-(4*a*c);

      if(D<0)
      {
         System.out.println("there are no real solutions");
         double real=-b/(2*a);
         double complex=Math.pow(-D,(1/2.0))/(2*a);
         System.out.println("the complex roots are:"+real+"+i*"+complex+" and
"+real+"-i*"+complex);



      }
      else
      {
         double rt1=(-b+Math.pow(D,(1/2.0)))/(2*a);
         double rt2=(-b-Math.pow(D,(1/2.01
         -2
         )))/(2*a);
         if(D==0)
         {
            System.out.println("the roots are equal and they are:\n"+rt1);
         }
         else
         {
            System.out.println("there are 2 real roots and they are:\n"+rt1+" and "+rt2);
         }
```

```
        }
    }

}
```

OUTPUT:



```
PS C:\1bf24cs289> cd "c:\1bf24cs289\" ; if ($?) { javac quad.java } ; if ($?) { java quad }
enter the coefficient a:
1
enter the coefficient b:
-2
enter the coefficient c:
1
the roots are equal and they are:
1.0
PS C:\1bf24cs289> cd "c:\1bf24cs289\" ; if ($?) { javac quad.java } ; if ($?) { java quad }
enter the coefficient a:
1
enter the coefficient b:
-5
enter the coefficient c:
6
there are 2 real roots and they are:
3.0 and 2.0
PS C:\1bf24cs289> cd "c:\1bf24cs289\" ; if ($?) { javac quad.java } ; if ($?) { java quad }
enter the coefficient a:
1
enter the coefficient b:
1
enter the coefficient c:
1
there are no real solutions
the complex roots are:-0.5+i*0.8660254037844386 and -0.5-i*0.8660254037844386
PS C:\1bf24cs289>
```

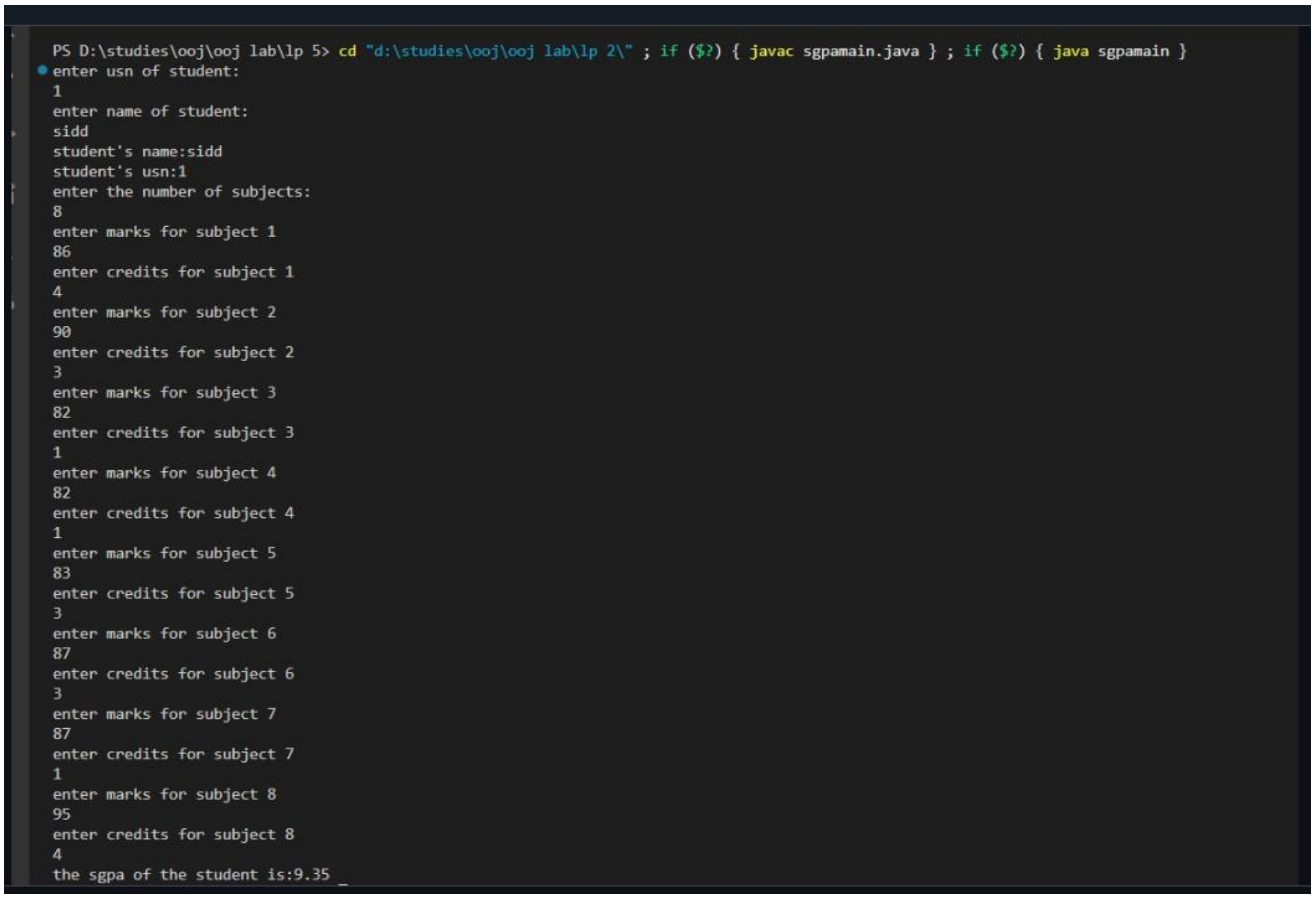
PROGRAM 2:
SGPA CALCULATION
CODE: import java.util.*;

```
class student {
    String usn;
```

```
String name;
double creds[];
double marks[];
Scanner sc=new Scanner(System.in);
//method to accept details
void accept()
{

   System.out.println("enter usn of student:");
   this.usn=sc.nextLine();
   System.out.println("enter name of student:");
   this.name=sc.nextLine();
}
//method to display details
void display()
{
   System.out.println("student's name:"+name);
   System.out.println("student's usn:"+usn);
}
void sgpa()
{
   System.out.println("enter the number of subjects:");
   int num=sc.nextInt();
   creds=new double[num];
   marks=new double[num];
     double grade[]=new double[num];
       double numerator=0;
       double denom=0;
   for(int  i=0;i<num;i++)
   {

       System.out.println("enter marks for subject "+(i+1));
       marks[i]=sc.nextDouble();
       sc.nextline();
       System.out.println("enter credits for subject "+(i+1));
       creds[i]=sc.nextDouble();
       sc.nextline();

       //now,we need to calculate grade array based of range of marks
       if(marks[i]>=90 && marks[i]<=100)
       {
          grade[i]= 10;
       }
       else if(marks[i]>=80 && marks[i]<90)
       {
          grade[i]=  9;
       }
```

```
        else if(marks[i]>=70 && marks[i]<80)
        {
           grade[i]=  8;
        }
        else if(marks[i]>=60 && marks[i]<70)
        {
           grade[i]= 7;
        }

        else if(marks[i]>=50 && marks[i]<60)
        {
           grade[i]=  6;
        }
        else if(marks[i]>=40 && marks[i]<50)
        {
           grade[i]=  5;
        }
        else if(marks[i]>=0 && marks[i]<40)
        {
           grade[i]=  0;
        }
        numerator+=creds[i]*grade[i];
        denom+=creds[i];

      }
      double sgpa=(double)(numerator/denom);
      System.out.println("the sgpa of the student is:"+sgpa);

   }


}
public class sgpamain {
   public static void main(String[] args) {
      student s1=new student();
      s1.accept();
      s1.display();
      s1.sgpa();
   }

}
```

OUTPUT:

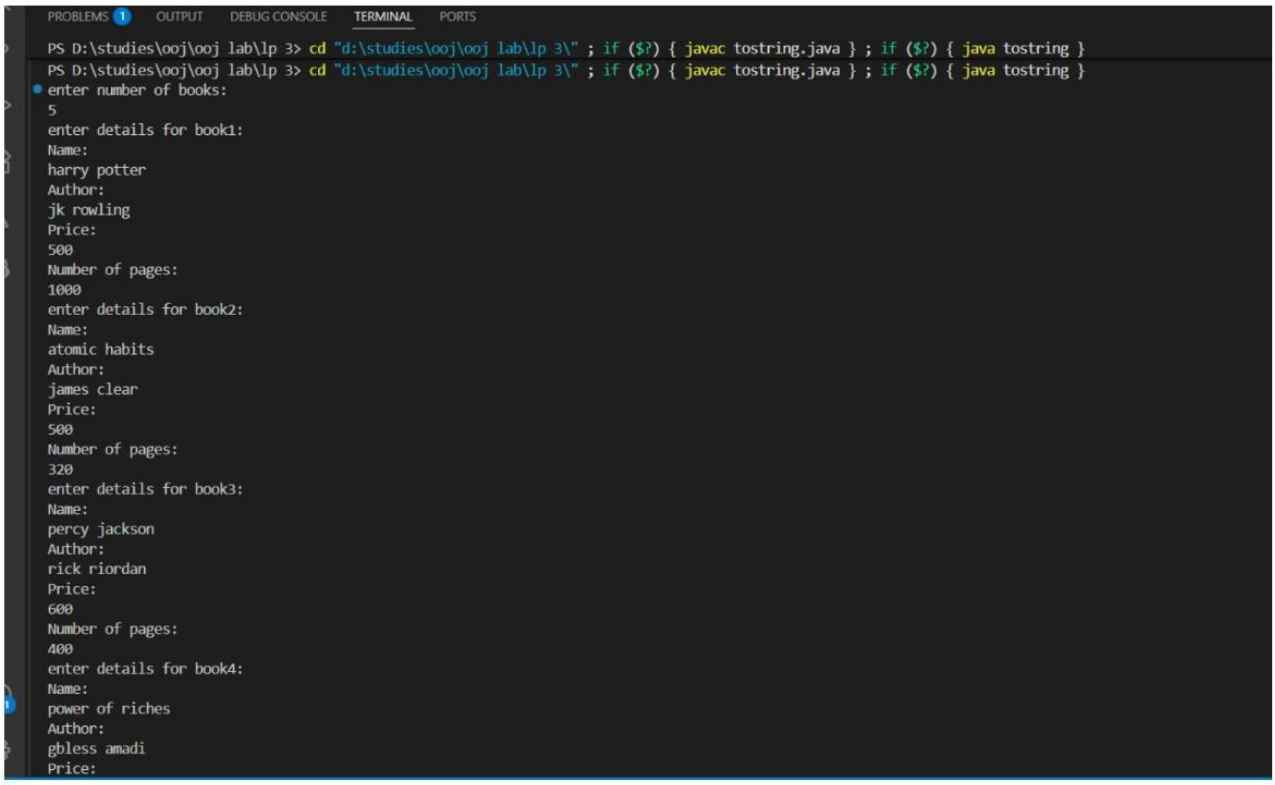

PS D:\studies\ooj\ooj lab\lp 5> cd "d:\studies\ooj\ooj lab\lp 2\" ; if ($?) { javac sgpamain.java } ; if ($?) { java sgpamain }
enter usn of student:
1
enter name of student:
sidd
student's name:sidd
student's usn:1
enter the number of subjects:
8
enter marks for subject 1
86
enter credits for subject 1
4
enter marks for subject 2
90
enter credits for subject 2
3
enter marks for subject 3
82
enter credits for subject 3
1
enter marks for subject 4
82
enter credits for subject 4
1
enter marks for subject 5
83
enter credits for subject 5
3
enter marks for subject 6
87
enter credits for subject 6
3
enter marks for subject 7
87
enter credits for subject 7
1
enter marks for subject 8
95
enter credits for subject 8
4
the sgpa of the student is:9.35

PROGRAM 3:
TO STRING DEMO
CODE:

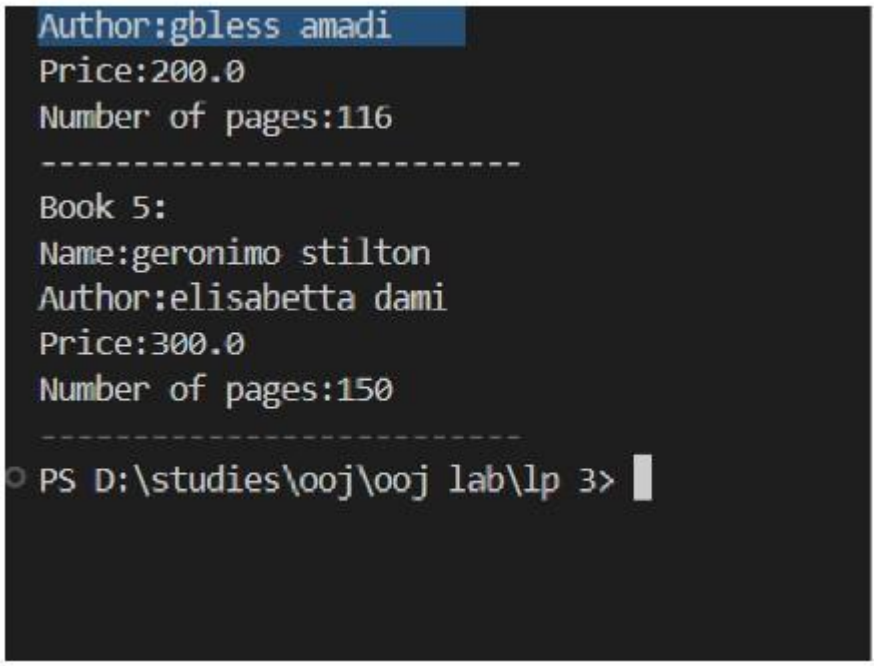
```
import java.util.*;
class Book {
   String name,author;
   double price;
   int num_pages;
   //constructor for setting values of the members
   Book(String name,String author,double price,int num_pages)
   {
      this.name=name;
      this.author=author;
      this.price=price;
      this.num_pages=num_pages;
   }
   //set methods
   void SetName(String name)
   {
      this.name=name;
   }
   void SetAuthor(String author)
   {
      this.author=author;
   }
   void SetPrice(double price)
   {
      this.price=price;
   }
   void SetNum_Pages(int num_pages)
   {
      this.num_pages=num_pages;
   }
   //get methods
   String GetName()
   {
      return name;
   }
   String GetAuthor()
   {
      return author;
   }
   double GetPrice()
   {
     return price;
   }
   int GetNum_Pages()
   {
```

```
        return num_pages;
    }
    //tostring method
    public String toString() {
        return "Name:"+name+"\nAuthor:"+author+"\nPrice:"+price+"\nNumber of
pages:"+num_pages;
    }
    }
    public class tostring {
        public static void main(String[] args) {
            Scanner sc=new Scanner(System.in);
            int n;
            System.out.println("enter number of books:");
            n=sc.nextInt();
            sc.nextLine();
            Book b[]=new Book[n];
            //for loop for setting details of n objects of type Book through constructor
            for(int i=0;i<n;i++)
            {
                System.out.println("enter details for book"+(i+1)+":");
                System.out.println("Name:");
                String Name=sc.nextLine();
                System.out.println("Author:");
                String Author=sc.nextLine();
                System.out.println("Price:");
                double Price=sc.nextDouble();
                System.out.println("Number of pages:");
                int NumPages=sc.nextInt();
                sc.nextLine();
                b[i]= new Book(Name,Author,Price,NumPages);
            }
            //displaying details
            System.out.println("------------Book details:------------");
            //for loop to display using tostring
            for(int i=0;i<n;i++)
            {
                System.out.println("Book "+(i+1)+":");
                System.out.println(b[i].toString());
                System.out.println("-------------------------");
            }
        }
    }
```

OUTPUT:


PROBLEMS 1
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
PS D:\studies\ooj\ooj lab\lp 3> cd "d:\studies\ooj\ooj lab\lp 3\" ; if ($?) { javac tostring.java } ; if ($?) { java tostring }
PS D:\studies\ooj\ooj lab\lp 3> cd "d:\studies\ooj\ooj lab\lp 3\" ; if ($?) { javac tostring.java } ; if ($?) { java tostring }
enter number of books:
5
enter details for book1:
Name:
harry potter
Author:
jk rowling
Price:
500
Number of pages:
1000
enter details for book2:
Name:
atomic habits
Author:
james clear
Price:
500
Number of pages:
320
enter details for book3:
Name:
percy jackson
Author:
rick riordan
Price:
600
Number of pages:
400
enter details for book4:
Name:
power of riches
Author:
gbless amadi
Price:

```
Price:
200
Number of pages:
116
enter details for book5:
Name:
geronimo stilton
Author:
elisabetta dami
Price:
300
Number of pages:
150
------------Book details:------------
Book 1:
Name:harry potter
Author:jk rowling
Price:500.0
Number of pages:1000
-------------------------
Book 2:
Name:atomic habits
Author:james clear
Price:500.0
Number of pages:320
-------------------------
Book 3:
Name:percy jackson
Author:rick riordan
Price:600.0
Number of pages:400
-------------------------
Book 4:
Name:power of riches
Author:gbless amadi
```


Author:gbless amadi
Price:200.0
Number of pages:116
Book 5:
Name:geronimo stilton
Author:elisabetta dami
Price:300.0
Number of pages:150
PS D:\studies\ooj\ooj lab\lp 3>

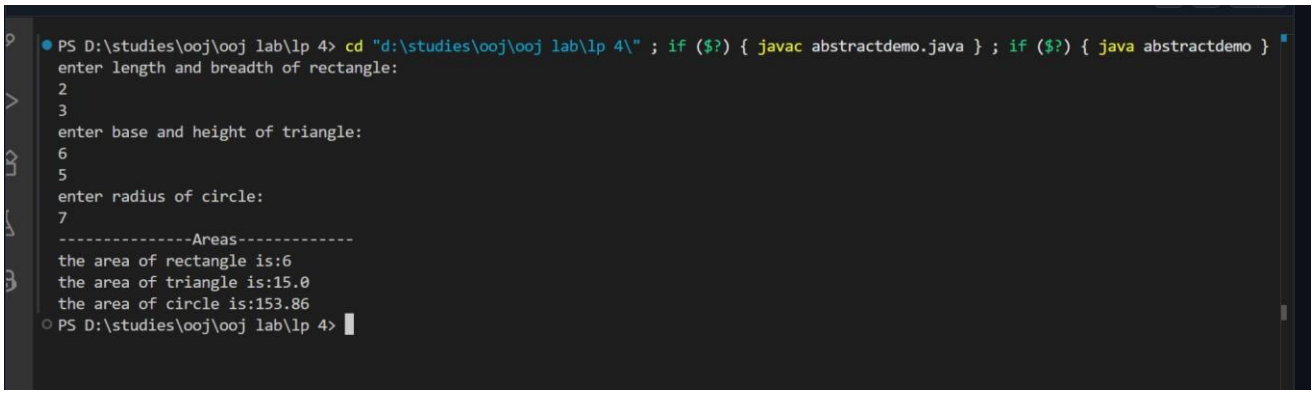
PROGRAM 4:
ABSTRACT CLASS DEMO
CODE:

```
import java.util.*;
abstract class Shape{
    int i,j;
    Shape(int i,int j)
    {
        this.i=i;
        this.j=j;
    }
    abstract void printArea();

}
class Rectangle extends Shape {
    Rectangle(int length,int breadth)
    {
        super(length,breadth);
    }
    void printArea()
    {
        System.out.println("the area of rectangle is:"+(i*j));
    }
}
class Triangle extends Shape {
    Triangle(int base,int height)
    {
        super(base,height);
    }
    void printArea() {
    System.out.println("the area of triangle is:"+((1/2.0)*i*j));
    }
```

```
}
class Circle extends Shape {
    Circle(int radius)
    {
        super(radius,0);
    }
    void printArea() {
        System.out.println("the area of circle is:"+(3.14*i*i));
    }

}
public class abstractdemo {
    public static void main(String[] args) {
      Scanner sc=new Scanner(System.in);

      //inputting length and breadth of rectangle
      System.out.println("enter length and breadth of rectangle:");
      int l=sc.nextInt();
      int b=sc.nextInt();
      Rectangle rect=new Rectangle(l,b);

      //inputting base and height of triangle
      System.out.println("enter base and height of triangle:");
      int base=sc.nextInt();
      int height=sc.nextInt();
      Triangle tri=new Triangle(base,height);

      //inputting radius of circle
      System.out.println("enter radius of circle:");
      int radius=sc.nextInt();
      Circle circ=new Circle(radius);
```

```
        //calling classes for calculating areas
        System.out.println("---------------Areas-------------");
        rect.printArea();
        tri.printArea();
        circ.printArea();
    }
}
```

OUTPUT:



PROGRAM 5:
BANK

CODE: import java.util.*;

```
class Account {

    //initialising instance variables
    String cname;
    int accNo;
    String accType;
    double balance;
    Scanner sc=new Scanner(System.in);

    //constructor
    Account(String cname,int accNo,String accType,double balance)
    {
        this.cname=cname;
        this.accNo=accNo;
        this.accType=accType;
        this.balance=balance;
    }

    //deposit method
    void deposit()
    {
        double amount;
        System.out.println("enter the amount to be deposited:");
        amount=sc.nextDouble();
        balance+=amount;
        System.out.println("deposited succesfully");
```

```
    }

    //display balance method
    void disBal()
    {
        System.out.println("the balance right now is:"+balance);
    }

    //method for withdrawal(general as we have to modify later for
current account)
    void withdrawal()
    {
        double amount;
        System.out.println("enter the amount to be withdrawn:");
        amount=sc.nextDouble();
        if(amount>balance)
        {
            System.out.println("insufficient funds");
        }
        else
        {
            balance-=amount;
            System.out.println("withdrawal successful");
        }
    }
}
class cur_Acct extends Account {
    //giving a minimum balance limit and a service charge
    double minBal=10000;
    double serviceCharge=500;
```

```
    //constructor involving super
    cur_Acct(String name,int accNo,double balance)
    {
        super(name,accNo,"Current",balance);
    }

    //method for checking whether current balance is above
minimum balance or not
    void checkMinBal()
    {
        if(balance<minBal)
        {
            balance-=serviceCharge;
            System.out.println("balance below minimum balance limit
therefore service charge imposed.");
        }
    }

    //withdraw method but modified/overridden with extra check of
minimum balance penalty
    void withdrawal()
    {
        double amount;
        System.out.println("enter the amount to be withdrawn:");
        amount=sc.nextDouble();
        if(amount>balance)
        {
            System.out.println("insufficient funds");
        }
        else
        {
```

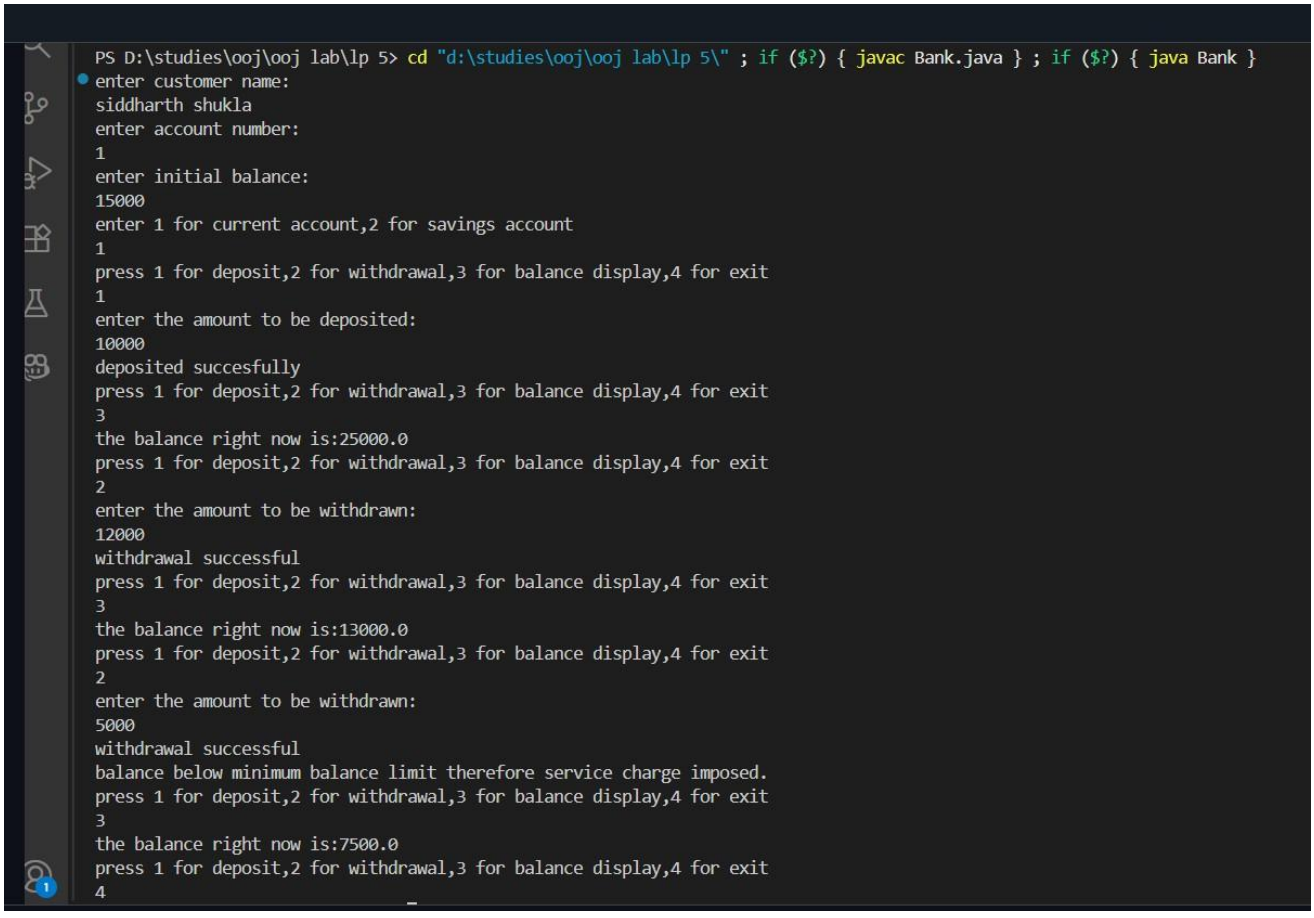
```
            balance-=amount;
            System.out.println("withdrawal successful");
            checkMinBal();
        }
    }
}
class sav_Acct extends Account {
    //defining the rate of interest
    double rate=0.05; //5% per annum

    //constructor involving super
    sav_Acct(String name,int accNo,double balance)
    {
        super(name,accNo,"Savings",balance);
    }

    //calculation and deposit of interest
    void intCalcDep()
    {
        double interest=balance*Math.pow(1+rate/12,12)-balance;
        balance+=interest;
        System.out.println("yearly compound interest of amount
"+interest+" has been added to the balance");
    }
}
public class Bank {
    public static void main(String[] args) {

        //asking input details from the user
        Scanner sc=new Scanner(System.in);
```

```
        String name;
        int accNo; int
        accType;
        double balance;
        System.out.println("enter customer name:");
        name=sc.nextLine();
        System.out.println("enter account number:");
        accNo=sc.nextInt();
        sc.nextLine();
        System.out.println("enter initial balance:");
        balance=sc.nextDouble();
        System.out.println("enter 1 for current account,2 for savings
account");
        accType=sc.nextInt();
        sc.nextLine();

        //prepartion of menu driven program
        int choice1;
        int choice2;
        //1st case-user enters current account
        if(accType==1)
        {
           //keep on asking the user until he stops/exits
           cur_Acct ob1=new cur_Acct(name, accNo, balance);
           while(true)
           {
              System.out.println("press 1 for deposit,2 for withdrawal,3
for balance display,4 for exit");
              choice1=sc.nextInt();

              switch(choice1)
```

```
            {
               case 1:ob1.deposit();
               break;
               case 2:ob1.withdrawal();
               break;
               case 3:ob1.disBal();
               break;
               case 4:System.exit(0);
               break;
               default:System.err.println("invalid input!");
            }
         }
      }
      else if(accType==2)
      {
         //keep on asking the user until he stops/exits
         sav_Acct ob1=new sav_Acct(name, accNo, balance);
         while(true)
         {
            System.out.println("press 1 for deposit,2 for withdrawal,3
for interest check,4 for balance display,5 for exit");
            choice1=sc.nextInt();

            switch(choice1)
            {
               case 1:ob1.deposit();
               break;
               case 2:ob1.withdrawal();
               break;
               case 3:ob1.intCalcDep();
               break;
```

```
                case 4:ob1.disBal();
                break;
                case 5:System.exit(0);
                break;
                default:System.err.println("invalid input!");
            }
        }
    }
}
```

OUTPUT:



```
PS D:\studies\ooj\ooj lab\lp 5> cd "d:\studies\ooj\ooj lab\lp 5\" ; if ($?) { javac Bank.java } ; if ($?) { java Bank }
enter customer name:
siddharth shukla
enter account number:
2
enter initial balance:
15000
enter 1 for current account,2 for savings account
2
press 1 for deposit,2 for withdrawal,3 for interest check,4 for balance display,5 for exit
1
enter the amount to be deposited:
10000
deposited succesfully
press 1 for deposit,2 for withdrawal,3 for interest check,4 for balance display,5 for exit
4
the balance right now is:25000.0
press 1 for deposit,2 for withdrawal,3 for interest check,4 for balance display,5 for exit
2
enter the amount to be withdrawn:
140000
insufficient funds
press 1 for deposit,2 for withdrawal,3 for interest check,4 for balance display,5 for exit
2
enter the amount to be withdrawn:
14000
withdrawal successful
press 1 for deposit,2 for withdrawal,3 for interest check,4 for balance display,5 for exit
4
the balance right now is:11000.0
press 1 for deposit,2 for withdrawal,3 for interest check,4 for balance display,5 for exit
3
yearly compound interest of amount 562.780876699062 has been added to the balance
press 1 for deposit,2 for withdrawal,3 for interest check,4 for balance display,5 for exit
4
the balance right now is:11562.780876699062
press 1 for deposit,2 for withdrawal,3 for interest check,4 for balance display,5 for exit
5
```

PROGRAM 6:
PACKAGES

CODE:
File 1:internals.java:

```
package cie;

import java.util.Scanner;
public class internals {


    public void setmarks(int marks[]) {
        System.out.println("enter marks of student in cie:");
```

```
        for(int i=0;i<5;i++)
            {
                Scanner sc=new Scanner(System.in);
                System.out.print("subject"+(i+1)+":");
                marks[i]=sc.nextInt();
                sc.nextLine();
            }
    }
}
```

file 2:
Personal.java:

```
package cie;
import java.util.Scanner;

public class personal {
    String usn,name;
    int sem;
    public personal(String usn,String name,int sem) {
        this.usn=usn;
        this.name=name;
        this.sem=sem;
    }
}
```

file 3:
external.java:

```
package see;

import java.util.Scanner;
```

```
import cie.personal;

public class External extends personal {


    public External(String usn,String name,int sem) {
        super(usn,name,sem);

    }
    public void setmarks(int marks1[]) {
        System.out.println("enter marks of student in see:");

        for(int i=0;i<5;i++)
            {
                Scanner sc=new Scanner(System.in);
                System.out.print("subject"+(i+1)+":");
                marks1[i]=sc.nextInt();
                sc.nextLine();
            }
    }
}
```

file 4:

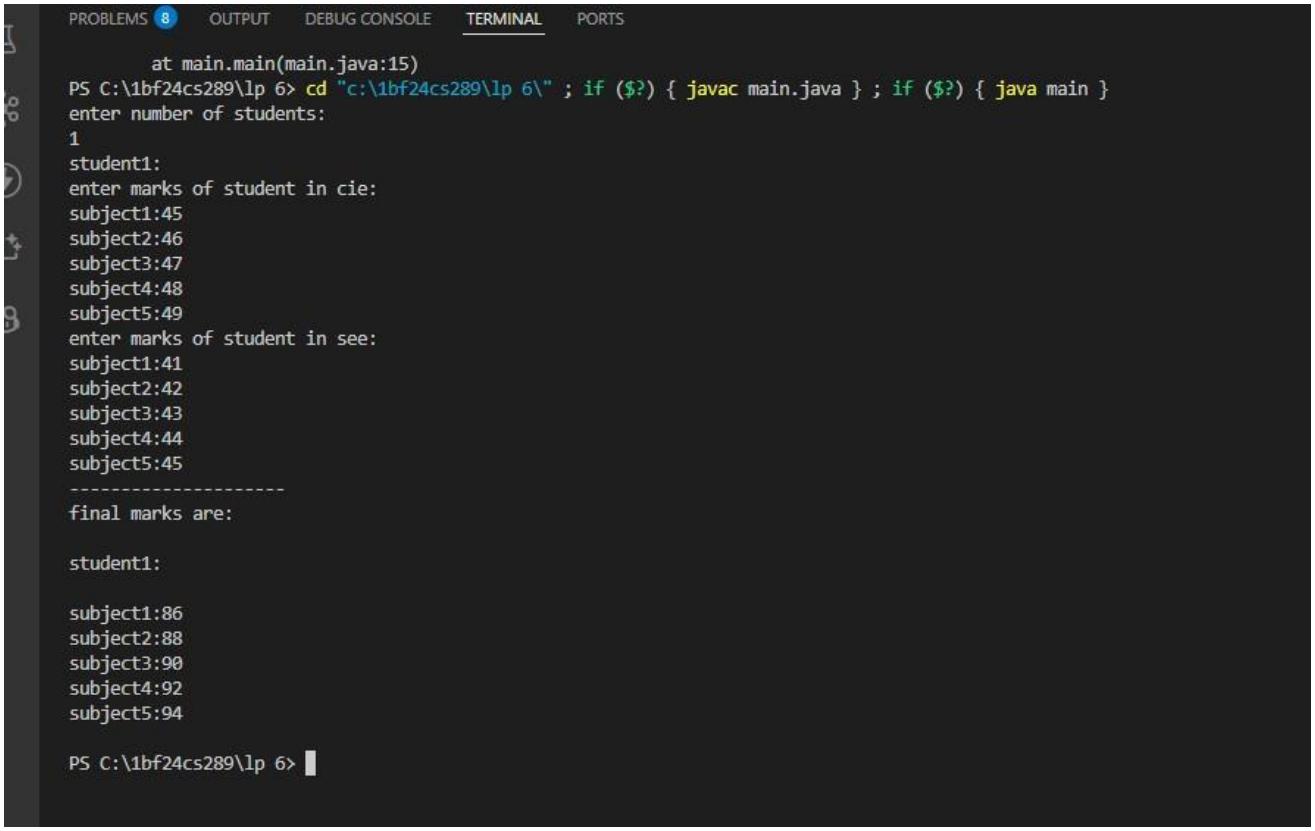
Main.java:

```
//coded by 1bf24cs289
import cie.*;
import see.*;
import java.util.Scanner;
public class main {
    public static void main(String[] args) {
         Scanner sc=new Scanner(System.in);
         internals internal=new internals();
```

```
External ext=new External("1bf24cs289","sidd",3);
int cie_marks[]=new int[5];
int see_marks[]=new int [5];

System.out.println("enter number of students:");
int num;
num=sc.nextInt();

int nfinalmarks[]=new int[num];
//FOR INPUTTING INFO OF N STUDENTS
for(int i=0;i<num;i++)
{
  System.out.println("student"+(i+1)+":");
  internal.setmarks(cie_marks);
  ext.setmarks(see_marks);
}
//for displaying info of n students
for(int i=0;i<num;i++)
{
  nfinalmarks[i]=cie_marks[i]+see_marks[i];
}
System.out.println("--------------------");
System.out.println("final marks are:");
System.out.println();
for(int i=0;i<num;i++)
{

  System.out.println("student"+(i+1)+":");
  System.out.println();
  for(int j=0;j<5;j++)
  {
```

```
System.out.println("subject"+(j+1)+":"+(cie_marks[j]+see_marks[j
]));
            }
             System.out.println();
        }
    }
}
```

OUTPUT:



PROGRAM 7:
EXCEPTIONS

CODE:

```
import java.util.*;
class wrongAgeException extends Exception {
   wrongAgeException(String message) {
      super(message);
   }
}
class wrongSonAgeException extends Exception {
   wrongSonAgeException(String message) {
      super(message);
}
}
 class Father { int
   fAge; Father(int
   fAge) {

      try {
      if(fAge<0) {
         throw new wrongAgeException("father's age cannot be less
than 0");
      }
      this.fAge=fAge;
   }
   catch (wrongAgeException e) {
      System.out.println("Error:"+e);
   }

   }
}
 class Son extends Father {
   int sAge;
   Son(int fAge,int sAge) {
```

```
        super( fAge );

    try {
        if (sAge>=fAge) {
            throw new wrongSonAgeException("Son's age cannot be
more than Father's age");
        }
         this.sAge=sAge;
    }
    catch (wrongSonAgeException e) {
        System.out.println("Error:"+e);
    }
    }

    }


public class exceptions {
    public static void main(String[] args) { Scanner
        sc=new Scanner(System.in);
        System.out.println("enter the father and son age");
        int fatherAge=sc.nextInt();
        int sonAge=sc.nextInt();
        Son s1=new Son(fatherAge,sonAge);
    }
}
```

OUTPUT:

PROGRAM 8:
MULTI-THREADING

CODE:

```
class MessageThread extends Thread {
    private String message;
    private int interval;  // in milliseconds

    public MessageThread(String message, int interval) {
        this.message = message;
        this.interval = interval;
    }

    @Override
    public void run() {
        while (true) {
```

```
            System.out.println(message);
            try {
                Thread.sleep(interval);
            } catch (InterruptedException e) {
                System.out.println("Thread interrupted: " +
e.getMessage());
            }
        }
    }
}

public class TwoThreadDemo {
    public static void main(String[] args) {
        // Thread 1: prints every 10 seconds
        MessageThread t1 = new MessageThread("BMS College of
Engineering", 10000);

        // Thread 2: prints every 2 seconds
        MessageThread t2 = new MessageThread("CSE", 2000);

        t1.start();
        t2.start();
    }
}
```

OUTPUT:

```
 } ; if ($?) { java TwoThreadDemo }
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
```