VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Object Oriented Java Programming

Submitted by

PALLE PADMAVATHI (1BM21CS125)

in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING

B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019
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B. M. S. College of Engineering,

Bull Temple Road, Bangalore 560019

(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "**OBJECT ORIENTED JAVA PROGRAMMING**" carried out by **PALLE PADMAVATHI(1BM21CS125),** who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2022-23. The Lab report has been approved as it satisfies the academic requirements in respect of OOJ Lab - **(**21CS3PCOOJ**)**work prescribed for the said degree.

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Department of CSE
BMSCE, Bengaluru

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LAB PROGRAM 1:

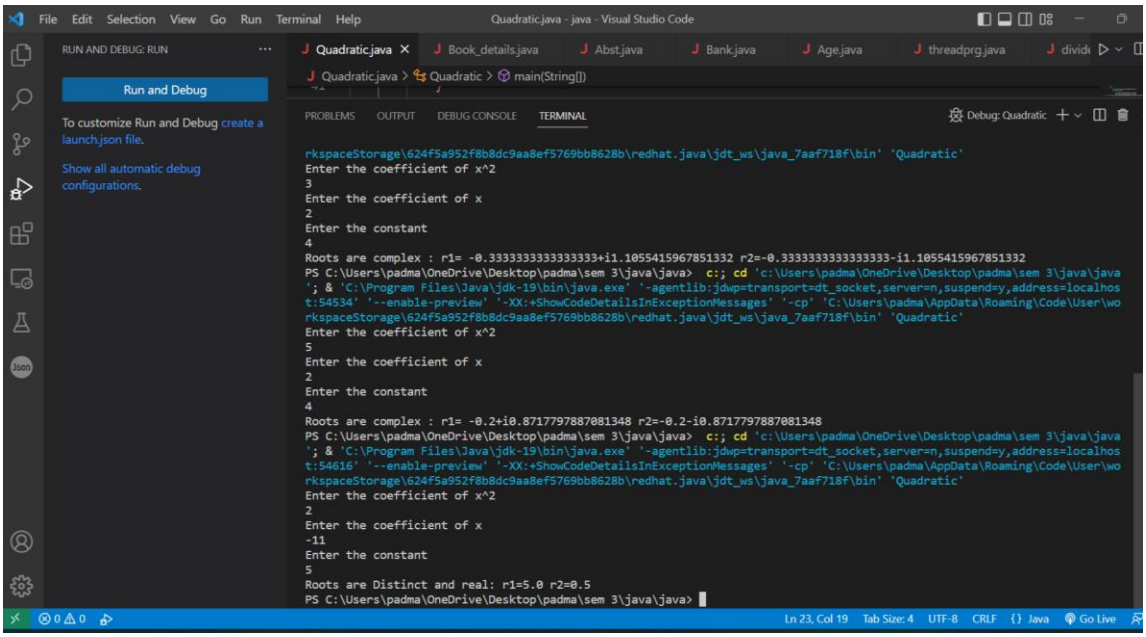
Develop a Java program that prints all real solutions to the quadratic equation ax2+bx+c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2 -4ac is negative, display a message stating that there are no real solutions.

CODE:

```
import java.util.*;
class Discriminant
{
    double a,b,c;
    Discriminant(double x,double y,double z)
    {
        a=x;
        b=y;
        c=z;
    }
    double discr()
    {
        return(b*b-4*a*c);
    }
}
class Quadratic
{
    public static void main(String args[])
    {
         try (Scanner sc= new Scanner(System.in)){;
        double a,b,c;
        double r1,r2;
        System.out.println("Enter the coefficient of x^2");
        a=sc.nextDouble();
        System.out.println("Enter the coefficient of x");
        b=sc.nextDouble();
        System.out.println("Enter the constant");
        c=sc.nextDouble();
        if(a==0)
        {
            System.out.println("Entered equation is not quadratic!!!!");
        }
        else
        {
```

```
            Discriminant d=new Discriminant(a,b,c);
            if (d.discr()>0)
            {
                r1=(-b+Math.sqrt(d.discr()))/(2*a);
                r2=(-b-Math.sqrt(d.discr()))/(2*a);
                System.out.println("Roots are Distinct and real: r1="+r1+"
r2="+r2);
            }
            else if(d.discr()<0)
            {
                r1=-b/(2*a);
                r2=(Math.sqrt(Math.abs(d.discr())))/(2*a);
                System.out.println("Roots are complex : r1= "+r1+"+i"+r2+"
r2="+r1+"-i"+r2);
            }
            else
            {
                r1=-b/(2*a);
                System.out.println("Roots are equal: r1=r2="+r1);
            }
        }
    }
}
}
```

OUTPUT:



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.

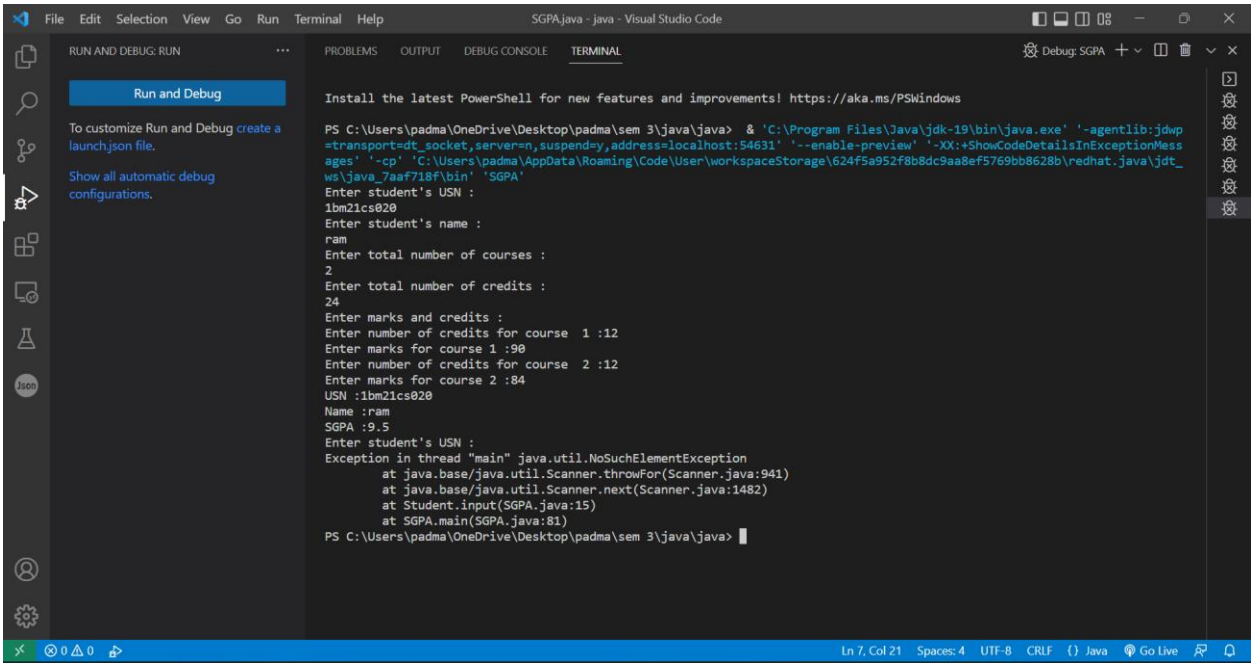
CODE:

```
import java.util.*;
class Student
{
    String USN;
    String name;
    int credits[]=new int[20];
    double tot,sgpa;
    int c,i;
    int marks[]=new int[20];
    int p[]=new int[20];
    void input()
    {
        try (Scanner sc = new Scanner(System.in)) {
            System.out.println("Enter student's USN :");
            USN=sc.next();
            System.out.println("Enter student's name :");
            name=sc.next();
            System.out.println("Enter total number of courses :");
            c=sc.nextInt();
            System.out.println("Enter total number of credits :");
            tot=sc.nextDouble();
            System.out.println("Enter marks and credits :");
            for(i=0;i<c;i++)
            {
                System.out.print("Enter number of credits for course  "+(i+1)+"
:");
                credits[i]=sc.nextInt();
                System.out.print("Enter marks for course "+(i+1)+" :");
                marks[i]=sc.nextInt();
   }
        }
    }
    double calculate()
    {

        for(i=0;i<c;i++)
```

```
        {
            if(marks[i]<=100 && marks[i]>=90)
                p[i]=10;
            else if(marks[i]<90 && marks[i]>=80)
                p[i]=9;
            else if(marks[i]<80 && marks[i]>=70)
                p[i]=8;
            else if(marks[i]<70 && marks[i]>=60)
                p[i]=7;
            else if(marks[i]<60 && marks[i]>=55)
                p[i]=6;
            else if(marks[i]<55 && marks[i]>=50)
                p[i]=5;
            else if(marks[i]<50 && marks[i]>=40)
            p[i]=4;
            else
                p[i]=0;

        }
        double total=0.0;


        for(i=0;i<c;i++)
        {
            total+=credits[i]*p[i];
        }
    sgpa=total/tot;
        return (sgpa);
    }
    void display()
    {
        System.out.println("USN :"+USN);
        System.out.println("Name :"+name);
        System.out.println("SGPA :"+calculate());
    }

}
class SGPA
{
    public static void main(String args[])
    {
        Student s1=new Student();
        s1.input();
        s1.display();
        Student s2=new Student();
```

```
        s2.input();
        s2.display();


    }
}
```

OUTPUT:



PROGRAM 3:

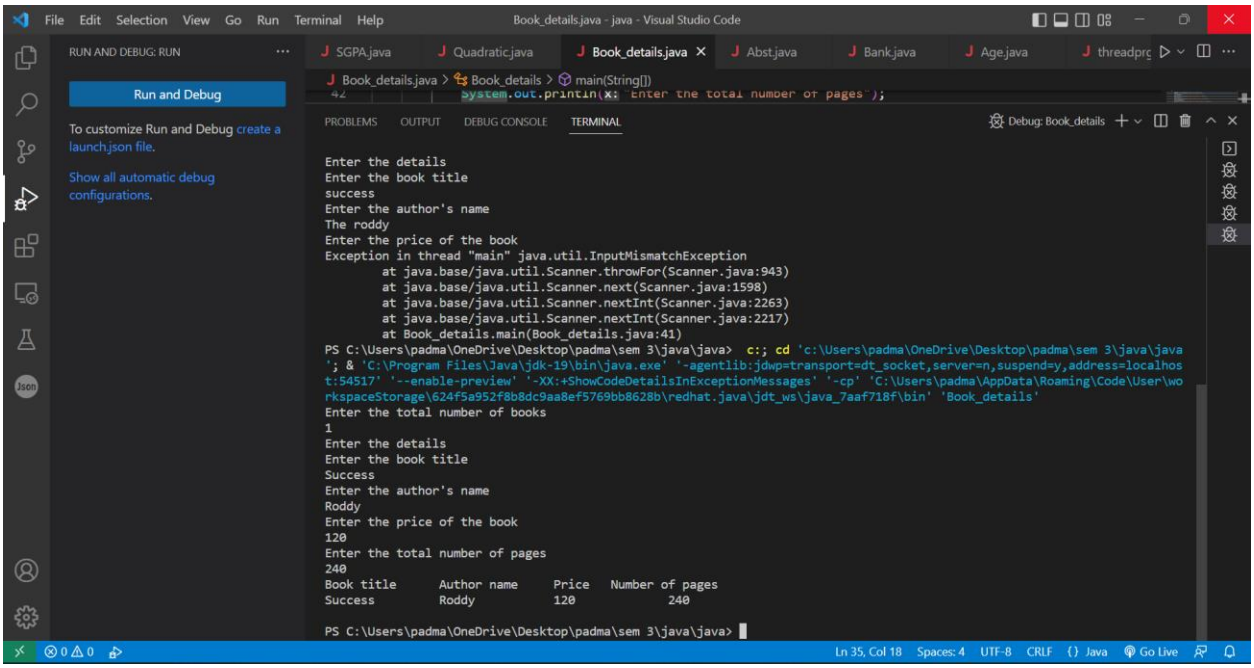
Create a class Book which contains four members: name, author, price, num_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString( ) method that could display the complete details of the book. Develop a Java program to create n book objects.

CODE:

```
import java.util.*;
class Book
{
    String name;
    String author;
    int price;
    int num_pages;
    Book(String n,String a,int p,int no)
    {
        name=n;
        author=a;
        price=p;
        num_pages=no;

    }
     public String toString()
    {
        return name+"\t\t"+author+"\t\t"+price+"\t\t"+num_pages+"\n";
    }
}
class Book_details
{
    public static void main(String args[])
    {
         try(Scanner sc=new Scanner(System.in)){;
        int count;
        System.out.println("Enter the total number of books");
        count=sc.nextInt();
        Book b[]=new Book[count];
        String n,a;
        int p,no;
```

```
        for(int i=0;i<count;i++)
        {
            System.out.println("Enter the details");
            System.out.println("Enter the book title");
            n=sc.next();
            System.out.println("Enter the author's name");
            a=sc.next();
            System.out.println("Enter the price of the book");
            p=sc.nextInt();
            System.out.println("Enter the total number of pages");
            no=sc.nextInt();
            b[i]=new Book(n,a,p,no);
        }
      System.out.println("Book title\tAuthor name\tPrice\tNumber of pages");
        for(int i=0;i<count;i++)
        {
            System.out.println(b[i]);
        }
    }
}
}
```

OUTPUT:



PROGRAM4:

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.

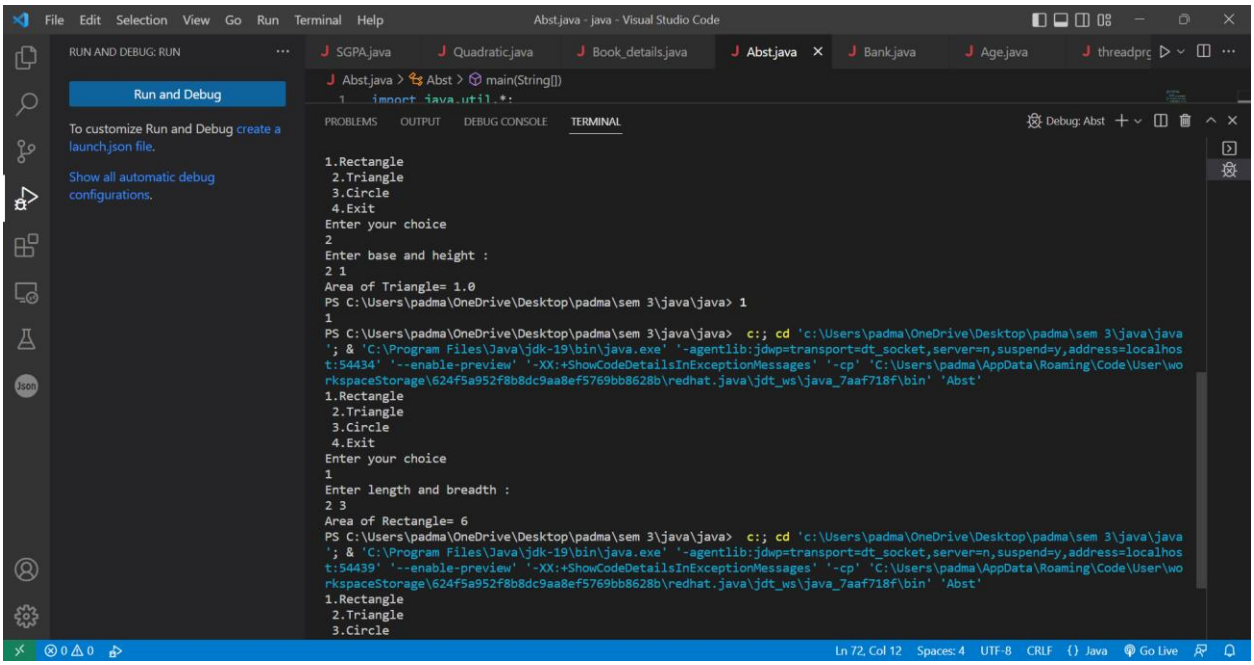
CODE:

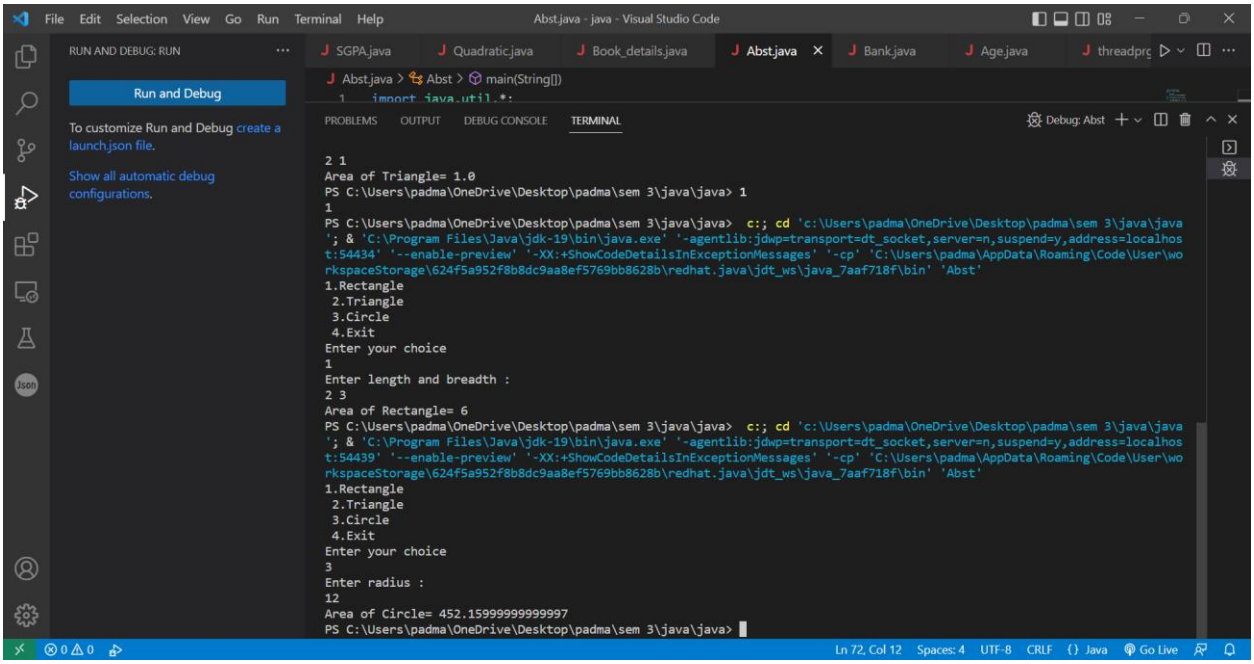
```
import java.util.*;
abstract class Shape
{
    int a,b;
    abstract void printArea();
}
class Rectangle extends Shape
{
    void get_data(int l,int h)
    {
        a=l;
        b=h;
    }
    void printArea()
    {
        System.out.println("Area of Rectangle= "+a*b);
    }
}
class Triangle extends Shape
{
    void get_data(int l,int h)
    {
        a=l;
        b=h;
    }
    void printArea()
    {
        System.out.println("Area of Triangle= "+0.5*a*b);
    }
}
class Circle extends Shape
```

```
{
    void get_data(int r)
    {
        a=r;
    }
    void printArea()
    {
        System.out.println("Area of Circle= "+3.14*a*a);
    }
}
class Abst
{
    public static void main(String args[])
    {
         try (Scanner sc=new Scanner(System.in)){;
        int a,b,choice;
        Rectangle r= new Rectangle();
        Triangle t= new Triangle();
        Circle c=new Circle();
        System.out.println("1.Rectangle\n 2.Triangle\n 3.Circle\n 4.Exit");
        System.out.println("Enter your choice");
        choice=sc.nextInt();
        switch(choice)
        {
            case 1:System.out.println("Enter length and breadth :");
                    a=sc.nextInt();
                    b=sc.nextInt();
                    r.get_data(a,b);
                    r.printArea();
                    break;
            case 2:System.out.println("Enter base and height :");
                    a=sc.nextInt();
                    b=sc.nextInt();
                    t.get_data(a,b);
                    t.printArea();
                    break;
            case 3:System.out.println("Enter radius :");
                    a=sc.nextInt();
                    c.get_data(a);
                    c.printArea();
                    break;
            default: System.out.println("Invalid choice!!!");

        }
```

```
    }
}
}
```

OUTPUT:


File Edit Selection View Go Run Terminal Help
Abst.java - java - Visual Studio Code
RUN AND DEBUG: RUN
Run and Debug
To customize Run and Debug create a launch.json file.
Show all automatic debug configurations.
SGPA.java
Quadratic.java
Book_details.java
Abst.java
Bank.java
Age.java
Abst.java > Abst > main(String[])
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
Debug: Abst
1.Rectangle
2.Triangle
3.Circle
4.Exit
Enter your choice
2
Enter base and height :
2 1
Area of Triangle= 1.0
PS C:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java> 1
1
PS C:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java> c:; cd 'c:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java'; & 'C:\Program Files\Java\jdk-19\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:54434' '--enable-preview' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\padma\AppData\Roaming\Code\User\workspaceStorage\624f5a952f8b8dc9aa8ef5769bb8628b\redhat.java\jdt_ws\java_7aaf718f\bin' 'Abst'
1.Rectangle
2.Triangle
3.Circle
4.Exit
Enter your choice
1
Enter length and breadth :
2 3
Area of Rectangle= 6
PS C:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java> c:; cd 'c:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java'; & 'C:\Program Files\Java\jdk-19\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:54439' '--enable-preview' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\padma\AppData\Roaming\Code\User\workspaceStorage\624f5a952f8b8dc9aa8ef5769bb8628b\redhat.java\jdt_ws\java_7aaf718f\bin' 'Abst'
1.Rectangle
2.Triangle
3.Circle
Ln 72, Col 12 Spaces: 4 UTF-8 CRLF Java Go Live


File Edit Selection View Go Run Terminal Help
Abst.java - java - Visual Studio Code
RUN AND DEBUG: RUN
Run and Debug
To customize Run and Debug create a launch.json file.
Show all automatic debug configurations.
SGPA.java
Quadratic.java
Book_details.java
Abst.java
Bank.java
Age.java
Abst.java > Abst > main(String[])
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
Debug: Abst
2 1
Area of Triangle= 1.0
PS C:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java> 1
1
PS C:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java> c:; cd 'c:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java'; & 'C:\Program Files\Java\jdk-19\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:54434' '--enable-preview' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\padma\AppData\Roaming\Code\User\workspaceStorage\624f5a952f8b8dc9aa8ef5769bb8628b\redhat.java\jdt_ws\java_7aaf718f\bin' 'Abst'
1.Rectangle
2.Triangle
3.Circle
4.Exit
Enter your choice
1
Enter length and breadth :
2 3
Area of Rectangle= 6
PS C:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java> c:; cd 'c:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java'; & 'C:\Program Files\Java\jdk-19\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:54439' '--enable-preview' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\padma\AppData\Roaming\Code\User\workspaceStorage\624f5a952f8b8dc9aa8ef5769bb8628b\redhat.java\jdt_ws\java_7aaf718f\bin' 'Abst'
1.Rectangle
2.Triangle
3.Circle
4.Exit
Enter your choice
3
Enter radius :
12
Area of Circle= 452.15999999999997
PS C:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java>
Ln 72, Col 12 Spaces: 4 UTF-8 CRLF Java Go Live

PROGRAM5:

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:

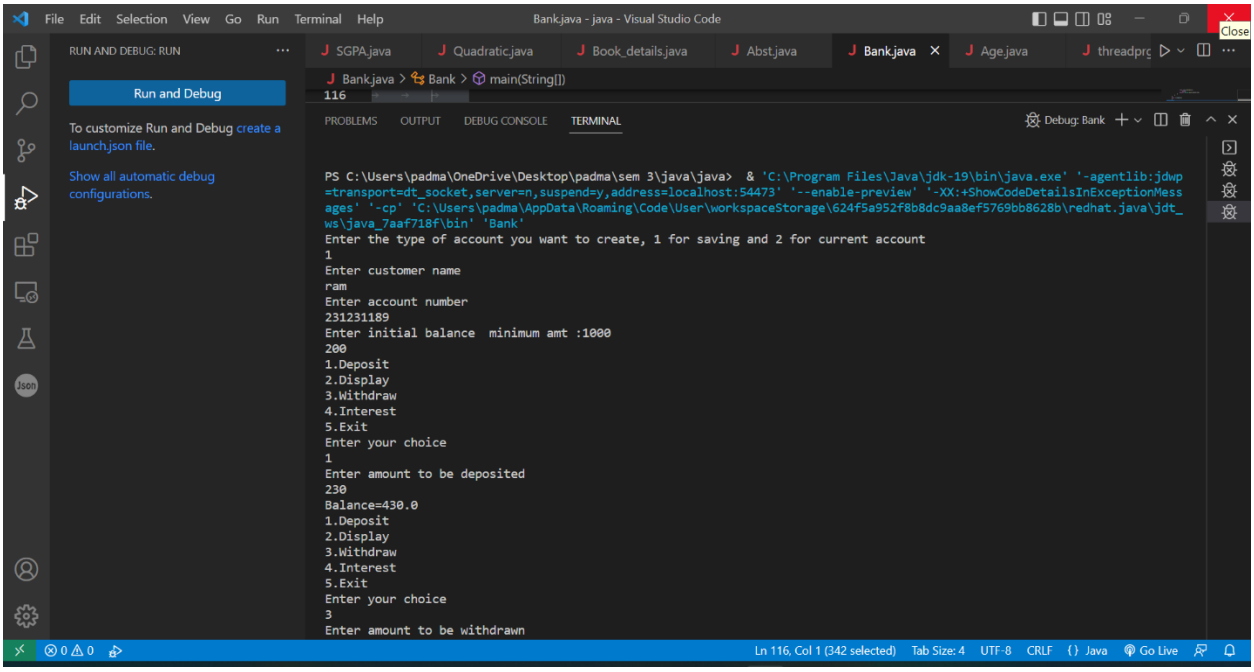
```
import java.util.Scanner;
class Account
{
    String cust_name;
    String accno;
    String type;
    double balance;
    double amt;
    Scanner sc=new Scanner(System.in);
    void get_values()
    {
```

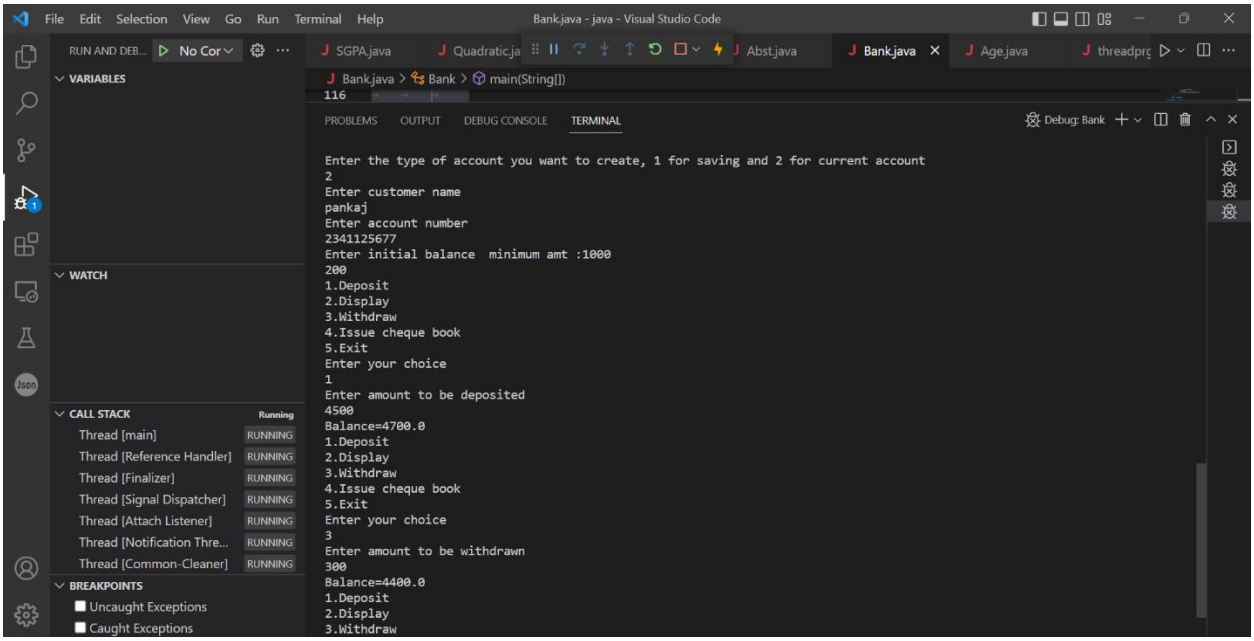
```
        System.out.println("Enter customer name");
        cust_name=sc.next();
        System.out.println("Enter account number");
        accno=sc.next();
        System.out.println("Enter initial balance  minimum amt :1000");
        balance=sc.nextDouble();
    }
    void depo()
    {
        System.out.println("Enter amount to be deposited");
        amt=sc.nextDouble();
        balance+=amt;
        System.out.println("Balance="+balance);
    }
    void withdraw()
    {
        System.out.println("Enter amount to be withdrawn");
        amt=sc.nextDouble();
        if(balance<=amt)
            System.out.println("Cannot withdraw");
        else
            balance-=amt;
        System.out.println("Balance="+balance);
    }

    void display_bal()
    {
        System.out.println("customer name="+cust_name);
        System.out.println("Account number="+accno);
        System.out.println("type="+type);
        if(balance<1000)
        {
            System.out.println("Below minimum balance");
            balance=balance-100;
        }
        System.out.println("Balance="+balance);
        System.out.println("\n");
    }
}
class Cur_acct extends Account
{
    Cur_acct()
    {
        type="Current_account";
    }
```

```
    void issue()
    {
        System.out.println("Cheque book issued");
    }

}
class Sav_acct extends Account
{
    Sav_acct()
    {
        type="Savings_account";
    }
    void interest()
    {
         try (Scanner sc=new Scanner(System.in)){;
        System.out.println("Enter rate of interest, time period");
        double r=sc.nextDouble();
        double t=sc.nextDouble();
        double n=2;
        balance=balance*(Math.pow((1+r/n),(n*t)));
    }
}
}
class Bank
{
    public static void main(String args[])
    {
         try (Scanner sc=new Scanner(System.in)){;
        int type;
        System.out.println("Enter the type of account you want to create, 1 for
saving and 2 for current account");
        type=sc.nextInt();
        if(type==1)
        {
            Sav_acct s1=new Sav_acct();
            s1.get_values();
            int c;

            while(true)
            {
                System.out.println("1.Deposit\n2.Display\n3.Withdraw\n4.Interest\
n5.Exit");
                System.out.println("Enter your choice");
                c=sc.nextInt();
                switch(c)
```

```
                {
                    case 1:s1.depo();
                        break;
                    case 2:s1.display_bal();
                        break;
                    case 3:s1.withdraw();
                        break;
                    case 4:s1.interest();
                        break;
                    default:System.exit(0);
                }
            }
        }
        else if(type==2)
        {

            Cur_acct c1=new Cur_acct();
            c1.get_values();
            int c;

            while(true)
            {
                System.out.println("1.Deposit\n2.Display\n3.Withdraw\n4.Issue
cheque book\n5.Exit");
                System.out.println("Enter your choice");
                c=sc.nextInt();
                switch(c)
                {
                    case 1:c1.depo();
                        break;
                    case 2:c1.display_bal();
                        break;
                    case 3:c1.withdraw();
                        break;
                    case 4:c1.issue();
                        break;
                    default:System.exit(0);
                }
            }
        }
        else
            System.out.println("Invalid choice");
    }
}
}
```

OUTPUT:


File Edit Selection View Go Run Terminal Help
Bank.java - java - Visual Studio Code
RUN AND DEBUG: RUN
Run and Debug
To customize Run and Debug create a launch.json file.
Show all automatic debug configurations.
SGPA.java
Quadratic.java
Book_details.java
Abst.java
Bank.java
Age.java
Bank.java > Bank > main(String[])
116
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
Debug: Bank
PS C:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java> & 'C:\Program Files\Java\jdk-19\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:54473' '--enable-preview' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\padma\AppData\Roaming\Code\User\workspaceStorage\624f5a952f8b8dc9aa8ef5769bb8628b\redhat.java\jdt_ws\java_7aaf718f\bin' 'Bank'
Enter the type of account you want to create, 1 for saving and 2 for current account
1
Enter customer name
ram
Enter account number
231231189
Enter initial balance minimum amt :1000
200
1.Deposit
2.Display
3.Withdraw
4.Interest
5.Exit
Enter your choice
1
Enter amount to be deposited
230
Balance=430.0
1.Deposit
2.Display
3.Withdraw
4.Interest
5.Exit
Enter your choice
3
Enter amount to be withdrawn
Ln 116, Col 1 (342 selected) Tab Size: 4 UTF-8 CRLF Java Go Live


File Edit Selection View Go Run Terminal Help
Bank.java - java - Visual Studio Code
VARIABLES
WATCH
CALL STACK
Thread [main] RUNNING
Thread [Reference Handler] RUNNING
Thread [Finalizer] RUNNING
Thread [Signal Dispatcher] RUNNING
Thread [Attach Listener] RUNNING
Thread [Notification Thre... RUNNING
Thread [Common-Cleaner] RUNNING
BREAKPOINTS
Uncaught Exceptions
Caught Exceptions
Bank.java > Bank > main(String[])
116
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
Debug: Bank
Enter the type of account you want to create, 1 for saving and 2 for current account
2
Enter customer name
pankaj
Enter account number
2341125677
Enter initial balance minimum amt :1000
200
1.Deposit
2.Display
3.Withdraw
4.Issue cheque book
5.Exit
Enter your choice
1
Enter amount to be deposited
4500
Balance=4700.0
1.Deposit
2.Display
3.Withdraw
4.Issue cheque book
5.Exit
Enter your choice
3
Enter amount to be withdrawn
300
Balance=4400.0
1.Deposit
2.Display
3.Withdraw

PROGRAM6:

Write a program that demonstrates handling of exceptions in inheritance tree.

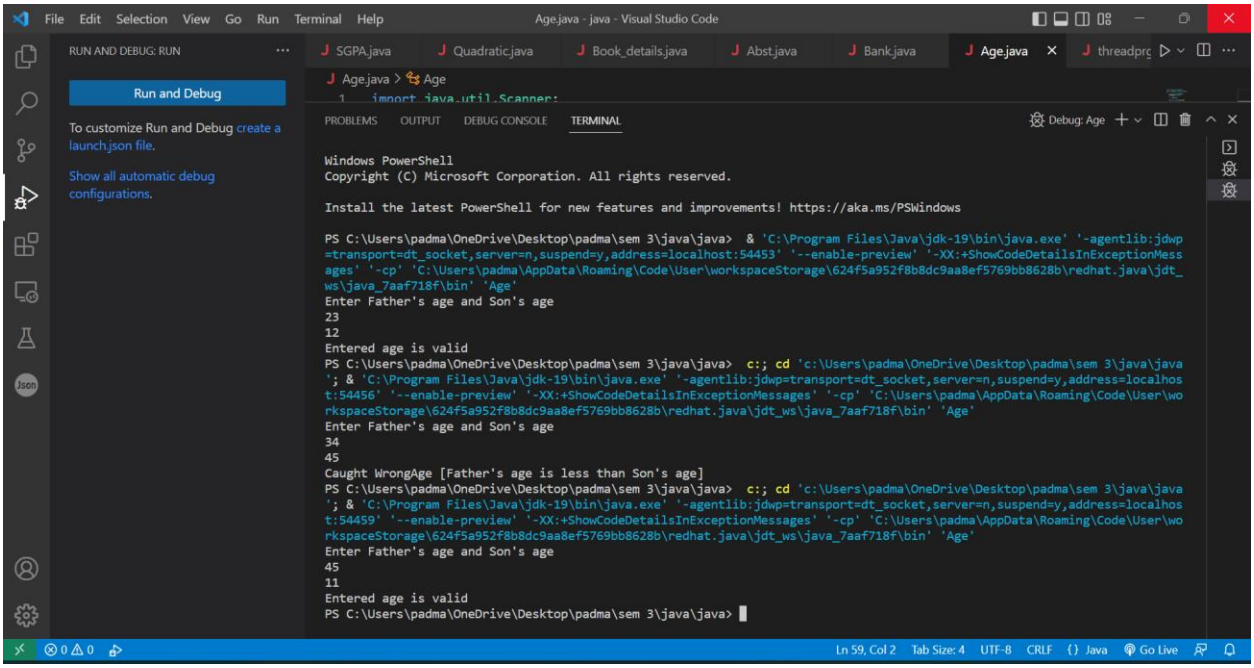
Create a base class called “Father” and derived class called “Son” which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge( ) when the input age<0. In Son class, implement a constructor that cases both father and son’s age and throws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

CODE:

```
import java.util.Scanner;
class WrongAge extends Exception
{
    private String detail;
    WrongAge(String a)
    {
        detail=a;
    }
    public String toString()
    {
        return "WrongAge [" +detail +"]";
    }
}
class Father
{
    int father_age;
    Father(int a)
    {
        father_age=a;
    }
}
class Son extends Father
{
    int son_age;
    Son(int a,int b)
    {
        super(a);
        son_age=b;
```

```
        try
        {
            if(son_age<=0 || father_age<=0)
            {
                throw new WrongAge("Son's age or Father's age is less than
zero");
            }
            if(father_age<=son_age)
            {
                throw new WrongAge("Father's age is less than Son's age");
            }
            else
                System.out.println("Entered age is valid");
        }
        catch(WrongAge e)
        {
            System.out.println("Caught "+e);
        }
    }
}
class Age
{
    public static void main(String args[])
    {
         try(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();
        new Son(fa,sa);
    }
}
}
```

OUTPUT:



PROGRAM7:

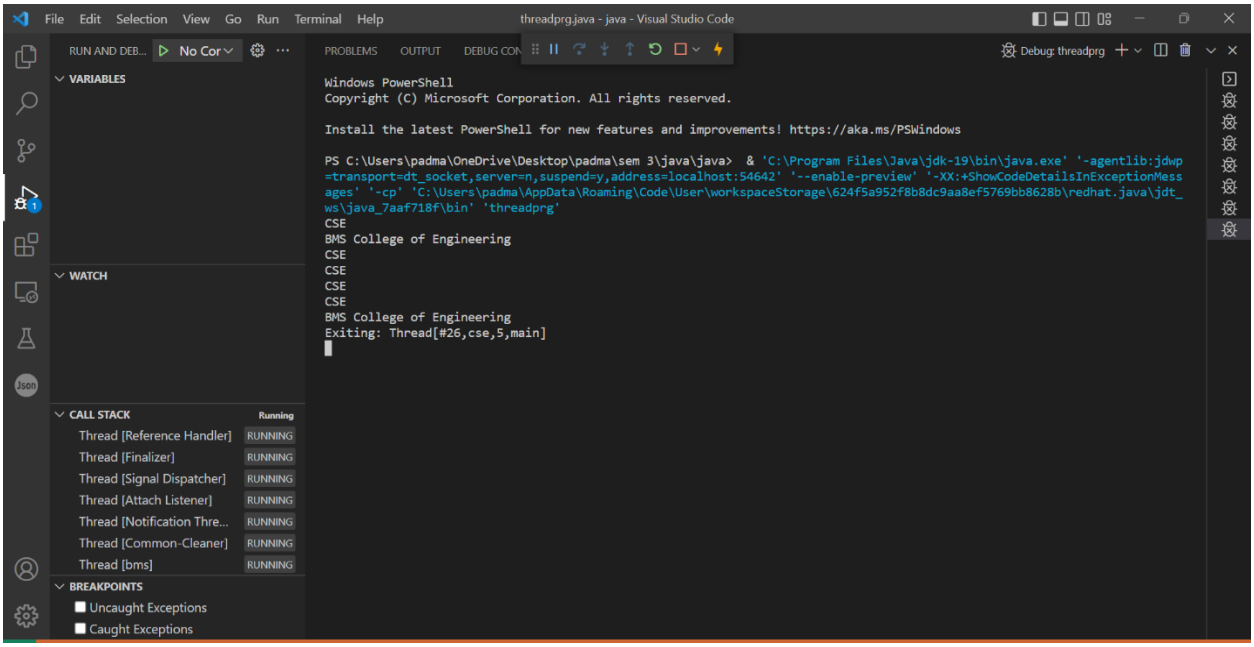
Write a program which creates two threads, one thread displaying "BMS College of Engineering" once every ten seconds and another displaying "CSE" once every two seconds.

CODE:

```
class bms implements Runnable{
    Thread t1;
    bms(){
        t1 = new Thread(this,"bms");
    }
    public void run(){
        try{
            for(int i=5; i>0; i--){
                System.out.println("BMS College of Engineering");
                Thread.sleep(10000);
```

```
            }
        }
        catch(InterruptedException e){
            System.out.println("BMS interrupted\n");
        }
        System.out.println("Exiting: "+t1);
    }
}

class cse implements Runnable{
    Thread t2;
    cse(){
        t2 = new Thread(this,"cse");
    }
    public void run(){
        try{
            for(int i=5; i>0; i--){
                System.out.println("CSE");
                Thread.sleep(2000);
            }
        }
        catch(InterruptedException e){
                System.out.println("CSE interrupted\n");
        }
        System.out.println("Exiting: "+t2);
    }
}

class threadprg{
    public static void main(String args[]){
        bms obj1 = new bms();
        cse obj2 = new cse();
        obj1.t1.start();
        obj2.t2.start();
    }
}
```

OUTPUT:


File Edit Selection View Go Run Terminal Help
threadprg.java - java - Visual Studio Code
RUN AND DEB... No Cor
VARIABLES
WATCH
CALL STACK Running
Thread [Reference Handler] RUNNING
Thread [Finalizer] RUNNING
Thread [Signal Dispatcher] RUNNING
Thread [Attach Listener] RUNNING
Thread [Notification Thre... RUNNING
Thread [Common-Cleaner] RUNNING
Thread [bms] RUNNING
BREAKPOINTS
Uncaught Exceptions
Caught Exceptions
PROBLEMS OUTPUT DEBUG CON
Debug: threadprg
Windows PowerShell
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PS C:\Users\padma\OneDrive\Desktop\padma\sem 3\java\java> & 'C:\Program Files\Java\jdk-19\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:54642' '--enable-preview' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\padma\AppData\Roaming\Code\User\workspaceStorage\624f5a952f8b8dc9aa8ef5769bb8628b\redhat.java\jdt_ws\java_7aaf718f\bin' 'threadprg'
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
BMS College of Engineering
Exiting: Thread[#26,cse,5,main]