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Student ID: BSCS-KC-006

Semester: 2.

Course Name: Object Oriented Programming-Lab.

Course Code: CSOO122L.

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National University of Modern Languages

Karachi Campus

Faculty of Engineering & Computing
Department of Computer Science

LAB 1

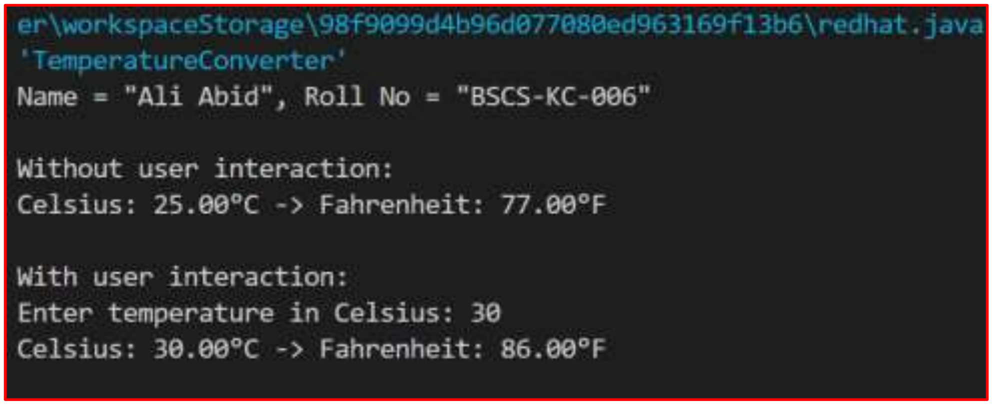
Explanation:

Convert temperature between Centigrade and Fahrenheit using a formula. Implement with and without user input. Display name and roll number.

Code:

```
import java.util.Scanner;
public class TemperatureConverter {
    public static void main(String[] args) {
        // Print name and roll number (common statement)
        System.out.println("Name = \"Ali Abid\", Roll No = \"BSCS-KC-006\"");

        // Method 1: Without user interaction (hardcoded value)
        double celsius1 = 25.0; // Example hardcoded value
        double fahrenheit1 = celsius1 * 9 / 5 + 32;
        System.out.println("\nWithout user interaction:");
        System.out.printf("Celsius: %.2f°C -> Fahrenheit: %.2f°F%n%n", celsius1,
fahrenheit1);

        // Method 2: With user interaction
        Scanner scanner = new Scanner(System.in);
        System.out.println("With user interaction:");
        System.out.print("Enter temperature in Celsius: ");
        double celsius2 = scanner.nextDouble();
        double fahrenheit2 = celsius2 * 9 / 5 + 32;
        System.out.printf("Celsius: %.2f°C -> Fahrenheit: %.2f°F%n%n", celsius2,
fahrenheit2);
    }
}
```

Output:



```
er\workspaceStorage\98f9099d4b96d077080ed963169f13b6\redhat.java
'TemperatureConverter'
Name = "Ali Abid", Roll No = "BSCS-KC-006"

Without user interaction:
Celsius: 25.00°C -> Fahrenheit: 77.00°F

With user interaction:
Enter temperature in Celsius: 30
Celsius: 30.00°C -> Fahrenheit: 86.00°F
```

LAB 2

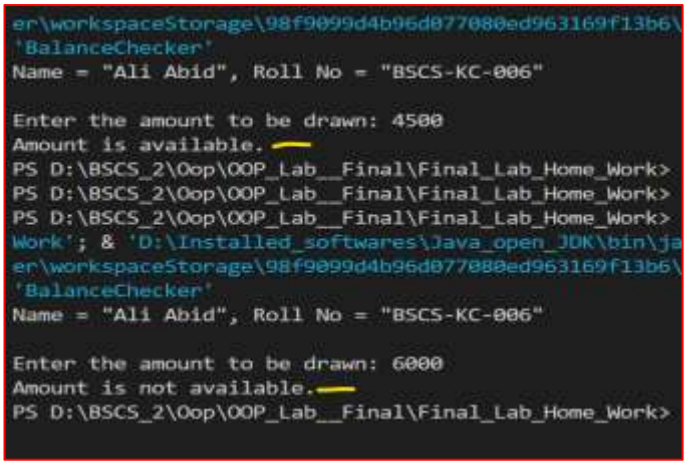
Explanation:

Check if a user-entered amount can be withdrawn based on the current balance. Print appropriate messages for available or unavailable funds.

Code:

```java
import java.util.Scanner;

public class BalanceChecker {
    public static void main(String[] args) {
        // Print name and roll number (common statement)
        System.out.println("Name = \"Ali Abid\", Roll No = \"BSCS-KC-006\"");

        // Define the current balance
        double currentBalance = 5000.00; // Example balance

        // Take input
        Scanner scanner = new Scanner(System.in);
        System.out.print("\nEnter the amount to be drawn: ");
        double amount = scanner.nextDouble();

        // Check if the amount is available
        if (amount <= currentBalance) {
            System.out.println("Amount is available.");
        } else {
            System.out.println("Amount is not available.");
        }

    }
}
```

Output:



```
er\workspaceStorage\98f9099d4b96d077080ed963169f13b6\
'BalanceChecker'
Name = "Ali Abid", Roll No = "BSCS-KC-006"

Enter the amount to be drawn: 4500
Amount is available.
PS D:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work>
PS D:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work>
PS D:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work>
Work'; & 'D:\Installed_softwares\Java_open_JDK\bin\ja
er\workspaceStorage\98f9099d4b96d077080ed963169f13b6\
'BalanceChecker'
Name = "Ali Abid", Roll No = "BSCS-KC-006"

Enter the amount to be drawn: 6000
Amount is not available.
PS D:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work>
```

LAB 3

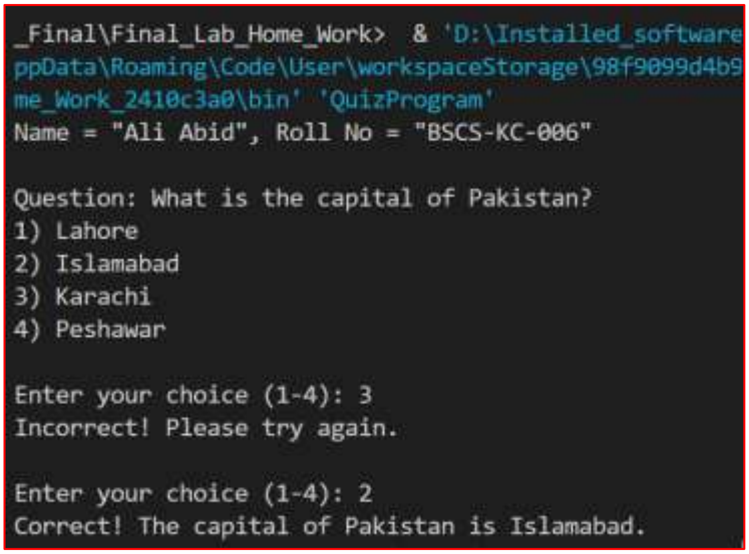
Explanation:

Use a while loop to prompt the user to select the correct answer from a list of choices for a question.

Code:

```java
import java.util.Scanner;

public class QuizProgram {
    public static void main(String[] args) {
        // Print name and roll number (common statement)
        System.out.println("Name = \"Ali Abid\", Roll No = \"BSCS-KC-006\"");

        Scanner scanner = new Scanner(System.in);
        int userChoice = -1;

        // Display the question and answer choices
        System.out.println("\nQuestion: What is the capital of Pakistan?");
        System.out.println("1) Lahore");
        System.out.println("2) Islamabad");
        System.out.println("3) Karachi");
        System.out.println("4) Peshawar");

        // Correct answer
        int correctAnswer = 2;

        // While loop to prompt the user until they choose the correct answer
        while (userChoice != correctAnswer) {
            System.out.print("\nEnter your choice (1-4): ");
            userChoice = scanner.nextInt();

            if (userChoice == correctAnswer) {
                System.out.println("Correct! The capital of Pakistan is Islamabad.");
            } else {
                System.out.println("Incorrect! Please try again.");
            }
        }
    }
}
```

Output:



```
_Final\Final_Lab_Home_Work>  & 'D:\Installed_software
ppData\Roaming\Code\User\workspaceStorage\98f9099d4b9
me_Work_2410c3a0\bin' 'QuizProgram'
Name = "Ali Abid", Roll No = "BSCS-KC-006"

Question: What is the capital of Pakistan?
1) Lahore
2) Islamabad
3) Karachi
4) Peshawar

Enter your choice (1-4): 3
Incorrect! Please try again.

Enter your choice (1-4): 2
Correct! The capital of Pakistan is Islamabad.
```

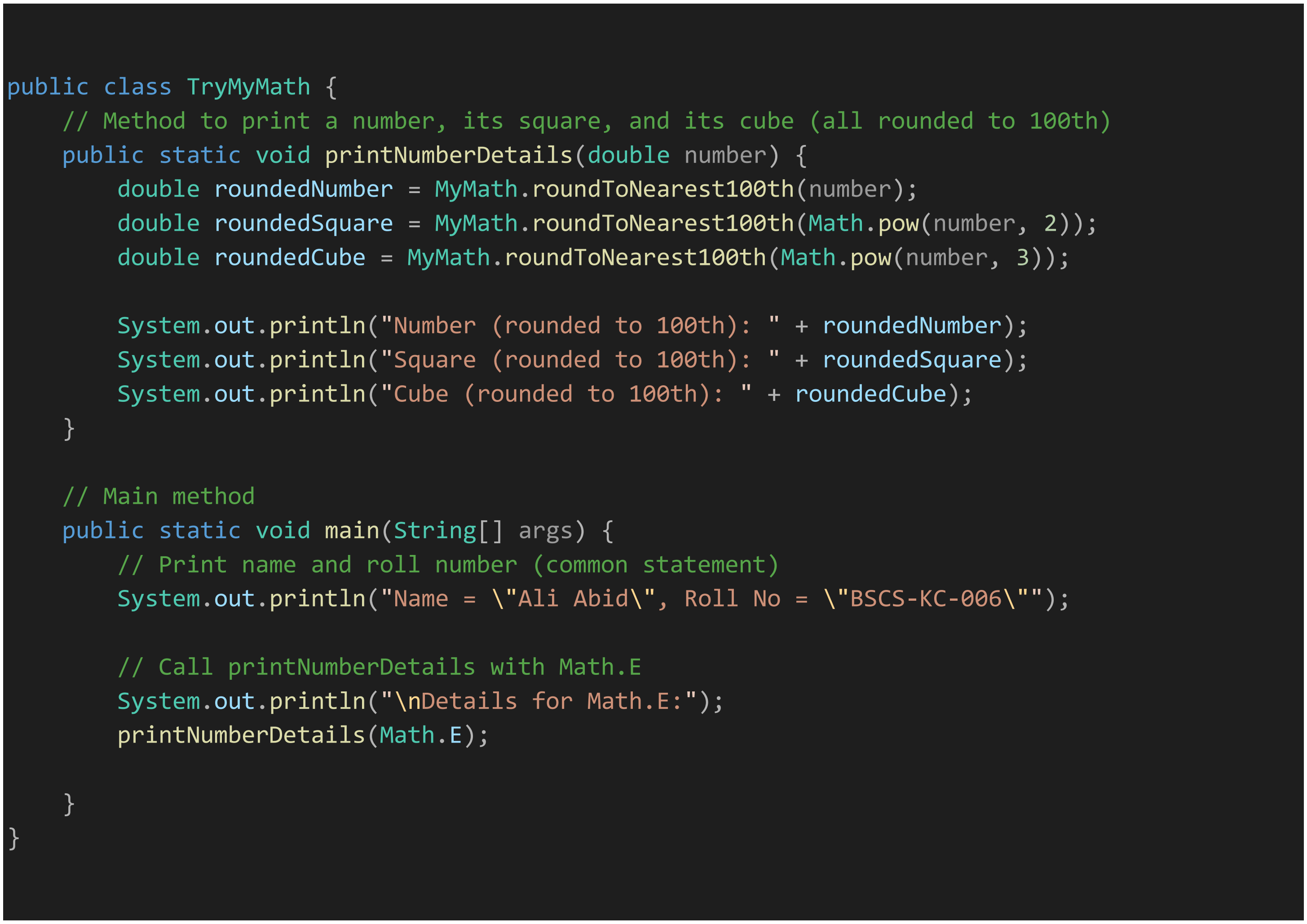
LAB 4

Explanation:

Create a class MyMath with a method to round numbers to the nearest hundredth. Use it in another class TryMyMath to calculate and display a number, its square, and cube.

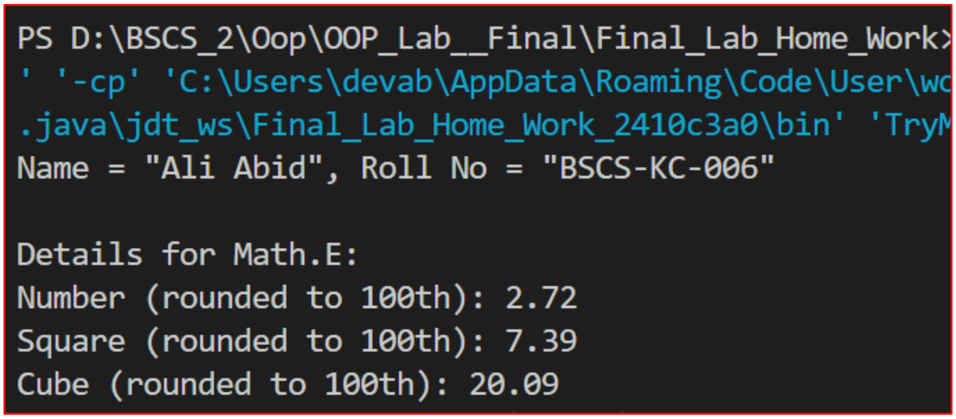
Code:

```
public class MyMath {
    // Static method to round a double to the nearest 100th
    public static double roundToNearest100th(double number) {
        return Math.round(number * 100) / 100.0;
    }
}
```



```java
public class TryMyMath {
    // Method to print a number, its square, and its cube (all rounded to 100th)
    public static void printNumberDetails(double number) {
        double roundedNumber = MyMath.roundToNearest100th(number);
        double roundedSquare = MyMath.roundToNearest100th(Math.pow(number, 2));
        double roundedCube = MyMath.roundToNearest100th(Math.pow(number, 3));

        System.out.println("Number (rounded to 100th): " + roundedNumber);
        System.out.println("Square (rounded to 100th): " + roundedSquare);
        System.out.println("Cube (rounded to 100th): " + roundedCube);
    }

    // Main method
    public static void main(String[] args) {
        // Print name and roll number (common statement)
        System.out.println("Name = \"Ali Abid\", Roll No = \"BSCS-KC-006\"");

        // Call printNumberDetails with Math.E
        System.out.println("\nDetails for Math.E:");
        printNumberDetails(Math.E);

    }
}
```

Output:



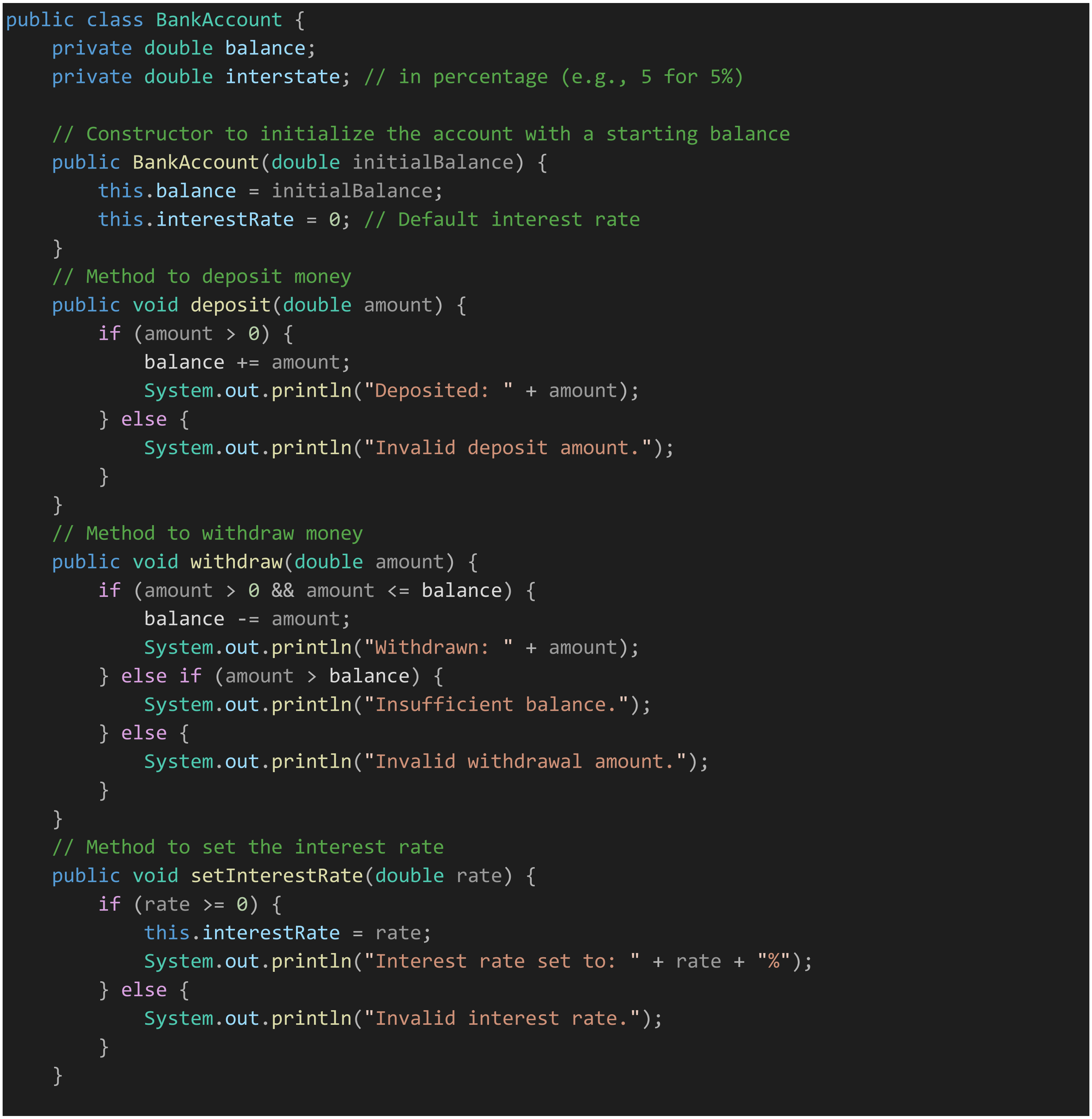
```
PS D:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work>
' '-cp' 'C:\Users\devab\AppData\Roaming\Code\User\wo
.java\jdt_ws\Final_Lab_Home_Work_2410c3a0\bin' 'TryM
Name = "Ali Abid", Roll No = "BSCS-KC-006"

Details for Math.E:
Number (rounded to 100th): 2.72
Square (rounded to 100th): 7.39
Cube (rounded to 100th): 20.09
```

LAB 5

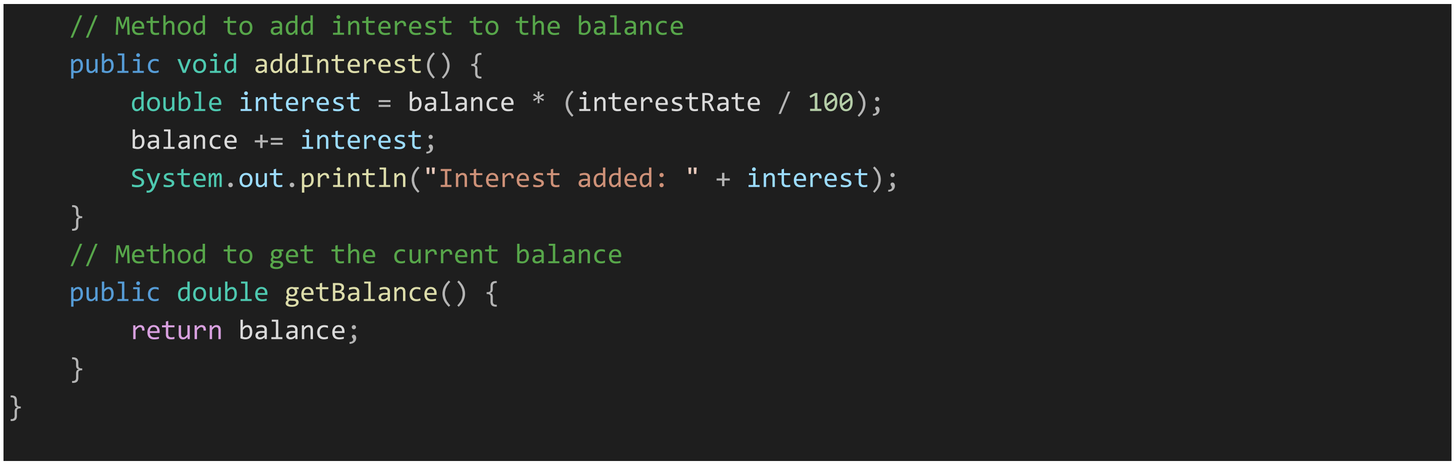
Explanation:

Simulate a bank account with features like deposits, withdrawals, interest rate settings, and balance checking. Demonstrate the account in action.

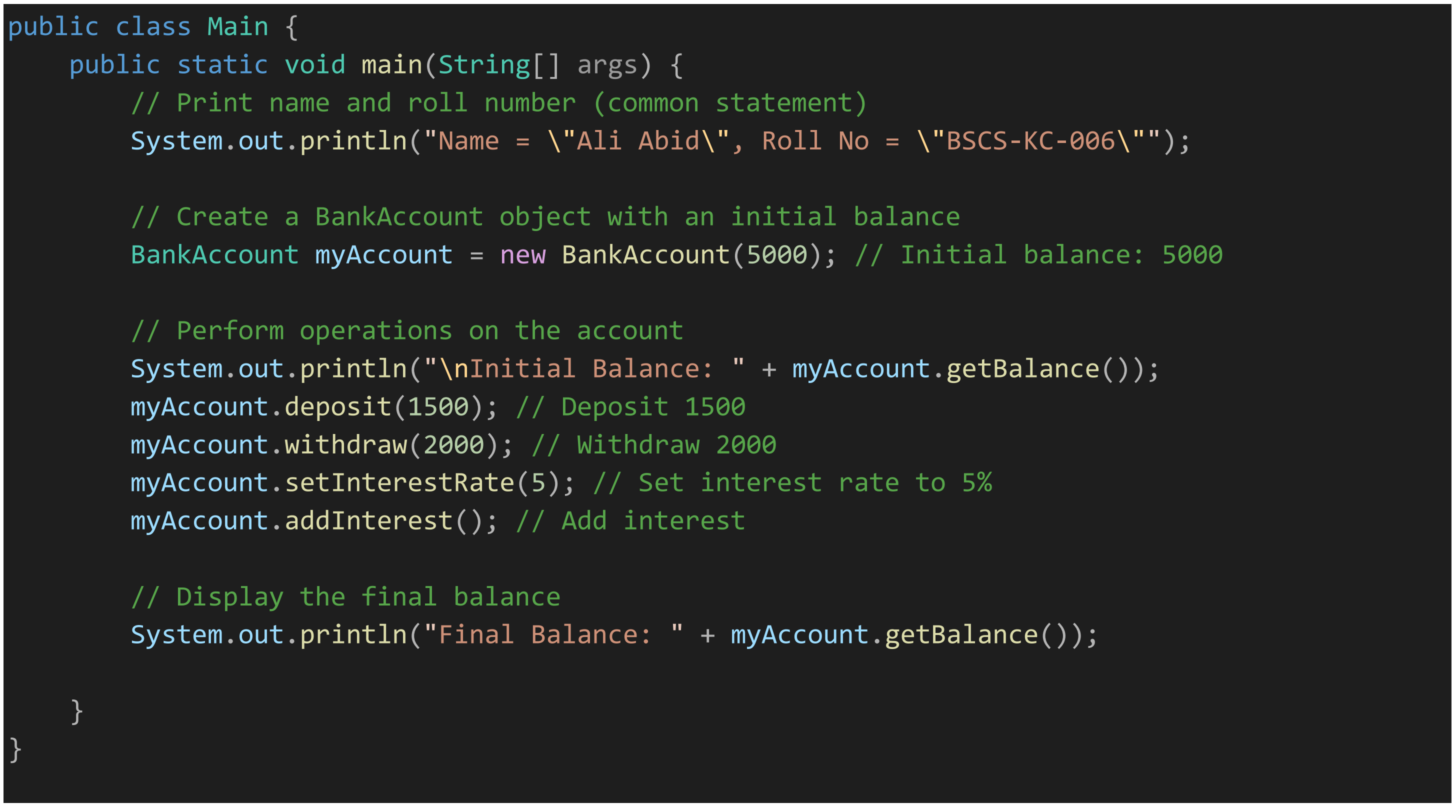
Code:



```java
public class BankAccount {
    private double balance;
    private double interstate; // in percentage (e.g., 5 for 5%)

    // Constructor to initialize the account with a starting balance
    public BankAccount(double initialBalance) {
        this.balance = initialBalance;
        this.interestRate = 0; // Default interest rate
    }
    // Method to deposit money
    public void deposit(double amount) {
        if (amount > 0) {
            balance += amount;
            System.out.println("Deposited: " + amount);
        } else {
            System.out.println("Invalid deposit amount.");
        }
    }
    // Method to withdraw money
    public void withdraw(double amount) {
        if (amount > 0 && amount <= balance) {
            balance -= amount;
            System.out.println("Withdrawn: " + amount);
        } else if (amount > balance) {
            System.out.println("Insufficient balance.");
        } else {
            System.out.println("Invalid withdrawal amount.");
        }
    }
    // Method to set the interest rate
    public void setInterestRate(double rate) {
        if (rate >= 0) {
            this.interestRate = rate;
            System.out.println("Interest rate set to: " + rate + "%");
        } else {
            System.out.println("Invalid interest rate.");
        }
    }
```

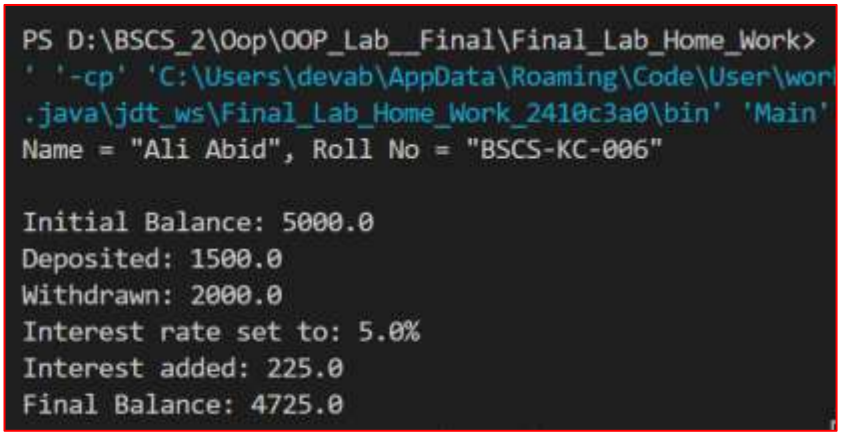


```java
    // Method to add interest to the balance
    public void addInterest() {
        double interest = balance * (interestRate / 100);
        balance += interest;
        System.out.println("Interest added: " + interest);
    }
    // Method to get the current balance
    public double getBalance() {
        return balance;
    }
}
```



```java
public class Main {
    public static void main(String[] args) {
        // Print name and roll number (common statement)
        System.out.println("Name = \"Ali Abid\", Roll No = \"BSCS-KC-006\"");

        // Create a BankAccount object with an initial balance
        BankAccount myAccount = new BankAccount(5000); // Initial balance: 5000

        // Perform operations on the account
        System.out.println("\nInitial Balance: " + myAccount.getBalance());
        myAccount.deposit(1500); // Deposit 1500
        myAccount.withdraw(2000); // Withdraw 2000
        myAccount.setInterestRate(5); // Set interest rate to 5%
        myAccount.addInterest(); // Add interest

        // Display the final balance
        System.out.println("Final Balance: " + myAccount.getBalance());

    }
}
```

Output:



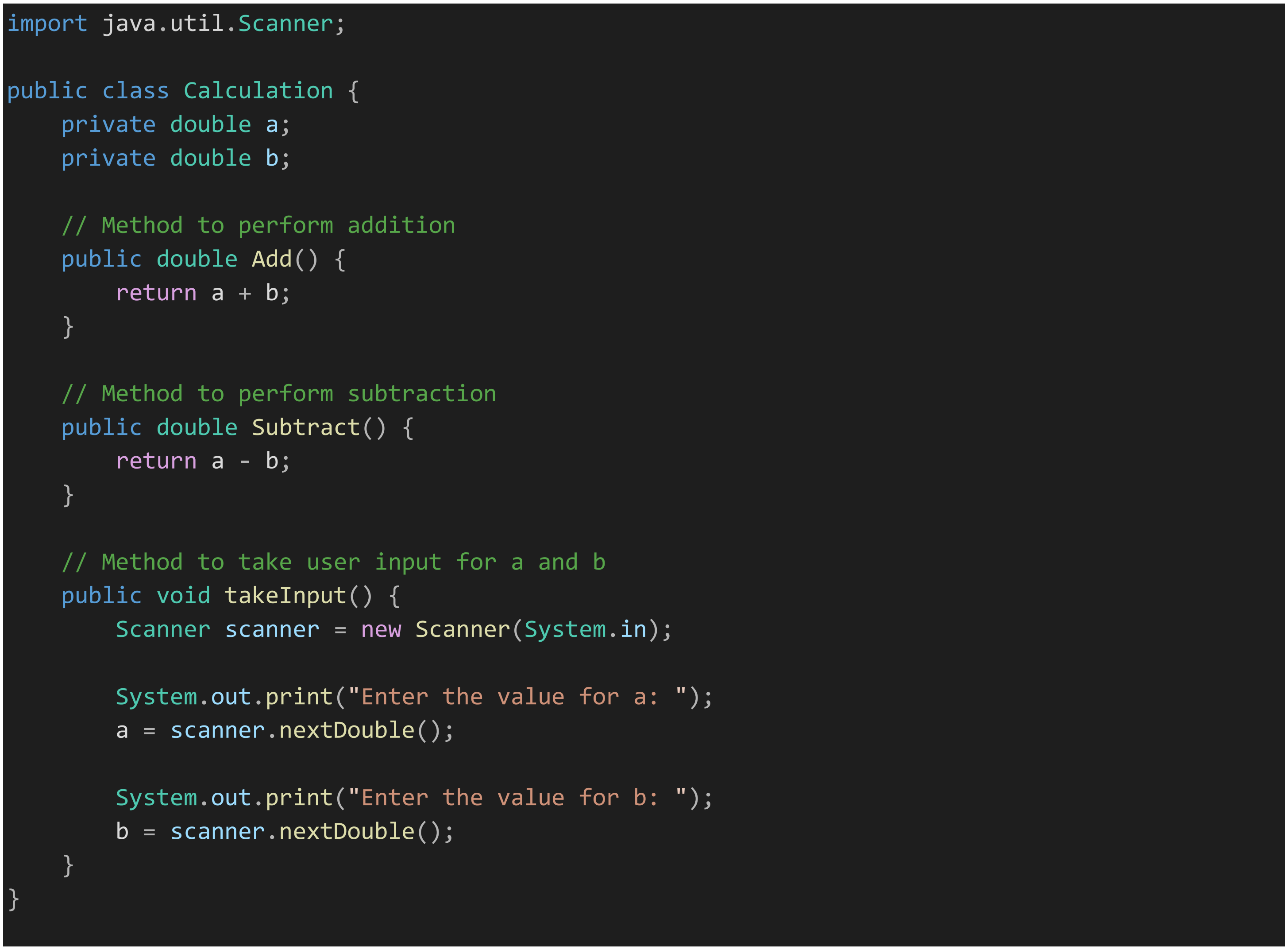
```
PS D:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work>
' '-cp' 'C:\Users\devab\AppData\Roaming\Code\User\wor
.java\jdt_ws\Final_Lab_Home_Work_2410c3a0\bin' 'Main'
Name = "Ali Abid", Roll No = "BSCS-KC-006"

Initial Balance: 5000.0
Deposited: 1500.0
Withdrawn: 2000.0
Interest rate set to: 5.0%
Interest added: 225.0
Final Balance: 4725.0
```

LAB 6

Explanation:

Create a Calculation class with methods for addition and subtraction. Take user input for variables and pass them to the methods for calculation.

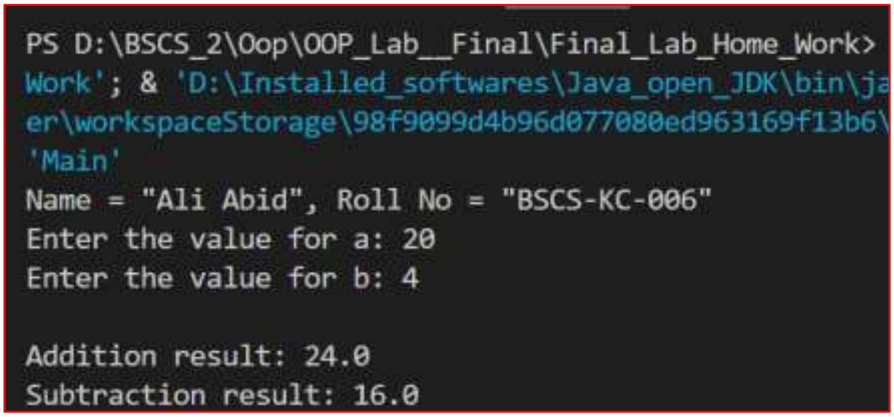
Code:



```java
import java.util.Scanner;

public class Calculation {
    private double a;
    private double b;

    // Method to perform addition
    public double Add() {
        return a + b;
    }

    // Method to perform subtraction
    public double Subtract() {
        return a - b;
    }

    // Method to take user input for a and b
    public void takeInput() {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the value for a: ");
        a = scanner.nextDouble();

        System.out.print("Enter the value for b: ");
        b = scanner.nextDouble();
    }
}
```

```java
public class Main {
    public static void main(String[] args) {
        // Print name and roll number (common statement)
        System.out.println("Name = \"Ali Abid\", Roll No = \"BSCS-KC-006\"");

        // Create an object of Calculation
        Calculation calc = new Calculation();

        // Take user input for a and b
        calc.takeInput();

        // Perform addition and subtraction and display the results
        System.out.println("\nAddition result: " + calc.Add());
        System.out.println("Subtraction result: " + calc.Subtract());

    }
}
```

Output:



```
PS D:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work>
Work'; & 'D:\Installed_softwares\Java_open_JDK\bin\ja
er\workspaceStorage\98f9099d4b96d077080ed963169f13b6\
'Main'
Name = "Ali Abid", Roll No = "BSCS-KC-006"
Enter the value for a: 20
Enter the value for b: 4

Addition result: 24.0
Subtraction result: 16.0
```

LAB 7

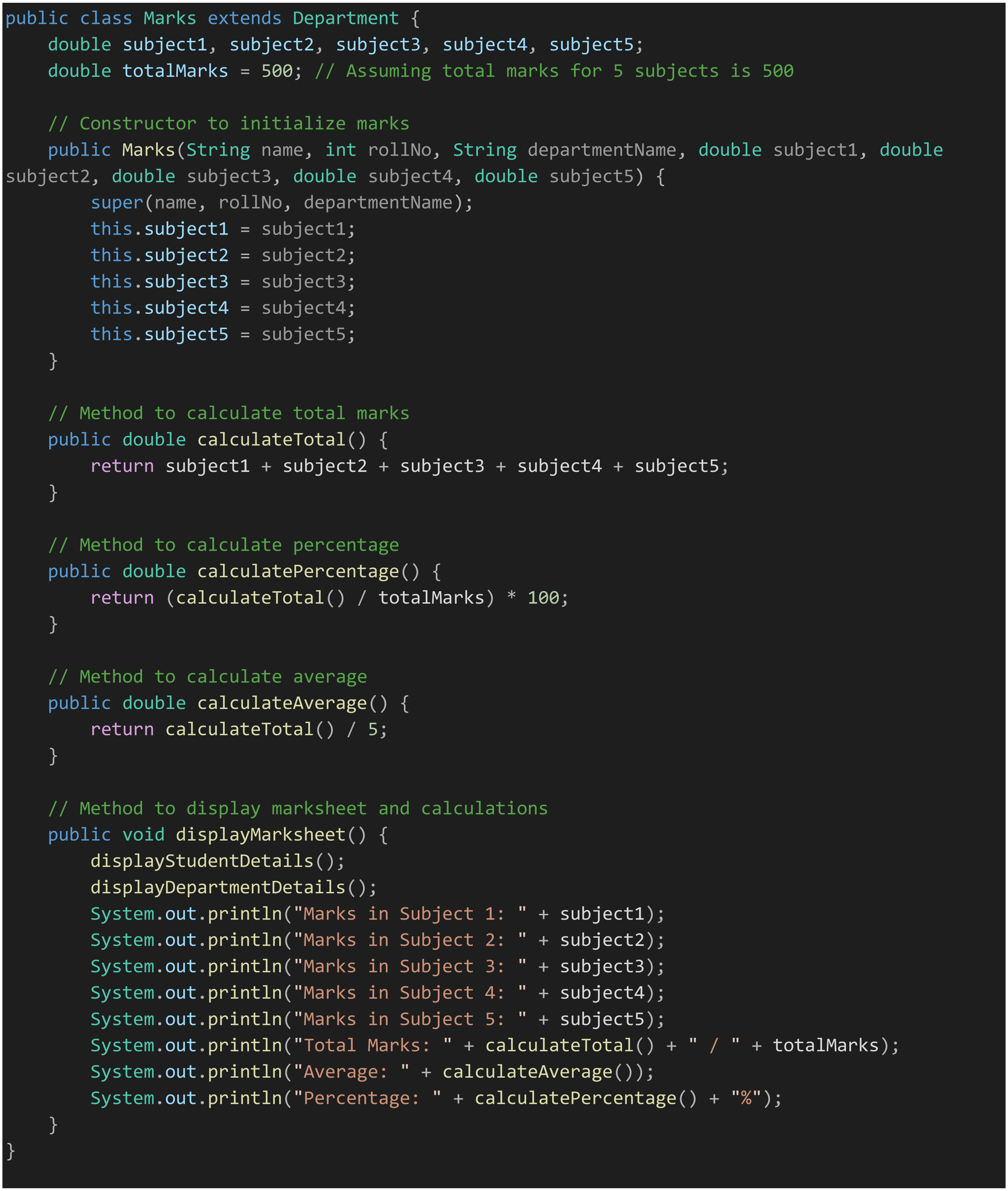
Explanation:

Use multilevel inheritance to create a program for generating a marksheet, calculating percentages and averages for different departments.

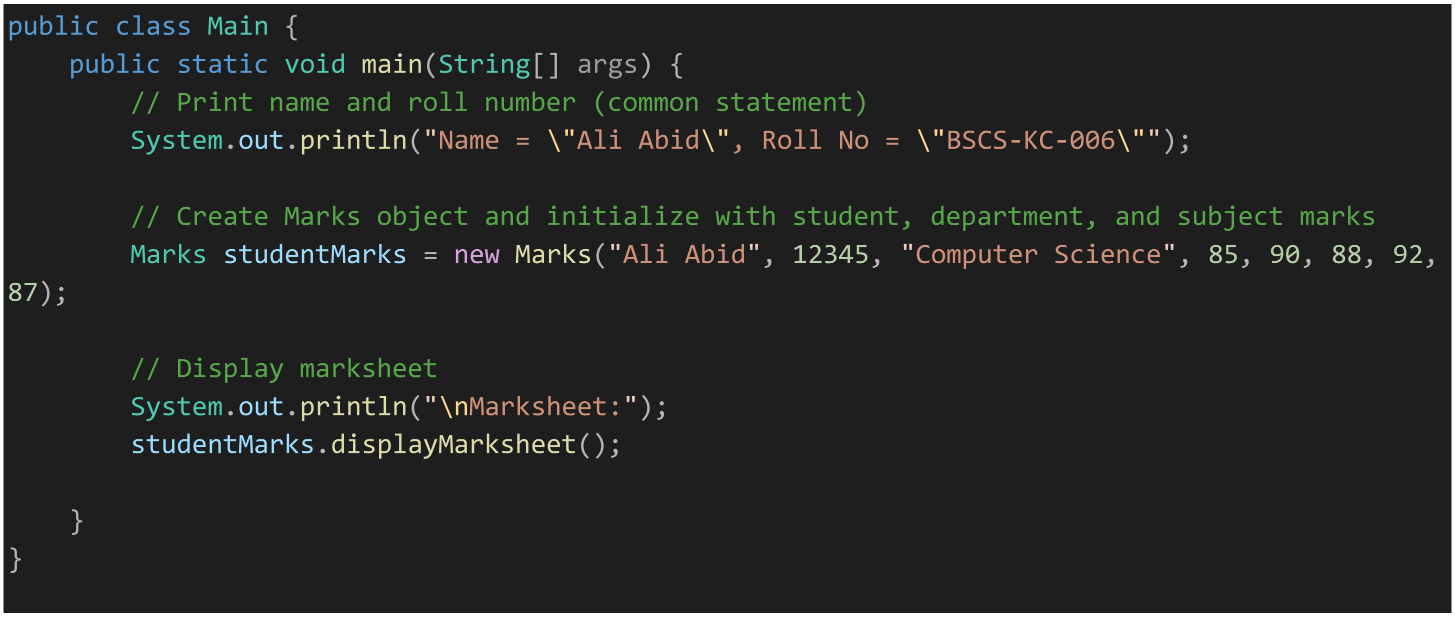
Code:

```java
public class Student {
    String name;
    int rollNo;

    // Constructor to initialize student details
    public Student(String name, int rollNo) {
        this.name = name;
        this.rollNo = rollNo;
    }

    // Method to display student details
    public void displayStudentDetails() {
        System.out.println("Student Name: " + name);
        System.out.println("Roll Number: " + rollNo);
    }
}
```

```java
public class Department extends Student {
    String departmentName;

    // Constructor to initialize department details
    public Department(String name, int rollNo, String departmentName) {
        super(name, rollNo);
        this.departmentName = departmentName;
    }

    // Method to display department details
    public void displayDepartmentDetails() {
        System.out.println("Department: " + departmentName);
    }
}
```

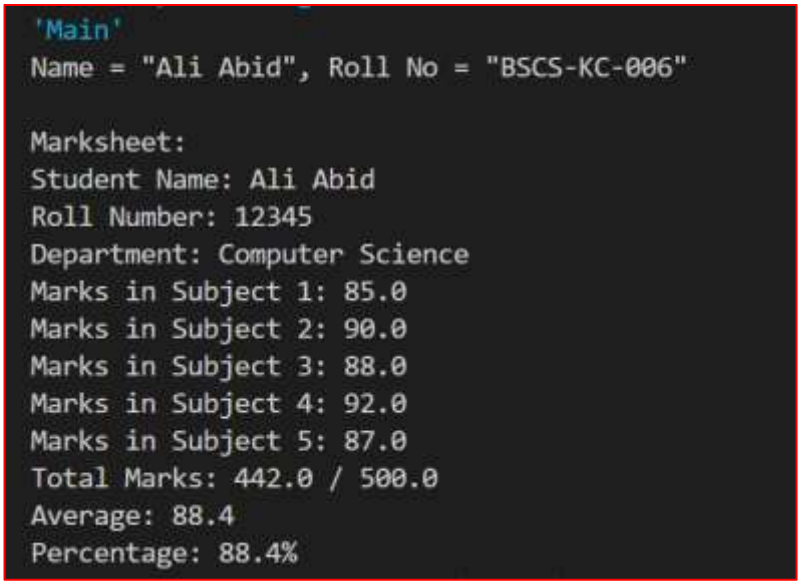


```java
public class Marks extends Department {
    double subject1, subject2, subject3, subject4, subject5;
    double totalMarks = 500; // Assuming total marks for 5 subjects is 500

    // Constructor to initialize marks
    public Marks(String name, int rollNo, String departmentName, double subject1, double subject2, double subject3, double subject4, double subject5) {
        super(name, rollNo, departmentName);
        this.subject1 = subject1;
        this.subject2 = subject2;
        this.subject3 = subject3;
        this.subject4 = subject4;
        this.subject5 = subject5;
    }

    // Method to calculate total marks
    public double calculateTotal() {
        return subject1 + subject2 + subject3 + subject4 + subject5;
    }

    // Method to calculate percentage
    public double calculatePercentage() {
        return (calculateTotal() / totalMarks) * 100;
    }

    // Method to calculate average
    public double calculateAverage() {
        return calculateTotal() / 5;
    }

    // Method to display marksheet and calculations
    public void displayMarksheet() {
        displayStudentDetails();
        displayDepartmentDetails();
        System.out.println("Marks in Subject 1: " + subject1);
        System.out.println("Marks in Subject 2: " + subject2);
        System.out.println("Marks in Subject 3: " + subject3);
        System.out.println("Marks in Subject 4: " + subject4);
        System.out.println("Marks in Subject 5: " + subject5);
        System.out.println("Total Marks: " + calculateTotal() + " / " + totalMarks);
        System.out.println("Average: " + calculateAverage());
        System.out.println("Percentage: " + calculatePercentage() + "%");
    }
}
```



```
public class Main {
    public static void main(String[] args) {
        // Print name and roll number (common statement)
        System.out.println("Name = \"Ali Abid\", Roll No = \"BSCS-KC-006\"");

        // Create Marks object and initialize with student, department, and subject marks
        Marks studentMarks = new Marks("Ali Abid", 12345, "Computer Science", 85, 90, 88, 92,
87);

        // Display marksheet
        System.out.println("\nMarksheet:");
        studentMarks.displayMarksheet();

    }
}
```

Output:



```
'Main'
Name = "Ali Abid", Roll No = "BSCS-KC-006"

Marksheet:
Student Name: Ali Abid
Roll Number: 12345
Department: Computer Science
Marks in Subject 1: 85.0
Marks in Subject 2: 90.0
Marks in Subject 3: 88.0
Marks in Subject 4: 92.0
Marks in Subject 5: 87.0
Total Marks: 442.0 / 500.0
Average: 88.4
Percentage: 88.4%
```

LAB 8

Explanation:

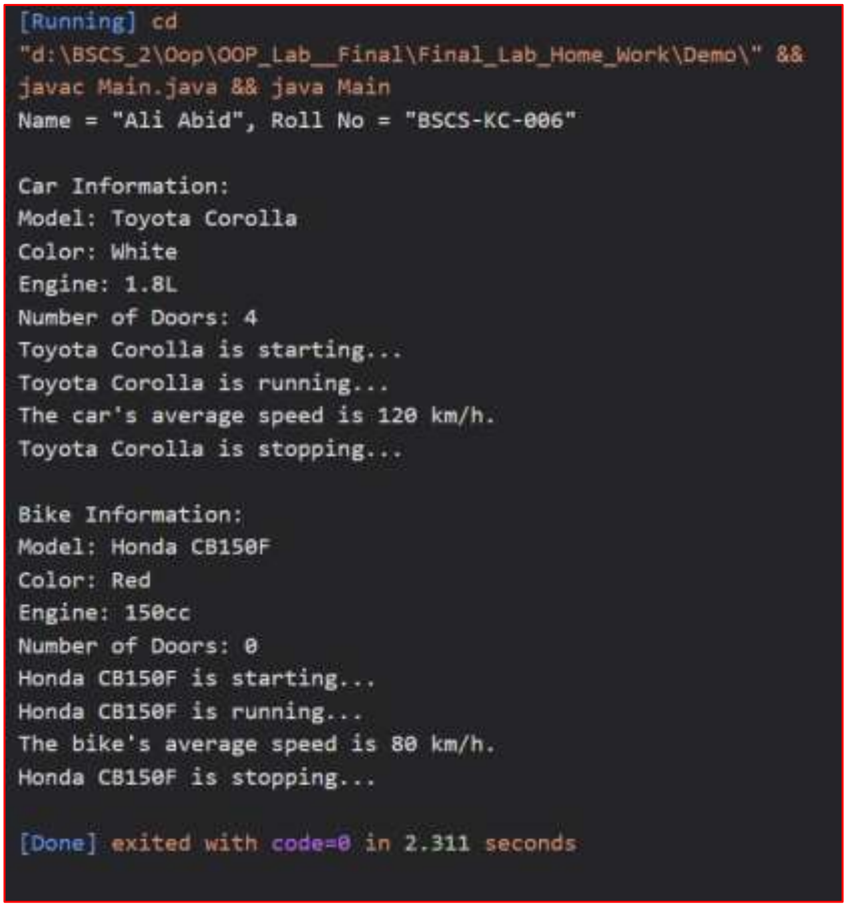
Create a Vehicle class with data members, constructors, and methods. Inherit Car and Bike classes, and override a virtual method to calculate speed.

Code:

```
abstract class Vehicle {
    String model;
    String color;
    String engine;
    int door;

    // Default Constructor
    Vehicle() {
        this.model = "Unknown";
        this.color = "Unknown";
        this.engine = "Unknown";
        this.door = 0;
    }

    // Parameterized Constructor
    Vehicle(String model, String color, String engine, int door) {
        this.model = model;
        this.color = color;
        this.engine = engine;
        this.door = door;
    }

    // Method to start the vehicle
    void start() {
        System.out.println(model + " is starting...");
    }

    // Method to stop the vehicle
    void stop() {
        System.out.println(model + " is stopping...");
    }

    // Method to run the vehicle
    void run() {
        System.out.println(model + " is running...");
    }

    // Abstract method to calculate speed
```

```java
    abstract void calculateSpeed();

    // Method to print vehicle information
    void printInfo() {
        System.out.println("Model: " + model);
        System.out.println("Color: " + color);
        System.out.println("Engine: " + engine);
        System.out.println("Number of Doors: " + door);
    }
}


class Car extends Vehicle {
    // Constructor
    Car(String model, String color, String engine, int door) {
        super(model, color, engine, door);
    }

    // Override the calculateSpeed method
    @Override
    void calculateSpeed() {
        System.out.println("The car's average speed is 120 km/h.");
    }
}


class Bike extends Vehicle {
    // Constructor
    Bike(String model, String color, String engine, int door) {
        super(model, color, engine, door);
    }

    // Override the calculateSpeed method
    @Override
    void calculateSpeed() {
        System.out.println("The bike's average speed is 80 km/h.");
    }
}



public class Main {
    public static void main(String[] args) {
        // Print name and roll number (common statement)
        System.out.println("Name = \"Ali Abid\", Roll No = \"BSCS-KC-006\"");

        // Create a Car object
        Car car = new Car("Toyota Corolla", "White", "1.8L", 4);
        System.out.println("\nCar Information:");
        car.printInfo();
        car.start();
        car.run();
        car.calculateSpeed();
        car.stop();

        // Create a Bike object
        Bike bike = new Bike("Honda CB150F", "Red", "150cc", 0);
        System.out.println("\nBike Information:");
        bike.printInfo();
        bike.start();
        bike.run();
        bike.calculateSpeed();
        bike.stop();


    }
}
```

Output:



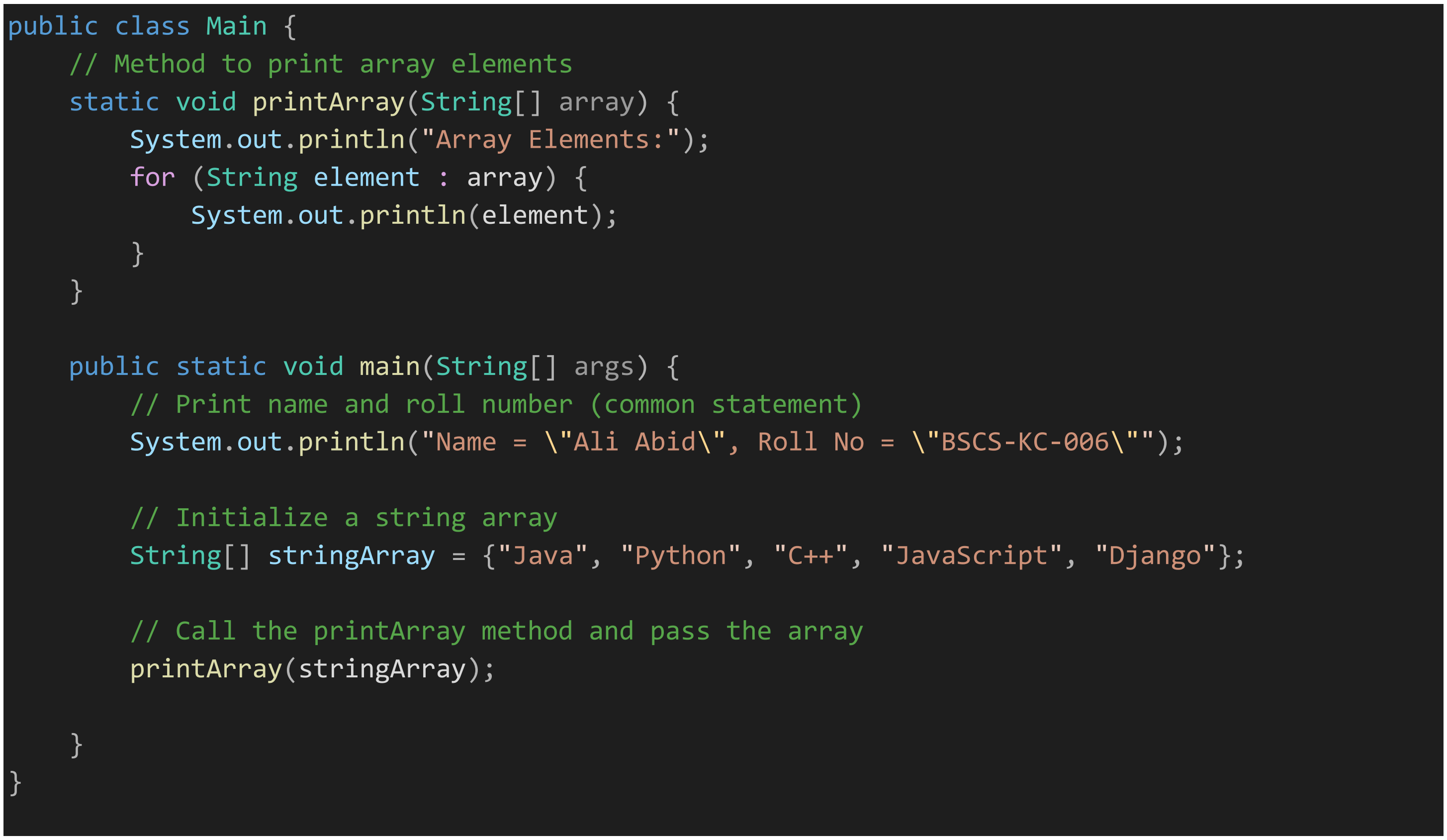
```
[Running] cd
"d:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work\Demo\" &&
javac Main.java && java Main
Name = "Ali Abid", Roll No = "BSCS-KC-006"

Car Information:
Model: Toyota Corolla
Color: White
Engine: 1.8L
Number of Doors: 4
Toyota Corolla is starting...
Toyota Corolla is running...
The car's average speed is 120 km/h.
Toyota Corolla is stopping...

Bike Information:
Model: Honda CB150F
Color: Red
Engine: 150cc
Number of Doors: 0
Honda CB150F is starting...
Honda CB150F is running...
The bike's average speed is 80 km/h.
Honda CB150F is stopping...

[Done] exited with code=0 in 2.311 seconds
```

LAB 9

Explanation:

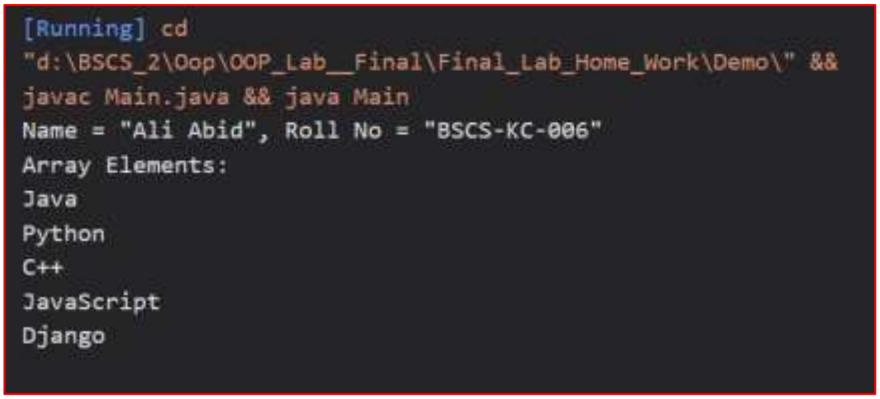
Write a program to print the elements of a string array using a function. Initialize the array in the main method and pass it to the function.

Code:



```java
public class Main {
    // Method to print array elements
    static void printArray(String[] array) {
        System.out.println("Array Elements:");
        for (String element : array) {
            System.out.println(element);
        }
    }

    public static void main(String[] args) {
        // Print name and roll number (common statement)
        System.out.println("Name = \"Ali Abid\", Roll No = \"BSCS-KC-006\"");

        // Initialize a string array
        String[] stringArray = {"Java", "Python", "C++", "JavaScript", "Django"};

        // Call the printArray method and pass the array
        printArray(stringArray);

    }
}
```

Output:



```
[Running] cd
"d:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work\Demo\" &&
javac Main.java && java Main
Name = "Ali Abid", Roll No = "BSCS-KC-006"
Array Elements:
Java
Python
C++
JavaScript
Django
```

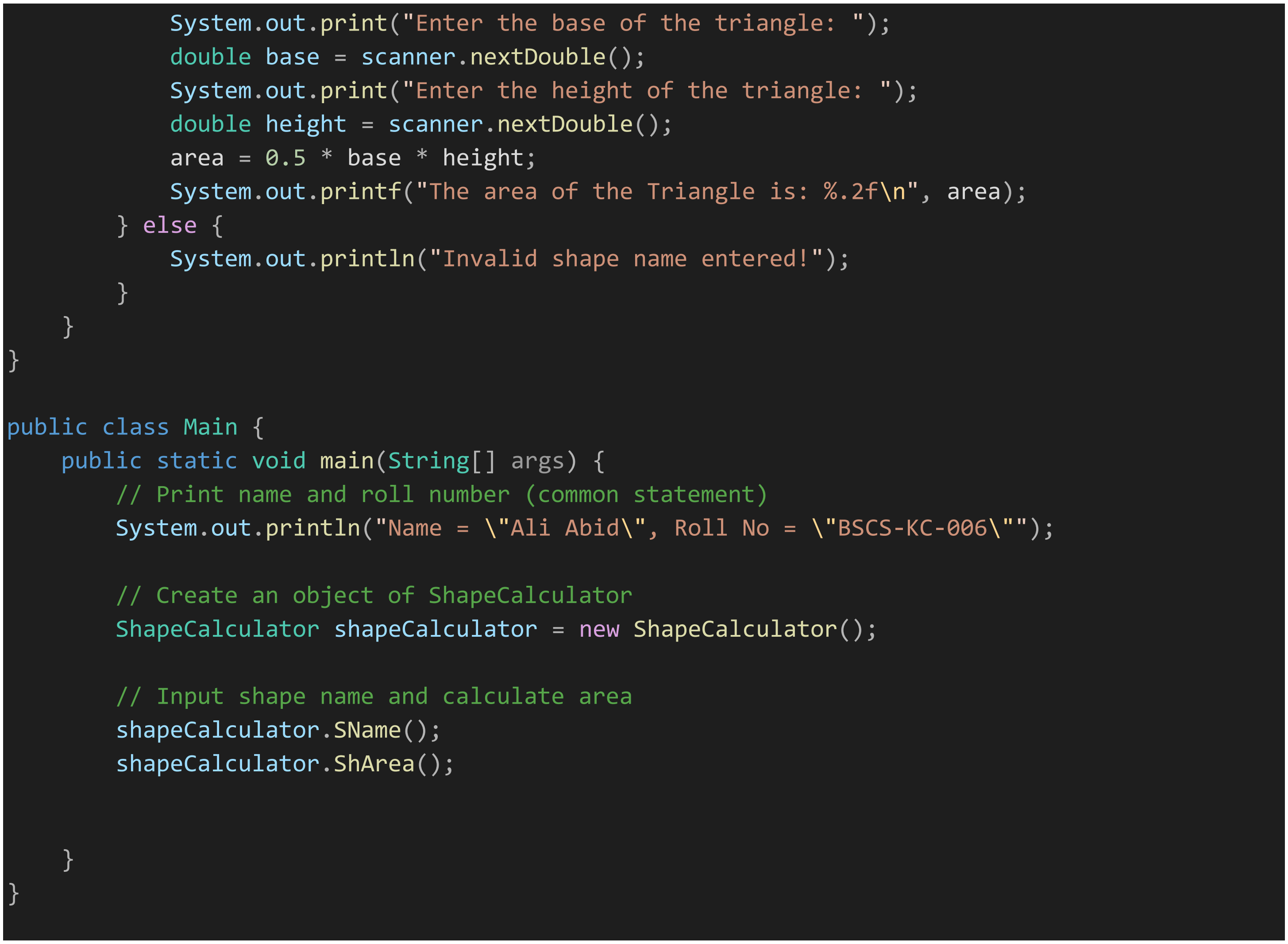
LAB 10

Explanation:

Implement an interface IShape with methods to input a shape name and calculate its area. Use if-else to handle different shapes like Circle, Rectangle, and Triangle.

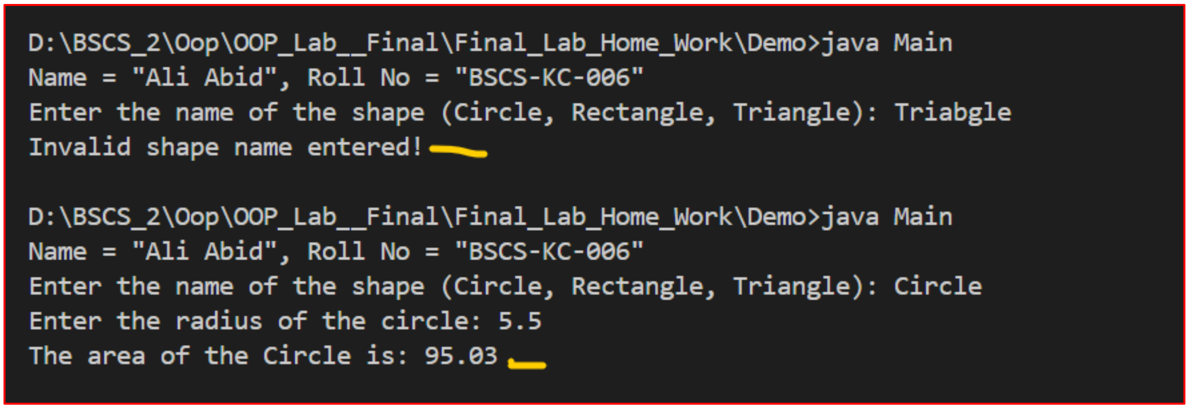
Code:

```java
import java.util.Scanner;

interface IShape {
    void SName(); // Method to input the name of the shape
    void ShArea(); // Method to calculate and display the area of the shape
}


class ShapeCalculator implements IShape {
    private String shapeName;

    // Method to input the name of the shape
    @Override
    public void SName() {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the name of the shape (Circle, Rectangle, Triangle): ");
        shapeName = scanner.nextLine();
    }

    // Method to calculate and display the area of the shape
    @Override
    public void ShArea() {
        Scanner scanner = new Scanner(System.in);
        double area = 0;

        if (shapeName.equalsIgnoreCase("Circle")) {
            System.out.print("Enter the radius of the circle: ");
            double radius = scanner.nextDouble();
            area = Math.PI * radius * radius;
            System.out.printf("The area of the Circle is: %.2f\n", area);
        } else if (shapeName.equalsIgnoreCase("Rectangle")) {
            System.out.print("Enter the length of the rectangle: ");
            double length = scanner.nextDouble();
            System.out.print("Enter the width of the rectangle: ");
            double width = scanner.nextDouble();
            area = length * width;
            System.out.printf("The area of the Rectangle is: %.2f\n", area);
        } else if (shapeName.equalsIgnoreCase("Triangle")) {
```



```java
            System.out.print("Enter the base of the triangle: ");
            double base = scanner.nextDouble();
            System.out.print("Enter the height of the triangle: ");
            double height = scanner.nextDouble();
            area = 0.5 * base * height;
            System.out.printf("The area of the Triangle is: %.2f\n", area);
        } else {
            System.out.println("Invalid shape name entered!");
        }
    }
}

public class Main {
    public static void main(String[] args) {
        // Print name and roll number (common statement)
        System.out.println("Name = \"Ali Abid\", Roll No = \"BSCS-KC-006\"");

        // Create an object of ShapeCalculator
        ShapeCalculator shapeCalculator = new ShapeCalculator();

        // Input shape name and calculate area
        shapeCalculator.SName();
        shapeCalculator.ShArea();


    }
}
```

Output:



```
D:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work\Demo>java Main
Name = "Ali Abid", Roll No = "BSCS-KC-006"
Enter the name of the shape (Circle, Rectangle, Triangle): Triabgle
Invalid shape name entered!

D:\BSCS_2\Oop\OOP_Lab__Final\Final_Lab_Home_Work\Demo>java Main
Name = "Ali Abid", Roll No = "BSCS-KC-006"
Enter the name of the shape (Circle, Rectangle, Triangle): Circle
Enter the radius of the circle: 5.5
The area of the Circle is: 95.03
```

Source Code:

https://github.com/abidkk/NUML-Programming-/tree/main/Second%20Semester/Java_OOP_Final_Lab