VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Object-Oriented Java Programming

(23CS3PCOOJ)

Submitted by

Saanvi Jaiswal (1BF24CS260)

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

B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019
Aug-2025 to Jan-2026

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)" was carried out by Saanvi Jaiswal (1BF24CS260), who is a bona fide student of **B.M.S. College of Engineering.** It is in partial fulfilment of the requirements 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 Associate Professor Department of CSE, BMSCE	Dr. Kavitha Sooda Professor & HOD Department of CSE, BMSCE

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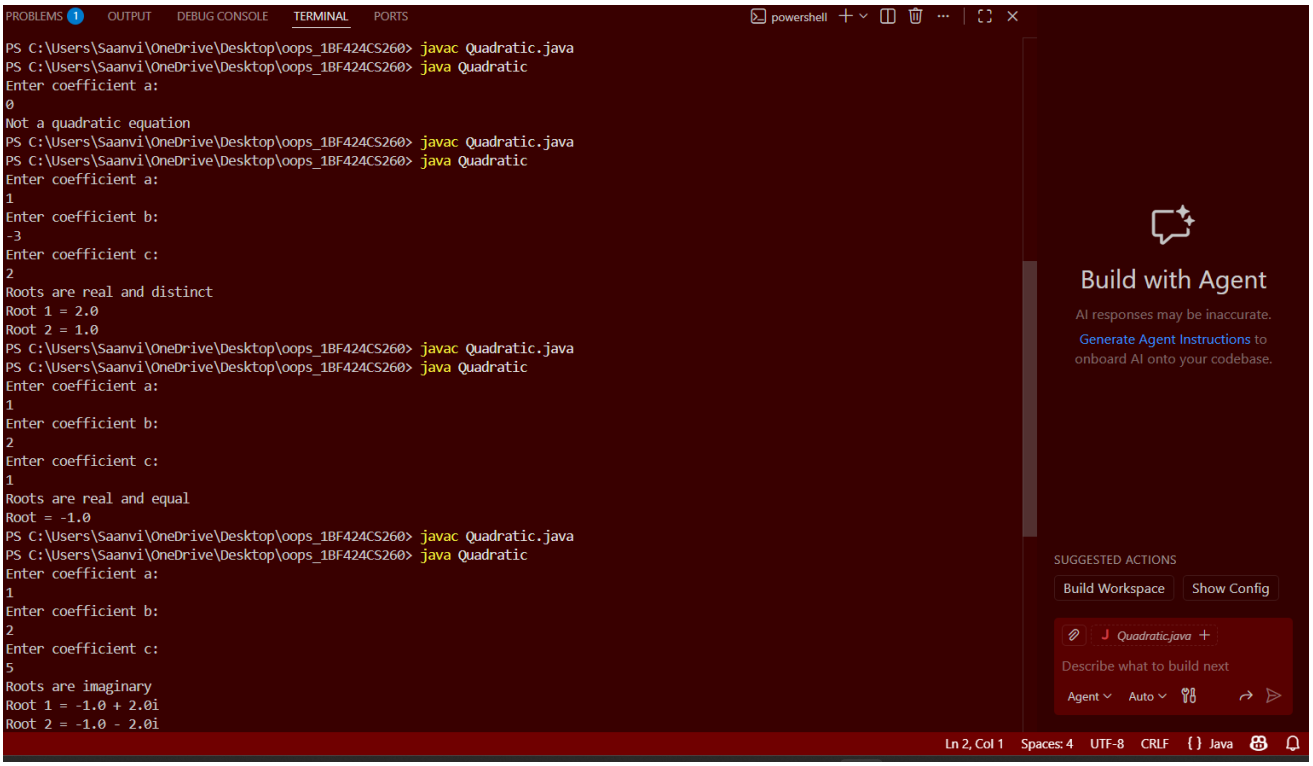
Program 1

Implement the Quadratic Equation.

Code:

```
import java.util.Scanner;
class Quadratic {
   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; // important
      }
      System.out.println("Enter coefficient b:");
      double b = sc.nextDouble();
      System.out.println("Enter coefficient c:");
      double c = sc.nextDouble();
      double discriminant = b * b - 4 * a * c;
      if (discriminant > 0) {
         double root1 = (-b + Math.sqrt(discriminant)) / (2 * a);
         double root2 = (-b - Math.sqrt(discriminant)) / (2 * a);

         System.out.println("Roots are real and distinct");
         System.out.println("Root 1 = " + root1);
         System.out.println("Root 2 = " + root2);

      } else if (discriminant == 0) {
         double root = -b / (2 * a);
         System.out.println("Roots are real and equal");
         System.out.println("Root = " + root);
      } else {
         double realPart = -b / (2 * a);
         double imaginaryPart = Math.sqrt(-discriminant) / (2 * a);
         System.out.println("Roots are imaginary");
         System.out.println("Root 1 = " + realPart + " + " + imaginaryPart + "i");
         System.out.println("Root 2 = " + realPart + " - " + imaginaryPart + "i");
      }
   }
}
```

Output:


PROBLEMS 1
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
powershell
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> javac Quadratic.java
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> java Quadratic
Enter coefficient a:
0
Not a quadratic equation
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> javac Quadratic.java
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> java Quadratic
Enter coefficient a:
1
Enter coefficient b:
-3
Enter coefficient c:
2
Roots are real and distinct
Root 1 = 2.0
Root 2 = 1.0
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> javac Quadratic.java
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> java Quadratic
Enter coefficient a:
1
Enter coefficient b:
2
Enter coefficient c:
1
Roots are real and equal
Root = -1.0
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> javac Quadratic.java
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> java Quadratic
Enter coefficient a:
1
Enter coefficient b:
2
Enter coefficient c:
5
Roots are imaginary
Root 1 = -1.0 + 2.0i
Root 2 = -1.0 - 2.0i
Build with Agent
AI responses may be inaccurate.
Generate Agent Instructions to onboard AI onto your codebase.
SUGGESTED ACTIONS
Build Workspace
Show Config
Quadraticjava
Describe what to build next
Agent
Auto
Ln 2, Col 1
Spaces: 4
UTF-8
CRLF
{ } Java

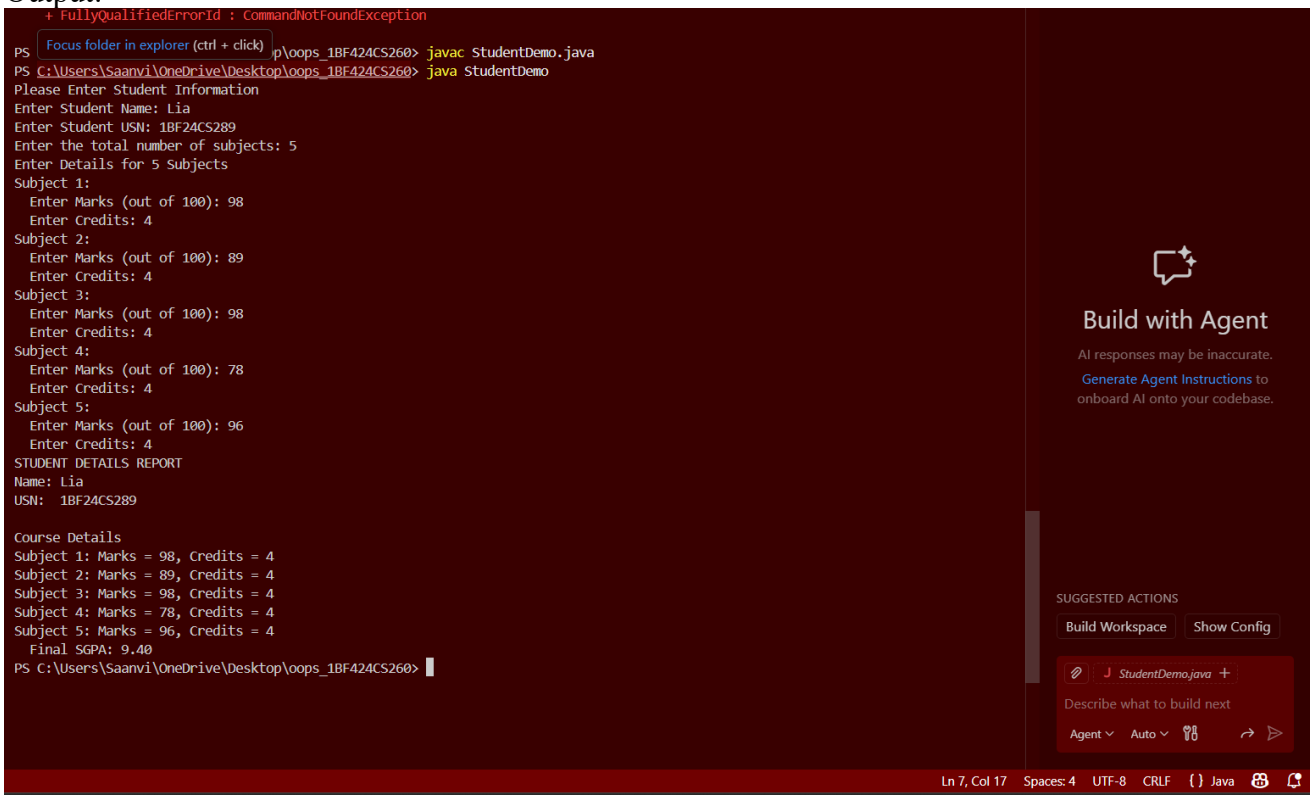
Program 2: SGPA Calculator

Code:

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

  Student() {
  }
    public void acceptDetails(Scanner var1) {
    System.out.print("Enter Student Name: ");
    this.name = var1.nextLine();
    System.out.print("Enter Student USN: ");
    this.usn = var1.nextLine();
    System.out.print("Enter the total number of subjects: ");
    this.numSubjects = var1.nextInt();
    this.credits = new int[this.numSubjects];
    this.marks = new int[this.numSubjects];
    System.out.println("Enter Details for " + this.numSubjects + " Subjects");
    for(int var2 = 0; var2 < this.numSubjects; ++var2) {
      System.out.println("Subject " + (var2 + 1) + ":");
      System.out.print("  Enter Marks (out of 100): ");
      this.marks[var2] = var1.nextInt();
      System.out.print("  Enter Credits: ");
      this.credits[var2] = var1.nextInt();
    }

  }
  public double calculateSGPA() {
    double var1 = 0.0;
    int var3 = 0;
    for(int var4 = 0; var4 < this.numSubjects; ++var4) {
      int var5 = this.marks[var4];
      int var6 = this.credits[var4];
      byte var7;
      if (var5 >= 90) {
        var7 = 10;
      } else if (var5 >= 80) {
        var7 = 9;
      } else if (var5 >= 70) {
        var7 = 8;
      } else if (var5 >= 60) {
        var7 = 7;
      } else if (var5 >= 50) {
```

```
            var7 = 6;
          } else if (var5 >= 40) {
            var7 = 5;
          } else {
            var7 = 0;
          }

          var1 += (double)(var7 * var6);
          var3 += var6;
        }
        if (var3 == 0) {
          return 0.0;
        } else {
          return var1 / (double)var3;
        }
      }

      public void displayDetails() {
        System.out.println("STUDENT DETAILS REPORT");
        System.out.println("Name: " + this.name);
        System.out.println("USN:  " + this.usn);
        System.out.println("\nCourse Details");

        for(int var1 = 0; var1 < this.numSubjects; ++var1) {
          System.out.println("Subject " + (var1 + 1) + ": Marks = " + this.marks[var1] + ", Credits = " +
this.credits[var1]);
        }

        double var3 = this.calculateSGPA();
        System.out.printf("  Final SGPA: %.2f\n", var3);
      }
}
```

Output:


+ FullyQualifiedErrorId : CommandNotFoundException
Focus folder in explorer (ctrl + click)
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> javac StudentDemo.java
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> java StudentDemo
Please Enter Student Information
Enter Student Name: Lia
Enter Student USN: 1BF24CS289
Enter the total number of subjects: 5
Enter Details for 5 Subjects
Subject 1:
Enter Marks (out of 100): 98
Enter Credits: 4
Subject 2:
Enter Marks (out of 100): 89
Enter Credits: 4
Subject 3:
Enter Marks (out of 100): 98
Enter Credits: 4
Subject 4:
Enter Marks (out of 100): 78
Enter Credits: 4
Subject 5:
Enter Marks (out of 100): 96
Enter Credits: 4
STUDENT DETAILS REPORT
Name: Lia
USN: 1BF24CS289
Course Details
Subject 1: Marks = 98, Credits = 4
Subject 2: Marks = 89, Credits = 4
Subject 3: Marks = 98, Credits = 4
Subject 4: Marks = 78, Credits = 4
Subject 5: Marks = 96, Credits = 4
Final SGPA: 9.40
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260>
Build with Agent
AI responses may be inaccurate.
Generate Agent Instructions to onboard AI onto your codebase.
SUGGESTED ACTIONS
Build Workspace
Show Config
StudentDemo.java
Describe what to build next
Agent
Auto
Ln 7, Col 17
Spaces: 4
UTF-8
CRLF
{ } Java

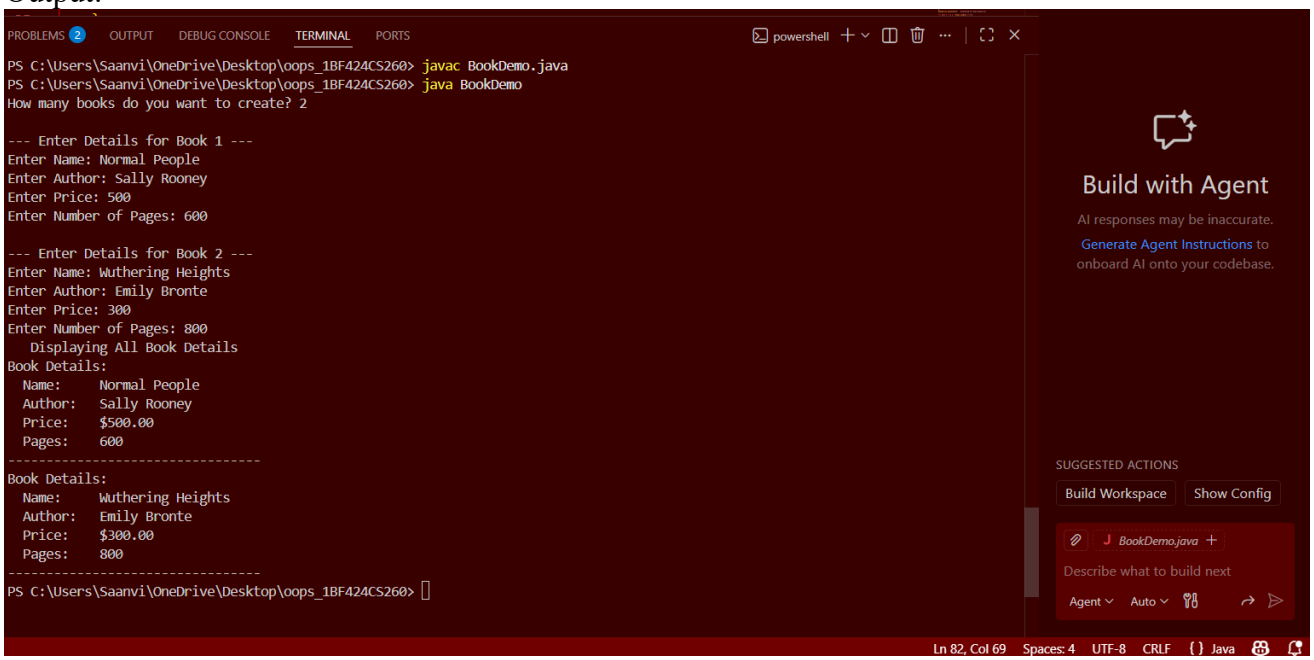
Program 3: Bookstore Program

Code:

```
import java.util.Scanner;
class Book {
    private String name;
    private String author;
    private double price;
    private int num_pages;
    public Book(String name, String author, double price, int num_pages) {
        this.name = name;
        this.author = author;
        this.price = price;
        this.num_pages = num_pages;
    }
    public String getName() {
        return name;
    }
    public String getAuthor() {
        return author;
    }
    public double getPrice() {
        return price;
    }
    public int getNumPages() {
        return num_pages;
    }
    public void setName(String name) {
        this.name = name;
    }
    public void setAuthor(String author) {
        this.author = author;
    }
    public void setPrice(double price) {
        this.price = price;
    }
    public void setNumPages(int num_pages) {
        this.num_pages = num_pages;
    }
    public String toString() {
        return "Book Details:\n" +
               "  Name:     " + name + "\n" +
               "  Author:   " + author + "\n" +
               "  Price:    $" + String.format("%.2f", price) + "\n" +
               "  Pages:    " + num_pages;
    }
}
public class BookDemo {
```

```
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("How many books do you want to create? ");
        int n = scanner.nextInt();
        scanner.nextLine();
        Book[] books = new Book[n];
        for (int i = 0; i < n; i++) {
            System.out.println("\n--- Enter Details for Book " + (i + 1) + " ---");
            System.out.print("Enter Name: ");
            String name = scanner.nextLine();
            System.out.print("Enter Author: ");
            String author = scanner.nextLine();
            System.out.print("Enter Price: ");
            double price = scanner.nextDouble();
            System.out.print("Enter Number of Pages: ");
            int num_pages = scanner.nextInt();
            scanner.nextLine();
            books[i] = new Book(name, author, price, num_pages);
        }
        System.out.println("   Displaying All Book Details");
        for (int i = 0; i < books.length; i++) {
            System.out.println(books[i]);
        }
        scanner.close();
    }
}
```

Output:


PROBLEMS 2
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
powershell
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> javac BookDemo.java
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> java BookDemo
How many books do you want to create? 2
--- Enter Details for Book 1 ---
Enter Name: Normal People
Enter Author: Sally Rooney
Enter Price: 500
Enter Number of Pages: 600
--- Enter Details for Book 2 ---
Enter Name: Wuthering Heights
Enter Author: Emily Bronte
Enter Price: 300
Enter Number of Pages: 800
Displaying All Book Details
Book Details:
Name: Normal People
Author: Sally Rooney
Price: $500.00
Pages: 600
Book Details:
Name: Wuthering Heights
Author: Emily Bronte
Price: $300.00
Pages: 800
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260>
Build with Agent
AI responses may be inaccurate.
Generate Agent Instructions to onboard AI onto your codebase.
SUGGESTED ACTIONS
Build Workspace
Show Config
BookDemo.java
Describe what to build next
Agent
Auto
Ln 82, Col 69
Spaces: 4
UTF-8
CRLF
{ } Java

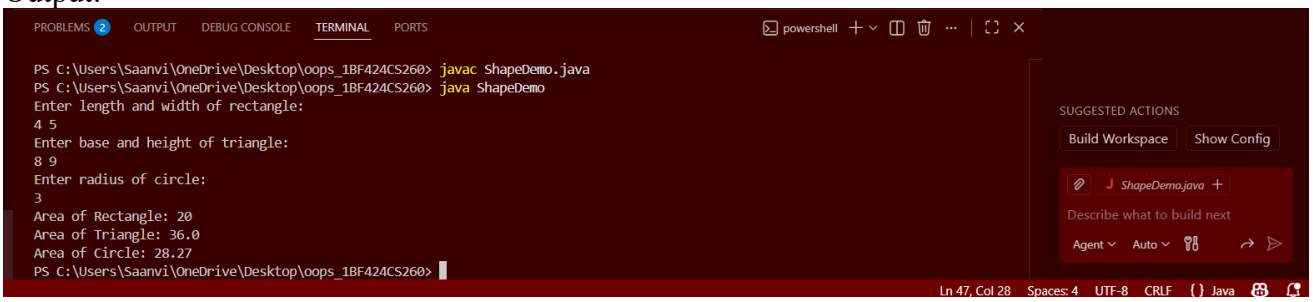
Program 4: Shapes Program

Code:

```
import java.util.Scanner;
abstract class Shape {
   protected int dim1;
   protected int dim2;
   public abstract void printArea();
}
class Rectangle extends Shape {
   public Rectangle(int length, int width) {
      this.dim1 = length;
      this.dim2 = width;
   }
   public void printArea() {
      int area = dim1 * dim2;
      System.out.println("Area of Rectangle: " + area);
   }
}
class Triangle extends Shape {
   public Triangle(int base, int height) {
      this.dim1 = base;
      this.dim2 = height;
   }
   public void printArea() {
      double area = 0.5 * dim1 * dim2;
      System.out.println("Area of Triangle: " + area);
   }
}
class Circle extends Shape {
   public Circle(int radius) {
      this.dim1 = radius;
   }
   public void printArea() {
      double area = Math.PI * dim1 * dim1;
      System.out.printf("Area of Circle: %.2f\n", area);
   }
}
public class ShapeDemo {
   public static void main(String[] args) {
      Scanner sc= new Scanner(System.in);
      System.out.println("Enter length and width of rectangle: ");
      int l = sc.nextInt();
      int w = sc.nextInt();
      Shape rect = new Rectangle(l, w);
      System.out.println("Enter base and height of triangle:");
      int b=sc.nextInt();
      int h=sc.nextInt();
```

```
        Shape tri= new Triangle(b,h);
        System.out.println("Enter radius of circle:");
        int r=sc.nextInt();
        Shape circ=new Circle(r);
        rect.printArea();
        tri.printArea();
        circ.printArea();
    }
}
```

Output:



Program 5: Bank Program

Code:

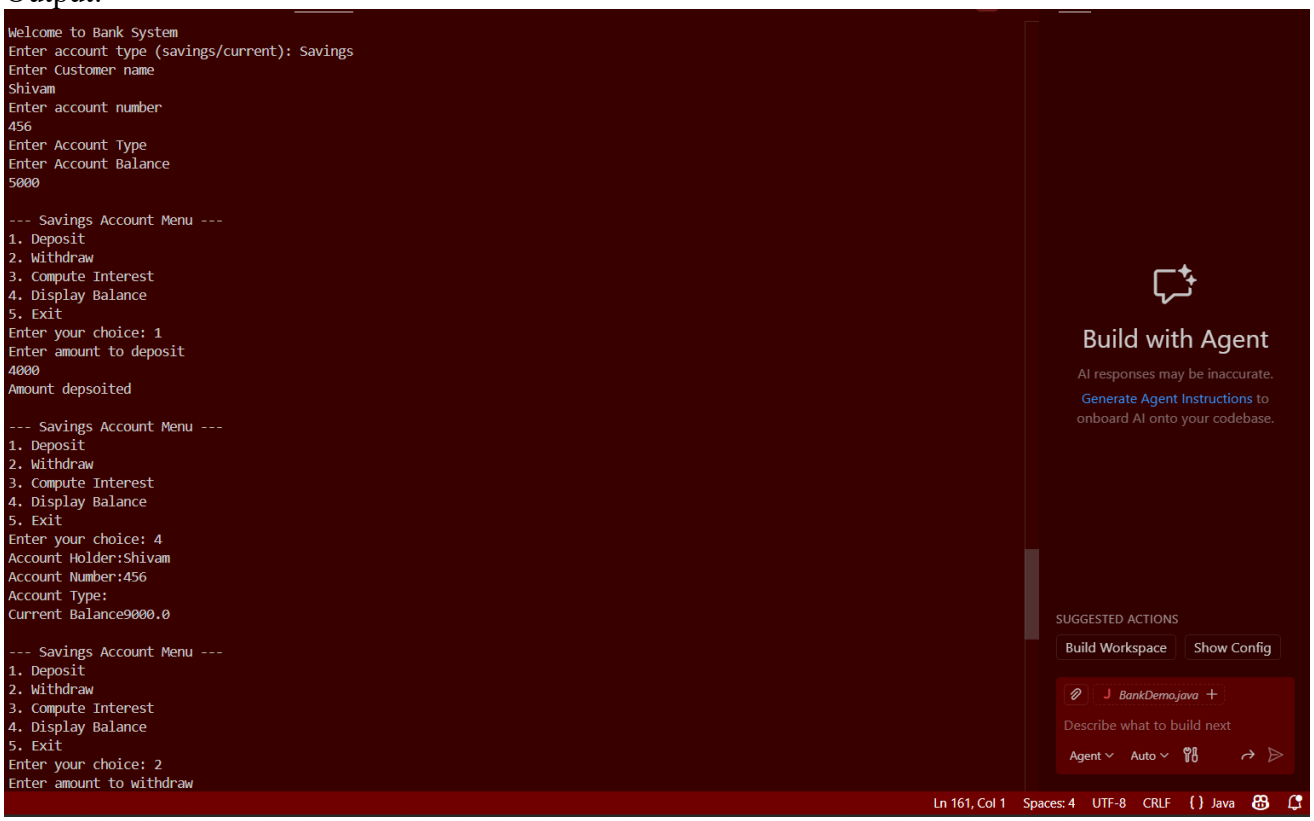
```
import java.util.Scanner;
class Account{
   String customername;
   int accountnumber;
   String accounttype;
   double balance;
   Scanner scanner=new Scanner(System.in);
   void getAccountDetails(){
      System.out.println("Enter Customer name");
      customername=scanner.nextLine();
      System.out.println("Enter account number");
      accountnumber=scanner.nextInt();
      System.out.println("Enter Account Type");
      accounttype=scanner.nextLine();
      System.out.println("Enter Account Balance");
      balance=scanner.nextInt();
   }
   void deposit(){
      System.out.println("Enter amount to deposit");
      double amount=scanner.nextDouble();
      balance += amount;
      System.out.println("Amount depsoited");
   }
   void displaybalance(){
      System.out.println("Account Holder:"+customername);
      System.out.println("Account Number:"+accountnumber);
      System.out.println("Account Type:"+accounttype);
      System.out.println("Current Balance"+balance);
   }
}
class Savacct extends Account{
   final double interestrate=0.05;
   void computeInterest(){
      System.out.println("Enter the time period in years");
      double time=scanner.nextDouble();
      double interest= (balance*interestrate*time)/100;
      balance+=interest;
   }
   void withdraw(){
      System.out.println("Enter amount to withdraw");
      double amount=scanner.nextDouble();
      if(amount<=balance){
         balance-=amount;
         System.out.println("Withdrawn");
      }
```

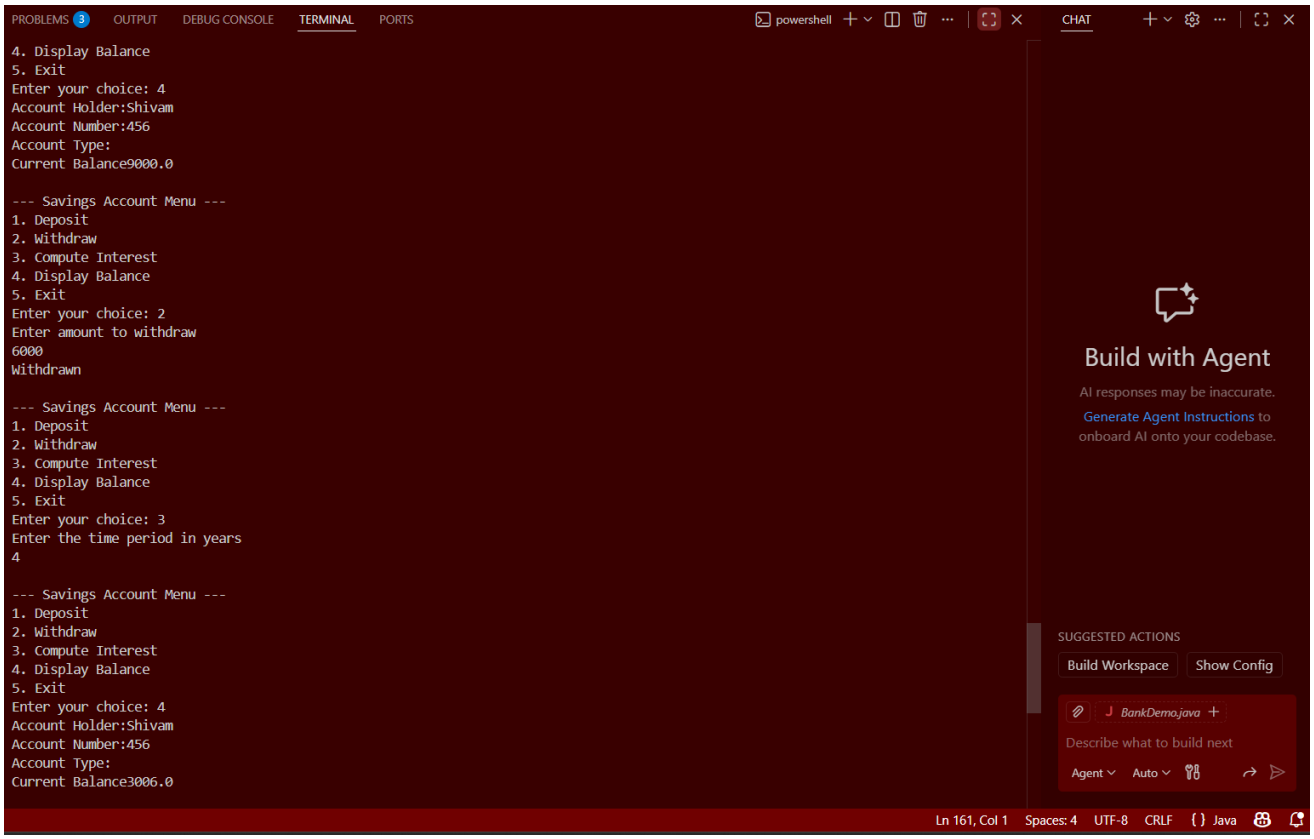
```
        else{
            System.out.println("Insufficient balance");
        }
    }
}
class Curacct extends Account{
    final double minimumbalance=1000;
    final double servicecharge=100;
    void checkminimumbalance(){
        if(balance<minimumbalance){
            balance-=servicecharge;
            System.out.println("Service charge imposed");
        }
        else{
            System.out.println("Minimum balance is there");
        }
    }
    void withdraw(){
        System.out.println("Enter amount to withdraw");
        double amount=scanner.nextDouble();
        if(amount<=balance){
            balance-=amount;
            System.out.println("Withdrawn");
        }
        else{
            System.out.println("Insufficient balance");
        }
    }
}
public class BankDemo {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Welcome to Bank System ");
        System.out.print("Enter account type (savings/current): ");
        String type = scanner.nextLine().toLowerCase();
        if (type.equals("savings")) {
            Savacct s = new Savacct();
            s.getAccountDetails();
            while (true) {
                System.out.println("\n--- Savings Account Menu ---");
                System.out.println("1. Deposit");
                System.out.println("2. Withdraw");
                System.out.println("3. Compute Interest");
                System.out.println("4. Display Balance");
                System.out.println("5. Exit");
                System.out.print("Enter your choice: ");
                int ch = scanner.nextInt();
```

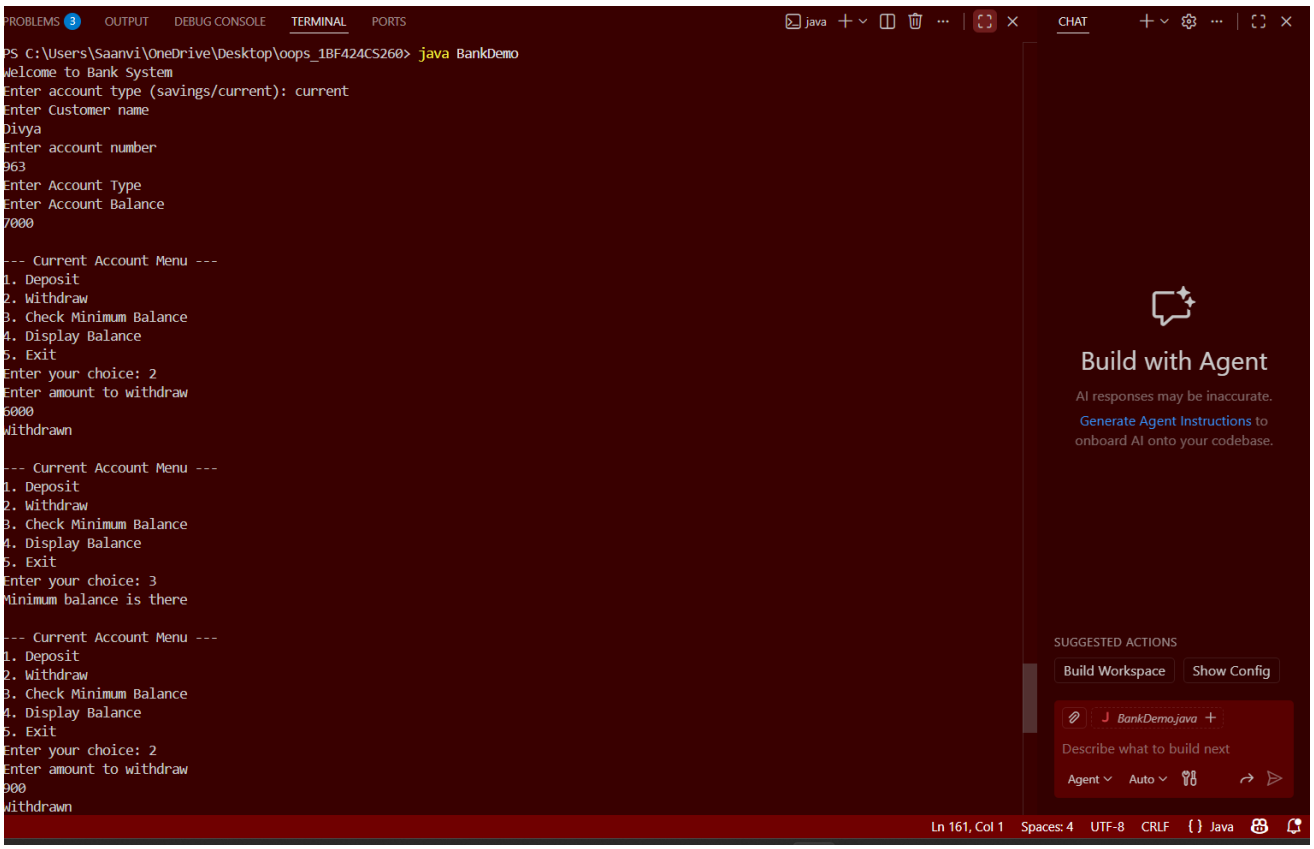
```
        switch (ch) {
            case 1:
                s.deposit();
                break;
            case 2:
                s.withdraw();
                break;
            case 3:
                s.computeInterest();
                break;
            case 4:
                s.displaybalance();
                break;
            case 5:
                System.out.println("Thank you for using our bank!");
                return;
            default:
                System.out.println("Invalid choice!");
        }
    }

} else if (type.equals("current")) {
    Curacct c = new Curacct();
    c.getAccountDetails();
    while (true) {
        System.out.println("\n--- Current Account Menu ---");
        System.out.println("1. Deposit");
        System.out.println("2. Withdraw");
        System.out.println("3. Check Minimum Balance");
        System.out.println("4. Display Balance");
        System.out.println("5. Exit");
        System.out.print("Enter your choice: ");
        int ch = scanner.nextInt();
        switch (ch) {
            case 1:
                c.deposit();
                break;
            case 2:
                c.withdraw();
                break;
            case 3:
                c.checkminimumbalance();
                break;
            case 4:
                c.displaybalance();
                break;
            case 5:
```

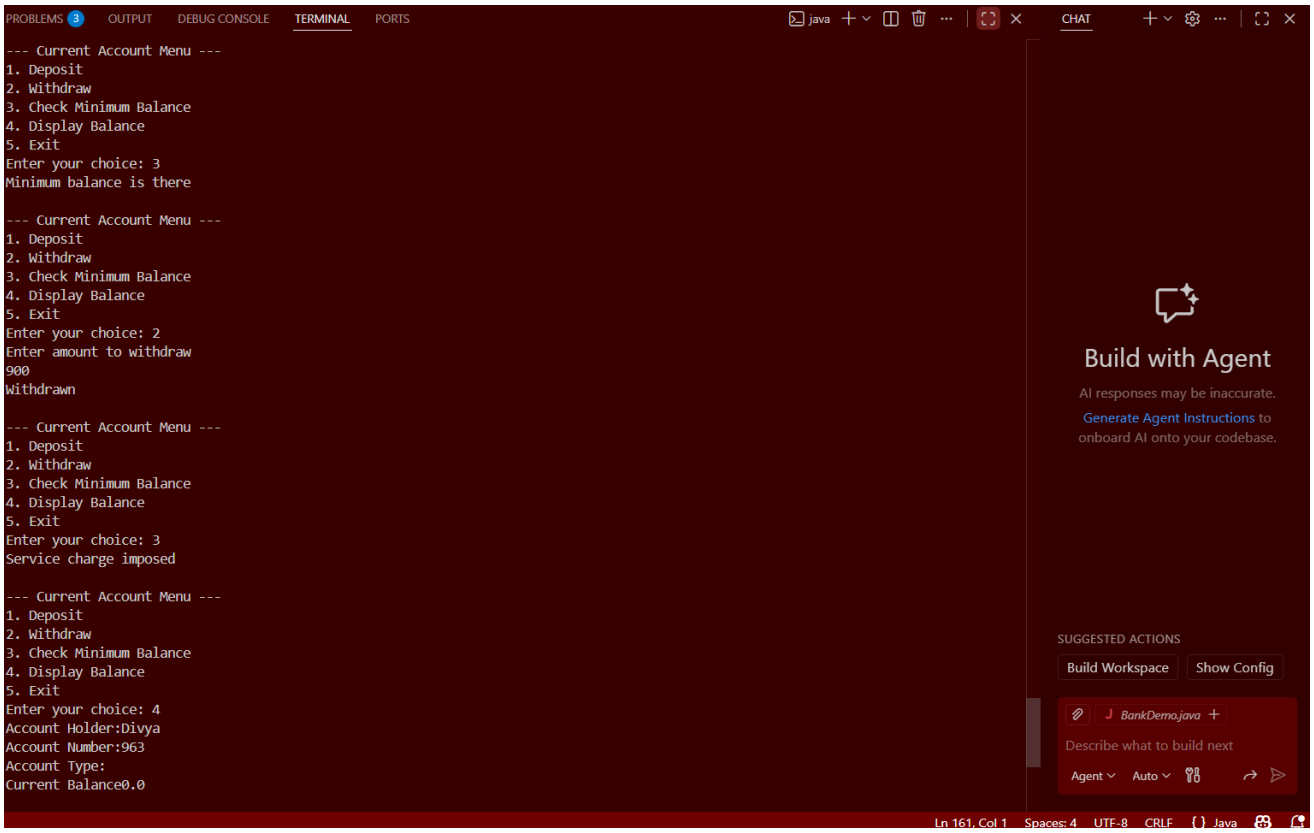
```
                System.out.println("Thank you for using our bank!");
                return;
            default:
                System.out.println("Invalid choice!");
        }
      }

    } else {
      System.out.println("Invalid account type entered!");
    }
  }
}
```

Output:


Welcome to Bank System
Enter account type (savings/current): Savings
Enter Customer name
Shivam
Enter account number
456
Enter Account Type
Enter Account Balance
5000
--- Savings Account Menu ---
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Balance
5. Exit
Enter your choice: 1
Enter amount to deposit
4000
Amount depsoited
--- Savings Account Menu ---
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Balance
5. Exit
Enter your choice: 4
Account Holder:Shivam
Account Number:456
Account Type:
Current Balance9000.0
--- Savings Account Menu ---
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Balance
5. Exit
Enter your choice: 2
Enter amount to withdraw
Build with Agent
AI responses may be inaccurate.
Generate Agent Instructions to onboard AI onto your codebase.
SUGGESTED ACTIONS
Build Workspace
Show Config
BankDemo.java
Describe what to build next
Agent
Auto
Ln 161, Col 1
Spaces: 4
UTF-8
CRLF
{ } Java


PROBLEMS 3
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
powershell
CHAT
4. Display Balance
5. Exit
Enter your choice: 4
Account Holder:Shivam
Account Number:456
Account Type:
Current Balance9000.0
--- Savings Account Menu ---
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Balance
5. Exit
Enter your choice: 2
Enter amount to withdraw
6000
Withdrawn
--- Savings Account Menu ---
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Balance
5. Exit
Enter your choice: 3
Enter the time period in years
4
--- Savings Account Menu ---
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Balance
5. Exit
Enter your choice: 4
Account Holder:Shivam
Account Number:456
Account Type:
Current Balance3006.0
Build with Agent
AI responses may be inaccurate.
Generate Agent Instructions to onboard AI onto your codebase.
SUGGESTED ACTIONS
Build Workspace
Show Config
BankDemo.java
Describe what to build next
Agent
Auto
Ln 161, Col 1
Spaces: 4
UTF-8
CRLF
{ } Java


PROBLEMS 3
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
java
CHAT
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260> java BankDemo
Welcome to Bank System
Enter account type (savings/current): current
Enter Customer name
Divya
Enter account number
963
Enter Account Type
Enter Account Balance
7000
--- Current Account Menu ---
1. Deposit
2. Withdraw
3. Check Minimum Balance
4. Display Balance
5. Exit
Enter your choice: 2
Enter amount to withdraw
6000
Withdrawn
--- Current Account Menu ---
1. Deposit
2. Withdraw
3. Check Minimum Balance
4. Display Balance
5. Exit
Enter your choice: 3
Minimum balance is there
--- Current Account Menu ---
1. Deposit
2. Withdraw
3. Check Minimum Balance
4. Display Balance
5. Exit
Enter your choice: 2
Enter amount to withdraw
900
Withdrawn
Build with Agent
AI responses may be inaccurate.
Generate Agent Instructions to onboard AI onto your codebase.
SUGGESTED ACTIONS
Build Workspace
Show Config
BankDemo.java
Describe what to build next
Agent
Auto
Ln 161, Col 1
Spaces: 4
UTF-8
CRLF
{ } Java


PROBLEMS 3
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
java
CHAT
--- Current Account Menu ---
1. Deposit
2. Withdraw
3. Check Minimum Balance
4. Display Balance
5. Exit
Enter your choice: 3
Minimum balance is there
--- Current Account Menu ---
1. Deposit
2. Withdraw
3. Check Minimum Balance
4. Display Balance
5. Exit
Enter your choice: 2
Enter amount to withdraw
900
Withdrawn
--- Current Account Menu ---
1. Deposit
2. Withdraw
3. Check Minimum Balance
4. Display Balance
5. Exit
Enter your choice: 3
Service charge imposed
--- Current Account Menu ---
1. Deposit
2. Withdraw
3. Check Minimum Balance
4. Display Balance
5. Exit
Enter your choice: 4
Account Holder:Divya
Account Number:963
Account Type:
Current Balance0.0
Build with Agent
AI responses may be inaccurate.
Generate Agent Instructions to onboard AI onto your codebase.
SUGGESTED ACTIONS
Build Workspace
Show Config
BankDemo.java
Describe what to build next
Agent
Auto
Ln 161, Col 1
Spaces: 4
UTF-8
CRLF
{} Java

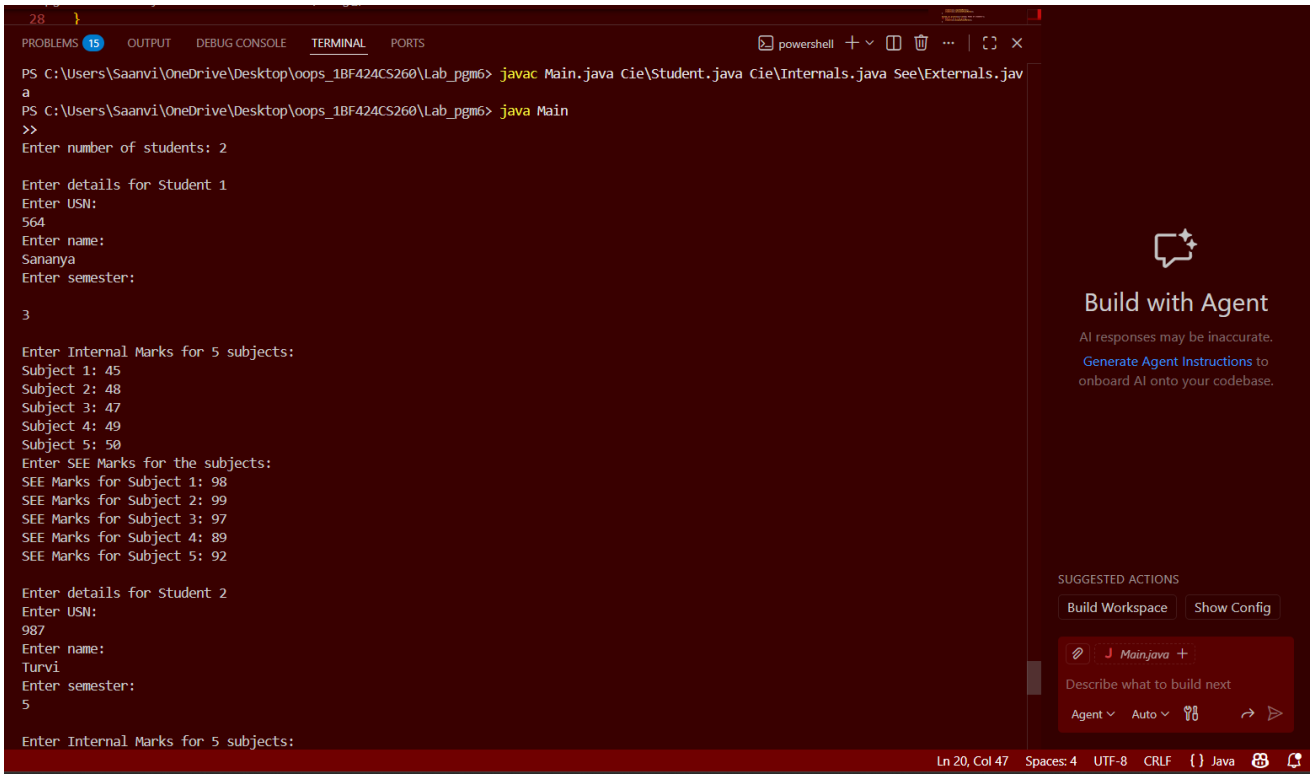
Program 6: Packages

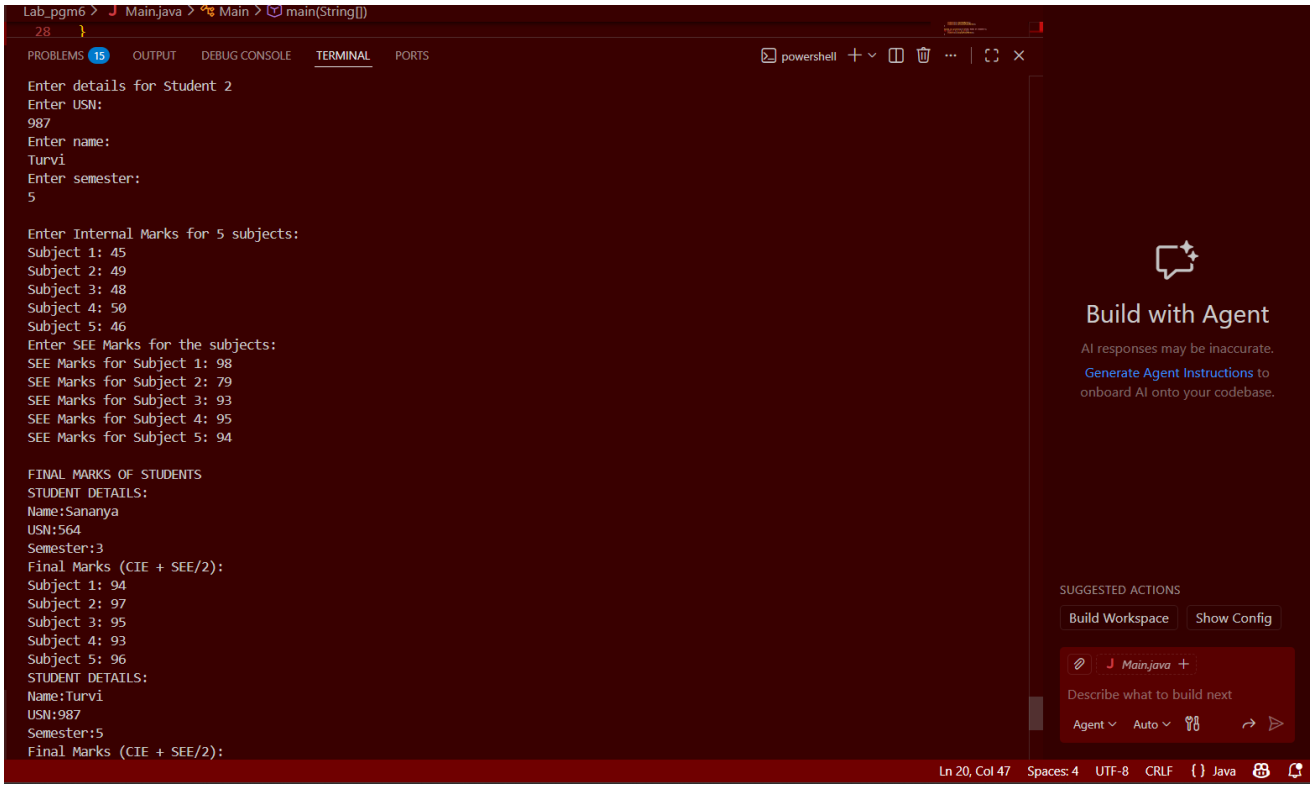
Code:

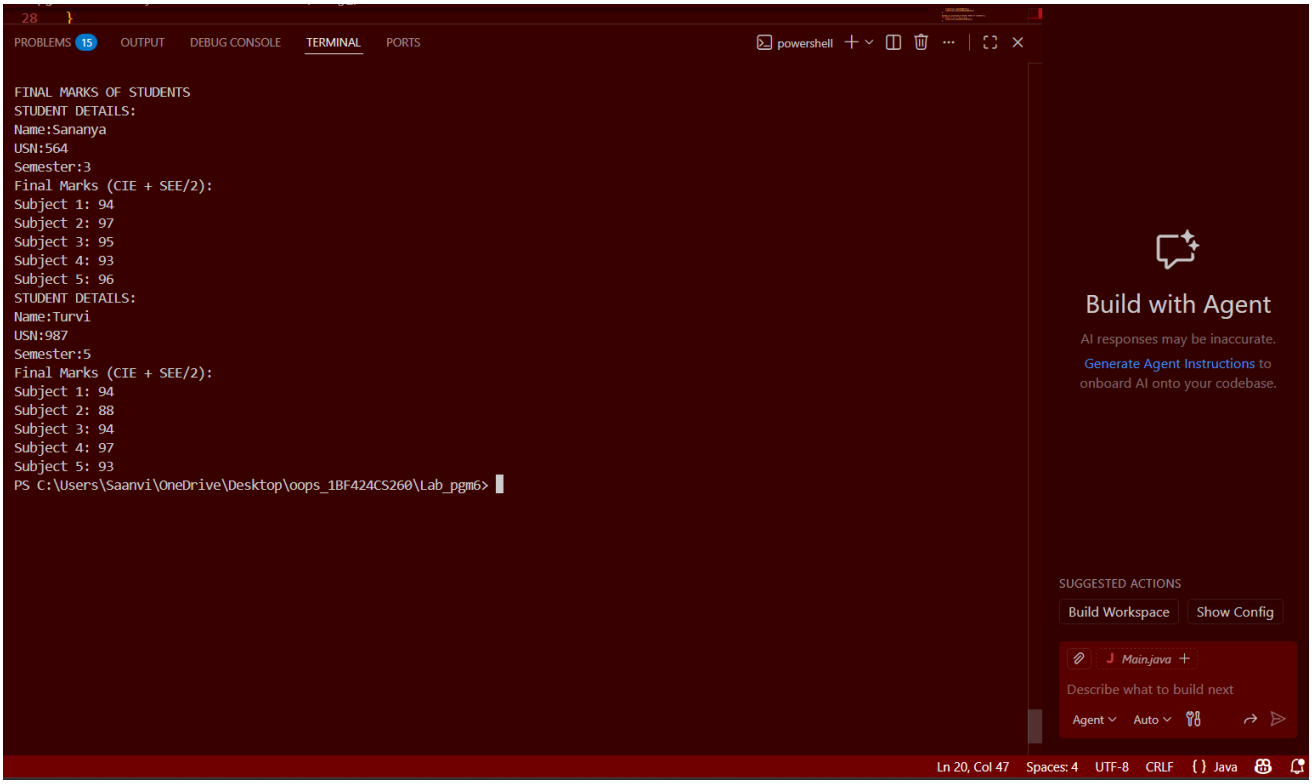
```
package Cie;
import java.util.Scanner;
public class Student {
   protected String usn = new String();
   protected String name = new String();
   protected int sem;
   public void inputStudentDetails() {
      Scanner scanner = new Scanner(System.in);
      System.out.println("Enter USN:");
      usn = scanner.nextLine();
      System.out.println("Enter name:");
      name = scanner.nextLine();
      System.out.println("Enter semester:");
      sem = scanner.nextInt();
   }
   public void displayStudentDetails() {
      System.out.println("STUDENT DETAILS:");
      System.out.println("Name:" + name);
      System.out.println("USN:" + usn);
      System.out.println("Semester:" + sem);
   }
}
package Cie;
import java.util.Scanner;
public class Internals extends Student {
   protected int marks[] = new int[5];
   public void inputCIEMarks() {
      Scanner scanner = new Scanner(System.in);
      System.out.println("\nEnter Internal Marks for 5 subjects:");
      for (int i = 0; i < 5; i++) {
         System.out.print("Subject " + (i + 1) + ": ");
         marks[i] = scanner.nextInt();
      }
   }
}

package See;
import Cie.Internals;
import java.util.Scanner;
public class Externals extends Internals {
   protected int finalMarks[];
   protected int seeMarks[];
   public Externals() {
      finalMarks = new int[5];
      seeMarks = new int[5];
```

```
    }
    public void inputSeeMarks() {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter SEE Marks for the subjects:");
        for (int i = 0; i < 5; i++) {
            System.out.print("SEE Marks for Subject " + (i + 1) + ": ");
            seeMarks[i] = scanner.nextInt();
        }
    }
    public void calculateFinalMarks() {
        for (int i = 0; i < 5; i++) {
            finalMarks[i] = marks[i] + (seeMarks[i] / 2);
        }
    }
    public void displayFinalMarks() {
        displayStudentDetails();
        System.out.println("Final Marks (CIE + SEE/2):");
        for (int i = 0; i < 5; i++) {
            System.out.println("Subject " + (i + 1) + ": " + finalMarks[i]);
        }
    }
}
import See.Externals;
import java.util.Scanner;
class Main {
    public static void main(String args[]) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter number of students: ");
        int n = scanner.nextInt();
        Externals students[] = new Externals[n];
        for (int i = 0; i < n; i++) {
            System.out.println("\nEnter details for Student " + (i + 1));
            students[i] = new Externals();
            students[i].inputStudentDetails();
            students[i].inputCIEMarks();
            students[i].inputSeeMarks();
            students[i].calculateFinalMarks();
        }System.out.println("\nFINAL MARKS OF STUDENTS");
        for (int i = 0; i < n; i++) {
            students[i].displayFinalMarks();
        }
    }
}
```

Output:


PROBLEMS 15
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
powershell
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260\Lab_pgm6> javac Main.java Cie\Student.java Cie\Internals.java See\Externals.jav
a
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260\Lab_pgm6> java Main
>>
Enter number of students: 2
Enter details for Student 1
Enter USN:
564
Enter name:
Sananya
Enter semester:
3
Enter Internal Marks for 5 subjects:
Subject 1: 45
Subject 2: 48
Subject 3: 47
Subject 4: 49
Subject 5: 50
Enter SEE Marks for the subjects:
SEE Marks for Subject 1: 98
SEE Marks for Subject 2: 99
SEE Marks for Subject 3: 97
SEE Marks for Subject 4: 89
SEE Marks for Subject 5: 92
Enter details for Student 2
Enter USN:
987
Enter name:
Turvi
Enter semester:
5
Enter Internal Marks for 5 subjects:
Build with Agent
AI responses may be inaccurate.
Generate Agent Instructions to onboard AI onto your codebase.
SUGGESTED ACTIONS
Build Workspace
Show Config
Main.java
Describe what to build next
Agent
Auto
Ln 20, Col 47
Spaces: 4
UTF-8
CRLF
Java


Lab_pgm6 > Main.java > Main > main(String[])
PROBLEMS 15
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
powershell
Enter details for Student 2
Enter USN:
987
Enter name:
Turvi
Enter semester:
5
Enter Internal Marks for 5 subjects:
Subject 1: 45
Subject 2: 49
Subject 3: 48
Subject 4: 50
Subject 5: 46
Enter SEE Marks for the subjects:
SEE Marks for Subject 1: 98
SEE Marks for Subject 2: 79
SEE Marks for Subject 3: 93
SEE Marks for Subject 4: 95
SEE Marks for Subject 5: 94
FINAL MARKS OF STUDENTS
STUDENT DETAILS:
Name:Sananya
USN:564
Semester:3
Final Marks (CIE + SEE/2):
Subject 1: 94
Subject 2: 97
Subject 3: 95
Subject 4: 93
Subject 5: 96
STUDENT DETAILS:
Name:Turvi
USN:987
Semester:5
Final Marks (CIE + SEE/2):
Build with Agent
AI responses may be inaccurate.
Generate Agent Instructions to onboard AI onto your codebase.
SUGGESTED ACTIONS
Build Workspace
Show Config
Main.java
Describe what to build next
Agent
Auto
Ln 20, Col 47
Spaces: 4
UTF-8
CRLF
Java


28 }
PROBLEMS 15
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
powershell
FINAL MARKS OF STUDENTS
STUDENT DETAILS:
Name:Sananya
USN:564
Semester:3
Final Marks (CIE + SEE/2):
Subject 1: 94
Subject 2: 97
Subject 3: 95
Subject 4: 93
Subject 5: 96
STUDENT DETAILS:
Name:Turvi
USN:987
Semester:5
Final Marks (CIE + SEE/2):
Subject 1: 94
Subject 2: 88
Subject 3: 94
Subject 4: 97
Subject 5: 93
PS C:\Users\Saanvi\OneDrive\Desktop\oops_1BF424CS260\Lab_pgm6>
Build with Agent
AI responses may be inaccurate.
Generate Agent Instructions to onboard AI onto your codebase.
SUGGESTED ACTIONS
Build Workspace
Show Config
Main.java
Describe what to build next
Agent
Auto
Ln 20, Col 47
Spaces: 4
UTF-8
CRLF
{ } Java

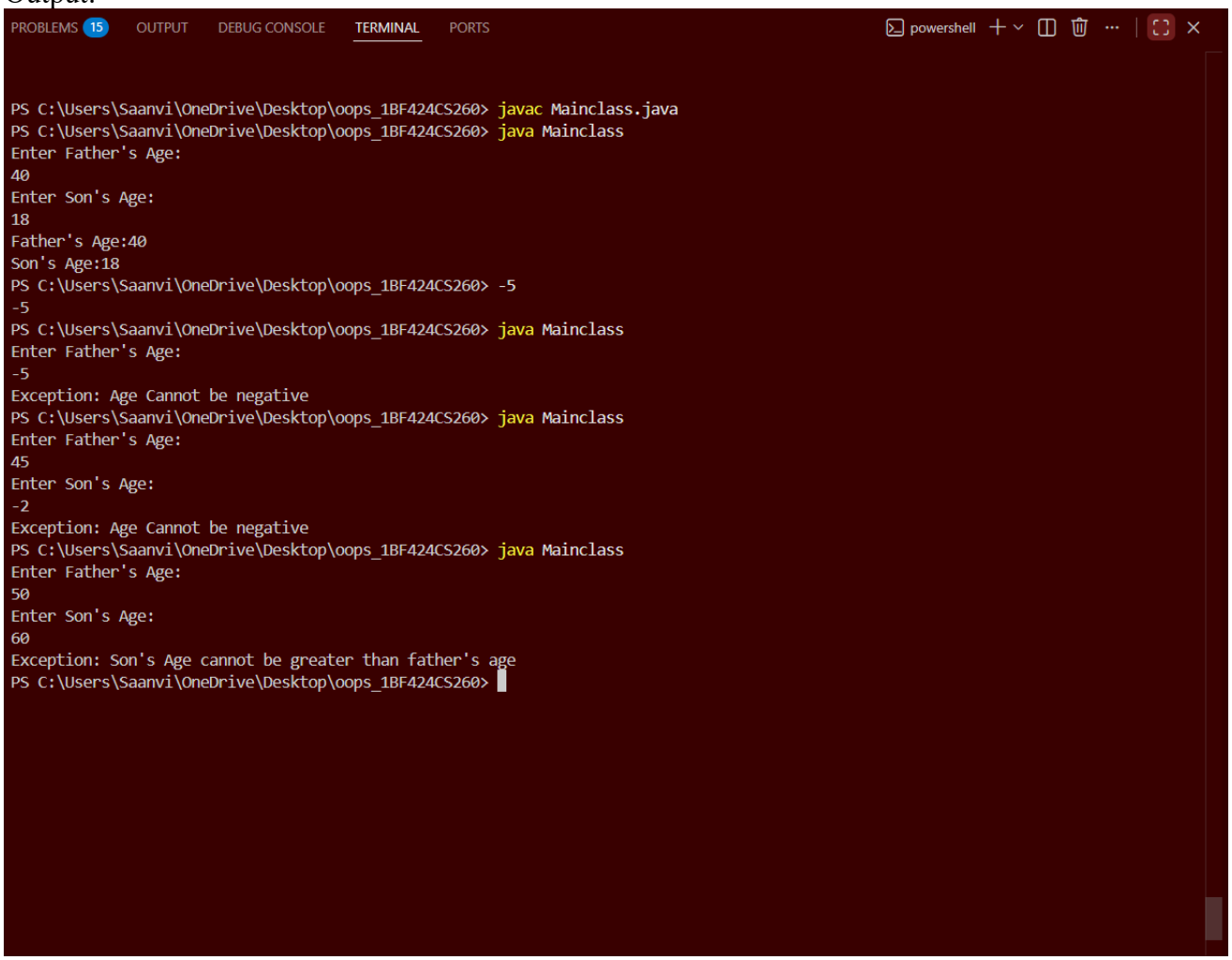
Program 7: Exceptions

Code:

```
import java.util.Scanner;
class WrongAge extends Exception {
   WrongAge() {
      super("Age Error");
   }
   WrongAge(String message) {
      super(message);
   }
}
class InputScanner {
   Scanner scanner = new Scanner(System.in);
}
class Father extends InputScanner {
   int FatherAge;
   Father() throws WrongAge {
      System.out.println("Enter Father's Age:");
      FatherAge = scanner.nextInt();
      if (FatherAge < 0) {
         throw new WrongAge("Age Cannot be negative");
      }
   }
   void display() {
      System.out.println("Father's Age:" + FatherAge);
   }
}
class Son extends Father {
   int SonAge;
   Son() throws WrongAge {
      super();
      System.out.println("Enter Son's Age:");
      SonAge = scanner.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 father's age");
      }
   }
   void display() {
      super.display();
      System.out.println("Son's Age:" + SonAge);
   }
}
public class Mainclass {
   public static void main(String[] args) {
```

```
        try {
            Son obj = new Son();
            obj.display();
        } catch (WrongAge e) {
            System.out.println("Exception: " + e.getMessage());
        }
    }
}
```

Output:

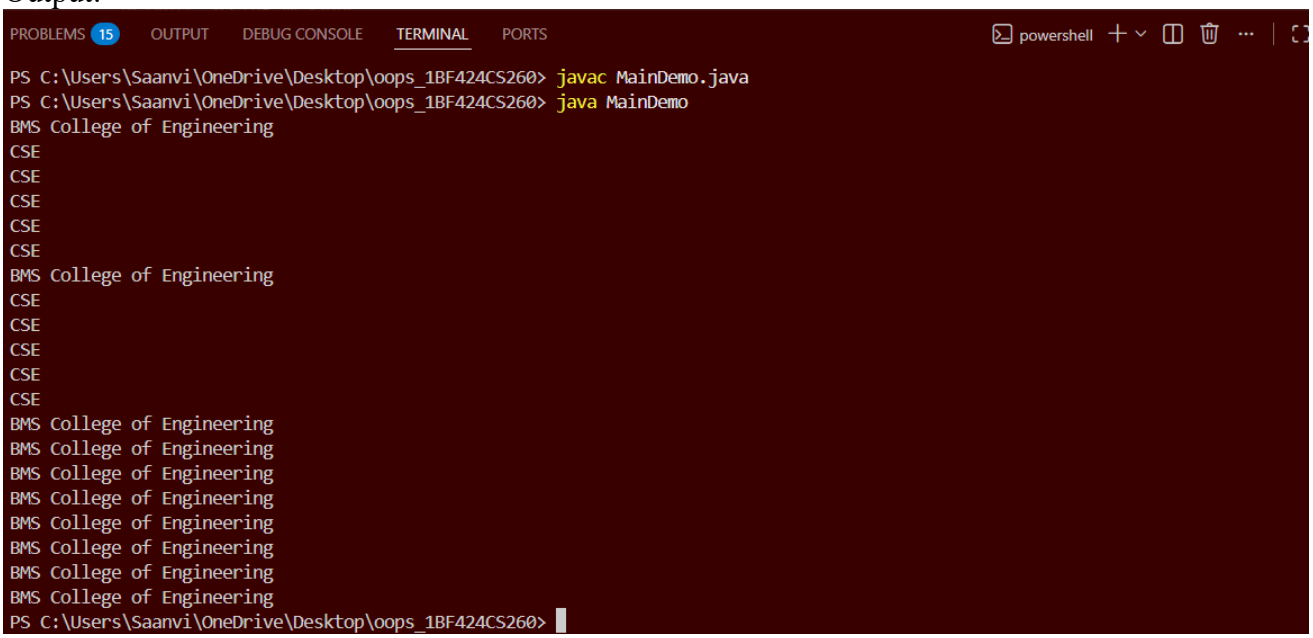


Program 8: Multi Threading

Code:

```
class MessageThread extends Thread {
    private String message;
    private int interval;
    public MessageThread(String message, int interval) {
        this.message = message;
        this.interval = interval;
    }
    public void run() {
        try {
            for (int i = 0; i < 10; i++) {
                System.out.println(message);
                Thread.sleep(interval);
            }
        } catch (InterruptedException e) {
            System.out.println("Thread interrupted");
        }
    }
}
public class MainDemo {
    public static void main(String[] args) {
        MessageThread t1 = new MessageThread("BMS College of Engineering", 10000);
        MessageThread t2 = new MessageThread("CSE", 2000);
        t1.start();
        t2.start();
    }
}
```

Output:



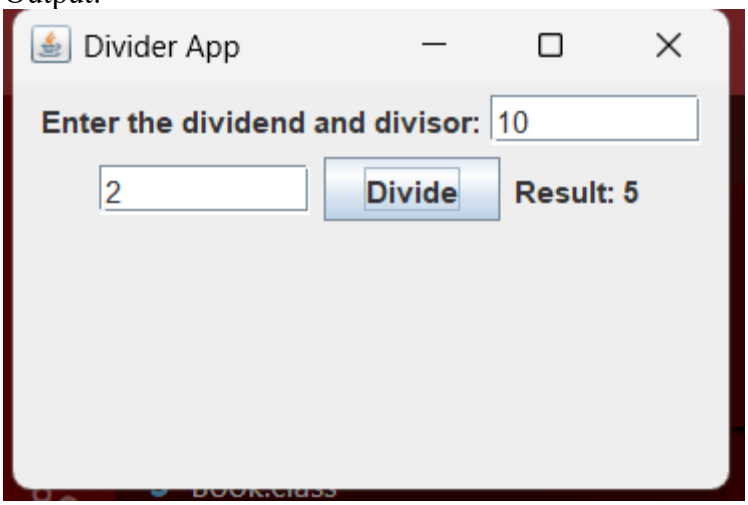
Program 9: Open-Ended Question 1

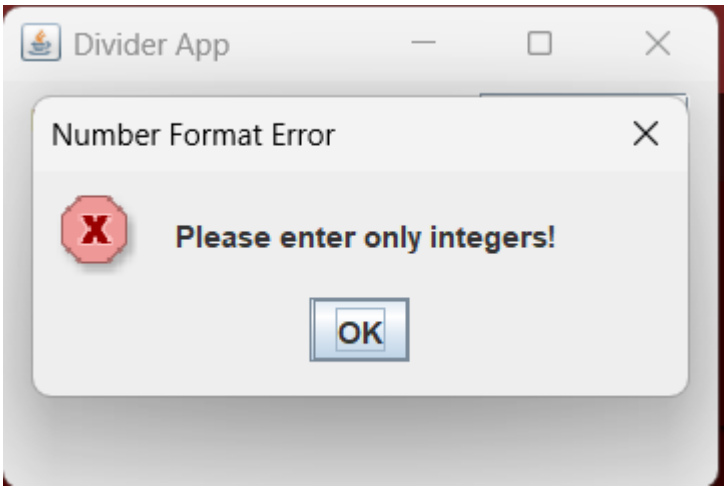
Code:

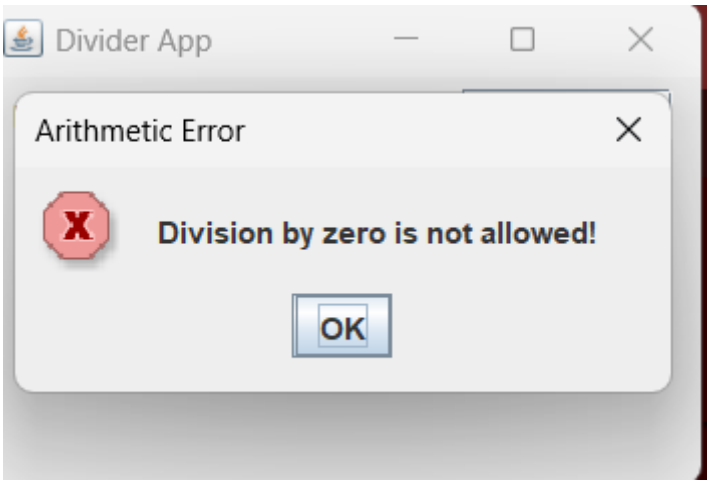
```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
public class SwingDemo {
   SwingDemo() {
      JFrame jfrm = new JFrame("Divider App");
      jfrm.setSize(300, 200);
      jfrm.setLayout(new FlowLayout());
      jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
      JLabel jlab = new JLabel("Enter the dividend and divisor:");
      JTextField ajtf = new JTextField(8);
      JTextField bjtf = new JTextField(8);
      JLabel resultLabel = new JLabel("Result:");
      JButton button = new JButton("Divide");
      jfrm.add(jlab);
      jfrm.add(ajtf);
      jfrm.add(bjtf);
      jfrm.add(button);
      jfrm.add(resultLabel);
      button.addActionListener(new ActionListener() {
         public void actionPerformed(ActionEvent evt) {
            try {
               int num1 = Integer.parseInt(ajtf.getText());
               int num2 = Integer.parseInt(bjtf.getText());

               int result = num1 / num2;
               resultLabel.setText("Result: " + result);

            } catch (NumberFormatException e) {
               JOptionPane.showMessageDialog(jfrm,
                     "Please enter only integers!",
                     "Number Format Error",
                     JOptionPane.ERROR_MESSAGE);
            } catch (ArithmeticException e) {
               JOptionPane.showMessageDialog(jfrm,
                     "Division by zero is not allowed!",
                     "Arithmetic Error",
                     JOptionPane.ERROR_MESSAGE);
            }
         }
      });
      jfrm.setVisible(true);
   }
```

```
    public static void main(String[] args) {
        SwingUtilities.invokeLater(new Runnable() {
            public void run() {
                new SwingDemo();
            }
        });
    }
}
```

Output:





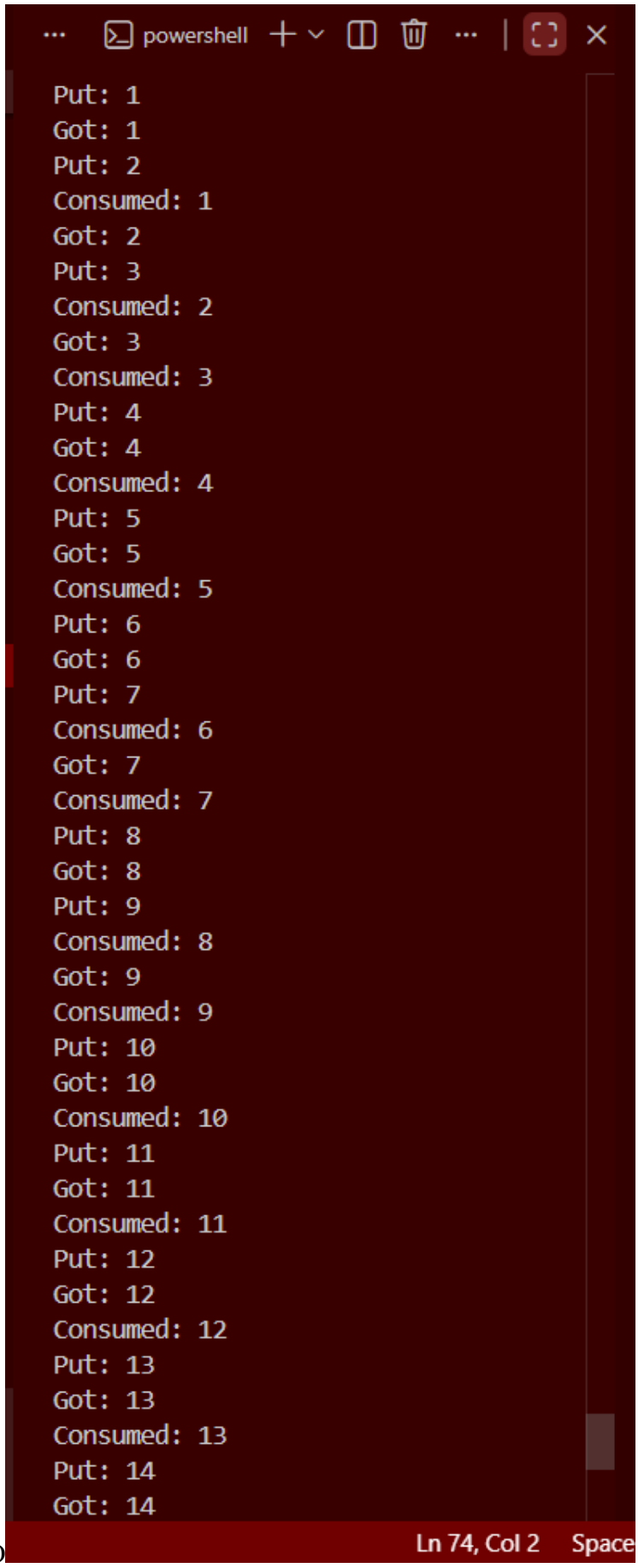

Divider App
Arithmetic Error
Division by zero is not allowed!
OK

Program 10: Open-Ended Question 2

Code:

```
class Q {
   int n;
   boolean valueSet = false;
   synchronized int get() {
      while (!valueSet) {
         try {
            wait();
         } catch (InterruptedException e) {
            System.out.println("InterruptedException caught");
         }
      }
      System.out.println("Got: " + n);
      valueSet = false;
      notify();
      return n;
   }
   synchronized void put(int n) {
      while (valueSet) {
         try {
            wait();
         } catch (InterruptedException e) {
            System.out.println("InterruptedException caught");
         }
      }
      this.n = n;
      valueSet = true;
      System.out.println("Put: " + n);
      notify();
   }
}
class Producer implements Runnable {
   Q q;
   Producer(Q q) {
      this.q = q;
      new Thread(this, "Producer").start();
   }
   public void run() {
      int i = 1;
      while (i <= 15) {
         q.put(i++);
      }
   }
}
class Consumer implements Runnable {
   Q q;
```

```
    Consumer(Q q) {
        this.q = q;
        new Thread(this, "Consumer").start();
    }
    public void run() {
        int i = 1;
        while (i <= 15) {
            int r = q.get();
            System.out.println("Consumed: " + r);
            i++;
        }
    }
}
public class Main23 {
    public static void main(String args[]) {
        Q q = new Q();
        new Producer(q);
        new Consumer(q);
    }
}
```


powershell
Put: 1
Got: 1
Put: 2
Consumed: 1
Got: 2
Put: 3
Consumed: 2
Got: 3
Consumed: 3
Put: 4
Got: 4
Consumed: 4
Put: 5
Got: 5
Consumed: 5
Put: 6
Got: 6
Put: 7
Consumed: 6
Got: 7
Consumed: 7
Put: 8
Got: 8
Put: 9
Consumed: 8
Got: 9
Consumed: 9
Put: 10
Got: 10
Consumed: 10
Put: 11
Got: 11
Consumed: 11
Put: 12
Got: 12
Consumed: 12
Put: 13
Got: 13
Consumed: 13
Put: 14
Got: 14
Ln 74, Col 2
Space

O