LAB RECORD

23CSE111 – Object Oriented Programming

Submitted by

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BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

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AMRITA SCHOOL OF COMPUTING

CHENNAI

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AMRITA SCHOOL OF COMPUTING, CHENNAI

BONAFIDE CERTIFICATE

This is to certify that the Lab Record work for 23CSE111-Object Oriented Programming Subject submitted by ***CH.SC.U4CSE24107 – CHEEDELLA JYOTHIRMAI*** in **"Computer Science and Engineering"** is a bonafide record of the work carried out under my guidance and supervision at Amrita School of Computing, Chennai.

Internal Examiner 1 Internal Examiner 2

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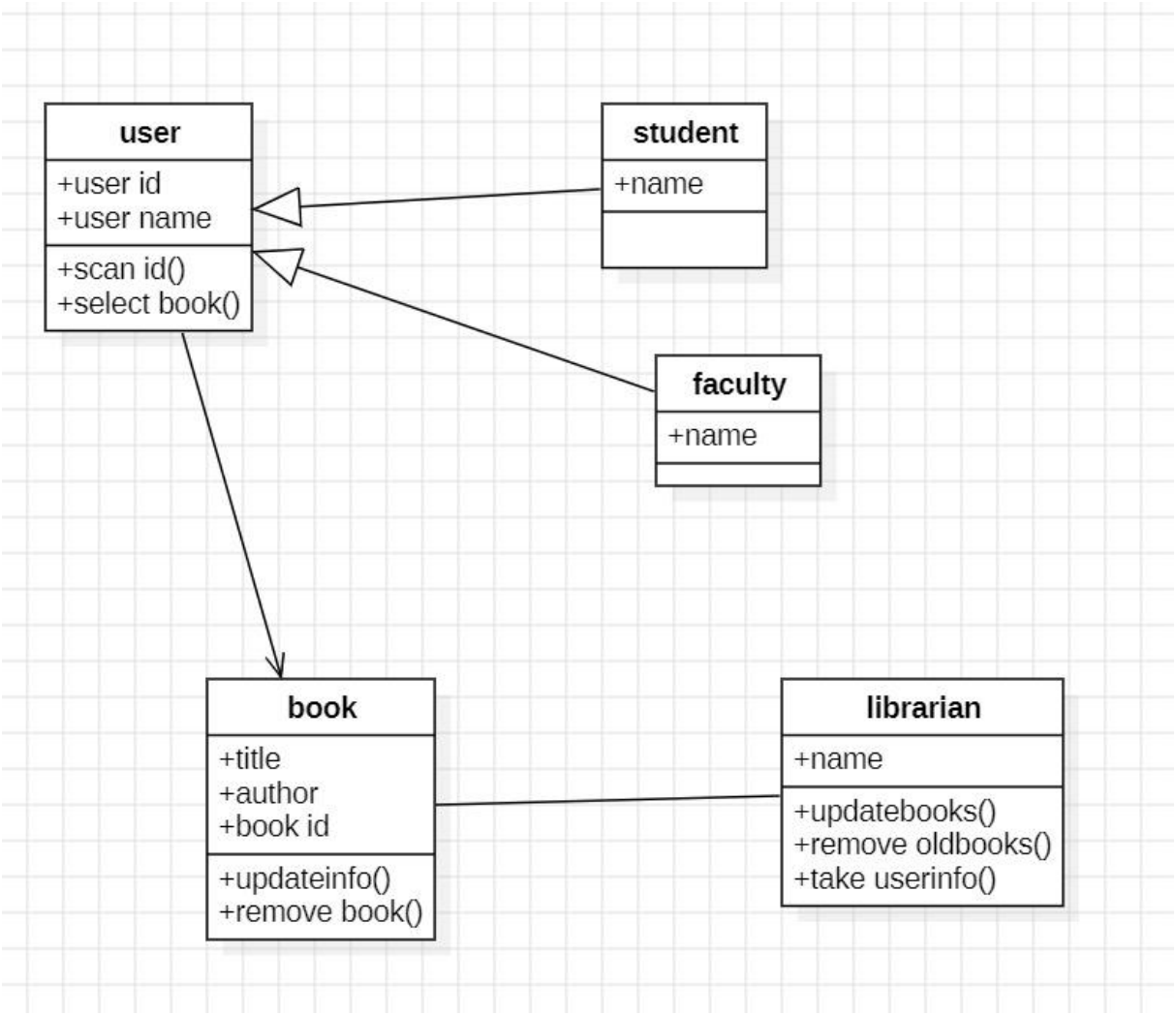

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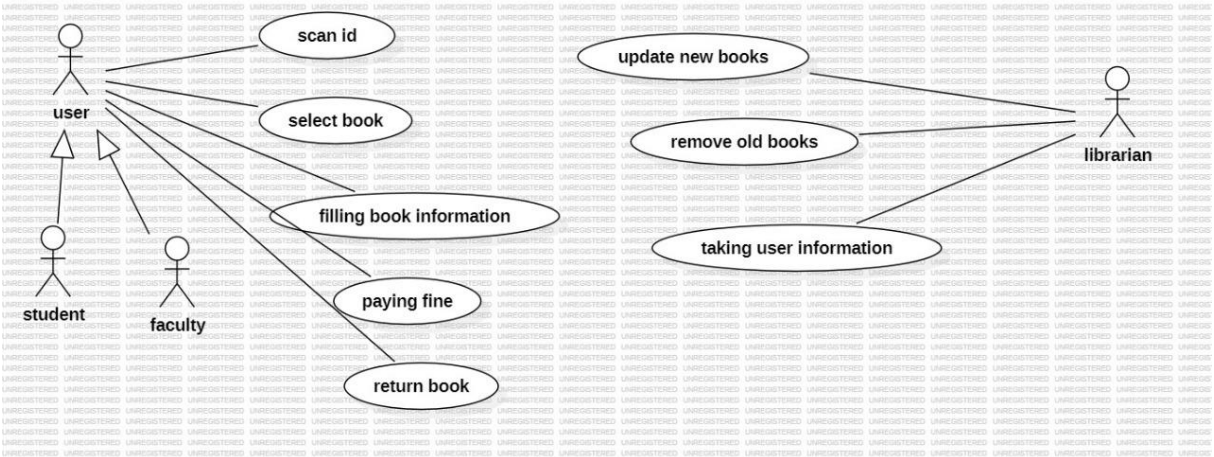

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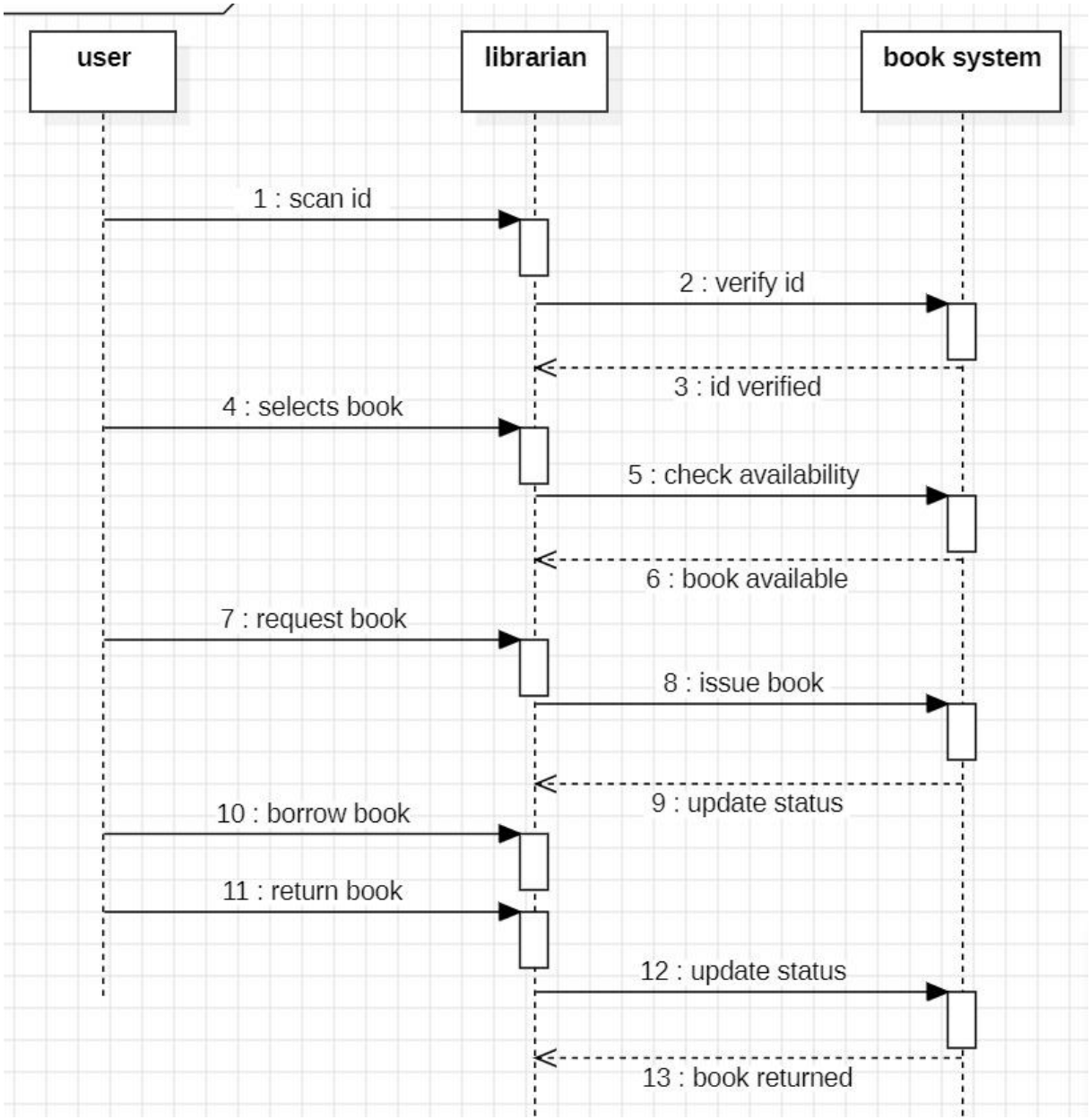
user
librarian
book system
1 : scan id
2 : verify id
3 : id verified
4 : selects book
5 : check availability
6 : book available
7 : request book
8 : issue book
9 : update status
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11 : return book
12 : update status
13 : book returned

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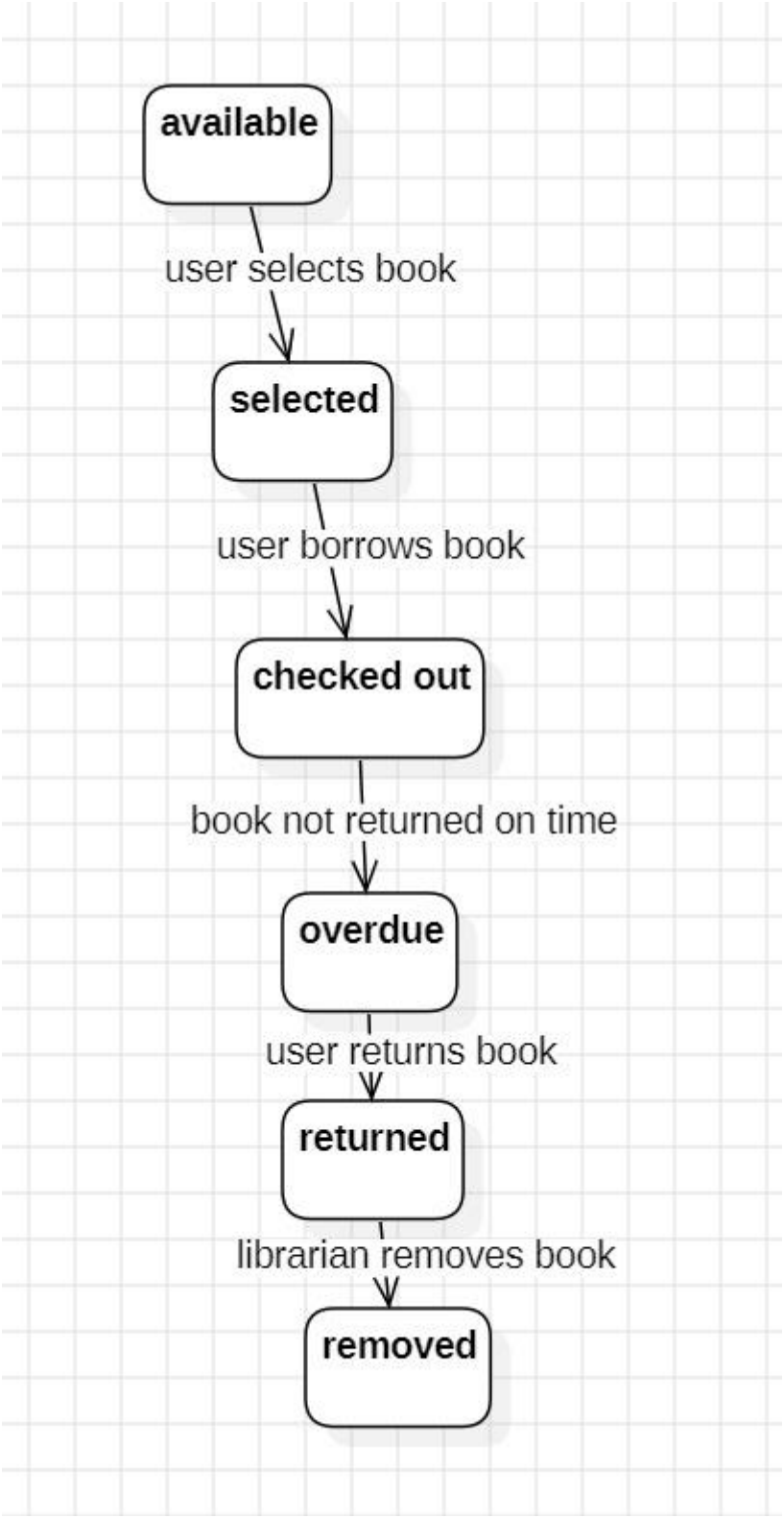
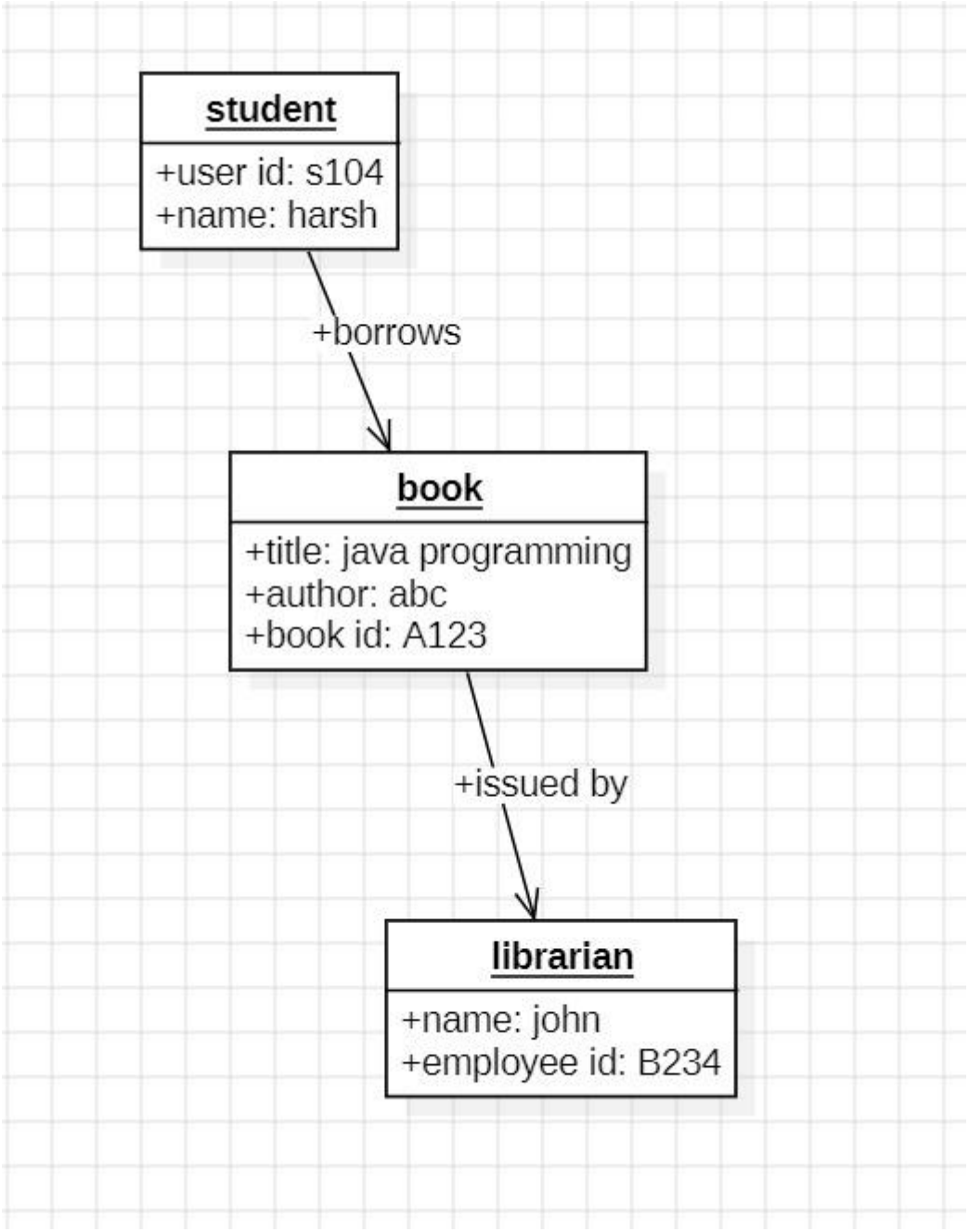
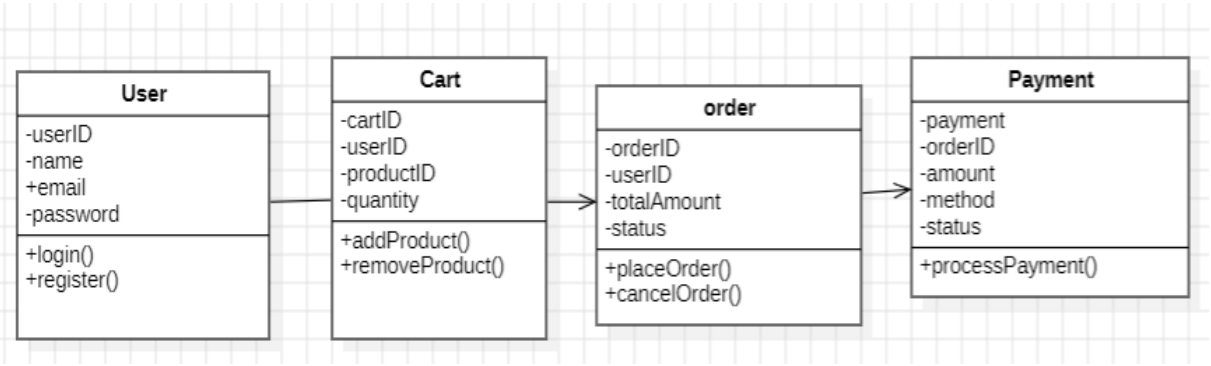


v. Object Diagram:

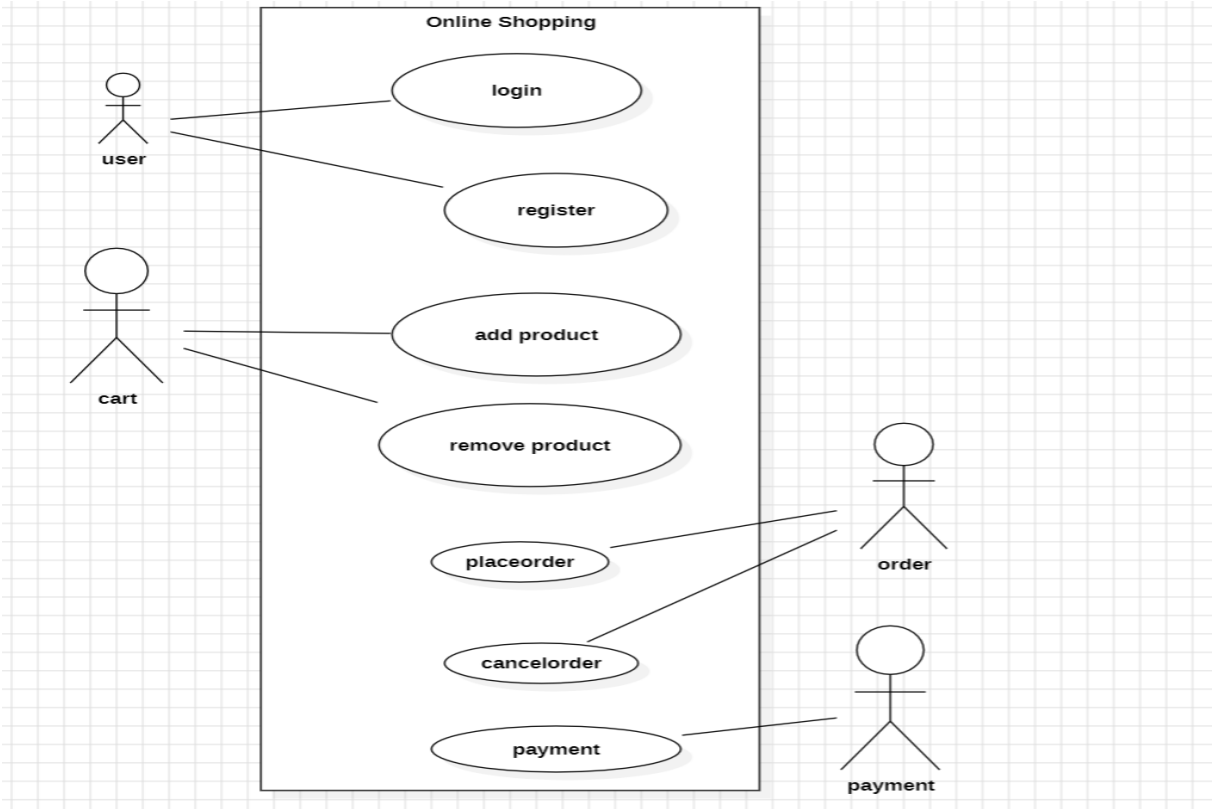


2.Online Shopping

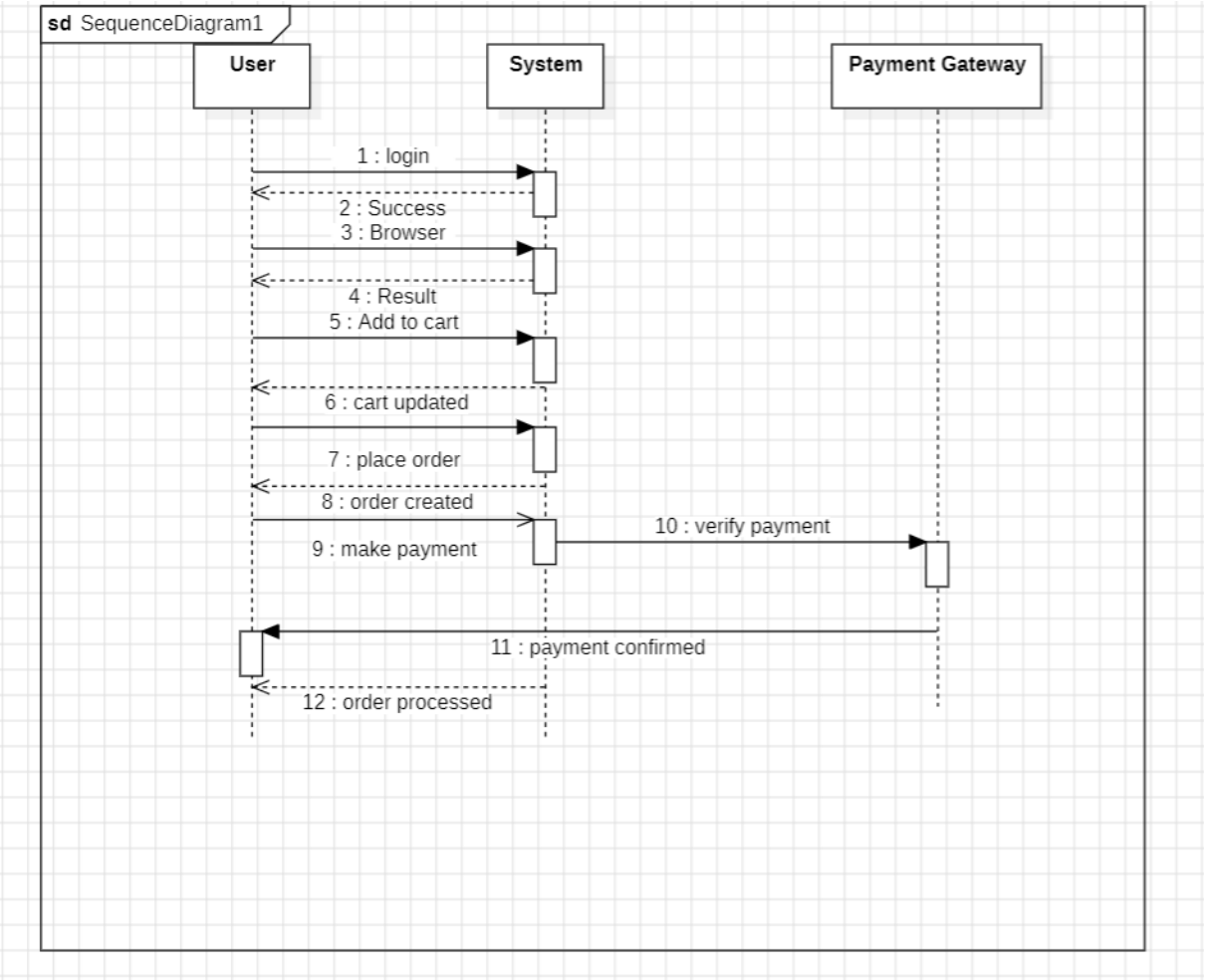
i. Class Diagram:



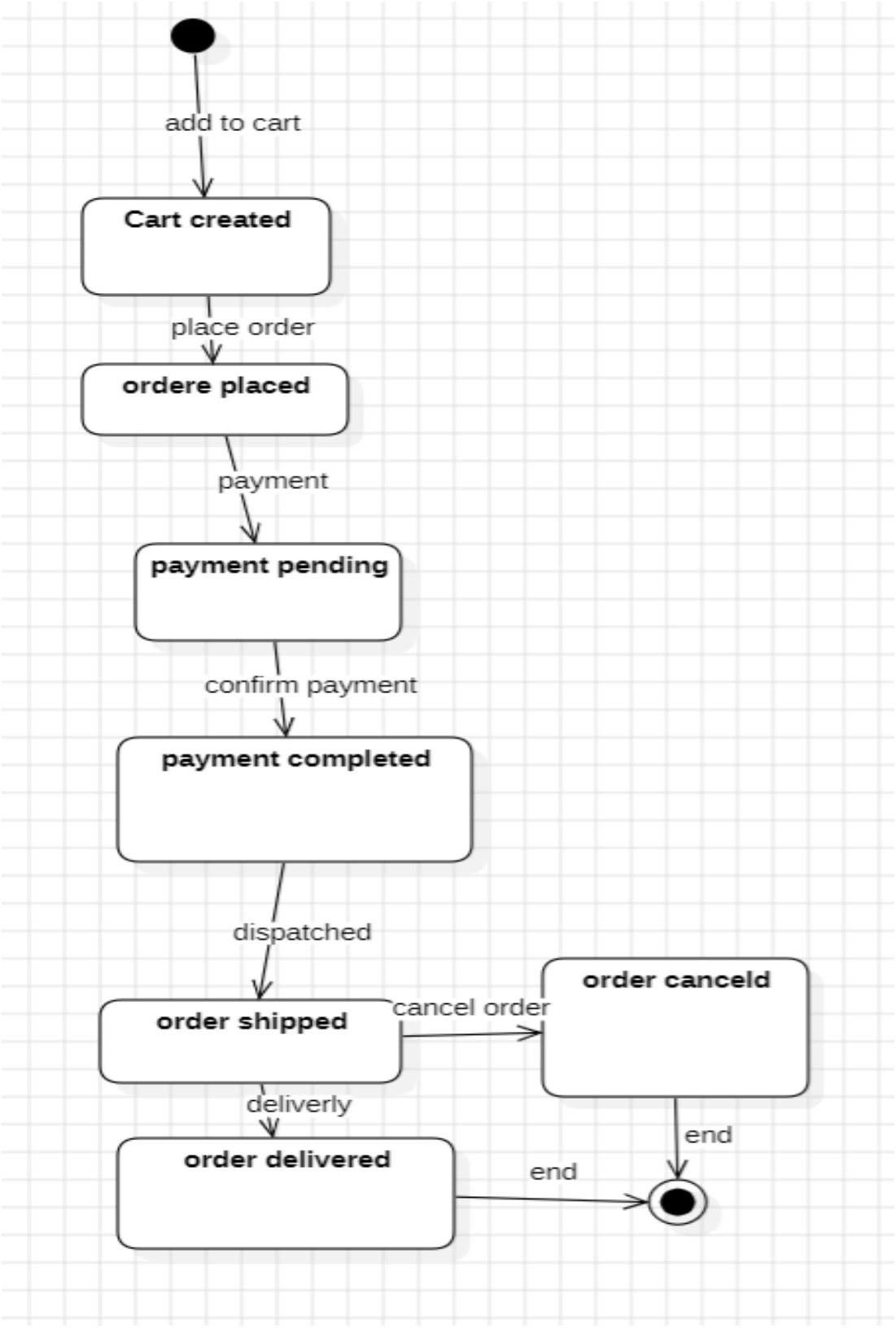
ii. Use Case Diagram:



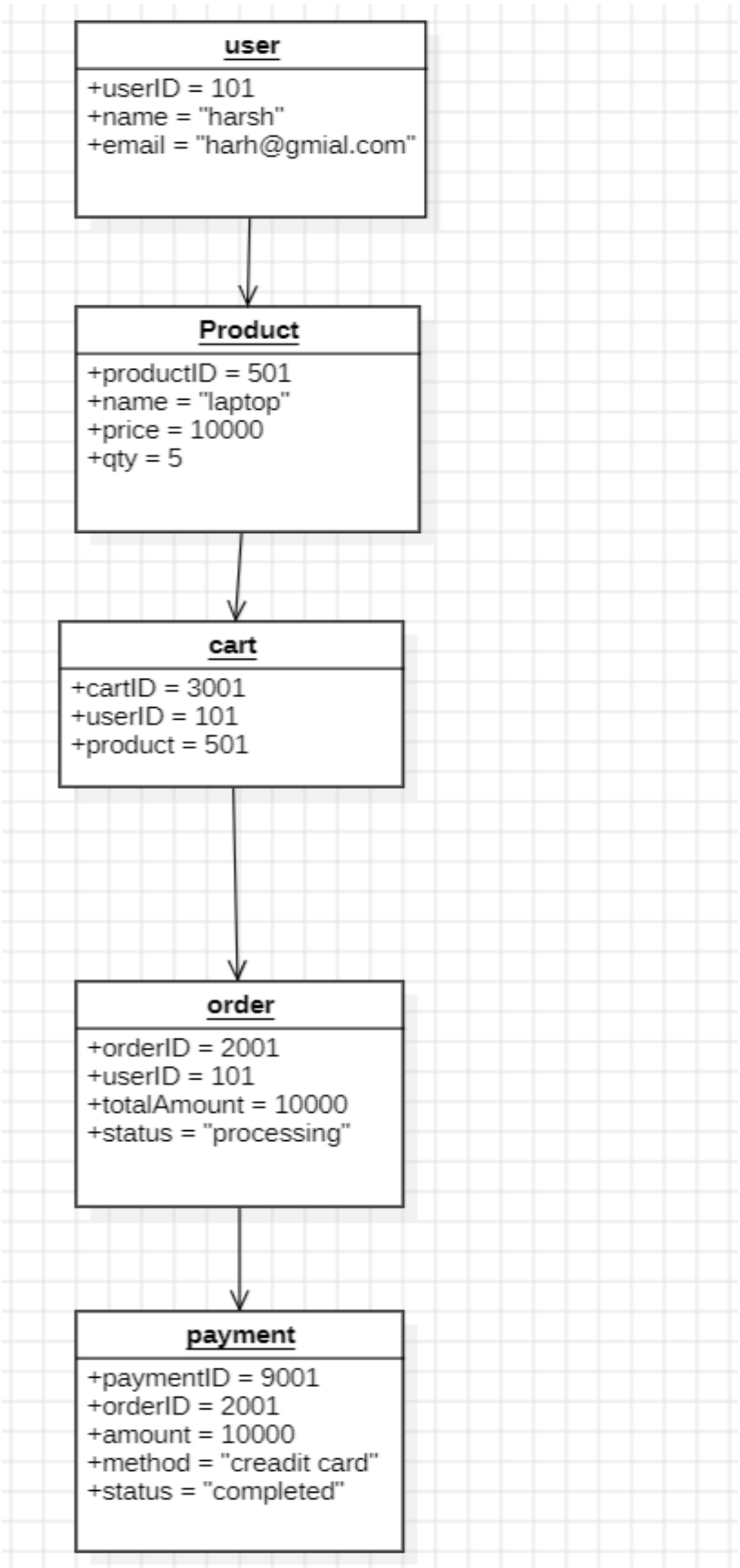
iii. Sequence Diagram:



iv. State Activity Diagram:



v. Object Diagram:


user
+userID = 101
+name = "harsh"
+email = "harh@gmial.com"
Product
+productID = 501
+name = "laptop"
+price = 10000
+qty = 5
cart
+cartID = 3001
+userID = 101
+product = 501
order
+orderID = 2001
+userID = 101
+totalAmount = 10000
+status = "processing"
payment
+paymentID = 9001
+orderID = 2001
+amount = 10000
+method = "creadit card"
+status = "completed"

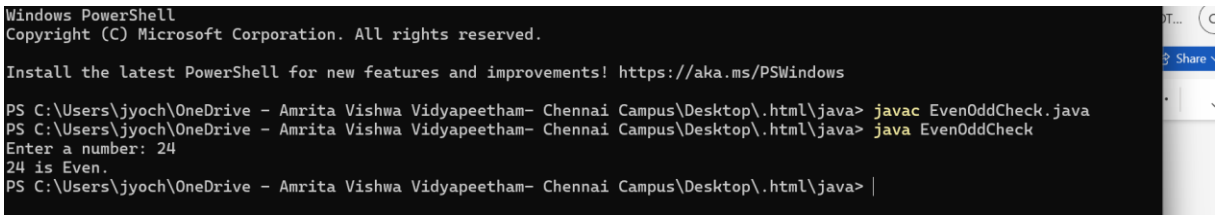
Basic Java Programs

1. Even or Odd:

Code:

```
import java.util.Scanner;

public class EvenOddCheck {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();

        if (num % 2 == 0) {
            System.out.println(num + " is Even.");
        } else {
            System.out.println(num + " is Odd.");
        }
        sc.close();
    }
}
```

Output:

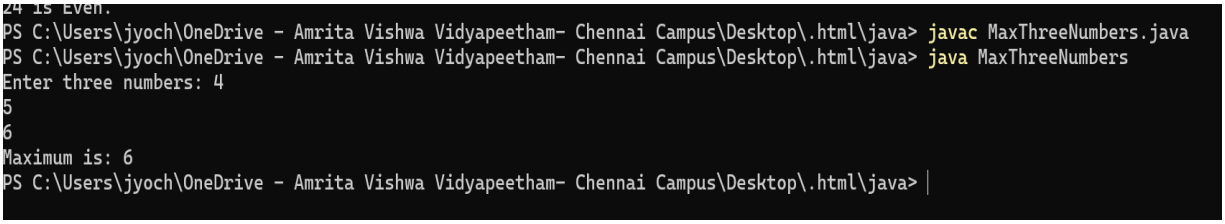


2. Max of 3 numbers:

Code:

```java
import java.util.Scanner;

public class MaxThreeNumbers {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter three numbers: ");
        int a = sc.nextInt();
        int b = sc.nextInt();
        int c = sc.nextInt();

        if (a > b && a > c)
            System.out.println("Maximum is: " + a);
        else if (b > c)
            System.out.println("Maximum is: " + b);
        else
            System.out.println("Maximum is: " + c);

        sc.close();
    }
}
```

Output:



3.Calculator

Code:

```java
import java.util.Scanner;

public class Calculator {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter first number: ");
        double num1 = sc.nextDouble();
        System.out.print("Enter second number: ");
        double num2 = sc.nextDouble();
        System.out.print("Enter operation (+, -, *, /): ");
        char op = sc.next().charAt(0);

        double result;
        switch (op) {
            case '+': result = num1 + num2; break;
            case '-': result = num1 - num2; break;
            case '*': result = num1 * num2; break;
            case '/':
                if (num2 != 0) result = num1 / num2;
                else { System.out.println("Cannot divide by zero!"); return; }
                break;
            default: System.out.println("Invalid operator!"); return;
        }

        System.out.println("Result: " + result);
        sc.close();
    }
}
```

Output:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac Calculator.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java Calculator
Enter first number: 23
Enter second number: 65
Enter operation (+, -, *, /): *
Result: 1495.0
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java>
```

4.Fibonacci series:

Code:

```
import java.util.Scanner;

public class FibonacciSeries {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter number of terms: ");
        int n = sc.nextInt();

        int a = 0, b = 1, next;
        System.out.print("Fibonacci Series: " + a + " " + b);
        for (int i = 2; i < n; i++) {
            next = a + b;
            System.out.print(" " + next);
            a = b;
            b = next;
        }

        sc.close();
    }
}
```

Output:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac FibonacciSeries.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java  FibonacciSeries
Enter number of terms: 4
Fibonacci Series: 0 1 1 2
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java>
```

5.Reverse a number:

Code:

```java
import java.util.Scanner;

public class ReverseNumber {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();
        int rev = 0;

        while (num != 0) {
            rev = rev * 10 + num % 10;
            num /= 10;
        }

        System.out.println("Reversed number: " + rev);
        sc.close();
    }
}
```

Output:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac ReverseNumber
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java ReverseNumber
Enter a number: 536
Reversed number: 635
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java>
```

6.Factorial of a number:

Code:

```
import java.util.Scanner;

public class Factorial {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();

        int fact = 1;
        for (int i = 1; i <= num; i++) {
            fact *= i;
        }

        System.out.println("Factorial of " + num + " is: " + fact);
        sc.close();
    }
}
```

Output:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac Factorial.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java Factorial
Enter a number: 6
Factorial of 6 is: 720
```

7.Prime Number Check:

Code:

```java
import java.util.Scanner;

public class PrimeCheck {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();

        boolean isPrime = true;

        if (num <= 1) {
            isPrime = false;
        } else {
            for (int i = 2; i <= num / 2; i++) {
                if (num % i == 0) {
                    isPrime = false;
                    break;
                }
            }
        }

        if (isPrime)
            System.out.println(num + " is a Prime number.");
        else
            System.out.println(num + " is not a Prime number.");

        sc.close();
    }
}
```

Output:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac PrimeCheck.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java PrimeCheck
Enter a number: 12
12 is not a Prime number.
```

8.Palindrome Check:

Code:

```
import java.util.Scanner;

public class PalindromeCheck {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();

        int original = num, rev = 0;

        while (num != 0) {
            rev = rev * 10 + num % 10;
            num /= 10;
        }

        if (original == rev)
            System.out.println(original + " is a Palindrome.");
        else
            System.out.println(original + " is not a Palindrome.");

        sc.close();
    }
}
```

Output:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac PalindromeCheck.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java PalindromeCheck
Enter a number: 23
23 is not a Palindrome.
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java>
```

9.Armstrong Number:

Code:

```java
import java.util.Scanner;

public class ArmstrongNumber {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();

        int original = num, sum = 0, digits = String.valueOf(num).length();

        while (num != 0) {
            int digit = num % 10;
            sum += Math.pow(digit, digits);
            num /= 10;
        }

        if (sum == original)
            System.out.println(original + " is an Armstrong number.");
        else
            System.out.println(original + " is not an Armstrong number.");

        sc.close();
    }
}
```

Output:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac  ArmstrongNumber.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java  ArmstrongNumber
Enter a number: 153
153 is an Armstrong number.
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java>
```

10.Sum of Natural Number:

Code:

```java
import java.util.Scanner;

public class SumNaturalNumbers {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();

        int sum = 0;
        for (int i = 1; i <= num; i++) {
            sum += i;
        }

        System.out.println("Sum of first " + num + " natural numbers is: " + sum);
        sc.close();
    }
}
```

Output:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac SumNaturalNumbers.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> ja
                                                                                            java SumNaturalNumbers
Enter a number: 5
```

INHERITANCE:

4)Hierarchical Inheritance:

A)

CODE:

```
class Vehicle {
   private String brand;
   private String model;
    public Vehicle(String brand, String model) {
      this.brand = brand;
      this.model = model;
   }
   public void start() {
      System.out.println("Vehicle is starting.");
   }
   public void stop() {
      System.out.println("Vehicle is stopping.");
```

```
    }
    public String getBrand() {
        return brand;
    }
  public String getModel() {
        return model;
    }
}
class Car extends Vehicle {
    private int numberOfDoors
   public Car(String brand, String model, int numberOfDoors) {
        super(brand, model);
        this.numberOfDoors = numberOfDoors;
    }
  public void drive() {
        System.out.println("Car is driving.");
    }
    public int getNumberOfDoors() {
        return numberOfDoors;
    }
}
class ElectricCar extends Car {
    private int batteryCapacity;
   public ElectricCar(String brand, String model, int numberOfDoors, int batteryCapacity)
{
        super(brand, model, numberOfDoors);
        this.batteryCapacity = batteryCapacity;
    }
  public void charge() {
        System.out.println("Electric car is charging.");
```

```
    }
 public int getBatteryCapacity() {
        return batteryCapacity;
    }
}
class Truck extends Vehicle {
    private double cargoCapacity;
    public Truck(String brand, String model, double cargoCapacity) {
        super(brand, model);
        this.cargoCapacity = cargoCapacity;
    }
 public void loadCargo() {
        System.out.println("Truck is loading cargo.");
    }
  public double getCargoCapacity() {
        return cargoCapacity;
    }
}
public class Main {
    public static void main(String[] args) {
        Car car = new Car("Toyota", "Corolla", 4);
        car.start();
        car.drive();
        car.stop();
        System.out.println("Car doors: " + car.getNumberOfDoors());
        ElectricCar electricCar = new ElectricCar("Tesla", "Model S", 4, 100);
        electricCar.start();
        electricCar.drive();
        electricCar.charge();
        System.out.println("Battery capacity: " + electricCar.getBatteryCapacity());
```

```
    Truck truck = new Truck("Ford", "F-150", 2000.5);
    truck.start();
    truck.loadCargo();
    truck.stop();
    System.out.println("Cargo capacity: " + truck.getCargoCapacity());
  }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop> javac q1.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop> java q1
Vehicle is starting.
Car is driving.
Vehicle is stopping.
Car doors: 4
Vehicle is starting.
Car is driving.
Electric car is charging.
Battery capacity: 100
Vehicle is starting.
Truck is loading cargo.
Vehicle is stopping.
Cargo capacity: 2000.5
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop>
```

B)

CODE:

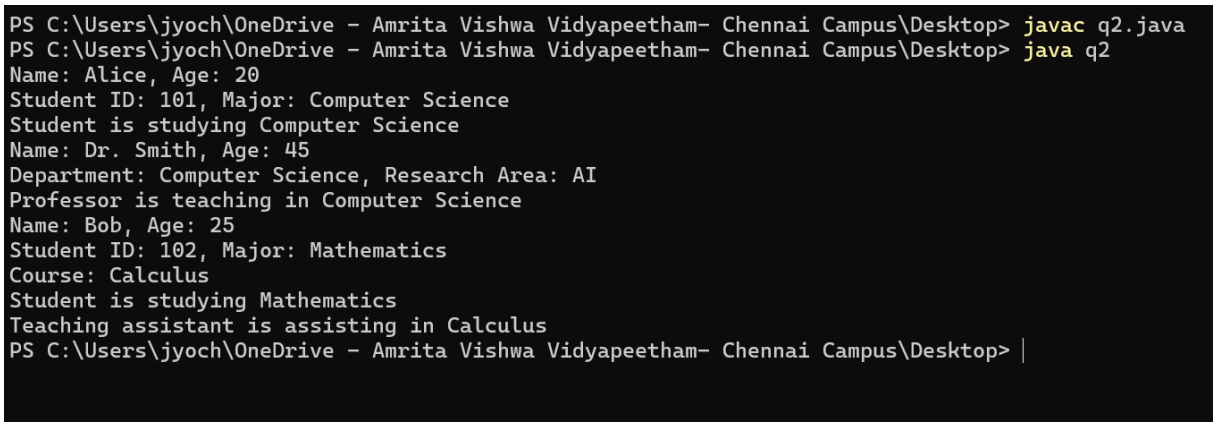
```
class Person {
  private String name;
  private int age;

  public Person(String name, int age) {
    this.name = name;
    this.age = age;
  }

  public void displayDetails() {
    System.out.println("Name: " + name + ", Age: " + age);
```

```
    }
}
class Student extends Person {
    private int studentId;
    private String major;
    public Student(String name, int age, int studentId, String major) {
        super(name, age);
        this.studentId = studentId;
        this.major = major;
    }
    public void study() {
        System.out.println("Student is studying " + major);
    }
  public void displayDetails() {
        super.displayDetails();
        System.out.println("Student ID: " + studentId + ", Major: " + major);
    }
}
class Professor extends Person {
    private String department;
    private String researchArea;
  public Professor(String name, int age, String department, String researchArea) {
        super(name, age);
        this.department = department;
        this.researchArea = researchArea;
    }
 public void teach() {
        System.out.println("Professor is teaching in " + department);
    }
   public void displayDetails() {
```

```
        super.displayDetails();
        System.out.println("Department: " + department + ", Research Area: " +
researchArea);
    }
}
class TeachingAssistant extends Student {
    private String course;

    public TeachingAssistant(String name, int age, int studentId, String major, String
course) {
        super(name, age, studentId, major);
        this.course = course;
    }
    public void assist() {
        System.out.println("Teaching assistant is assisting in " + course);
    }
public void displayDetails() {
        super.displayDetails();
        System.out.println("Course: " + course);
    }
}
public class q2 {
    public static void main(String[] args) {
        Student student = new Student("Alice", 20, 101, "Computer Science");
        student.displayDetails();
        student.study()
         Professor professor = new Professor("Dr. Smith", 45, "Computer Science", "AI");
        professor.displayDetails();
        professor.teach(TeachingAssistant ta = new TeachingAssistant("Bob", 25, 102,
"Mathematics", "Calculus");
        ta.displayDetails();
```

```
    ta.study();
    ta.assist();
  }
}
```

OUTPUT:



5)SINGLE INHERITANCE:

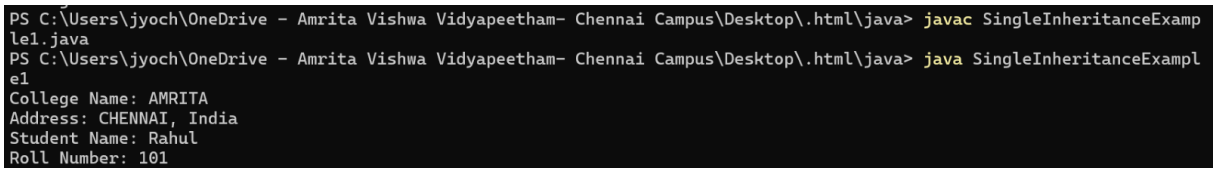
A)

CODE:

```
class College {
  String collegeName = "AMRITA";
  String address = "CHENNAI, India";

  void showCollegeDetails() {
    System.out.println("College Name: " + collegeName);
    System.out.println("Address: " + address);
  }
}
class Student extends College {
  String studentName;
  int rollNumber;
```

```
    Student(String studentName, int rollNumber) {
        this.studentName = studentName;
        this.rollNumber = rollNumber;
    }

    void showStudentDetails() {
        System.out.println("Student Name: " + studentName);
        System.out.println("Roll Number: " + rollNumber);
    }
}
public class SingleInheritanceExample1 {
    public static void main(String[] args) {
        Student s1 = new Student("Rahul", 101);
        s1.showCollegeDetails();
        s1.showStudentDetails();
    }
}
```

OUTPUT:



B)

CODE:

```
class BankAccount {
    String accountHolder;
    double balance;
```

```
    BankAccount(String accountHolder, double balance) {
        this.accountHolder = accountHolder;
        this.balance = balance;
    }

    void showBalance() {
        System.out.println("Account Holder: " + accountHolder);
        System.out.println("Balance: $" + balance);
    }
}
class SavingsAccount extends BankAccount {
    double interestRate = 5.0;

    SavingsAccount(String accountHolder, double balance) {
        super(accountHolder, balance);
    }

    void calculateInterest() {
        double interest = (balance * interestRate) / 100;
        System.out.println("Annual Interest: $" + interest);
    }
}

public class SingleInheritanceExample2 {
    public static void main(String[] args) {
        SavingsAccount acc1 = new SavingsAccount("John Doe", 5000);
        acc1.showBalance();
        acc1.calculateInterest();
    }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac SingleInheritanceExamp
le2.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java SingleInheritanceExampl
e2
Account Holder: John Doe
Balance: $5000.0
Annual Interest: $250.0
```

6)MULTILEVEL INHERITANCE:

A)

CODE:

```
class LivingBeing {
   void breathe() {
      System.out.println("Living beings breathe.");
   }
}
class Human extends LivingBeing {
   void speak() {
      System.out.println("Humans can speak.");
   }
}
class Student extends Human {
   String name;
   int studentID;

   Student(String name, int studentID) {
      this.name = name;
      this.studentID = studentID;
   }

   void study() {
```

```
    System.out.println(name + " is studying.");
  }

  void showDetails() {
    System.out.println("Student Name: " + name);
    System.out.println("Student ID: " + studentID);
  }
}
public class MultilevelExample1 {
  public static void main(String[] args) {
    Student s1 = new Student("Rahul", 101);
    s1.breathe();
    s1.speak();
    s1.study();
    s1.showDetails();
  }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac  MultilevelExample1.ja
va
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java  MultilevelExample1
Living beings breathe.
Humans can speak.
Rahul is studying.
Student Name: Rahul
Student ID: 101
```

B)

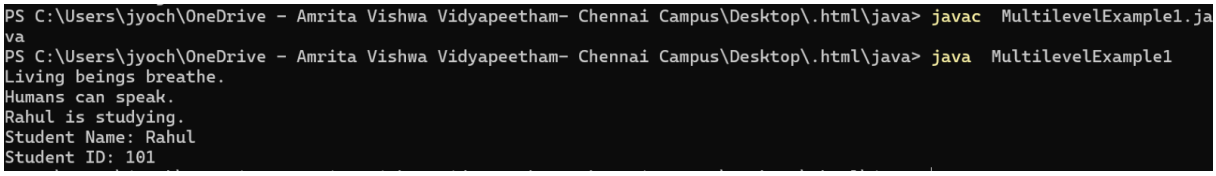
CODE:

```
class Person {
  String name;
  Person(String name) {
    this.name = name;
  }
```

```
    void showPerson() {
        System.out.println("Person Name: " + name);
    }
}
class Employee extends Person {
    int employeeID;
    double salary;
    Employee(String name, int employeeID, double salary) {
        super(name);
        this.employeeID = employeeID;
        this.salary = salary;
    }
    void showEmployee() {
        System.out.println("Employee ID: " + employeeID);
        System.out.println("Salary: $" + salary);
    }
}
class Manager extends Employee {
    String department;
    Manager(String name, int employeeID, double salary, String department) {
        super(name, employeeID, salary);
        this.department = department;
    }
    void showManager() {
        System.out.println("Department: " + department);
        System.out.println("Role: Manager");
    }
}
public class MultilevelExample2 {
    public static void main(String[] args) {
```

```
    Manager m1 = new Manager("Alice", 2001, 75000, "HR");
    m1.showPerson();
    m1.showEmployee();
    m1.showManager();
  }
}
```

OUTPUT:



7)HYBRID INHERITANCE:

A)

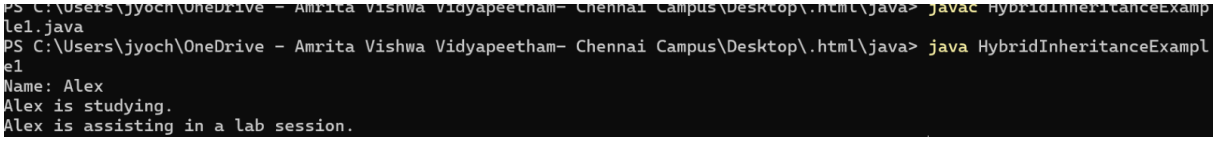
CODE:

```
class Person {
  String name;

  Person(String name) {
    this.name = name;
  }

  void showDetails() {
    System.out.println("Name: " + name);
  }
}
class Student extends Person {
  int studentID;

  Student(String name, int studentID) {
```

```
        super(name);
        this.studentID = studentID;
    }

    void study() {
        System.out.println(name + " is studying.");
    }
}
class Teacher extends Person {
    String subject;

    Teacher(String name, String subject) {
        super(name);
        this.subject = subject;
    }

    void teach() {
        System.out.println(name + " is teaching " + subject + ".");
    }
}
interface Assistant {
    void assist();
}
class TeachingAssistant extends Student implements Assistant {
    TeachingAssistant(String name, int studentID) {
        super(name, studentID);
    }

    public void assist() {
        System.out.println(name + " is assisting in a lab session.");
```

```
    }
}
public class HybridInheritanceExample1 {
    public static void main(String[] args) {
        TeachingAssistant ta = new TeachingAssistant("Alex", 101);
        ta.showDetails();
        ta.study();
        ta.assist();
    }
}
```

OUTPUT:



B)

CODE:

```
class Vehicle {
    void startEngine() {
        System.out.println("Vehicle engine started.");
    }
}
class Car extends Vehicle {
    void drive() {
        System.out.println("Car is driving.");
    }
}
class Boat extends Vehicle {
    void sail() {
```

```
        System.out.println("Boat is sailing.");
    }
}
interface Amphibious {
    void switchMode();
}
class AmphibiousCar extends Car implements Amphibious {
    public void switchMode() {
        System.out.println("Switching between land and water mode.");
    }

    void sail() {
        System.out.println("Amphibious car is sailing on water.");
    }
}
public class HybridInheritanceExample2 {
    public static void main(String[] args) {
        AmphibiousCar ac = new AmphibiousCar();
        ac.startEngine();
        ac.drive();
        ac.switchMode();
        ac.sail();
    }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac HybridInheritanceExampl
e2.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java HybridInheritanceExampl
e2
Vehicle engine started.
Car is driving.
Switching between land and water mode.
Amphibious car is sailing on water.
```

POLYMORPHISM:

8)METHOD OVERLOADING

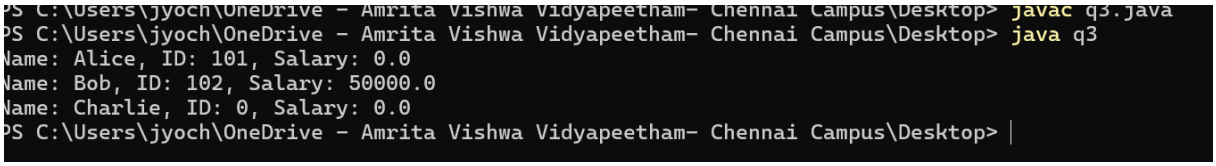
A)

CODE:

```
class Employee {
   private String name;
   private int id;
   private double salary;
   void setDetails(String name, int id) {
      this.name = name;
      this.id = id;
   }
   void setDetails(String name, int id, double salary) {
      this.name = name;
      this.id = id;
      this.salary = salary;
   }
   void setDetails(String name) {
      this.name = name;
   }
   void displayDetails() {
      System.out.println("Name: " + name + ", ID: " + id + ", Salary: " + salary);
   }
}
public class q3 {
   public static void main(String[] args) {
      Employee emp1 = new Employee();
      emp1.setDetails("Alice", 101); // Calls first method
      emp1.displayDetails();
```

```
        Employee emp2 = new Employee();
        emp2.setDetails("Bob", 102, 50000.0); // Calls second method
        emp2.displayDetails();
        Employee emp3 = new Employee();
        emp3.setDetails("Charlie"); // Calls third method
        emp3.displayDetails();
    }
}
```

OUTPUT:



B)

CODE:

```
class Shape {
    void draw(double radius) {
        System.out.println("Drawing a circle with radius: " + radius);
    }
  void draw(double length, double width) {
        System.out.println("Drawing a rectangle with length: " + length + " and width: " + width);
    }
    void draw(double side1, double side2, double side3) {
        System.out.println("Drawing a triangle with sides: " + side1 + ", " + side2 + ", " + side3);
    }
}
public class q4 {
    public static void main(String[] args) {
```

```
        Shape shape = new Shape();
        shape.draw(5.0);
        shape.draw(4.0, 6.0);
        shape.draw(3.0, 4.0, 5.0);    }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop> javac q4.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop> java q4
Drawing a circle with radius: 5.0
Drawing a rectangle with length: 4.0 and width: 6.0
Drawing a triangle with sides: 3.0, 4.0, 5.0
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop>
```

9)METHOD OVER RIDING:

A)

CODE:

```
abstract class Employee {
    protected String name;
    protected double salary;
    public Employee(String name, double salary) {
        this.name = name;
        this.salary = salary;
    }
    abstract double calculateBonus();
    public void displayDetails() {
        System.out.println("Name: " + name + ", Salary: " + salary);
    }
}
class Manager extends Employee {
    private static final double BONUS_PERCENTAGE = 0.20; // 20% bonus

    public Manager(String name, double salary) {
```

```
        super(name, salary);
    }
    double calculateBonus() {
        return salary * BONUS_PERCENTAGE;
    }
}
class Developer extends Employee {
    private static final double BONUS_PERCENTAGE = 0.10; // 10% bonus
     public Developer(String name, double salary) {
        super(name, salary);
    }
    double calculateBonus() {
        return salary * BONUS_PERCENTAGE;
    }
}
public class q5 {
    public static void main(String[] args) {
        Employee manager = new Manager("John", 100000);
        Employee developer = new Developer("Alice", 80000);
       System.out.println("Manager Bonus: " + manager.calculateBonus());
        System.out.println("Developer Bonus: " + developer.calculateBonus());
      manager.displayDetails();
        developer.displayDetails();
    }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop> javac q5.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop> java q5
Manager Bonus: 20000.0
Developer Bonus: 8000.0
Name: John, Salary: 100000.0
Name: Alice, Salary: 80000.0
```

B)

CODE:

abstract class Shape { abstract double calculateArea(); abstract double calculatePerimeter(); } class Circle extends Shape { private double radius;

```
public Circle(double radius) {
    this.radius = radius;
}
double calculateArea() {
    return Math.PI * radius * radius;
}
double calculatePerimeter() {
    return 2 * Math.PI * radius;
}
```

} class Rectangle extends Shape { private double length; private double width;

```
public Rectangle(double length, double width) {
    this.length = length;
    this.width = width;
}
double calculateArea() {
    return length * width;
}

double calculatePerimeter() {
    return 2 * (length + width);
}

}
```

public class q6 { public static void main(String[] args) {

Shape circle = new Circle(5);

Shape rectangle = new Rectangle(4, 6);

```
   System.out.println("Circle Area: " + circle.calculateArea());
    System.out.println("Circle Perimeter: " +
circle.calculatePerimeter());

    System.out.println("Rectangle Area: " +
rectangle.calculateArea());
    System.out.println("Rectangle Perimeter: " +
rectangle.calculatePerimeter());
}
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop> javac q6.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop> java q6
Circle Area: 78.53981633974483
Circle Perimeter: 31.41592653589793
Rectangle Area: 24.0
Rectangle Perimeter: 20.0
```

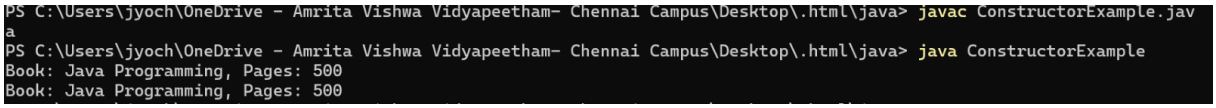
10)CONSTRUCTOR PROGRMS:

CODE:

```
class Book {
   String title;
   int pages;
   Book(String t, int p) {
      title = t;
      pages = p;
   }
   Book(Book b) {
      title = b.title;
      pages = b.pages;
   }
   void display() {
      System.out.println("Book: " + title + ", Pages: " + pages);
   }
}
 public class ConstructorExample {
   public static void main(String[] args) {
      Book b1 = new Book("Java Programming", 500);
      Book b2 = new Book(b1);
      b1.display();
      b2.display();
   }
```

}

OUTPUT:



11)CONSTRUCTOR OVERLOADING:

CODE:

```
class Employee {
   String name;
   int age;
   double salary;

   Employee() {
      name = "Unknown";
      age = 18;
      salary = 30000;
   }

   Employee(String n, int a) {
      name = n;
      age = a;
      salary = 40000;
   }

   Employee(String n, int a, double s) {
      name = n;
      age = a;
      salary = s;
```

```
    }

    void display() {
        System.out.println("Name: " + name + ", Age: " + age + ", Salary: $" + salary);
    }
}

public class ConstructorOverloadingExample {
    public static void main(String[] args) {
        Employee e1 = new Employee();
        Employee e2 = new Employee("John", 25);
        Employee e3 = new Employee("Alice", 30, 60000);

        e1.display();
        e2.display();
        e3.display();
    }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac ConstructorOverloadi
Example.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java ConstructorOverloadin
xample
Name: Unknown, Age: 18, Salary: $30000.0
Name: John, Age: 25, Salary: $40000.0
Name: Alice, Age: 30, Salary: $60000.0
```

ABSTRACTION:

12)ABSTRACT CLASS:

A)

CODE:

```
public class abstractclass1{
public static void main(String[] args){
Car c1=new kia();
c1.carName("kia");
c1.carSpeed(122,"kia");
}
}

abstract class Car{
abstract void carName(String name);

abstract void carSpeed(int speed,String name);

abstract void Mileage(int fuel,double mileage);

}
class kia extends Car{
void carName(String name){
System.out.println("Your Car name is "+name);
}
void carSpeed(int speed,String name){
System.out.println(name+" can travel at the speed of "+speed+" km/h");
}
void Mileage(int fuel,double mileage){
System.out.println("kia "+"can travel range of "+(fuel*mileage));
}

}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac abstractclass1.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java abstractclass1
Your Car name is kia
kia can travel at the speed of 122 km/h
```

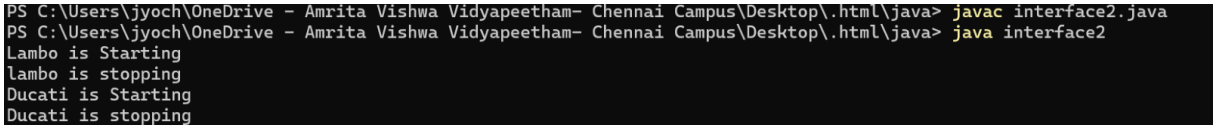
B)

CODE:

```
abstract class Vehicle{

abstract void start(String name);


abstract void stop(String name);


}

class Car extends Vehicle{

void start(String name){

System.out.println( name+" is Starting");

}

void stop(String name){

System.out.println(name+" is stopping");

}

}

class Bike extends Vehicle{

void start(String name){

System.out.println( name+" is Starting");

}

void stop(String name){

System.out.println(name+" is stopping");

}

}

public class interface2{

public static void main(String[] args){
```

```
Car v1=new Car();


v1.start("Lambo");
v1.stop("lambo");


Bike v2=new Bike();
v2.start("Ducati");
v2.stop("Ducati");
}
}
```

OUTPUT:



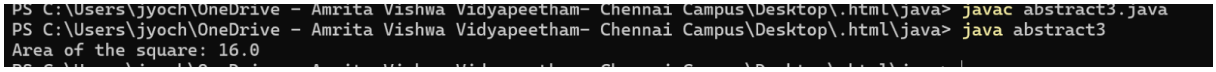
C)

CODE:

```
abstract class Shape {
   abstract double calculateArea();
}


class Square extends Shape {
   private double side;


   public Square(double side) {
      this.side = side;
   }
   double calculateArea() {
      return side * side;
   }
```

```
}
public class abstract3 {
   public static void main(String[] args) {
      Shape square = new Square(4.0);
      System.out.println("Area of the square: " + square.calculateArea());
   }
}
```

OUTPUT:



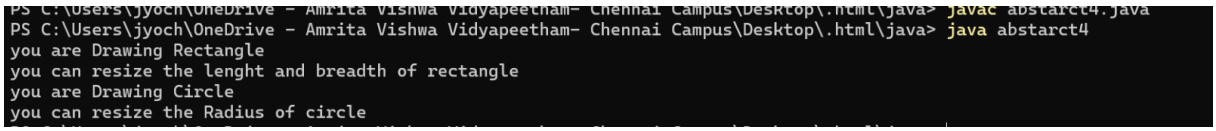
D)

CODE:

```
abstract class Shape2D{
abstract void draw();
abstract void resize();
}
class Rectangle extends Shape2D{
void draw(){
System.out.println("you are Drawing Rectangle");
}
void resize(){
System.out.println("you can resize the lenght and breadth of rectangle");
}
}
class Circle extends Shape2D{
void draw(){
System.out.println("you are Drawing Circle");
}
```

```
void resize(){
System.out.println("you can resize the Radius of circle ");
}
}
public class abstarct4{
public static void main(String[] args){
Shape2D s1=new Rectangle();
s1.draw();
s1.resize();
 Shape2D s2=new Circle();
s2.draw();
s2.resize();
}
}
```

OUTPUT:



13)INTERFACE PROGRAMS:

A)

CODE:

```
interface Shape{ void getArea();
 }
class Rectangle implements Shape
{ double lenght,breadth;
Rectangle(double lenght, double breadth) {
    this.lenght = lenght;
```

```
    this.breadth = breadth;
}
public void getArea(){
   System.out.println("The area of rectangle "+(lenght*breadth));
}


}
```

class Circle implements Shape{ double radius; Circle(double radius){

this.radius=radius;

}

public void getArea()

{ System.out.println("The are of circle is "+(3.14*(radius*radius)));

}

}

public class Interface1 {

public static void main(String[] args) {

Rectangle r1=new Rectangle(12, 12);

r1.getArea();

Circle c1=new Circle(4);

c1.getArea(); }

}

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac Interface1.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java Interface1
The area of rectangle 144.0
The are of circle is 50.24
```

B)

CODE:

interface Camara{

```
    void takePhoto();
}
interface MusicPlayer{
    void canPlayMusic();
}
class SmartPhone implements Camara,MusicPlayer{
    public void takePhoto(){
        System.out.println("SmartPhone can take photo");
    }
    public void canPlayMusic(){
        System.out.println("SmartPhone can play music");
    }
}
public class Interface22 {
    public static void main(String[] args) {
        SmartPhone s1=new SmartPhone();
        s1.canPlayMusic();
        s1.takePhoto();
    }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac Interface22.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java Interface22
SmartPhone can play music
SmartPhone can take photo
```

C)

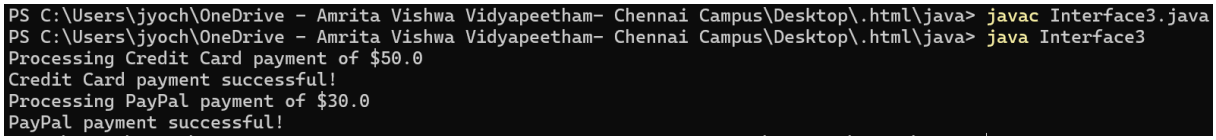
CODE:

```
interface Payment {
    void initiatePayment(double amount);
```

```
    void getPaymentStatus();
}
class CreditCard implements Payment {
    public void initiatePayment(double amount) {
        System.out.println("Processing Credit Card payment of $" + amount);
    }

    public void getPaymentStatus() {
        System.out.println("Credit Card payment successful!");
    }
}

class PayPal implements Payment {
    public void initiatePayment(double amount) {
        System.out.println("Processing PayPal payment of $" + amount);
    }
    public void getPaymentStatus() {
        System.out.println("PayPal payment successful!");
    }
}
public class Interface3 {
    public static void main(String[] args) {
        Payment creditCardPayment = new CreditCard();
        Payment paypalPayment = new PayPal();
         creditCardPayment.initiatePayment(50.0);
        creditCardPayment.getPaymentStatus();
         paypalPayment.initiatePayment(30.0);
        paypalPayment.getPaymentStatus();
```

```
    }
}
```

OUTPUT:



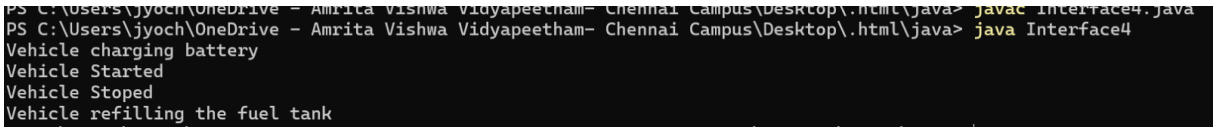
D)

CODE:

```
interface Vehicle{
    void start();
    void stop();
}
interface ElectricVehicle{
    void chargeBattery();
}
interface FuelVehicle{
    void refuel();
}
class HybridCar implements Vehicle,ElectricVehicle,FuelVehicle{
    public void start(){
        System.out.println("Vehicle Started ");
    }
    public void stop(){
        System.out.println("Vehicle Stoped ");
    }
     public void chargeBattery(){
        System.out.println("Vehicle charging battery ");
```

```
    }
     public void refuel(){
        System.out.println("Vehicle refilling the fuel tank ");
    }
 }
public class Interface4 {
    public static void main(String[] args) {
        HybridCar v1=new HybridCar();
        v1.chargeBattery();
        v1.start();
        v1.stop();
        v1.refuel();
    }
}
```

OUTPUT:



14)ENCAPSULATION

A)

CODE:

```
class Person {
    private String name;
    private int age;
    public void setName(String name) {
        this.name = name;
    }
     public String getName() {
```

```
        return name;
    }
     public void setAge(int age) {
        this.age = age;
    }
     public int getAge() {
        return age;
    }
}
 public class encap1 {
    public static void main(String[] args) {
        Person p = new Person();
        p.setName("John");
        p.setAge(20);
        System.out.println("Person: " + p.getName() + ", Age: " + p.getAge());
    }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac encap1.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java encap1
Person: John, Age: 20
```

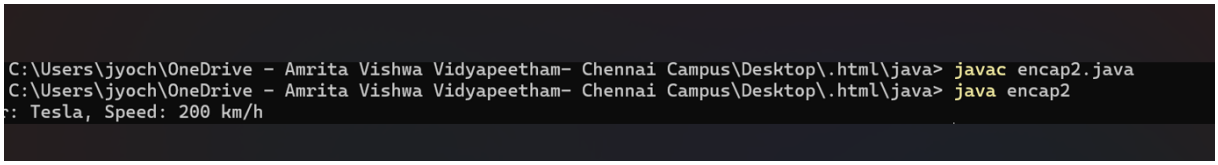
B)

CODE:

```
class Car {
    private String brand;
    private int speed;

    public void setBrand(String brand) {
```

```
        this.brand = brand;
    }

    public String getBrand() {
        return brand;
    }

    public void setSpeed(int speed) {
        if (speed > 200) {
            this.speed = 200;
        } else {
            this.speed = speed;
        }
    }
     public int getSpeed() {
        return speed;
    }
}
 public class encap2 {
    public static void main(String[] args) {
        Car car = new Car();
        car.setBrand("Tesla");
        car.setSpeed(250);
        System.out.println("Car: " + car.getBrand() + ", Speed: " + car.getSpeed() + " km/h");
    }
}
```

OUTPUT:



C)

CODE:

```
class BankAccount {
   private String accountNumber;
   private double balance;

   public BankAccount(String accountNumber, double balance) {
      this.accountNumber = accountNumber;
      this.balance = balance;
   }

   public void deposit(double amount) {
      if (amount > 0) {
         balance += amount;
      }
   }

   public void withdraw(double amount) {
      if (amount > 0 && amount <= balance) {
         balance -= amount;
      }
   }

   public double getBalance() {
      return balance;
   }
}

public class  encap3 {
   public static void main(String[] args) {
      BankAccount account = new BankAccount("12345678", 5000);
      account.deposit(2000);
      account.withdraw(3000);
      System.out.println("Balance: $" + account.getBalance());
   }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac encap3.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java encap3
Balance: $4000.0
```

D)

CODE:

```
import java.lang.*;
class MusicPlayer {
   private String songName;
   private int volume;
    MusicPlayer(String songName) {
      this.songName = songName;
      this.volume = 50;
   }
    String getSongName() {
      return songName;
   }
    void setVolume(int volume) {
      if (volume < 0) this.volume = 0;
      else if (volume > 100) this.volume = 100;
      else this.volume = volume;
   }
    int getVolume() {
      return volume;
   }
}
 public class encap4 {
   public static void main(String[] args) {
      MusicPlayer mp = new MusicPlayer("Shape of You");
      mp.setVolume(120);
```

```
    System.out.println("Now playing: " + mp.getSongName() + ", Volume: " +
mp.getVolume());
  }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac encap4.j
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java encap4
Now playing: Shape of You, Volume: 100
```

15.PACKAGES:

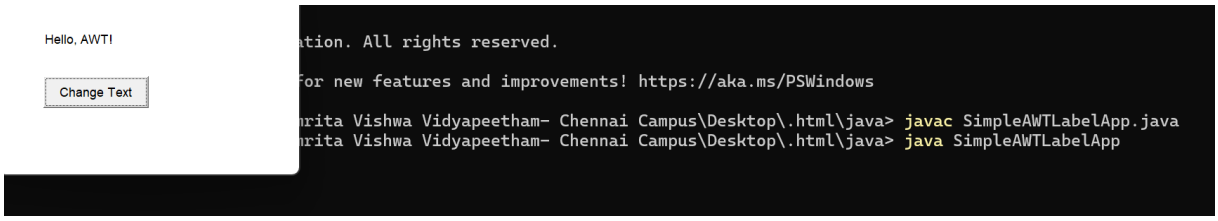
i)

CODE:

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

public class SimpleAWTLabelApp {
  SimpleAWTLabelApp() {
    Frame frame = new Frame("AWT Label Example");
    Label label = new Label("Hello, AWT!");
    Button button = new Button("Change Text");
        label.setBounds(50, 50, 150, 30);
    button.setBounds(50, 100, 100, 30);
        button.addActionListener(new ActionListener() {
      public void actionPerformed(ActionEvent e) {
        label.setText("Text Updated!");
      }
    });
      frame.add(label);
    frame.add(button);
```

```
        frame.setSize(300, 200);
      frame.setLayout(null);
      frame.setVisible(true);
        frame.addWindowListener(new WindowAdapter() {
        public void windowClosing(WindowEvent e) {
          frame.dispose();
        }
      });
   }
    public static void main(String[] args) {
      new SimpleAWTLabelApp();
   }
}
```

OUTPUT:



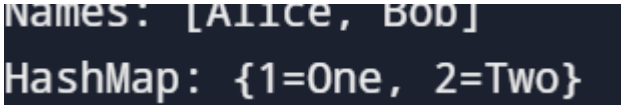
ii)

CODE:

```
import java.util.ArrayList;
import java.util.HashMap;

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

      ArrayList<String> names = new ArrayList<>();
```

```
        names.add("Alice");
        names.add("Bob");
        System.out.println("Names: " + names);
        HashMap<Integer, String> map = new HashMap<>();
        map.put(1, "One");
        map.put(2, "Two");
        System.out.println("HashMap: " + map);
    }
}
```

OUTPUT:



iii)

CODE:

```
package employee;

public class Employee {
     private int empId;
    private String name;
    private double basicSalary;
    private double hra;
    private double da;
    private double tax;
```

```
    public Employee(int empId, String name, double basicSalary, double hra,
double da, double tax) {
        this.empId = empId;
        this.name = name;
        this.basicSalary = basicSalary;
        this.hra = hra;
        this.da = da;
        this.tax = tax;
    }

        public int getEmpId() { return empId; }
    public String getName() { return name; }
    public double getBasicSalary() { return basicSalary; }
    public double getHra() { return hra; }
    public double getDa() { return da; }
    public double getTax() { return tax; }
}
package employee;

public class SalaryCalculator {
    public static double calculateGrossSalary(Employee emp) {
        return emp.getBasicSalary() + emp.getHra() + emp.getDa();
    }

      public static double calculateNetSalary(Employee emp) {
        return calculateGrossSalary(emp) - emp.getTax();
```

```
    }
}
package employee;

public class PayrollDisplay {
    public static void displayPayroll(Employee emp) {
    System.out.println("\n----------------------");
    System.out.println("EMPLOYEE PAYROLL DETAILS");
    System.out.println("----------------------");
    System.out.println("Employee ID   : " + emp.getEmpId());
    System.out.println("Employee Name : " + emp.getName());
    System.out.println("Basic Salary  : ₹" + emp.getBasicSalary());
    System.out.println("HRA           : ₹" + emp.getHra());
    System.out.println("DA            : ₹" + emp.getDa());
    System.out.println("Gross Salary  : ₹" +
SalaryCalculator.calculateGrossSalary(emp));
    System.out.println("Tax Deduction : ₹" + emp.getTax());
    System.out.println("Net Salary    : ₹" +
SalaryCalculator.calculateNetSalary(emp));
    System.out.println("----------------------\n");
    }
}
public class PayrollSystem {
   public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
```

```
        System.out.print("Enter Employee ID: ");
        int empId = scanner.nextInt();
        scanner.nextLine(); // Consume newline

        System.out.print("Enter Employee Name: ");
        String name = scanner.nextLine();

        System.out.print("Enter Basic Salary: ₹");
        double basicSalary = scanner.nextDouble();

        System.out.print("Enter HRA (House Rent Allowance): ₹");
        double hra = scanner.nextDouble();

        System.out.print("Enter DA (Dearness Allowance): ₹");
        double da = scanner.nextDouble();

        System.out.print("Enter Tax Deduction: ₹");
        double tax = scanner.nextDouble();

        Employee emp = new Employee(empId, name, basicSalary, hra, da,
tax);

            PayrollDisplay.displayPayroll(emp);

        scanner.close();
    }
```

}

OUTPUT:

```
 Enter Employee ID: 101
 Enter Employee Name: John Doe
 Enter Basic Salary: ₹50000
 Enter HRA (House Rent Allowance): ₹10000
 Enter DA (Dearness Allowance): ₹5000
 Enter Tax Deduction: ₹8000
```

```
---------------------
EMPLOYEE PAYROLL DETAILS
---------------------
Employee ID   : 101
Employee Name : John Doe
Basic Salary  : ₹50000.0
```

iv)

CODE:

```
package details;


public class Student {
   private int studentId;
   private String name;
   private double marks1, marks2, marks3;


   public Student(int studentId, String name, double marks1, double marks2, double marks3) {
      this.studentId = studentId;
      this.name = name;
      this.marks1 = marks1;
```

```
        this.marks2 = marks2;
        this.marks3 = marks3;
    }

    public int getStudentId() { return studentId; }
    public String getName() { return name; }
    public double getMarks1() { return marks1; }
    public double getMarks2() { return marks2; }
    public double getMarks3() { return marks3; }
}
package details;

public class MarksCalculator {
    public static double calculateTotal(Student stu) {
        return stu.getMarks1() + stu.getMarks2() + stu.getMarks3();
    }

    public static char calculateGrade(double total) {
        double avg = total / 3;
        if (avg >= 90) return 'A';
        else if (avg >= 75) return 'B';
        else if (avg >= 50) return 'C';
        else return 'F';
    }
}
package details;
```

```
public class Display {
    public static void showStudentDetails(Student stu) {
        double total = MarksCalculator.calculateTotal(stu);
        char grade = MarksCalculator.calculateGrade(total);

        System.out.println("\n----------------------");
        System.out.println("STUDENT REPORT CARD");
        System.out.println("----------------------");
        System.out.println("Student ID  : " + stu.getStudentId());
        System.out.println("Student Name: " + stu.getName());
        System.out.println("Total Marks : " + total);
        System.out.println("Grade       : " + grade);
        System.out.println("----------------------\n");
    }
}
import details.Student;
import details.MarksCalculator;
import details.Display;
import java.util.Scanner;

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

        // Taking Student Details
```

```
        System.out.print("Enter Student ID: ");
        int studentId = scanner.nextInt();
        scanner.nextLine();

        System.out.print("Enter Student Name: ");
        String name = scanner.nextLine();

        System.out.print("Enter Marks in Subject 1: ");
        double marks1 = scanner.nextDouble();

        System.out.print("Enter Marks in Subject 2: ");
        double marks2 = scanner.nextDouble();

        System.out.print("Enter Marks in Subject 3: ");
        double marks3 = scanner.nextDouble();

        // Creating Student Object
        Student stu = new Student(studentId, name, marks1, marks2, marks3);

        // Displaying Student Report
        Display.showStudentDetails(stu);
        scanner.close();
    }
}
```

OUTPUT:

```
Enter Student ID: 2001
Enter Student Name: Alice
Enter Marks in Subject 1: 85
Enter Marks in Subject 2: 78
Enter Marks in Subject 3: 90
```

```
----------------------
STUDENT REPORT CARD
----------------------
Student ID  : 2001
Student Name: Alice
Total Marks : 253.0
```

16.EXCEPTION HANDLING

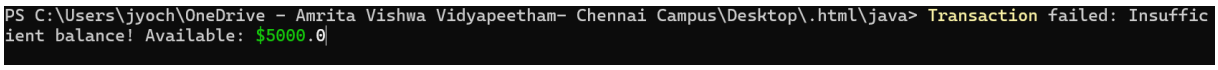
i)

CODE:

```
class InsufficientFundsException extends Exception {
   InsufficientFundsException(String message) {
      super(message);
   }
}

public class ATM {
   private static double balance = 5000; // Initial balance

   public static void main(String[] args) {
      try {
         withdraw(6000); // Trying to withdraw more than the balance
      } catch (InsufficientFundsException e) {
         System.out.println("Transaction failed: " + e.getMessage());
```

```
    }
  }

  public static void withdraw(double amount) throws
InsufficientFundsException {
    if (amount > balance) {
      throw new InsufficientFundsException("Insufficient balance!
Available: $" + balance);
    }
    balance -= amount;
    System.out.println("Withdrawal successful! Remaining Balance: $" +
balance);
  }
}
```

OUTPUT:



ii)

CODE:

```
class AgeRestrictionException extends Exception {
  AgeRestrictionException(String message) {
    super(message);
  }
}

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

```
        try {
            bookTicket(3); // Booking ticket for a 3-year-old
        } catch (AgeRestrictionException e) {
            System.out.println("Booking failed: " + e.getMessage());
        }
    }

    public static void bookTicket(int age) throws AgeRestrictionException {
        if (age < 5) {
            throw new AgeRestrictionException("Children below 5 years cannot travel alone.");
        }
        System.out.println("Ticket booked successfully!");
    }
}
```

OUTPUT:

```
Booking failed: Children below 5 years cannot travel alone.
```

iii)

CODE:

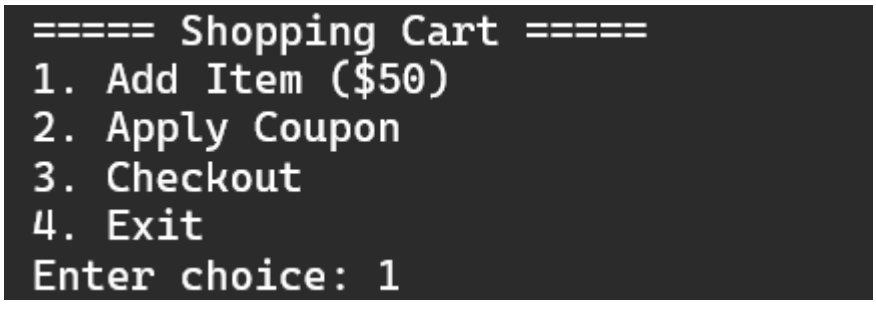
```
import java.util.Scanner;

class InvalidCouponException extends Exception {
    InvalidCouponException(String message) {
        super(message);
    }
}
```

```
class OutOfStockException extends Exception {
    OutOfStockException(String message) {
        super(message);
    }
}

public class ShoppingCart {
    private static double cartTotal = 0;
    private static final String validCoupon = "DISCOUNT20";
    private static boolean productInStock = true; // Simulating product
availability

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        int choice;

        do {
            System.out.println("\n===== Shopping Cart =====");
            System.out.println("1. Add Item ($50)");
            System.out.println("2. Apply Coupon");
            System.out.println("3. Checkout");
            System.out.println("4. Exit");
            System.out.print("Enter choice: ");
            choice = scanner.nextInt();
```

```
        try {
            switch (choice) {
                case 1:
                    addItem();
                    break;
                case 2:
                    System.out.print("Enter coupon code: ");
                    String coupon = scanner.next();
                    applyCoupon(coupon);
                    break;
                case 3:
                    checkout();
                    break;
                case 4:
                    System.out.println("Thank you for shopping with us!");
                    break;
                default:
                    System.out.println("Invalid choice. Try again.");
            }
        } catch (Exception e) {
            System.out.println("Error: " + e.getMessage());
        }
    } while (choice != 4);
}

public static void addItem() throws OutOfStockException {
```

```
        if (!productInStock) throw new OutOfStockException("Product is out of
stock!");
        cartTotal += 50;
        System.out.println("Item added! Cart total: $" + cartTotal);
    }

    public static void applyCoupon(String coupon) throws
InvalidCouponException {
        if (!coupon.equals(validCoupon)) throw new
InvalidCouponException("Invalid coupon code: " + coupon);
        cartTotal *= 0.8;
        System.out.println("Coupon applied! New total: $" + cartTotal);
    }

    public static void checkout() {
        System.out.println("Order placed! Final amount: $" + cartTotal);
    }
}
```

OUTPUT:



```
Enter choice: 1
Item added! Cart total: $50.0

===== Shopping Cart =====
1. Add Item ($50)
2. Apply Coupon
```

```
3. Checkout
4. Exit
Enter choice: 2
Enter coupon code: SAVE50
Error: Invalid coupon code: SAVE50
```

iv)

CODE:

```
import java.util.Scanner;


class AgeRestrictionException extends Exception {
    AgeRestrictionException(String message) {
        super(message);
    }
}


class NoSeatsAvailableException extends Exception {
    NoSeatsAvailableException(String message) {
        super(message);
    }
}


class InvalidInputException extends Exception {
```

```
    InvalidInputException(String message) {
        super(message);
    }
}

public class RailwayBooking {
    private static int availableSeats = 3; // Initial seat availability

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        int choice;

        do {
            System.out.println("\n===== Railway Ticket Booking =====");
            System.out.println("1. Book Ticket");
            System.out.println("2. Check Available Seats");
            System.out.println("3. Exit");
            System.out.print("Enter choice: ");
            choice = scanner.nextInt();

            try {
                switch (choice) {
                    case 1:
                        System.out.print("Enter Passenger Name: ");
                        String name = scanner.next();
                        System.out.print("Enter Passenger Age: ");
```

```
                int age = scanner.nextInt();
                bookTicket(name, age);
                break;
            case 2:
                System.out.println("Available Seats: " + availableSeats);
                break;
            case 3:
                System.out.println("Thank you for using our Railway Booking System!");
                break;
            default:
                throw new InvalidInputException("Invalid choice! Please enter a valid option.");
            }
        } catch (Exception e) {
            System.out.println("Error: " + e.getMessage());
        }
    } while (choice != 3);
  }

  public static void bookTicket(String name, int age) throws AgeRestrictionException, NoSeatsAvailableException {
    if (age < 5) throw new AgeRestrictionException("Children below 5 years cannot travel alone.");
    if (availableSeats == 0) throw new NoSeatsAvailableException("No seats available!");
    availableSeats--;
```

```
        System.out.println(" 🎉 Ticket Booked Successfully! Passenger: " + name +
" | Age: " + age);
        System.out.println("Remaining Seats: " + availableSeats);
    }
}
```

OUTPUT:

```
===== Railway Ticket Booking =====
1. Book Ticket
2. Check Available Seats
3. Exit
Enter choice: 1
Enter Passenger Name: Ramesh
Enter Passenger Age: 30
 🎉 Ticket Booked Successfully! Passenger: Ramesh | Age: 30
Remaining Seats: 2
```

17.FILE HANDLING

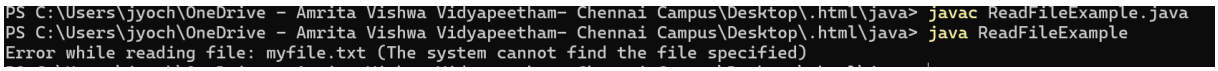
i)

CODE:

```
import java.io.BufferedReader;
import java.io.FileReader;


public class ReadFileExample {
    public static void main(String[] args) {
        try {
            FileReader reader = new FileReader("myfile.txt");
            BufferedReader buffer = new BufferedReader(reader);
            String line = buffer.readLine();
            while (line != null) {
```

```
            System.out.println(line);
            line = buffer.readLine();
        }
        buffer.close();
    } catch (Exception e) {
        System.out.println("Error while reading file: " + e.getMessage());
    }
  }
}
```

OUTPUT:



ii)

CODE:

```
import java.io.BufferedWriter;
import java.io.FileWriter;

public class WriteFileExample {
  public static void main(String[] args) {
    try {
      FileWriter file = new FileWriter("myfile.txt", true); // Append mode
      BufferedWriter writer = new BufferedWriter(file);
      writer.write("This is a new line.");
      writer.newLine();
      writer.write("Appending more data.");
```

```
            writer.close();
            System.out.println("Successfully wrote to the file.");
        } catch (Exception e) {
            System.out.println("Error while writing to file: " + e.getMessage());
        }
    }
}
```

OUTPUT:

```
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> javac WriteFileExample.java
PS C:\Users\jyoch\OneDrive - Amrita Vishwa Vidyapeetham- Chennai Campus\Desktop\.html\java> java WriteFileExample
Successfully wrote to the file.
```

iii)

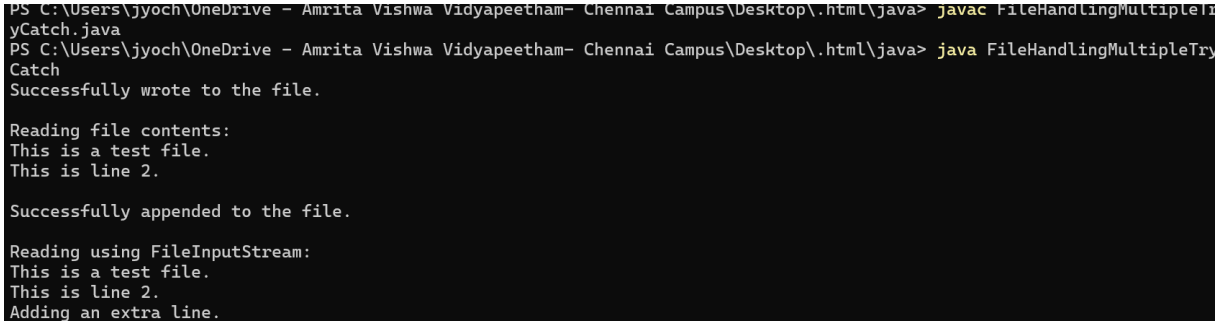
CODE:

```
import java.io.*;


public class FileHandlingMultipleTryCatch {
    public static void main(String[] args) {
        String fileName = "example.txt";
         try (FileWriter writer = new FileWriter(fileName)) {
            writer.write("This is a test file.\n");
            writer.write("This is line 2.");
            System.out.println("Successfully wrote to the file.");
        } catch (IOException e) {
            System.out.println("Error writing file: " + e.getMessage());
        }
```

```
        try (BufferedReader reader = new BufferedReader(new
FileReader(fileName))) {
            System.out.println("\nReading file contents:");
            String line;
            while ((line = reader.readLine()) != null) {
                System.out.println(line);
            }
        } catch (IOException e) {
            System.out.println("Error reading file: " + e.getMessage());
        }
        try (FileWriter writer = new FileWriter(fileName, true)) {
            writer.write("\nAdding an extra line.");
            System.out.println("\nSuccessfully appended to the file.");
        } catch (IOException e) {
            System.out.println("Error appending to file: " + e.getMessage());
        }
        try (FileInputStream fis = new FileInputStream(fileName)) {
            System.out.println("\nReading using FileInputStream:");
            int content;
            while ((content = fis.read()) != -1) {
                System.out.print((char) content);
            }
        } catch (IOException e) {
            System.out.println("Error reading file: " + e.getMessage());
        }
    }
```

}

OUTPUT:



IV)

CODE:

```
import java.io.*;


public class ReadWriteWordCount {
   public static void main(String[] args) {
      try (FileReader file = new FileReader("input.txt");
          BufferedReader reader = new BufferedReader(file);
          FileWriter fileWriter = new FileWriter("output.txt");
          BufferedWriter writer = new BufferedWriter(fileWriter)) {

         String line;
         int wordCount = 0;

         while ((line = reader.readLine()) != null) {
            System.out.println(line);
            writer.write(line);
            writer.newLine();
            wordCount += line.split("\\s+").length; // Count words
```

```
        }

        System.out.println("Total Words: " + wordCount);

      } catch (IOException e) {
        System.out.println("Error: " + e.getMessage());
      }
    }
}
```

OUTPUT: