# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

**"JnanaSangama", Belgaum -590014, Karnataka.**

**LAB REPORT**
**on**

# Object Oriented Java Programming

# (23CS3PCOOJ)

***Submitted by***

**Saney Vasudha sree (1BF24CS271)**

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

**Computer Science and Engineering**

**B.M.S. COLLEGE OF ENGINEERING**
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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 (23CS3PCOOJ)" carried out by **Saney Vasudha Sree(1BF24CS271),** 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.

| | |
|---|---|
| Dr. Seema Patil<br>Associate Professor<br>Department of CSE, BMSCE | Dr. Kavitha Sooda<br>Professor & HOD<br>Department of CSE, BMSCE |

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Github Link:
https://github.com/vasudhasreecs24/JAVA-VASUDHA

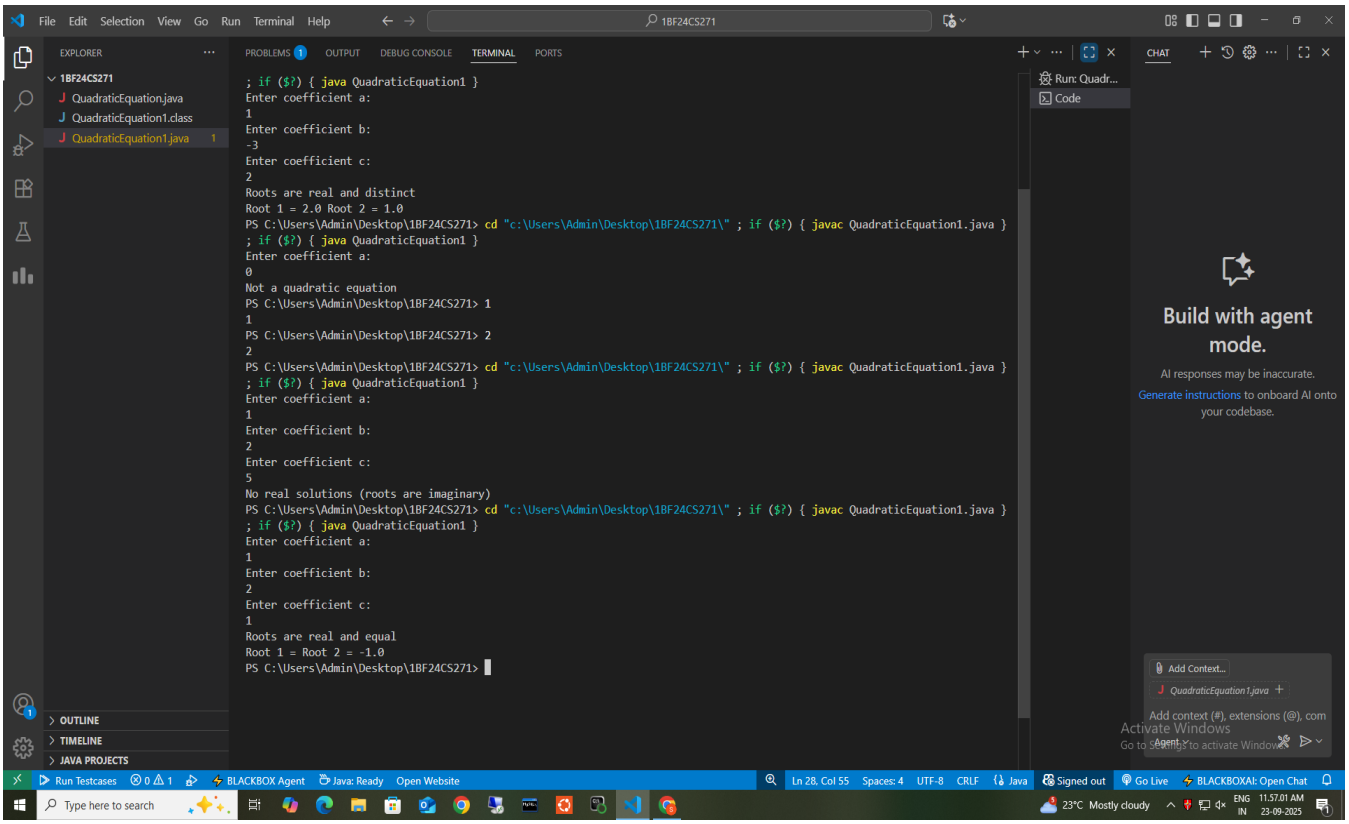
Lab program 1

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;

public class QuadraticEquation1 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        System.out.println("Enter coefficient a:");
        double a = sc.nextDouble();



        if (a == 0) {
            System.out.println("Not a quadratic equation");
            return;
        }

        System.out.println("Enter coefficient b:");
        double b = sc.nextDouble();

        System.out.println("Enter coefficient c:");
        double c = sc.nextDouble();
```

```
        double d = (b * b) - (4 * a * c);


        if (d > 0) {
            double r1 = (-b + Math.sqrt(d)) / (2 * a);
            double r2 = (-b - Math.sqrt(d)) / (2 * a);
            System.out.println("Roots are real and distinct");
            System.out.println("Root 1 = " + r1 + " Root 2 = " + r2);
        } else if (d == 0) {
            double r = -b / (2 * a);
            System.out.println("Roots are real and equal");
            System.out.println("Root 1 = Root 2 = " + r);
        } else {
            System.out.println("No real solutions (roots are
imaginary)");
        }

        sc.close();
    }
}
```




Lab program no 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.

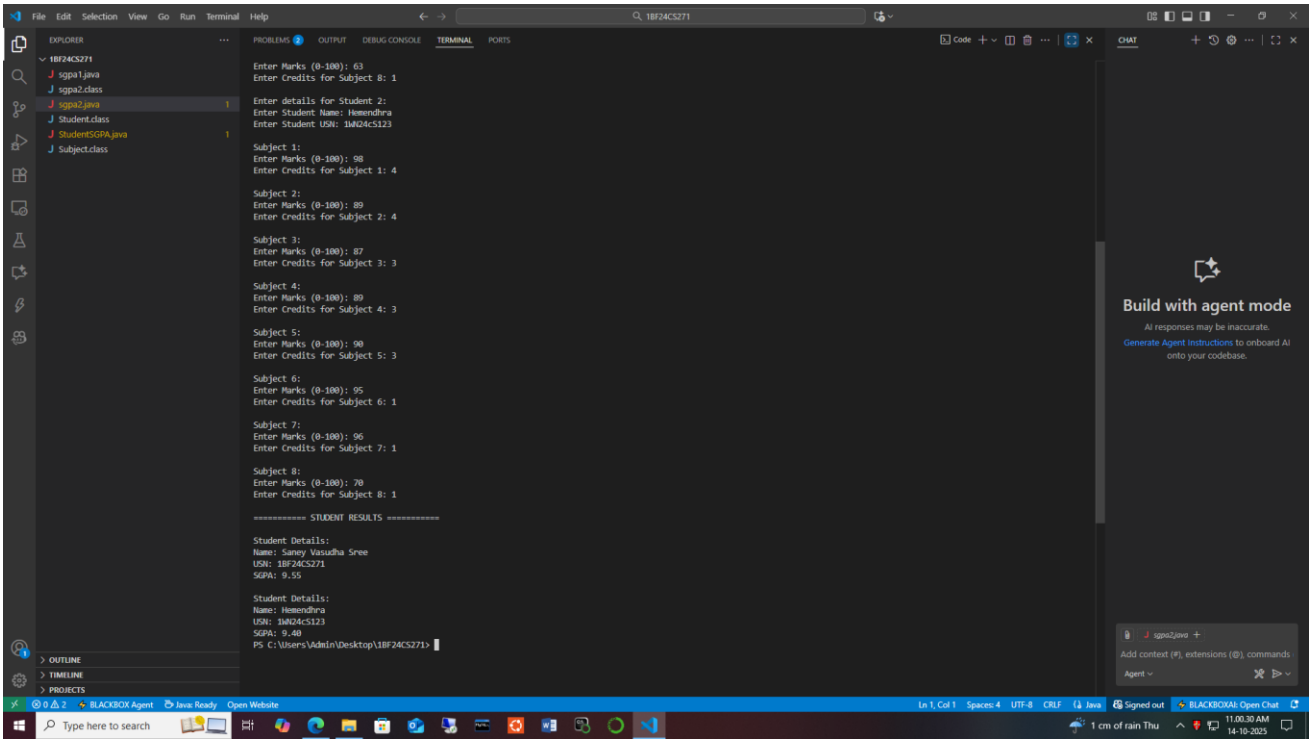
**Code:**

```
import java.util.Scanner;

class Subject {
    int subjectMarks;
    int credits;
    int grade;
}

class Student {
    String name, usn;
    double SGPA;
```

```
Scanner s = new Scanner(System.in);
Subject[] subject = new Subject[8];

Student() {
    for (int i = 0; i < 8; i++) {
        subject[i] = new Subject();
    }
}

void getStudentDetails() {
    System.out.print("Enter Student Name: ");
    name = s.nextLine();
    System.out.print("Enter Student USN: ");
    usn = s.nextLine();
}

void getMarks() {
    for (int i = 0; i < 8; i++) {
        System.out.println("\nSubject " + (i + 1) + ":");
        System.out.print("Enter Marks (0-100): ");
        int marks = s.nextInt();
        while (marks < 0 || marks > 100) {
            System.out.println("Invalid marks! Enter again:");
            marks = s.nextInt();
        }
        subject[i].subjectMarks = marks;

        System.out.print("Enter Credits for Subject " + (i + 1) + ": ");
        subject[i].credits = s.nextInt();

        subject[i].grade = (subject[i].subjectMarks / 10) + 1;
```

```
            if (subject[i].grade == 11)
                subject[i].grade = 10;
            if (subject[i].grade <= 4)
                subject[i].grade = 0;
        }
        s.nextLine();
    }

    void computeSGPA() {
        int totalScore = 0, totalCredits = 0;
        for (int i = 0; i < 8; i++) {
            totalScore += subject[i].grade * subject[i].credits;
            totalCredits += subject[i].credits;
        }
        SGPA = (double) totalScore / totalCredits;
    }

    void display() {
        System.out.println("\nStudent Details:");
        System.out.println("Name: " + name);
        System.out.println("USN: " + usn);
        System.out.printf("SGPA: %.2f\n", SGPA);
    }
}

public class sgpa2 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        Student[] students = new Student[2]; // For two students
```

```
        for (int i = 0; i < 2; i++) {
            System.out.println("\nEnter details for Student " + (i + 1) +
":");
            students[i] = new Student();
            students[i].getStudentDetails();
            students[i].getMarks();
            students[i].computeSGPA();
        }

        System.out.println("\n========== STUDENT RESULTS
==========");
        for (int i = 0; i < 2; i++) {
            students[i].display();
        }

        sc.close();
    }
}
```



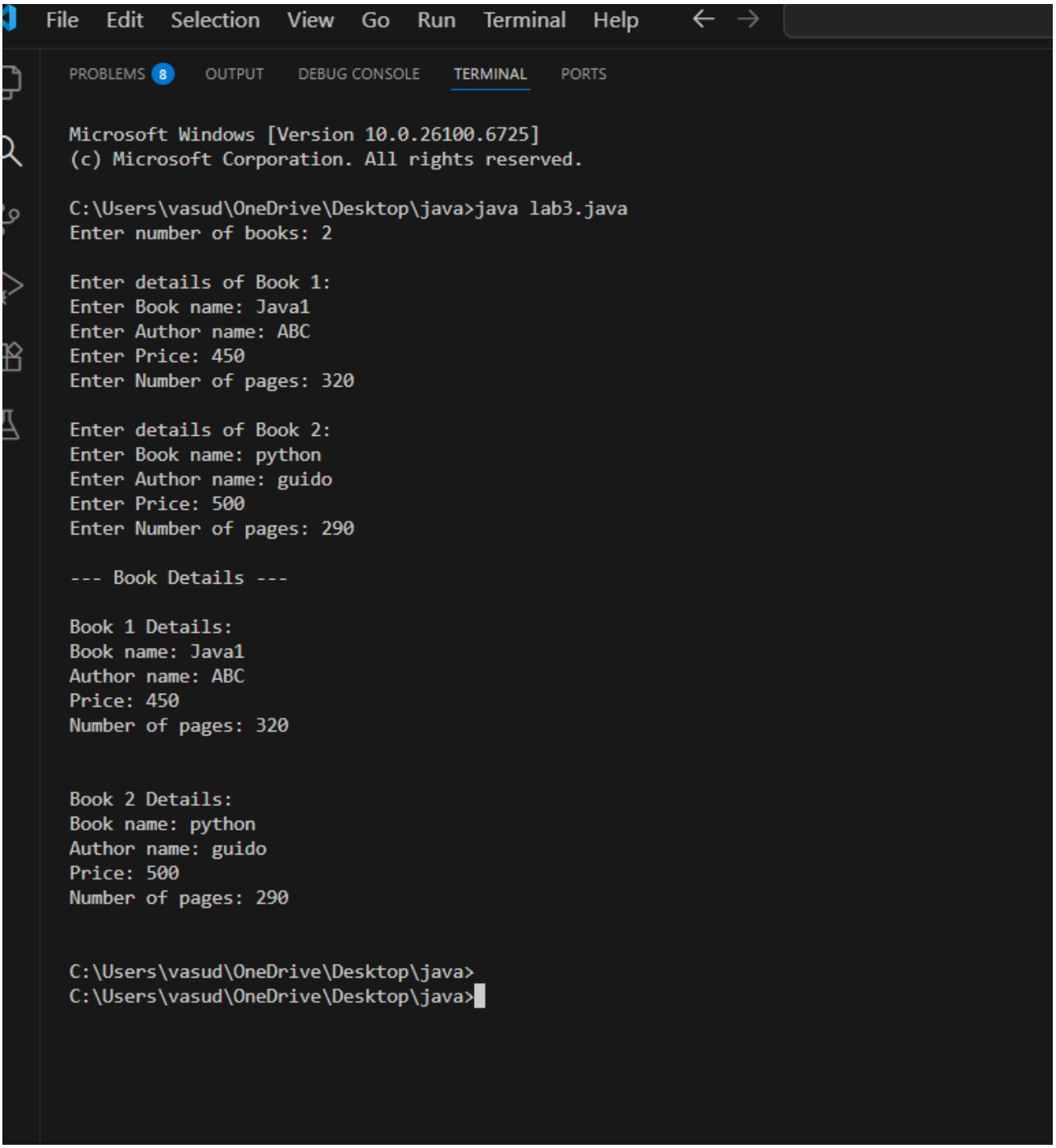
Lab Program no 3
Create a class Book which contains four members: name, author, price, num_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString( ) method that could display the complete details of
the book. Develop a Java program to create n book objects.

**Code:**

```
import java.util.Scanner;

class Books {
    String name;
    String author;
    int price;
    int numPages;

    // Constructor
    Books(String name, String author, int price, int numPages) {
        this.name = name;
        this.author = author;
        this.price = price;
        this.numPages = numPages;
    }

    // toString method to display details
    public String toString() {
        return "Book Name: " + name + "\n" +
               "Author Name: " + author + "\n" +
               "Price: " + price + "\n" +
               "Number of Pages: " + numPages + "\n";
    }
```

```
}

public class lab3 {
    public static void main(String[] args) {
        Scanner s = new Scanner(System.in);

        System.out.print("Enter number of books: ");
        int n = s.nextInt();
        s.nextLine(); // consume newline

        Books[] b = new Books[n];

        for (int i = 0; i < n; i++) {
            System.out.println("\nEnter details for Book " + (i + 1) + ":");

            System.out.print("Enter Book Name: ");
            String name = s.nextLine();

            System.out.print("Enter Author Name: ");
            String author = s.nextLine();

            System.out.print("Enter Book Price: ");
            int price = s.nextInt();

            System.out.print("Enter Number of Pages: ");
            int numPages = s.nextInt();
            s.nextLine(); // consume newline

            b[i] = new Books(name, author, price, numPages);
        }
```

```
        System.out.println("\n--- Book Details ---");
        for (int i = 0; i < n; i++) {
            System.out.println("Book " + (i + 1) + " details are:\n" +
b[i]);
        }

        s.close();
    }
}
```




Lab program no 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.

```
import java.util.Scanner;
public class labpgm4 {
    public static void main(String[] args) {
        Rectangle r = new Rectangle();
        r.input();
        r.printArea();

        Triangle t = new Triangle();
        t.input();
        t.printArea();

        Circle c = new Circle();
        c.input();
        c.printArea();
    }
}

class InputScanner {
    Scanner sc = new Scanner(System.in);
}

abstract class shape extends InputScanner {
    int dim1, dim2;
    abstract void input();
    abstract void printArea();
}

class Rectangle extends shape {
```

```
    void input() {
        System.out.println("Enter the dimensions of the rectangle (length and breadth):");
        dim1 = sc.nextInt();
        dim2 = sc.nextInt();
    }
    void printArea() {
        double area = (double) (dim1 * dim2);
        System.out.println("Area of Rectangle = " + area);
    }
}

class Triangle extends shape {
    void input() {
        System.out.println("Enter the dimensions of the triangle (base and height):");
        dim1 = sc.nextInt();
        dim2 = sc.nextInt();
    }
    void printArea() {
        double area = 0.5 * dim1 * dim2;
        System.out.println("Area of Triangle = " + area);
    }
}

class Circle extends shape {
    void input() {
        System.out.println("Enter the radius of the circle:");
        dim1 = sc.nextInt();
    }
    void printArea() {
```

```
        double area = Math.PI * dim1 * dim1;
        System.out.println("Area of Circle = " + area);
    }
}
```

```
Thank you!
PS C:\Users\Admin\Desktop\1BF24CS271> cd "c:\Users\Admin\Desktop\1BF24CS271\" ; if ($?) { javac labpgm4.java } ; if ($?) { java labpgm4 }
Enter the dimensions of the rectangle (length and breadth):
2
2
Area of Rectangle = 4.0
Enter the dimensions of the triangle (base and height):
4
3
Area of Triangle = 6.0
Enter the radius of the circle:
4
Area of Circle = 50.26548245743669
PS C:\Users\Admin\Desktop\1BF24CS271>
```

Lab program no 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

e) Check for the minimum balance, impose penalty if necessary and update the balance.

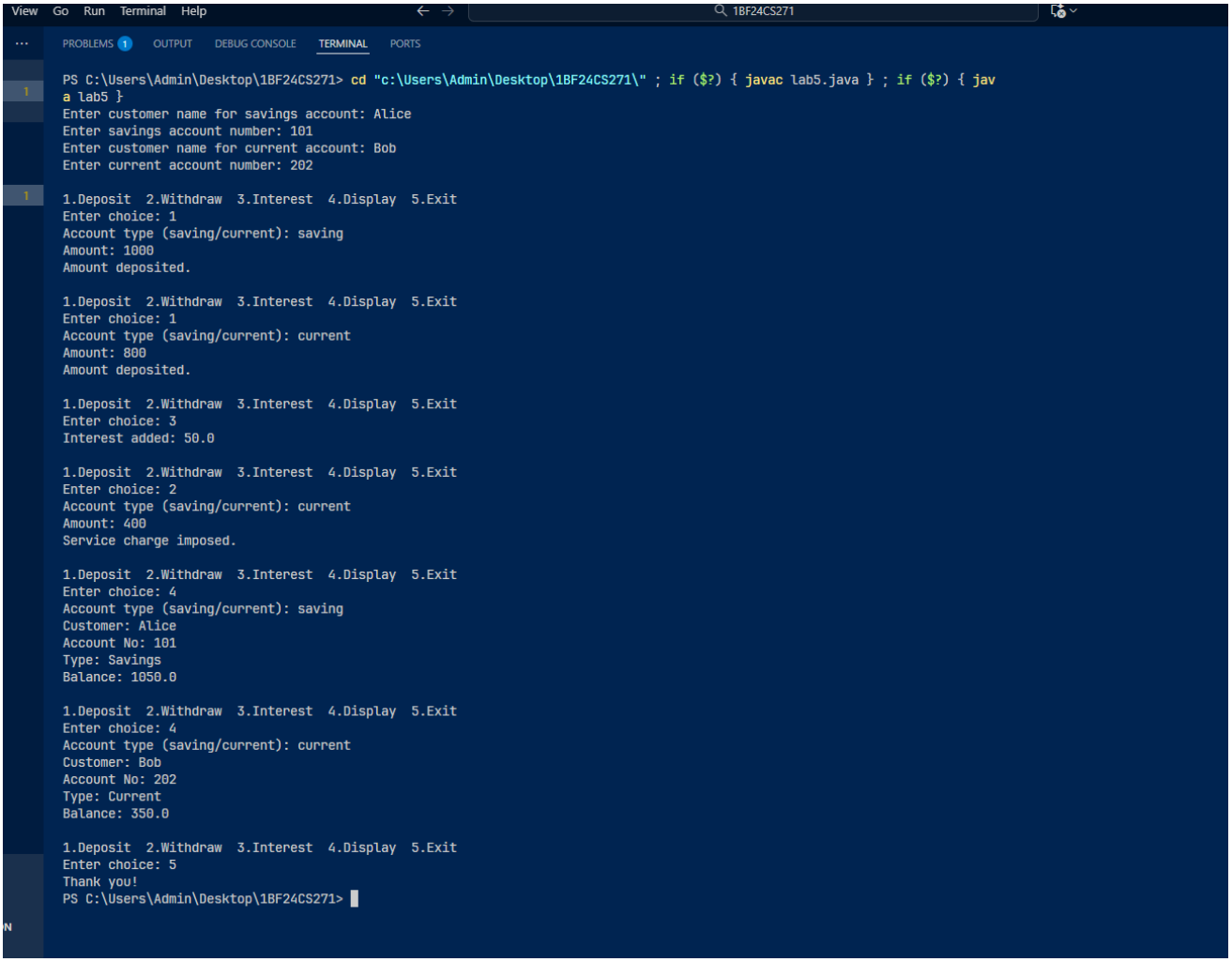
```
import java.util.Scanner;

class Account {
    String name, type;
    int accNo;
    double balance;

    // Constructor
    void account(String n, int no, String t) {
        name = n;
        accNo = no;
        type = t;
        balance = 0.0;
    }

    void deposit(double amt) {
        balance += amt;
        System.out.println("Amount deposited.");
    }

    void display() {
```

```
        System.out.println("Customer: " + name);
        System.out.println("Account No: " + accNo);
        System.out.println("Type: " + type);
        System.out.println("Balance: " + balance);
    }
}

class Savings extends Account {
    void interest() {
        double i = balance * 0.05;
        balance += i;
        System.out.println("Interest added: " + i);
    }

    void withdraw(double amt) {
        if (amt <= balance)
            balance -= amt;
        else
            System.out.println("Insufficient balance!");
    }
}

class Current extends Account {
    void withdraw(double amt) {
        balance -= amt;
        if (balance < 500) {
            balance -= 50;
            System.out.println("Service charge imposed.");
        }
    }
}
```

```
public class lab5 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        Savings s = new Savings();
        Current c = new Current();

        System.out.print("Enter customer name for savings account: ");
        String n1 = sc.next();
        System.out.print("Enter savings account number: ");
        int a1 = sc.nextInt();
        s.account(n1, a1, "Savings");

        System.out.print("Enter customer name for current account: ");
        String n2 = sc.next();
        System.out.print("Enter current account number: ");
        int a2 = sc.nextInt();
        c.account(n2, a2, "Current");

        int ch;
        do {
            System.out.println("\n1.Deposit      2.Withdraw      3.Interest
4.Display  5.Exit");
            System.out.print("Enter choice: ");
            ch = sc.nextInt();

            switch (ch) {
                case 1 -> {
                    System.out.print("Account type (saving/current): ");
                    String t = sc.next();
                    System.out.print("Amount: ");
```

```
            double d = sc.nextDouble();
            if (t.equalsIgnoreCase("saving"))
                s.deposit(d);
            else
                c.deposit(d);
        }
        case 2 -> {
            System.out.print("Account type (saving/current): ");
            String t = sc.next();
            System.out.print("Amount: ");
            double w = sc.nextDouble();
            if (t.equalsIgnoreCase("saving"))
                s.withdraw(w);
            else
                c.withdraw(w);
        }
        case 3 -> s.interest();
        case 4 -> {
            System.out.print("Account type (saving/current): ");
            String t = sc.next();
            if (t.equalsIgnoreCase("saving"))
                s.display();
            else
                c.display();
        }
        case 5 -> System.out.println("Thank you!");
        default -> System.out.println("Invalid choice!");
    }
} while (ch != 5);

sc.close();
```

```
    }
}
```




## Lab6

Create a package CIE which has two classes- Student and Internals. The class
Student has members like usn, name, sem. The class Internals derived from
Student 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.

**Student.java**

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

public class Student {
    protected String usn;
    protected String name;
    protected int sem;

    public void inputStudentDetails() {
        Scanner s = new Scanner(System.in);
        System.out.print("Enter USN: ");
        usn = s.nextLine();
        System.out.print("Enter Name: ");
        name = s.nextLine();
        System.out.print("Enter Semester: ");
        sem = s.nextInt();
    }

    public void displayStudentDetails() {
        System.out.println("\nUSN: " + usn);
        System.out.println("Name: " + name);
        System.out.println("Semester: " + sem);
    }
```

```
}
```

**Internals.java**

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

public class Student {
    protected String usn;
    protected String name;
    protected int sem;

    public void inputStudentDetails() {
        Scanner s = new Scanner(System.in);
        System.out.print("Enter USN: ");
        usn = s.nextLine();
        System.out.print("Enter Name: ");
        name = s.nextLine();
        System.out.print("Enter Semester: ");
        sem = s.nextInt();
    }

    public void displayStudentDetails() {
        System.out.println("\nUSN: " + usn);
        System.out.println("Name: " + name);
        System.out.println("Semester: " + sem);
    }
}
```

**Externals.java**

```
package SEE;

import CIE.Internals;
```

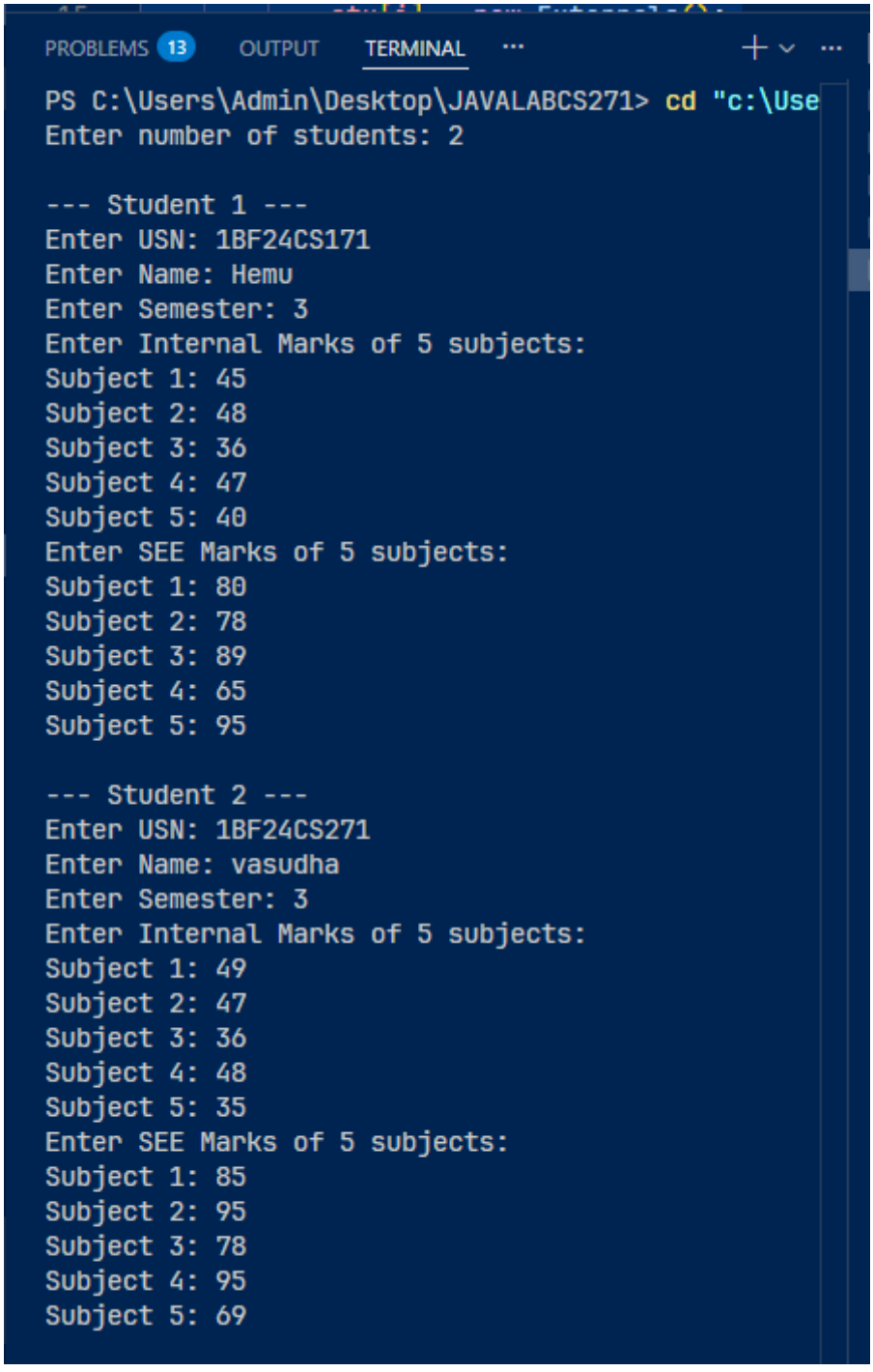
```
import java.util.Scanner;

public class Externals extends Internals {
    protected int marks[];
    protected int finalMarks[];

    public Externals() {
        marks = new int[5];
        finalMarks = new int[5];
    }

    public void inputSEEmarks() {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter SEE Marks of 5 subjects:");
        for (int i = 0; i < 5; i++) {
            System.out.print("Subject " + (i+1) + ": ");
            marks[i] = s.nextInt();
        }
    }

    public void calculateFinalMarks() {
    for (int i = 0; i < 5; i++) {
        finalMarks[i] = super.marks[i] + (marks[i] / 2);
    }
}



    public void displayFinalMarks() {
        displayStudentDetails();
        System.out.println("Final Marks:");
        for (int i = 0; i < 5; i++) {
```

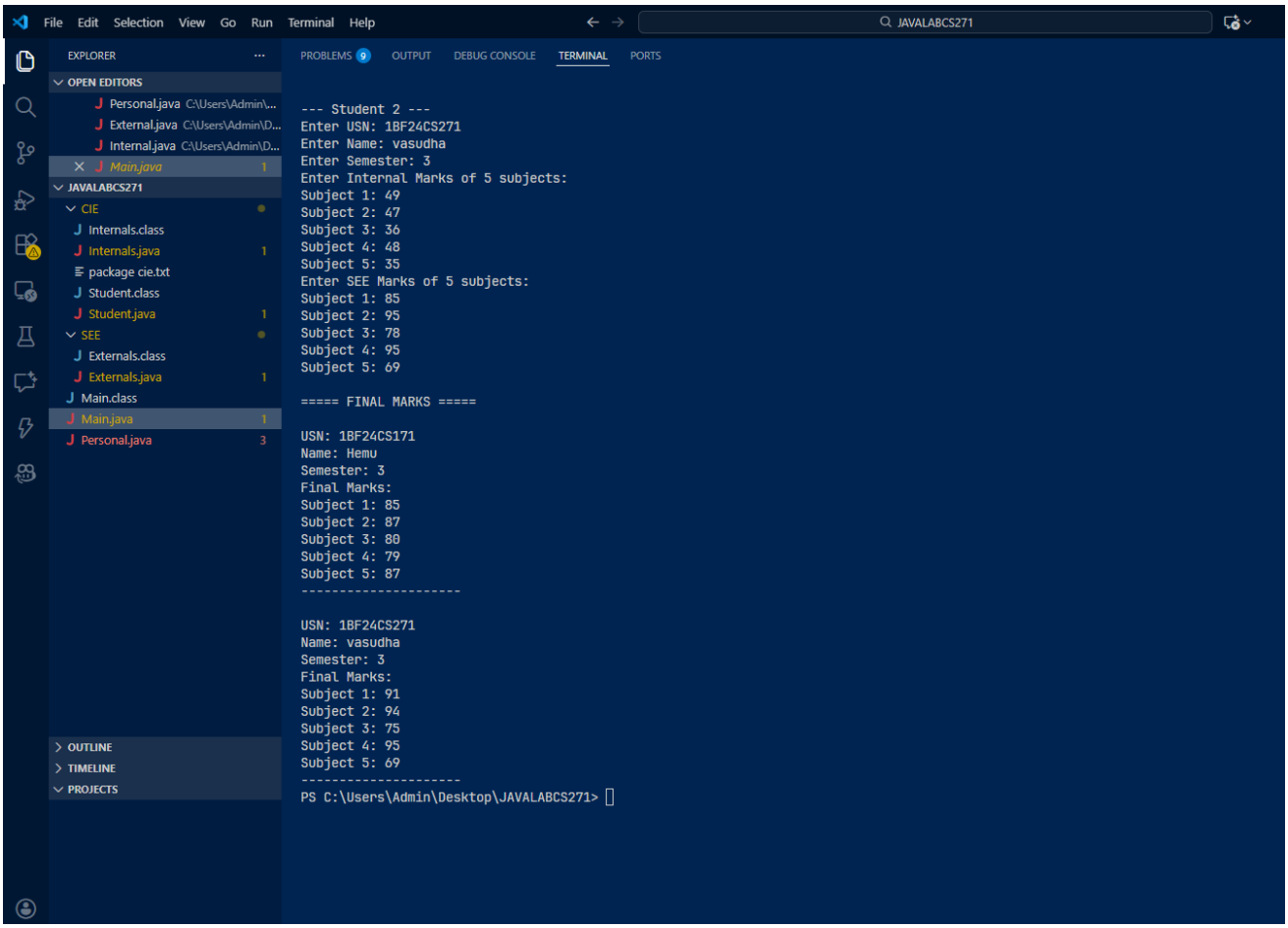
```
            System.out.println("Subject " + (i+1) + ": " + finalMarks[i]);
        }
    }
}
```

**Main.java**

```
import SEE.Externals;
import java.util.Scanner;

class Main {
    public static void main(String args[]) {

        Scanner s = new Scanner(System.in);
        System.out.print("Enter number of students: ");
        int n = s.nextInt();

        Externals stu[] = new Externals[n];

        for (int i = 0; i < n; i++) {
            System.out.println("\n--- Student " + (i+1) + " ---");
            stu[i] = new Externals();
            stu[i].inputStudentDetails();
            stu[i].inputCIEmarks();
            stu[i].inputSEEmarks();
            stu[i].calculateFinalMarks();
        }

        System.out.println("\n===== FINAL MARKS =====");
        for (int i = 0; i < n; i++) {
            stu[i].displayFinalMarks();
            System.out.println("---------------------");
        }
```

```
    }
}
```


PROBLEMS 13
OUTPUT
TERMINAL
PS C:\Users\Admin\Desktop\JAVALABCS271> cd "c:\Use
Enter number of students: 2
--- Student 1 ---
Enter USN: 1BF24CS171
Enter Name: Hemu
Enter Semester: 3
Enter Internal Marks of 5 subjects:
Subject 1: 45
Subject 2: 48
Subject 3: 36
Subject 4: 47
Subject 5: 40
Enter SEE Marks of 5 subjects:
Subject 1: 80
Subject 2: 78
Subject 3: 89
Subject 4: 65
Subject 5: 95
--- Student 2 ---
Enter USN: 1BF24CS271
Enter Name: vasudha
Enter Semester: 3
Enter Internal Marks of 5 subjects:
Subject 1: 49
Subject 2: 47
Subject 3: 36
Subject 4: 48
Subject 5: 35
Enter SEE Marks of 5 subjects:
Subject 1: 85
Subject 2: 95
Subject 3: 78
Subject 4: 95
Subject 5: 69




Lab program no 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.

```
import java.util.Scanner;
class WrongAge extends Exception{
```

```
    public WrongAge(){
        super("Age Error:");
    }
    public WrongAge(String message){
        super(message);
    }
}
class Inputscanner{
    protected static final Scanner s=new Scanner(System.in);
}
class Father extends Inputscanner{
    protected int fatherAge;
    public Father() throws WrongAge{
        System.out.println("Enter father's age:");
        fatherAge=s.nextInt();
        if(fatherAge <0){
            throw new WrongAge("Age cannot be negative");
        }
    }
    public void display(){
        System.out.println("Fathers age: "+fatherAge);
    }
}
class son extends Father{
    private int sonAge;
    public son() throws WrongAge{
        super();
        System.out.println("Enters son's age: ");
        sonAge=Inputscanner.s.nextInt();
        if(sonAge<0){
            throw new WrongAge("Age cannot be negative");
```

```
        }else if(sonAge>= fatherAge){
            throw new WrongAge("Son's age cannot be greater than or
equal to father's age");
        }
    }
    public void display(){
        super.display();
        System.out.println("Son's age: "+sonAge);
    }
}
public class labpgm7 {
    public static void main(String args[]){
        try{
            son Son=new son();
            Son.display();
        }
        catch(WrongAge e){
            System.out.println("Error : "+e.getMessage());
        } catch(Exception e){
            System.out.println("Unexcepted error: "+ e.getMessage());
        }
    }
}
```

```
PS C:\Users\Admin\Desktop\1BF24CS271> cd "c:\Users\Admin\Desktop\1BF24C
S271\" ; if ($?) { javac labpgm7.java } ; if ($?) { java labpgm7 }
Enter father's age:
-40
Error : Age cannot be negative
PS C:\Users\Admin\Desktop\1BF24CS271> cd "c:\Users\Admin\Desktop\1BF24CS271\" ; if ($?) { javac labpgm7.java } ; if ($?) { java labpgm7 }
Enter father's age:
40
Enters son's age:
-10
Error : Age cannot be negative
PS C:\Users\Admin\Desktop\1BF24CS271> cd "c:\Users\Admin\Desktop\1BF24CS271\" ; if ($?) { javac labpgm7.java } ; if ($?) { java labpgm7 }
Enter father's age:
40
Enters son's age:
60
Error : Son's age cannot be greater than or equal to father's age
PS C:\Users\Admin\Desktop\1BF24CS271> cd "c:\Users\Admin\Desktop\1BF24CS271\" ; if ($?) { javac labpgm7.java } ; if ($?) { java labpgm7 }
Enter father's age:
40
Enters son's age:
40
Error : Son's age cannot be greater than or equal to father's age
PS C:\Users\Admin\Desktop\1BF24CS271> cd "c:\Users\Admin\Desktop\1BF24CS271\" ; if ($?) { javac labpgm7.java } ; if ($?) { java labpgm7 }
Enter father's age:
40
Enters son's age:
15
Fathers age: 40
Son's age: 15
PS C:\Users\Admin\Desktop\1BF24CS271>
```

Lab program no 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.

```
class BMS extends Thread
{
   public void run()
   {
      try
      {
         for(int i = 1; i <= 5; i++)
         {
            System.out.println("BMS College of Engineering");
            Thread.sleep(10000);   // 10 seconds delay
         }
      }
```

```
        catch(InterruptedException e)
        {
            System.out.println("BMS Thread Interrupted");
        }
    }
}

class CSE extends Thread
{
    public void run()
    {
        try
        {
            for(int i = 1; i <= 5; i++)
            {
                System.out.println("CSE");
                Thread.sleep(2000);    // 2 seconds delay
            }
        }
        catch(InterruptedException e)
        {
            System.out.println("CSE Thread Interrupted");
        }
    }
}

public class labpgm8
{
    public static void main(String args[])
    {
        BMS t1 = new BMS();   // Thread 1
```

```
        CSE t2 = new CSE();   // Thread 2

        t1.start();           // Start first thread
        t2.start();           // Start second thread
    }
}
```

```
PS C:\Users\Admin\Desktop\1BF24CS271> cd "c:\Users\Admin\Desktop\1BF24CS271\" ; if ($?) { javac labpgm8.java } ; if ($?) { java labpgm8 }
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
PS C:\Users\Admin\Desktop\1BF24CS271>
```