23CSE111

OBJECT ORIENTED PROGRAMMING

LAB MANUAL

Department of computer and communication Engineering

Amrita School of Engineering

Amrita Vishwa Vidyapeetham, Amaravati Campus

Name:

Verified By **Roll No:**

INDEX

WEEK-1

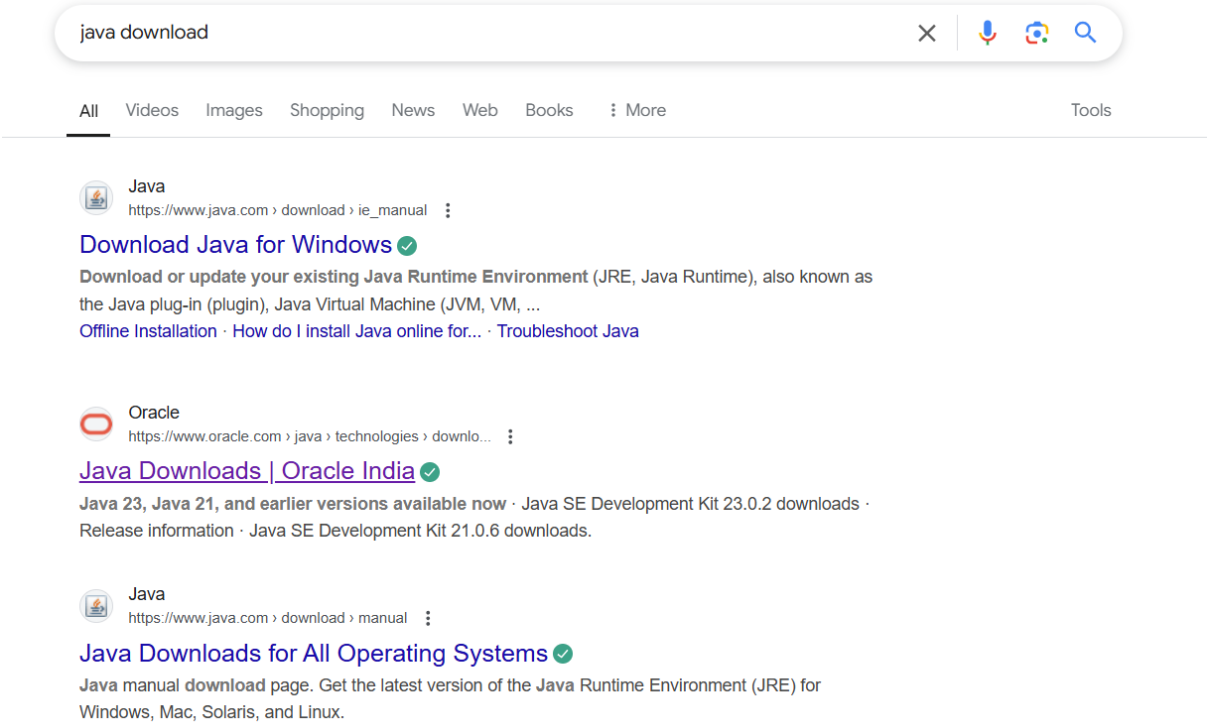
Program-1

AIM

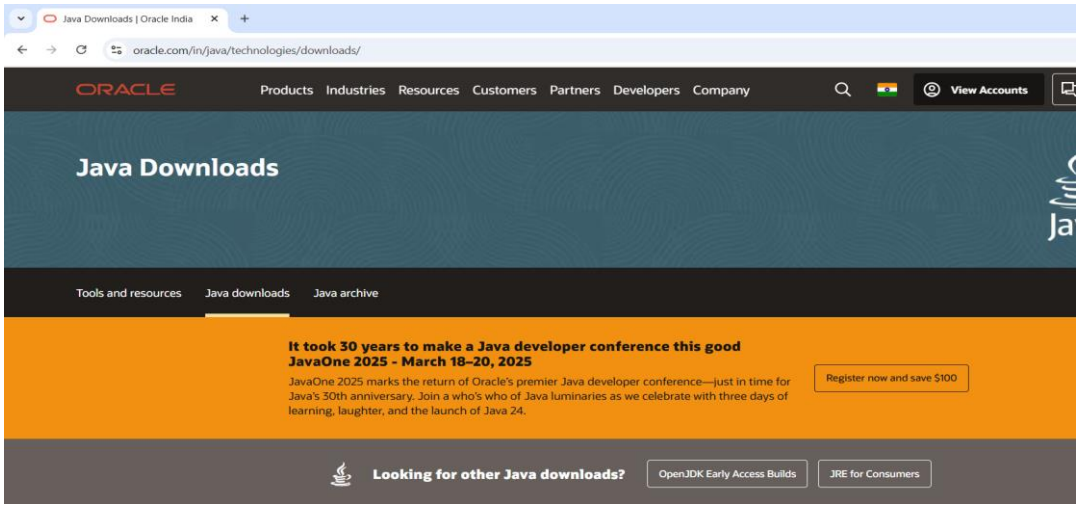
Installation of Java jdk-21

Procedure :-

Step 1: Go to google chrome and type "Java download".

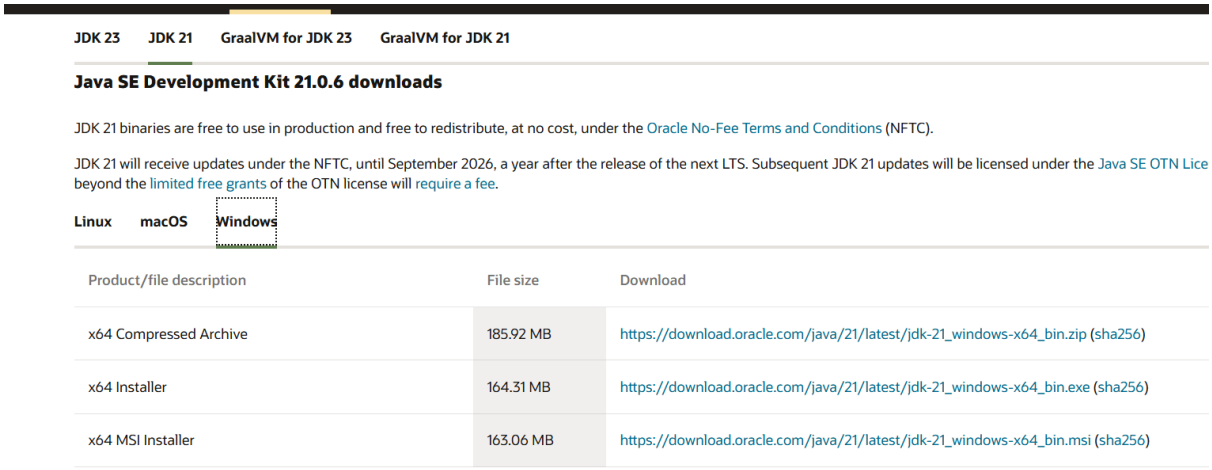


Step 2: Now you have to go to "Java download by ORACLE.com".

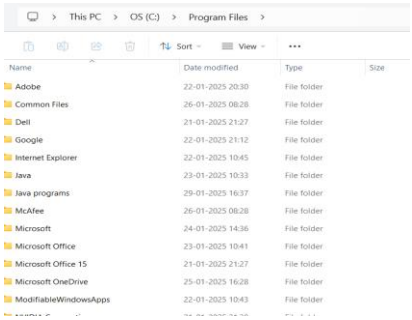


Step 3: You will see various versions of Java like JDK-21, JDK-21 etc. It is always better to download previous versions of Java.

Step 4: Now click on JDK-21 and select to download Windows and click on x64 installer and then JDK-21 is installed in your laptop.

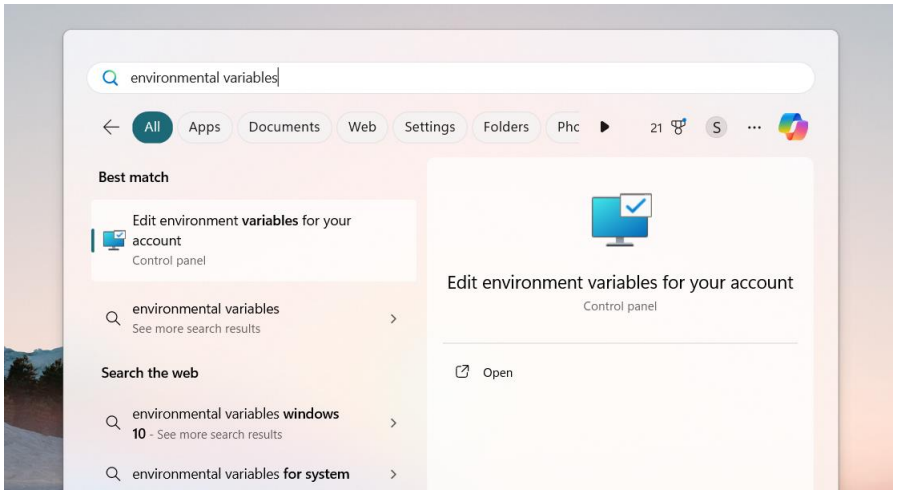


Step 5: The JDK-21 is automatically goes to windows c drive go to program files.

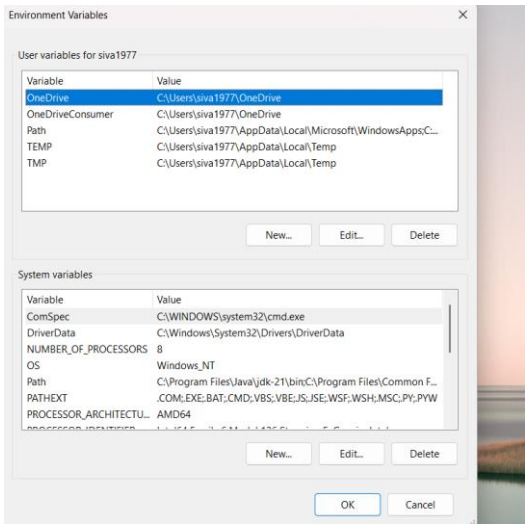


Step 6: Now click on JDK-21 and go to bin then copy the path.

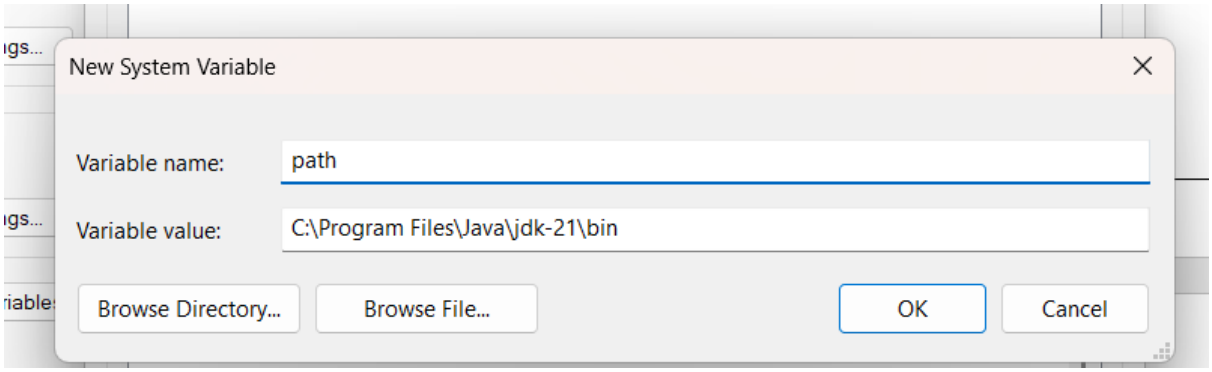
Step 7: Now type Environmental variables in system search box.



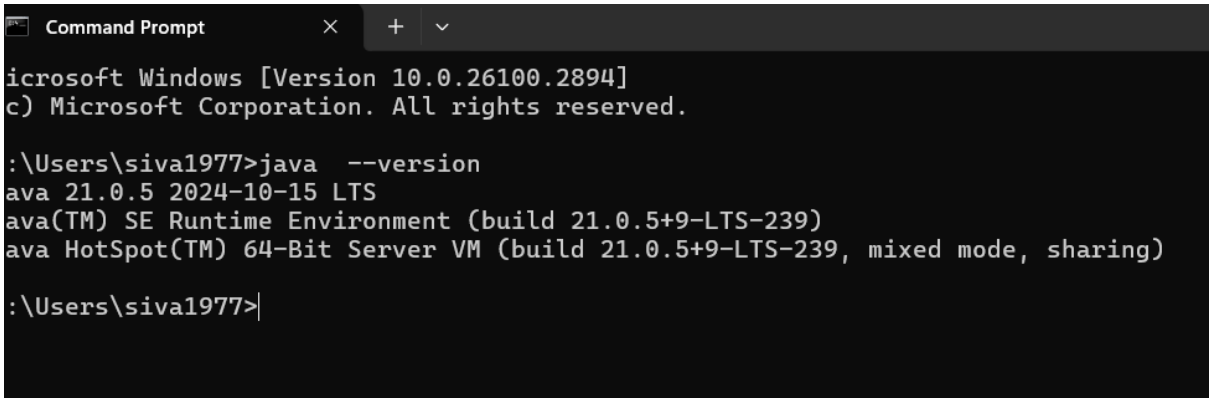
Step 8: Now click on the environmental variable you can see two variable in that it is better to set the path in system variables. There is “new” option in system variables click on that.



Step 9: Now give the variable name and paste the link on below aft that now path is set



Step10: check the jdk-21 is installed in your laptop

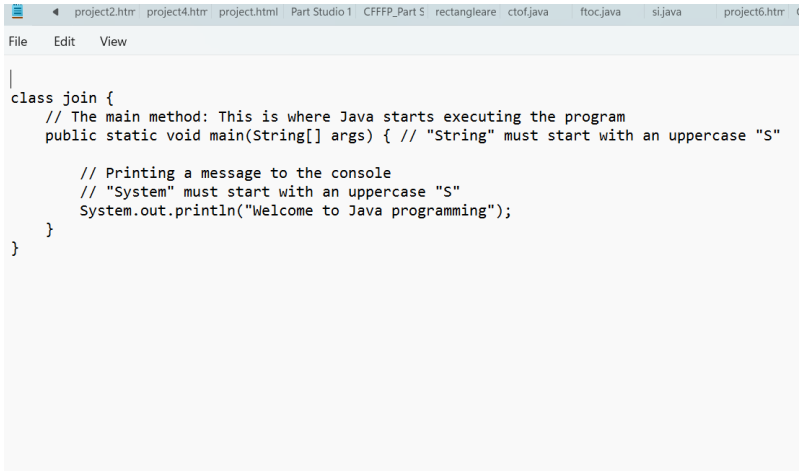


Program-2

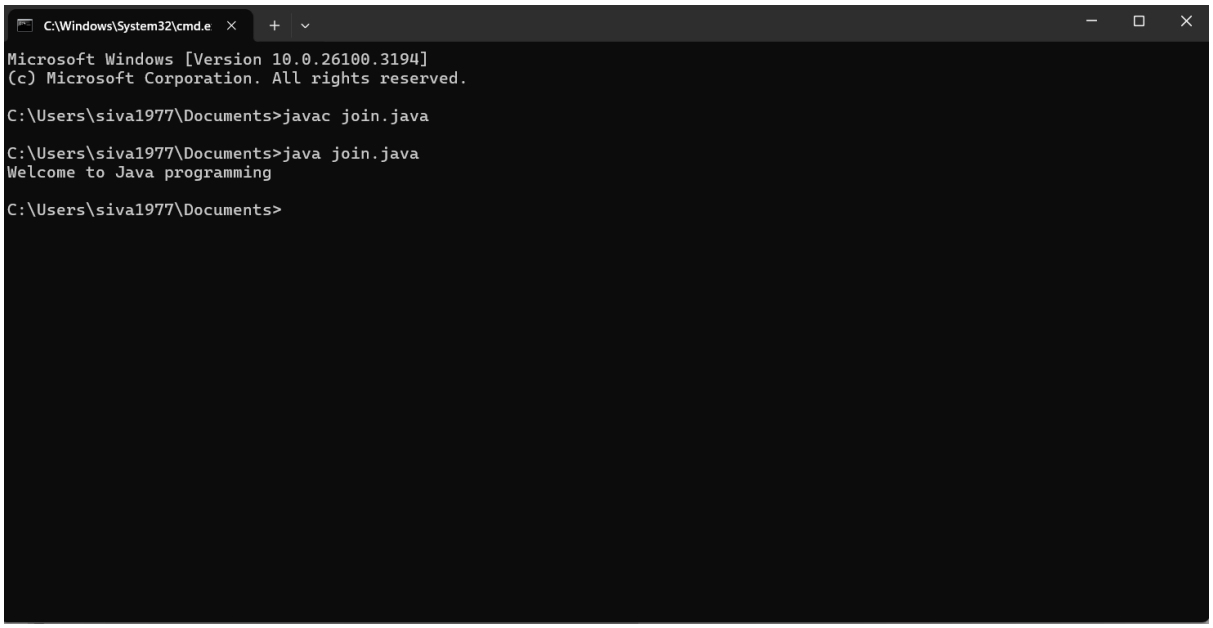
AIM:-

Write a java program to print the message “welcome to java program”

INPUT:-



Output:-



Errors:

Error: string[] args | **Fix:** Change to String[] args

Error: system | **Fix:** Change system to “System”

Program-3

AIM:-

Write a java program to print Name,Rollno,section of a student

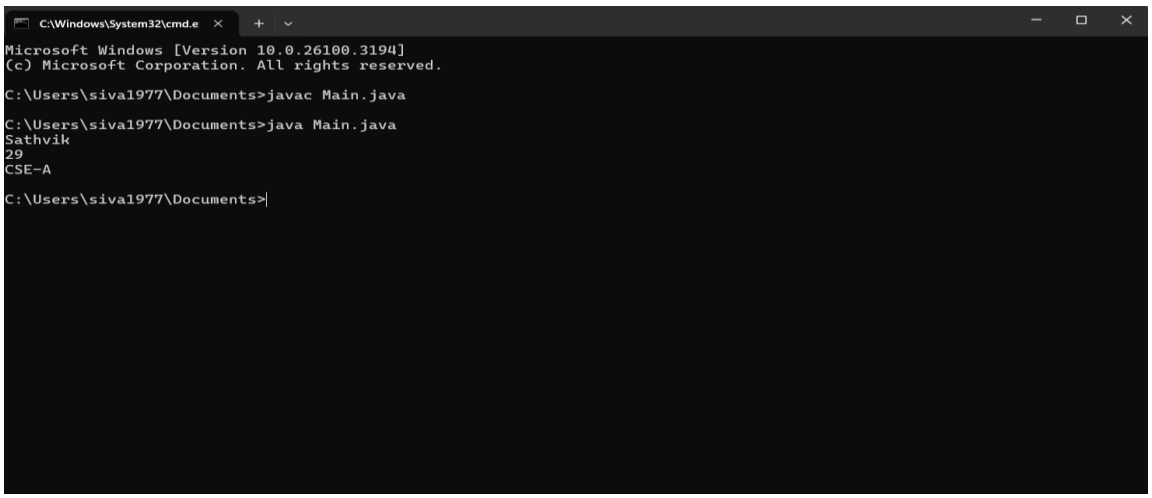
INPUT:-

```
class Main {
    // The main method: This is where Java starts executing the program
    public static void main(String[] args) {
        // Printing the name
        System.out.println("Sathvik");

        // Printing a number as a string
        System.out.println("29");

        // Printing a section/class name
        System.out.println("CSE-A");
    }
}
```

OUTPUT:-

Error: string[] args | **Fix:** Change to String[] args

Error: system | **Fix:** Change system to “System”



Errors:

Error: string[] args | **Fix:** Change to String[] args

Error: system | **Fix:** Change system to “System”

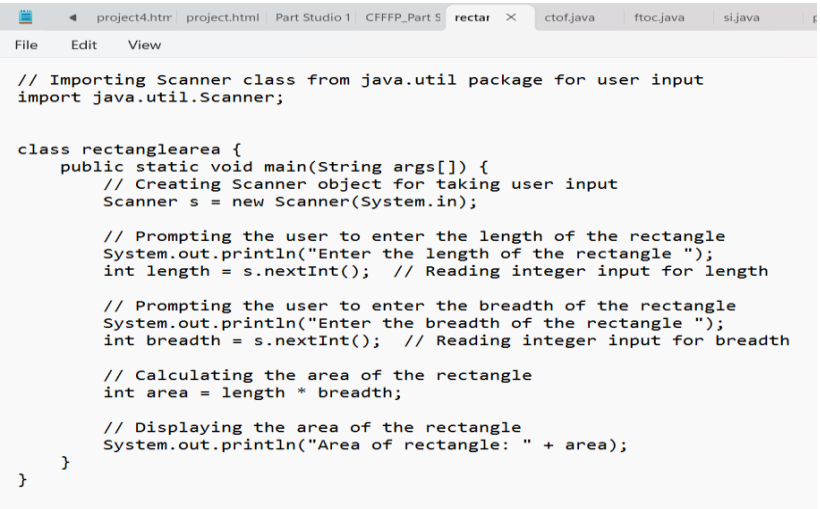
Error: System.out.println("Sathvik") | **Fix:** Add a semicolon ; at the end

WEEK-2

Program-1

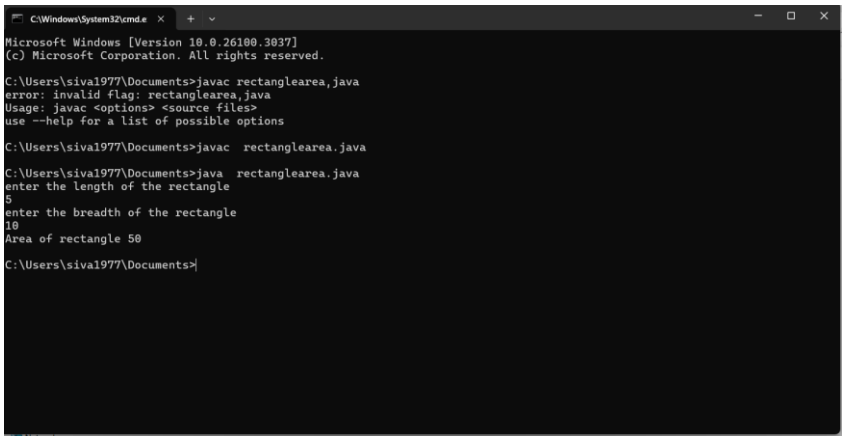
AIM: Writing a java program to calculate the area of rectangle

INPUT:



```
// Importing Scanner class from java.util package for user input
import java.util.Scanner;


class rectanglearea {
    public static void main(String args[]) {
        // Creating Scanner object for taking user input
        Scanner s = new Scanner(System.in);

        // Prompting the user to enter the length of the rectangle
        System.out.println("Enter the length of the rectangle ");
        int length = s.nextInt();  // Reading integer input for length

        // Prompting the user to enter the breadth of the rectangle
        System.out.println("Enter the breadth of the rectangle ");
        int breadth = s.nextInt();  // Reading integer input for breadth

        // Calculating the area of the rectangle
        int area = length * breadth;

        // Displaying the area of the rectangle
        System.out.println("Area of rectangle: " + area);
    }
}
```

OUTPUT:



```
Microsoft Windows [Version 10.0.26100.3037]
(c) Microsoft Corporation. All rights reserved.

C:\Users\siva1977\Documents>javac rectanglearea,java
error: invalid flag: rectanglearea,java
Usage: javac <options> <source files>
use --help for a list of possible options

C:\Users\siva1977\Documents>javac  rectanglearea.java

C:\Users\siva1977\Documents>java  rectanglearea.java
enter the length of the rectangle
5
enter the breadth of the rectangle
10
Area of rectangle 50

C:\Users\siva1977\Documents>
```

Errors:

Error: java util.Scaaner ; | **Fix:** import java.util.Scanner ;

Program-2

AIM:Converting temperature from Celsius to fahrenheit

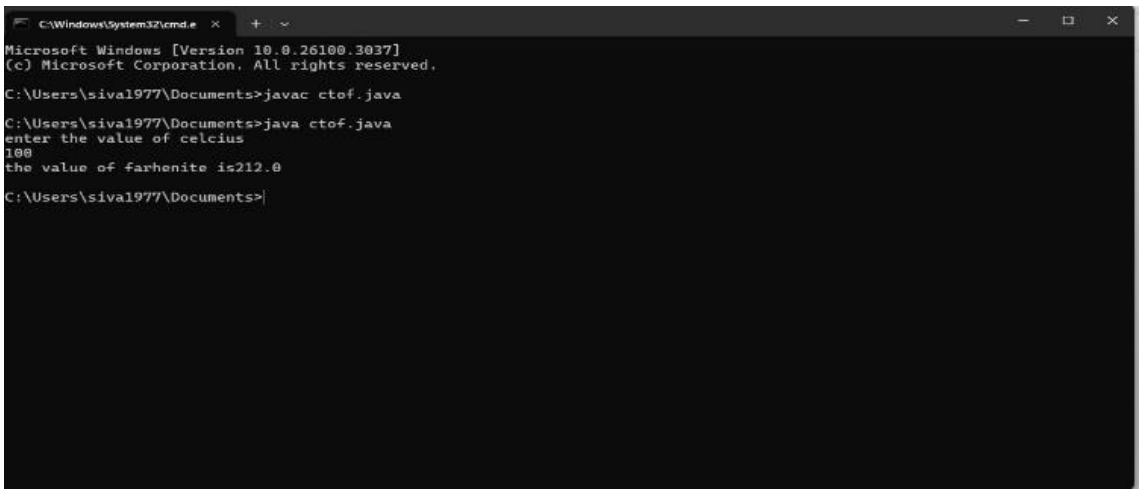
INPUT:

project4.htm | project.html | Part Studio 1 | CFFFP_Part S | rectan | ftoc.java | si.java | project6.htm | G1 | largestnumb

File Edit View

```
import java.util.Scanner;  // Importing Scanner class for user input

class ctof  // Class to convert Celsius to Fahrenheit
{
    public static void main(String args[]) {
        Scanner s = new Scanner(System.in);  // Creating Scanner object for input

        System.out.println("Enter the value of Celsius");  // Prompting user for input
        float c = s.nextFloat();  // Reading the float value (Celsius)

        float f = (c * 9 / 5) + 32;  // Formula to convert Celsius to Fahrenheit

        System.out.println("The value of Fahrenheit is " + f);  // Printing the result

    }
}
```

OUTPUT:



AIM:converting temperature from fahrenhiet to celsius

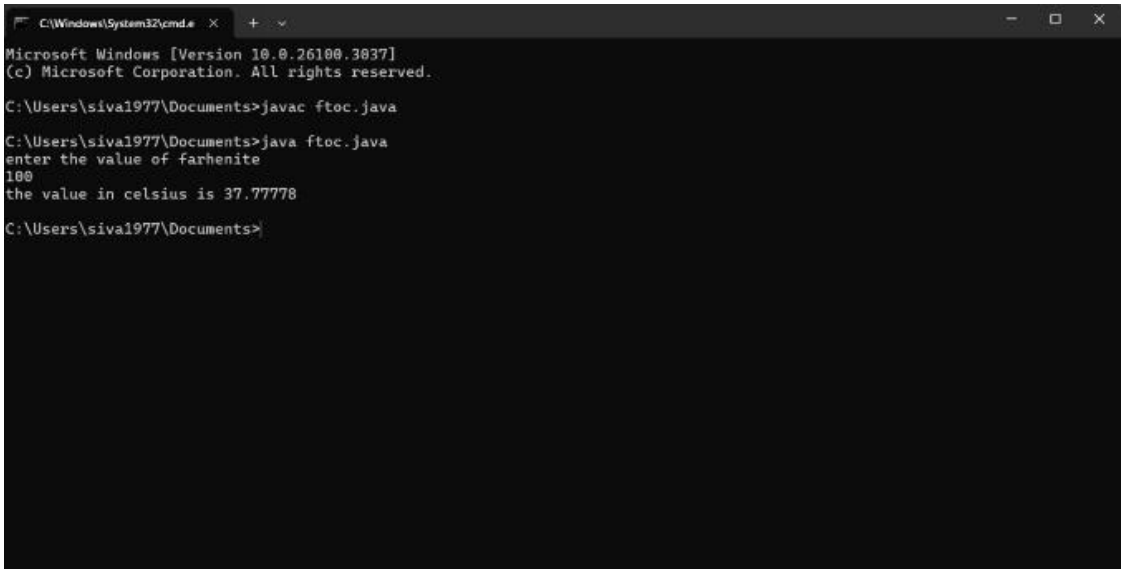
INPUT:

project4.htm project.html Part Studio 1 CFFFP_Part S rectan ftoc.ja si.java project6.htm G1 largestnumb factorial.java Ca

File Edit View

```
import java.util.Scanner; // Importing Scanner class to take user input

// Class to convert Fahrenheit to Celsius
class ftoc {
    public static void main(String args[]) {
        Scanner s = new Scanner(System.in); // Creating Scanner object for user input

        // Asking the user to enter temperature in Fahrenheit
        System.out.println("Enter the value of Fahrenheit: ");

        float f = s.nextFloat(); // Reading the user input as float (Fahrenheit temperature)

        // Converting Fahrenheit to Celsius using the formula: C = (F - 32) * 5/9
        float c = (f - 32) * 5 / 9;

        // Printing the converted Celsius value
        System.out.println("The value in Celsius is: " + c);


    }
}
```

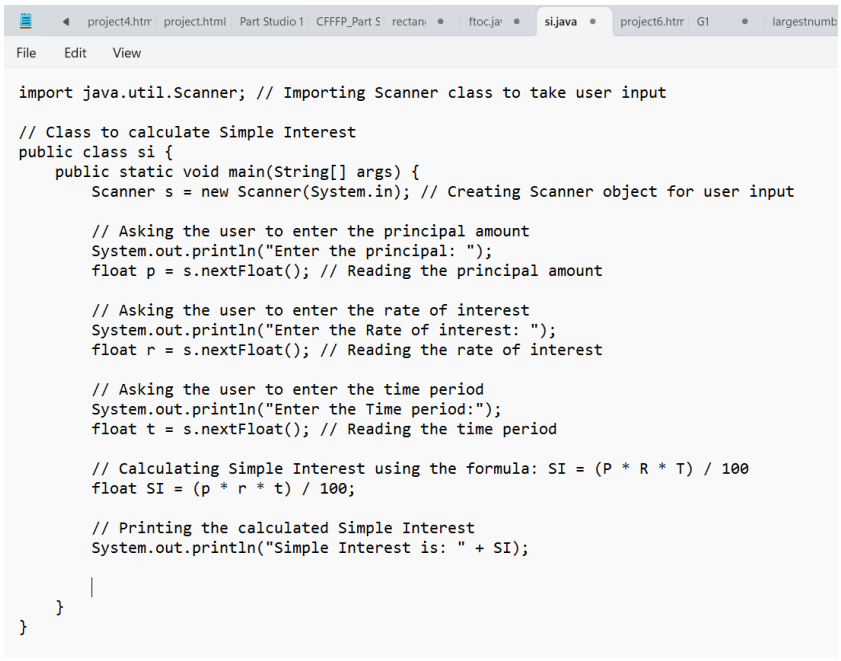
OUTPUT:



Program-3

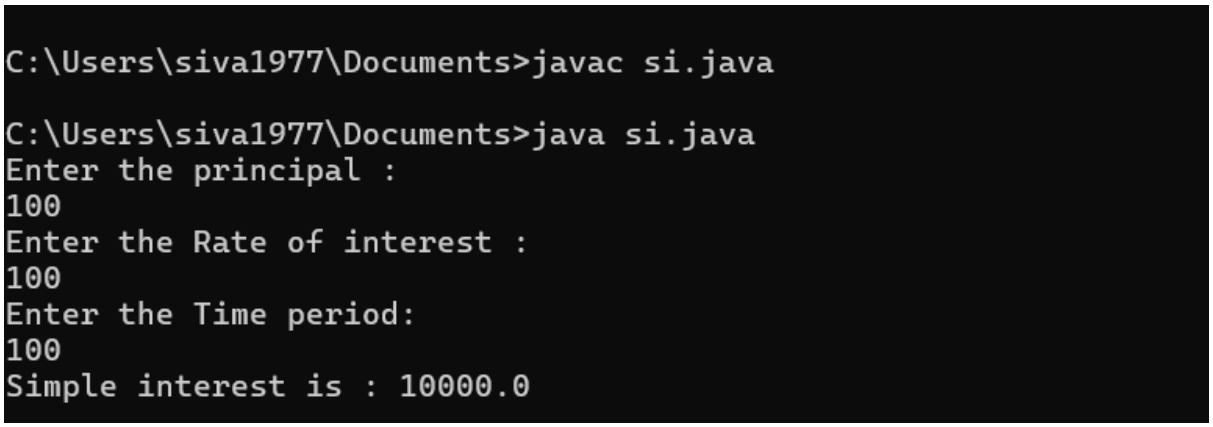
AIM: calculating simple intrest

INPUT:



```
import java.util.Scanner; // Importing Scanner class to take user input

// Class to calculate Simple Interest
public class si {
    public static void main(String[] args) {
        Scanner s = new Scanner(System.in); // Creating Scanner object for user input

        // Asking the user to enter the principal amount
        System.out.println("Enter the principal: ");
        float p = s.nextFloat(); // Reading the principal amount

        // Asking the user to enter the rate of interest
        System.out.println("Enter the Rate of interest: ");
        float r = s.nextFloat(); // Reading the rate of interest

        // Asking the user to enter the time period
        System.out.println("Enter the Time period:");
        float t = s.nextFloat(); // Reading the time period

        // Calculating Simple Interest using the formula: SI = (P * R * T) / 100
        float SI = (p * r * t) / 100;

        // Printing the calculated Simple Interest
        System.out.println("Simple Interest is: " + SI);

    }
}
```

OUTPUT:

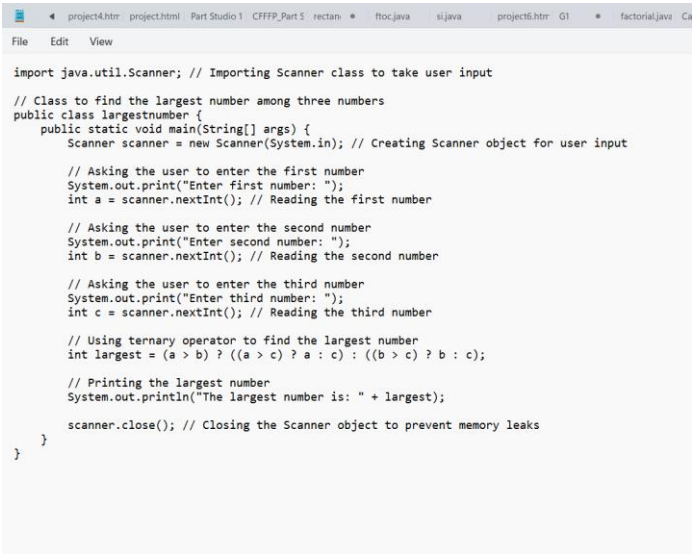


```
C:\Users\siva1977\Documents>javac si.java

C:\Users\siva1977\Documents>java si.java
Enter the principal :
100
Enter the Rate of interest :
100
Enter the Time period:
100
Simple interest is : 10000.0
```

Program-4

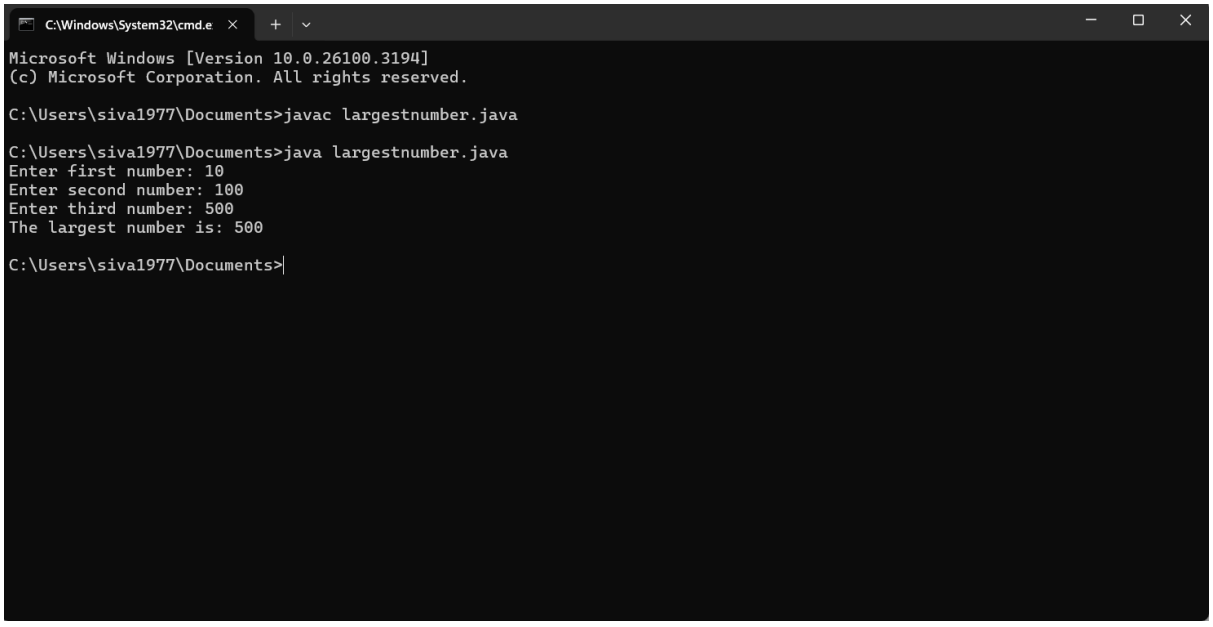
AIM:Finding the largest of three numbers using the ternary operators

INPUT:



```
File  Edit  View

import java.util.Scanner; // Importing Scanner class to take user input

// Class to find the largest number among three numbers
public class largestnumber {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in); // Creating Scanner object for user input

        // Asking the user to enter the first number
        System.out.print("Enter first number: ");
        int a = scanner.nextInt(); // Reading the first number

        // Asking the user to enter the second number
        System.out.print("Enter second number: ");
        int b = scanner.nextInt(); // Reading the second number

        // Asking the user to enter the third number
        System.out.print("Enter third number: ");
        int c = scanner.nextInt(); // Reading the third number

        // Using ternary operator to find the largest number
        int largest = (a > b) ? ((a > c) ? a : c) : ((b > c) ? b : c);

        // Printing the largest number
        System.out.println("The largest number is: " + largest);

        scanner.close(); // Closing the Scanner object to prevent memory leaks
    }
}
```

OUTPUT:

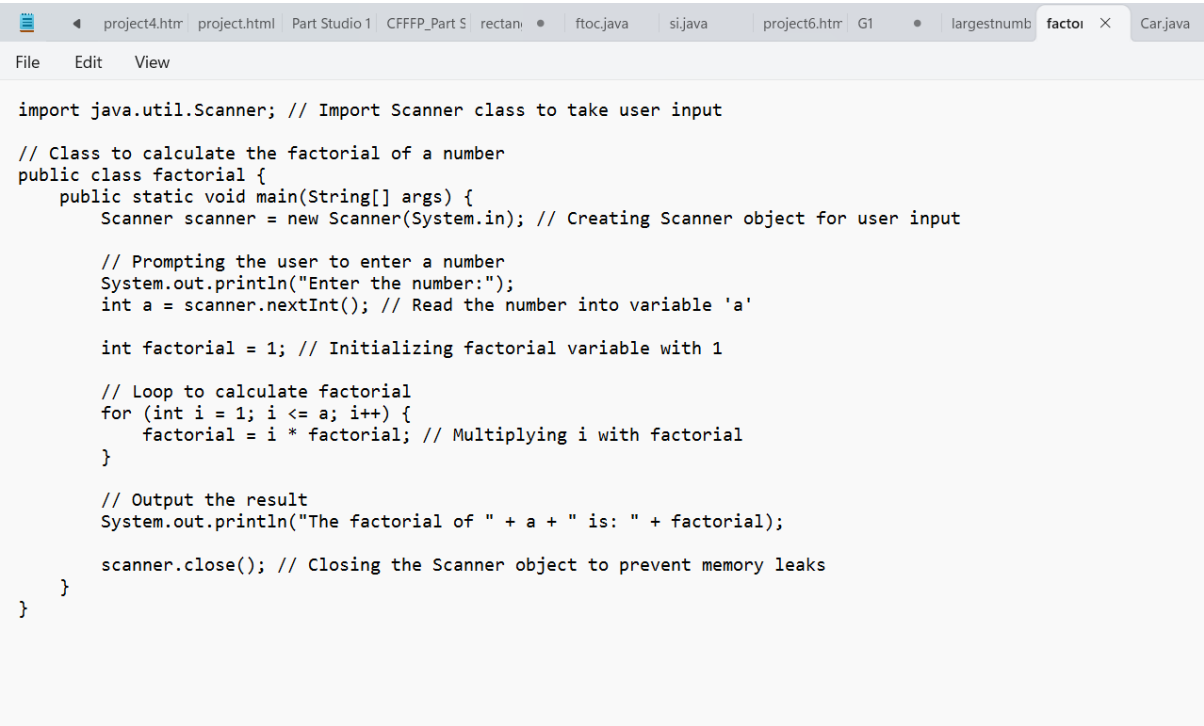


```
C:\Windows\System32\cmd.e

Microsoft Windows [Version 10.0.26100.3194]
(c) Microsoft Corporation. All rights reserved.

C:\Users\siva1977\Documents>javac largestnumber.java

C:\Users\siva1977\Documents>java largestnumber.java
Enter first number: 10
Enter second number: 100
Enter third number: 500
The largest number is: 500

C:\Users\siva1977\Documents>
```

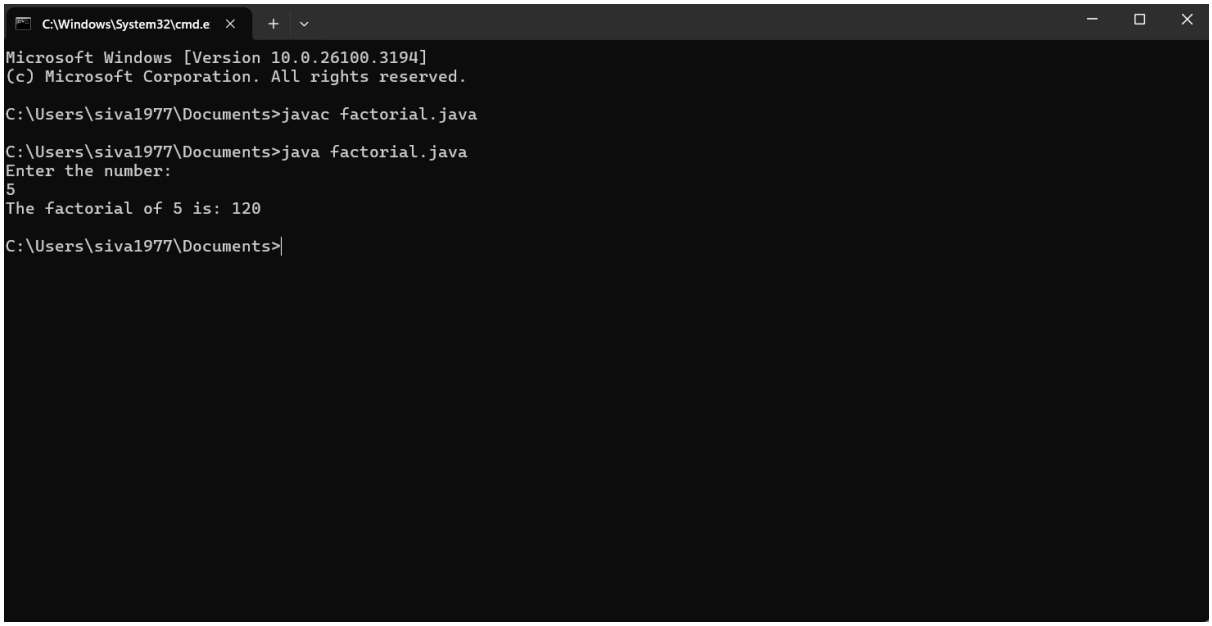
Program-5

AIM: Finding the factorial of a number

INPUT:



OUTPUT:



WEEK-3

Program-1

Aim: Create a Java program with the following instructions:

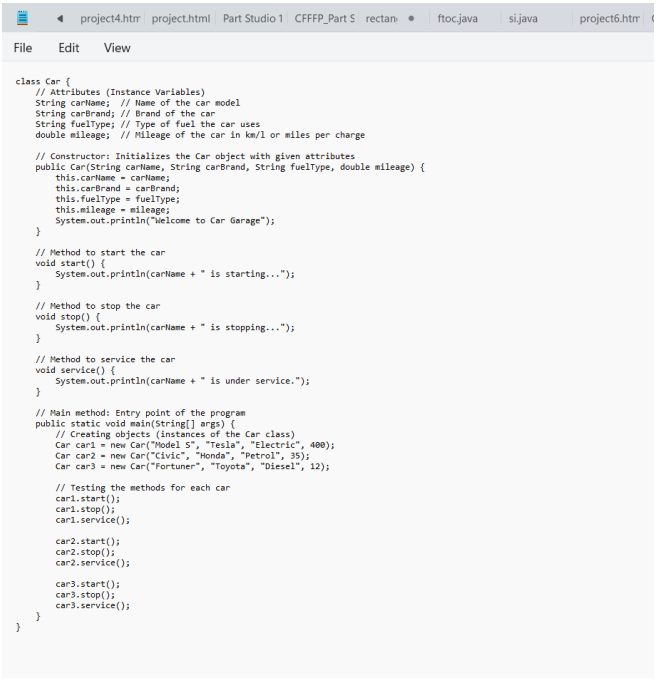
Create a class named Car.

Create 4 attributes: carName, carColor, carBrand, fuelType, mileage.

Create 3 methods named: start, stop, service.

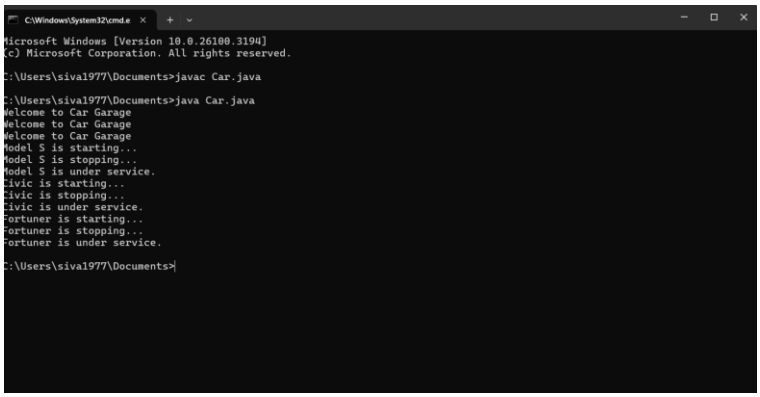
Create 3 objects named: car1, car2, car3.
Create a constructor that should print "Welcome to Car Garage".

INPUT:

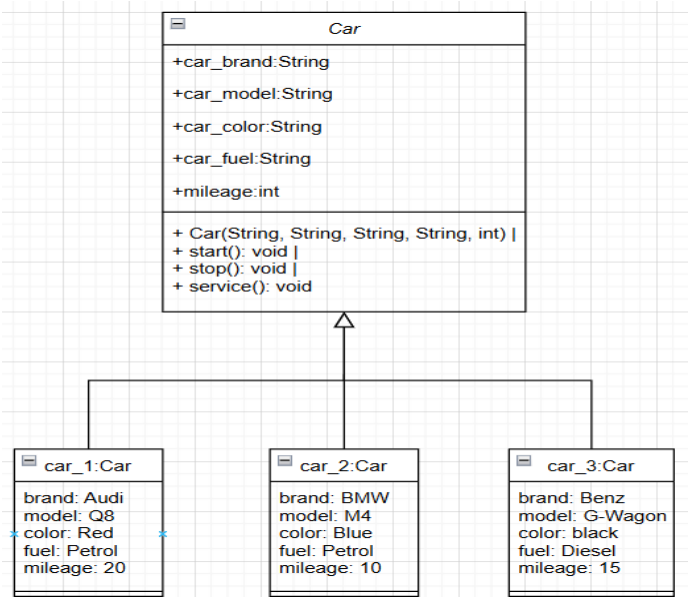



```
class Car {
    // Attributes (Instance Variables)
    String carName;  // Name of the car model
    String carBrand; // Brand of the car
    String fuelType; // Type of fuel the car uses
    double mileage;  // Mileage of the car in km/l or miles per charge

    // Constructor: Initializes the Car object with given attributes
    public Car(String carName, String carBrand, String fuelType, double mileage) {
        this.carName = carName;
        this.carBrand = carBrand;
        this.fuelType = fuelType;
        this.mileage = mileage;
        System.out.println("Welcome to Car Garage");
    }

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

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

    // Method to service the car
    void service() {
        System.out.println(carName + " is under service.");
    }

    // Main method: Entry point of the program
    public static void main(String[] args) {
        // Creating objects (instances of the Car class)
        Car car1 = new Car("Model S", "Tesla", "Electric", 400);
        Car car2 = new Car("Civic", "Honda", "Petrol", 35);
        Car car3 = new Car("Fortuner", "Toyota", "Diesel", 12);

        // Testing the methods for each car
        car1.start();
        car1.stop();
        car1.service();

        car2.start();
        car2.stop();
        car2.service();

        car3.start();
        car3.stop();
        car3.service();
    }
}
```

OUTPUT:



Class diagram



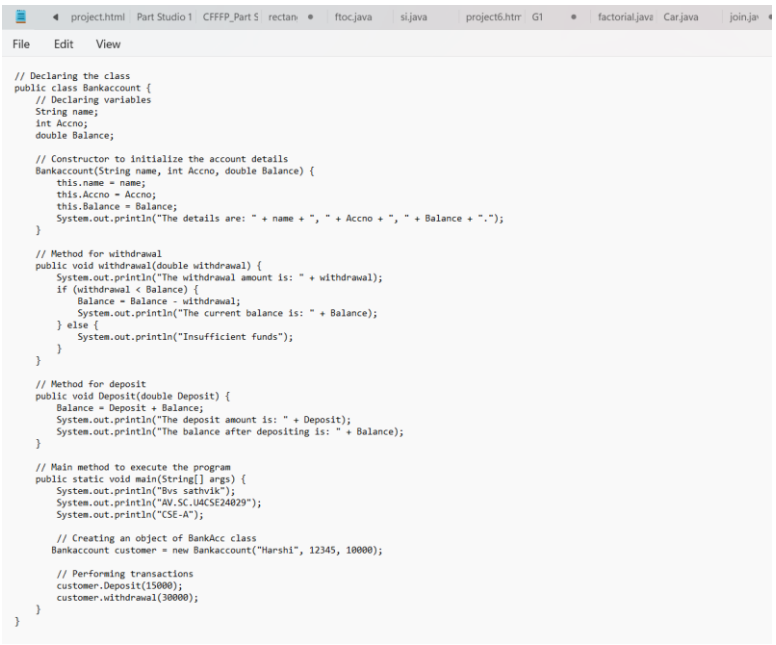
Program-2

AIM: Write a Java program to create a class named BankAccount with two methods: deposit and withdraw.

In the deposit method, whenever an amount is deposited, it has to be updated with the current amount.

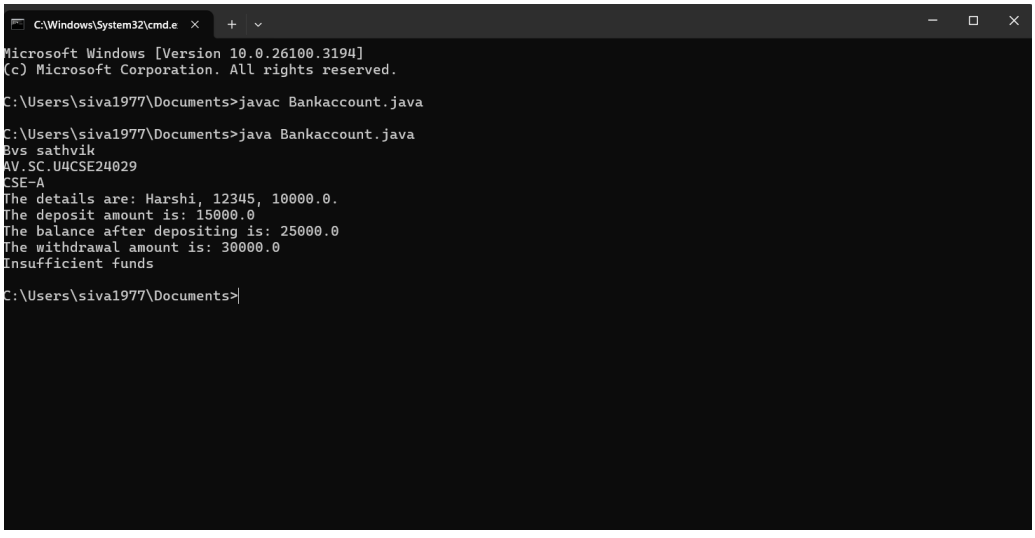
In the withdraw method, whenever an amount is withdrawn, it has to be less than the current balance; otherwise, print "Insufficient funds".

INPUT:



```
File  Edit  View

// Declaring the class
public class Bankaccount {
    // Declaring variables
    String name;
    int Accno;
    double Balance;

    // Constructor to initialize the account details
    Bankaccount(String name, int Accno, double Balance) {
        this.name = name;
        this.Accno = Accno;
        this.Balance = Balance;
        System.out.println("The details are: " + name + ", " + Accno + ", " + Balance + ".");
    }

    // Method for withdrawal
    public void withdrawal(double withdrawal) {
        System.out.println("The withdrawal amount is: " + withdrawal);
        if (withdrawal < Balance) {
            Balance = Balance - withdrawal;
            System.out.println("The current balance is: " + Balance);
        } else {
            System.out.println("Insufficient funds");
        }
    }

    // Method for deposit
    public void Deposit(double Deposit) {
        Balance = Deposit + Balance;
        System.out.println("The deposit amount is: " + Deposit);
        System.out.println("The balance after depositing is: " + Balance);
    }

    // Main method to execute the program
    public static void main(String[] args) {
        System.out.println("Bvs sathvik");
        System.out.println("AV.SC.U4CSE24029");
        System.out.println("CSE-A");

        // Creating an object of BankAcc class
       Bankaccount customer = new Bankaccount("Harshi", 12345, 10000);

        // Performing transactions
        customer.Deposit(15000);
        customer.withdrawal(30000);
    }
}
```

OUTPUT:



```
C:\Windows\System32\cmd.e

Microsoft Windows [Version 10.0.26100.3194]
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C:\Users\siva1977\Documents>javac Bankaccount.java

C:\Users\siva1977\Documents>java Bankaccount.java
Bvs sathvik
AV.SC.U4CSE24029
CSE-A
The details are: Harshi, 12345, 10000.0.
The deposit amount is: 15000.0
The balance after depositing is: 25000.0
The withdrawal amount is: 30000.0
Insufficient funds

C:\Users\siva1977\Documents>
```
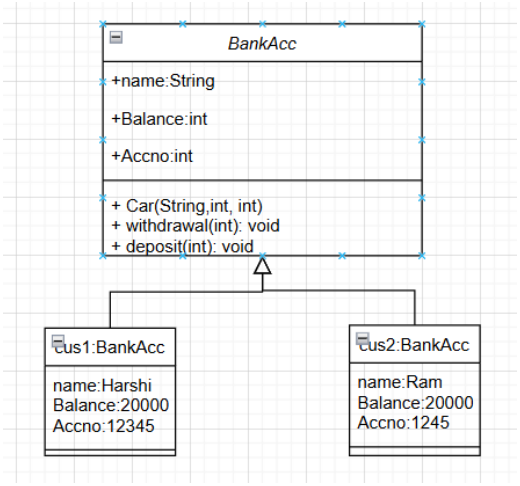

Class diagram



WEEK-4

Program-1

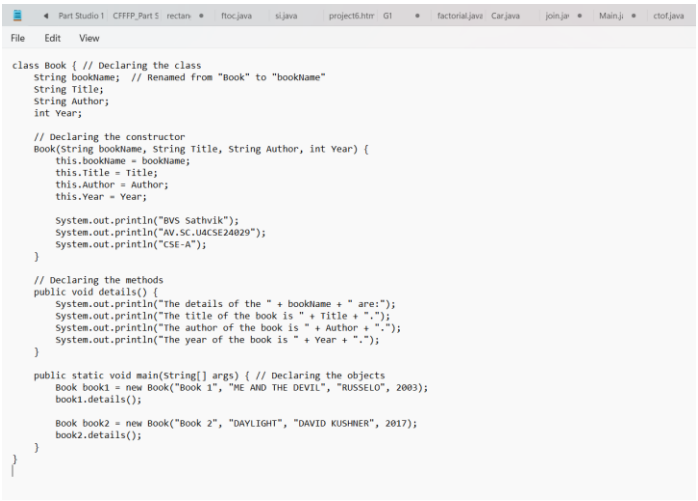
Aim: Write a simple program with class named “Book.”
The class should contain instance variables/attributes such as title of the book, author, and year of publication.
It should also contain:

A constructor with parameters which initializes these attributes.

A method displayPublication() which displays the details of the book.

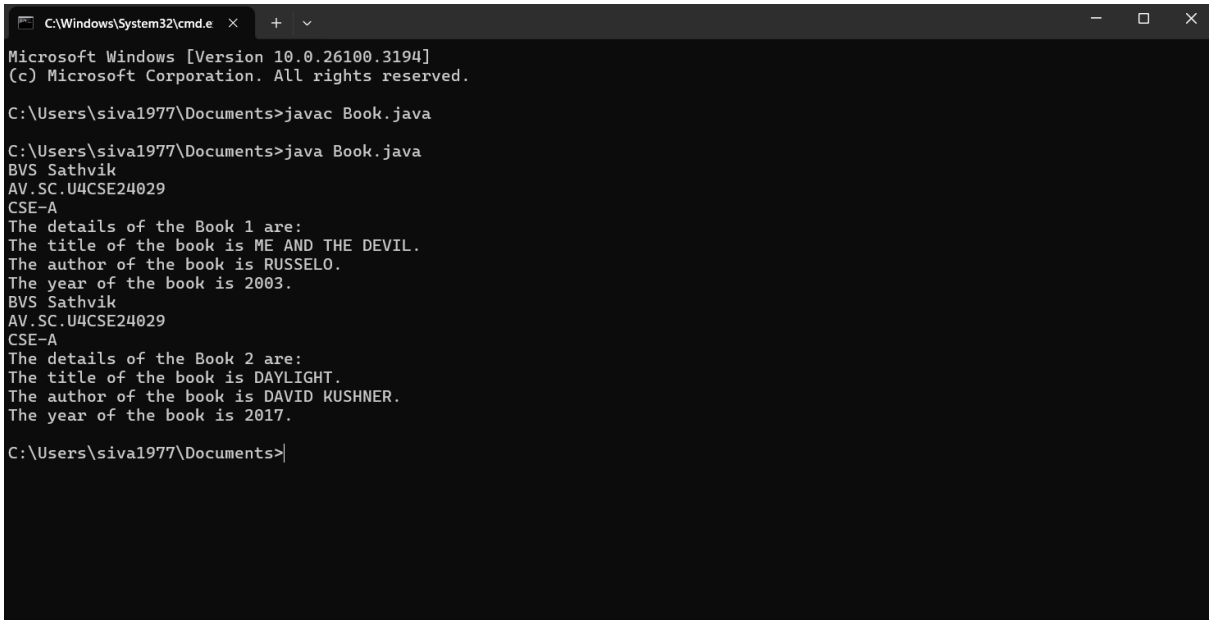
Create and display the details of two books by creating two objects.

INPUT:



```
File  Edit  View

class Book { // Declaring the class
    String bookName;  // Renamed from "Book" to "bookName"
    String Title;
    String Author;
    int Year;

    // Declaring the constructor
    Book(String bookName, String Title, String Author, int Year) {
        this.bookName = bookName;
        this.Title = Title;
        this.Author = Author;
        this.Year = Year;

        System.out.println("BVS Sathvik");
        System.out.println("AV.SC.U4CSE24029");
        System.out.println("CSE-A");
    }

    // Declaring the methods
    public void details() {
        System.out.println("The details of the " + bookName + " are:");
        System.out.println("The title of the book is " + Title + ".");
        System.out.println("The author of the book is " + Author + ".");
        System.out.println("The year of the book is " + Year + ".");
    }

    public static void main(String[] args) { // Declaring the objects
        Book book1 = new Book("Book 1", "ME AND THE DEVIL", "RUSSELO", 2003);
        book1.details();

        Book book2 = new Book("Book 2", "DAYLIGHT", "DAVID KUSHNER", 2017);
        book2.details();
    }
}
```

OUTPUT:



```
C:\Windows\System32\cmd.e
Microsoft Windows [Version 10.0.26100.3194]
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C:\Users\siva1977\Documents>javac Book.java

C:\Users\siva1977\Documents>java Book.java
BVS Sathvik
AV.SC.U4CSE24029
CSE-A
The details of the Book 1 are:
The title of the book is ME AND THE DEVIL.
The author of the book is RUSSELO.
The year of the book is 2003.
BVS Sathvik
AV.SC.U4CSE24029
CSE-A
The details of the Book 2 are:
The title of the book is DAYLIGHT.
The author of the book is DAVID KUSHNER.
The year of the book is 2017.

C:\Users\siva1977\Documents>
```
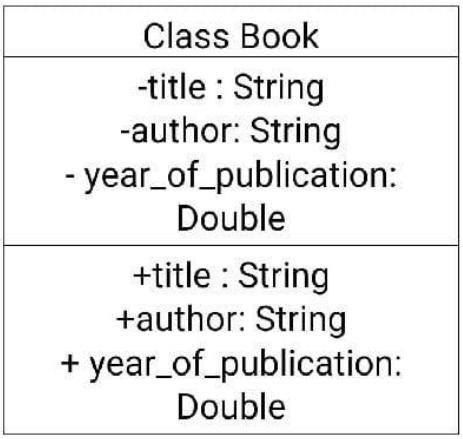

Class diagram

DIAGRAM:

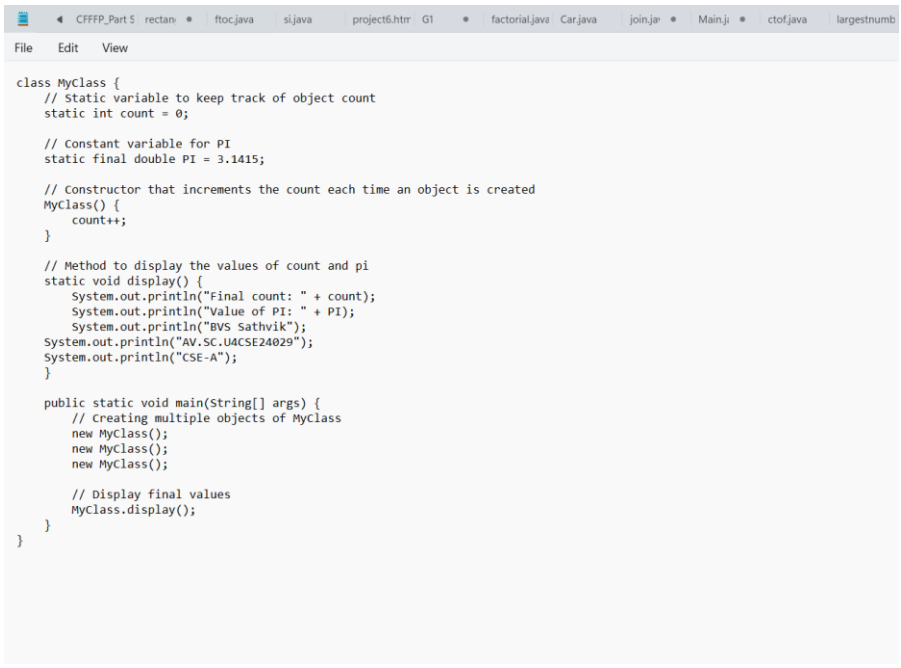


S :

Program-2

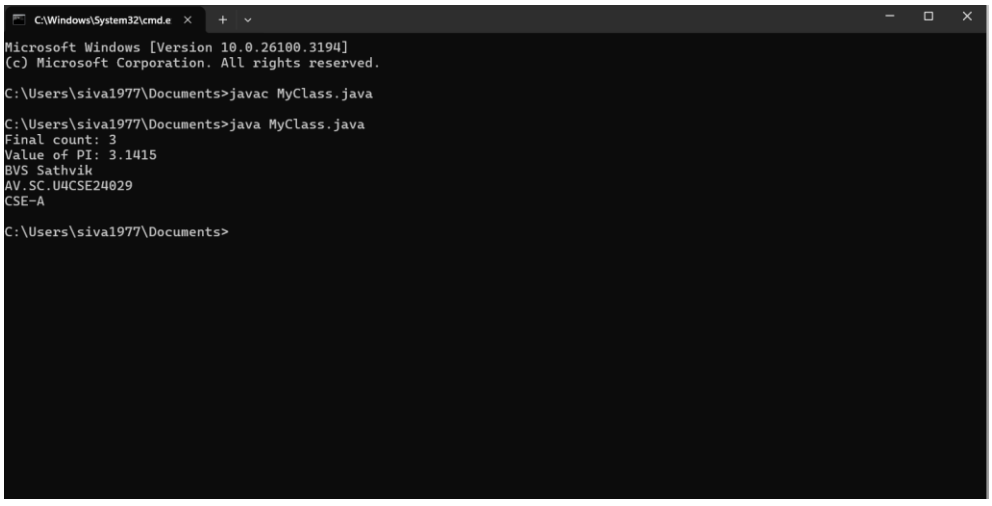
Aim: The create a sample program of the class named "MyClass" with a static variable count of int type, initializing to zero and a constructor which increments the count variable each time an object of MyClass is created. Finally, print the number of objects.

INPUT:



```
File  Edit  View

class MyClass {
    // Static variable to keep track of object count
    static int count = 0;

    // Constant variable for PI
    static final double PI = 3.1415;

    // Constructor that increments the count each time an object is created
    MyClass() {
        count++;
    }

    // Method to display the values of count and pi
    static void display() {
        System.out.println("Final count: " + count);
        System.out.println("Value of PI: " + PI);
        System.out.println("BVS Sathvik");
    System.out.println("AV.SC.U4CSE24029");
    System.out.println("CSE-A");
    }

    public static void main(String[] args) {
        // Creating multiple objects of MyClass
        new MyClass();
        new MyClass();
        new MyClass();

        // Display final values
        MyClass.display();
    }
}
```

OUTPUT:



```
Microsoft Windows [Version 10.0.26100.3194]
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C:\Users\siva1977\Documents>javac MyClass.java

C:\Users\siva1977\Documents>java MyClass.java
Final count: 3
Value of PI: 3.1415
BVS Sathvik
AV.SC.U4CSE24029
CSE-A

C:\Users\siva1977\Documents>
```
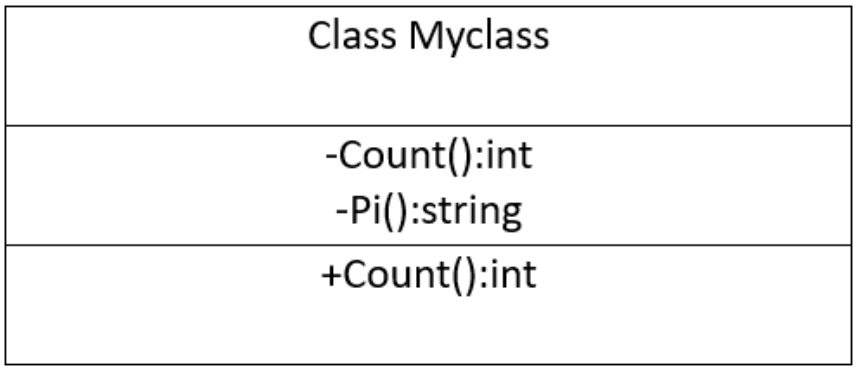

Class diagram



WEEK-5

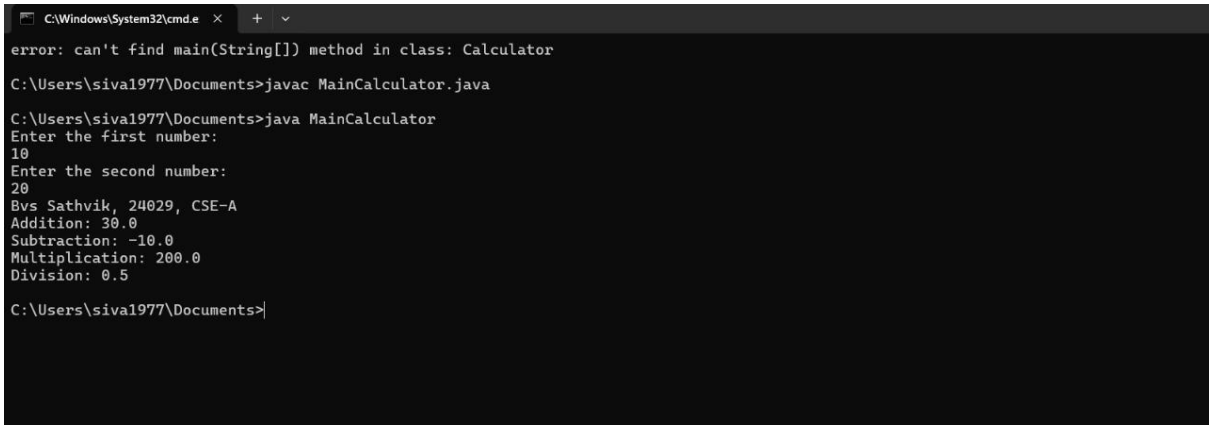
Program-1

AIM :- Create a calculator using the operations including addition, subtraction, multiplication and division using multilevel inheritance and display the desire output.

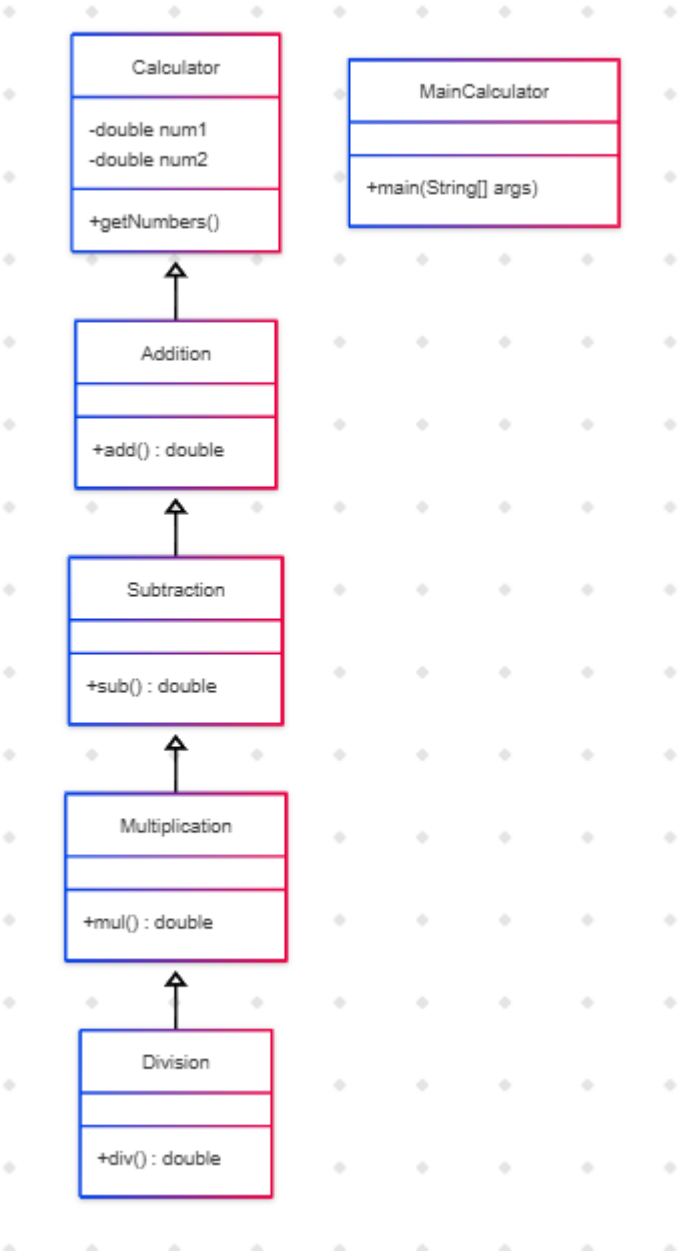
INPUT:

```
C: > Users > siva1977 > Documents > MainCalculator.java
import java.util.Scanner;

class Calculator {
    double num1, num2;  // Instance variables

    public void getNumbers() {  // Corrected method name
        Scanner s = new Scanner(System.in);
        System.out.println("Enter the first number:");
        num1 = s.nextDouble();
        System.out.println("Enter the second number:");
        num2 = s.nextDouble();
        s.close();
    }
}

// Using multilevel inheritance
class Addition extends Calculator {
    public double add() {
        return num1 + num2;
    }
}

class Subtraction extends Addition {
    public double sub() {
        return num1 - num2;
    }
}

class Multiplication extends Subtraction {
    public double mul() {
        return num1 * num2;
    }
}

class Division extends Multiplication {
    public double div() {
        if (num2 == 0) {
            return 0; // Prevent division by zero
        } else {
            return num1 / num2;
        }
    }
}

public class MainCalculator {
    Run main | Debug main
    public static void main(String[] args) {
        Division cal = new Division(); // Corrected object creation
        cal.getNumbers();

        System.out.println("Bvs Sathvik, 24029, CSE-A");
        System.out.println("Addition: " + cal.add());
        System.out.println("Subtraction: " + cal.sub());
        System.out.println("Multiplication: " + cal.mul());
        System.out.println("Division: " + cal.div());
    }
}
```

OUTPUT:



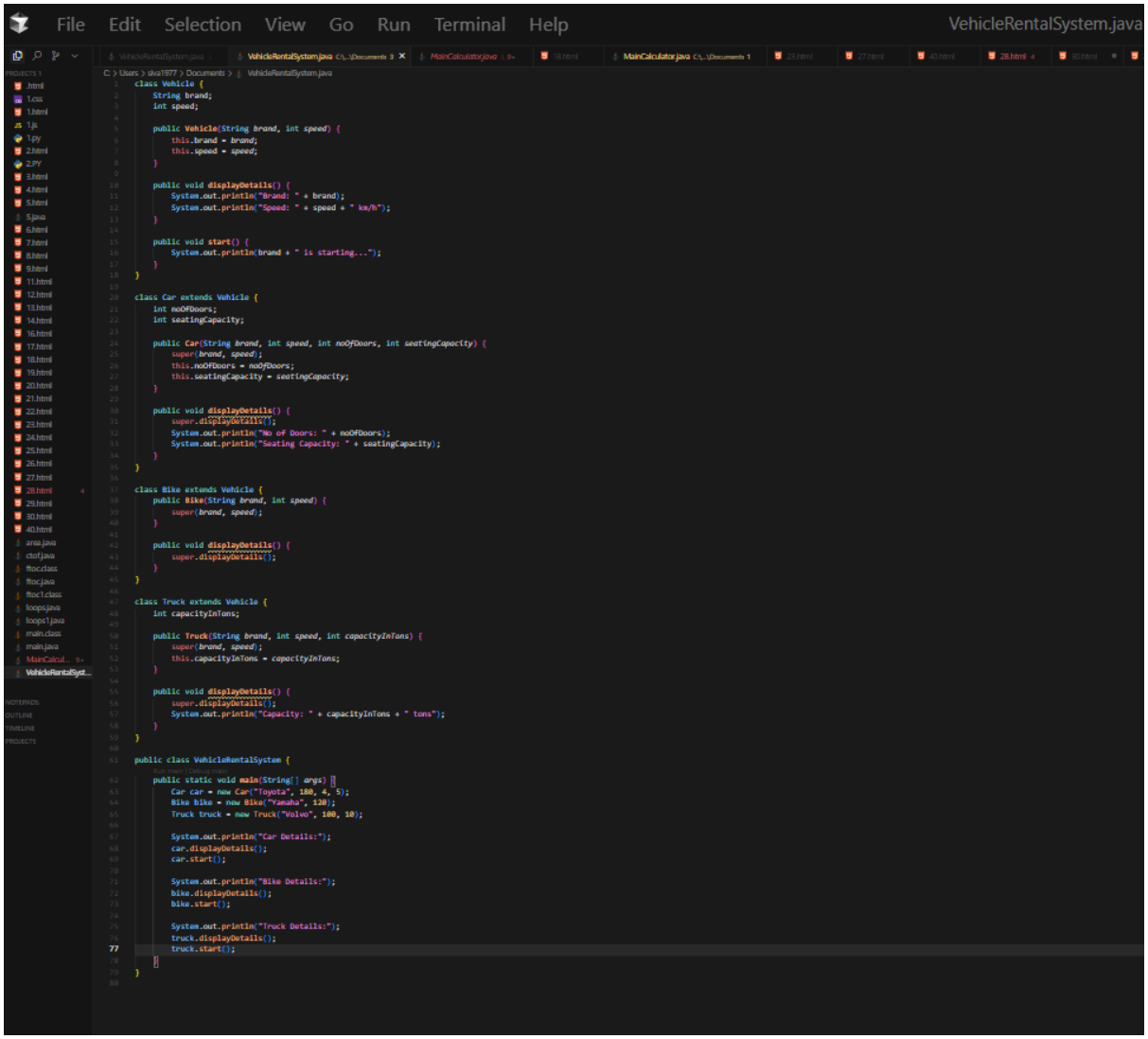
```
C:\Windows\System32\cmd.e
error: can't find main(String[]) method in class: Calculator

C:\Users\siva1977\Documents>javac MainCalculator.java

C:\Users\siva1977\Documents>java MainCalculator
Enter the first number:
10
Enter the second number:
20
Bvs Sathvik, 24029, CSE-A
Addition: 30.0
Subtraction: -10.0
Multiplication: 200.0
Division: 0.5

C:\Users\siva1977\Documents>
```


Calculator
-double num1
-double num2
+getNumbers()
MainCalculator
+main(String[] args)
Addition
+add() : double
Subtraction
+sub() : double
Multiplication
+mul() : double
Division
+div() : double

Program-2

AIM :- A vehicle rental company wants to develop a system that maintains information about different types of vehicles available for rent. The company rents out cars and bikes and they need a program to store details about each vehicle such as brand and speed. Cars should have an additional properties "no of doors", "Seating Capacity". Bikes should have a property indicating whether they have gears or not. The system should also include the function to display the details about each vehicle and indicate on when a vehicle is starting. Each class should have a Constructor. 1. Which object-oriented programming language is used in the above program? Explain why it is useful in the scenario. 2. The company decides to add a new type of vehicle: Truck. How would you modify the above program? Sub-Instructions: Truck should include an additional property: capacity (in tons). Create a showTruckDetails method to display the truck's capacity. Write a constructor for Truck that initializes all properties. Implement the Truck class and update the main method to create a Truck object and also create objects for Car and Bike subclasses. Finally, display their details.

INPUT:



OUTPUT:

```
C:\Windows\System32\cmd.e
Microsoft Windows [Version 10.0.26100.3194]
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C:\Users\siva1977\Documents>javac   VehicleRentalSystem.java

C:\Users\siva1977\Documents>java -cp . VehicleRentalSystem
Car Details:
Brand: Toyota
Speed: 180 km/h
No of Doors: 4
Seating Capacity: 5
Toyota is starting...
Bike Details:
Brand: Yamaha
Speed: 120 km/h
Yamaha is starting...
Truck Details:
Brand: Volvo
Speed: 100 km/h
Capacity: 10 tons
Volvo is starting...

C:\Users\siva1977\Documents>
```

Class Diagram:-