**23CSE111**

**OBJECT ORIENTED PROGRAMMING**

**LAB REPORT**



**Department of Computer Science Engineering**

**Amrita School of Computing**

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| --- | --- | --- | --- | --- |
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**WEEK 01**

**PROGRAM-1:**

**AIM:** Download and Install Java Software

**PROCEDURE:**

**Step 1: Download JDK 21**

1. Open your web browser and go to the Oracle JDK Downloads page
2. Scroll down to the Java SE Development Kit 21 section.
3. Choose the Windows x64 Installer version.
4. Click on Download, then Wait for the download to complete



**Step 2:** **Install JDK 21**

1. Locate the downloaded jdk-21\_windows-x64\_bin.exe file.
2. Double-click to launch the installer.
3. Click Next on the setup wizard.
4. Choose the installation path (default is C:\Program Files\Java\jdk-21).
5. Click Next, then click Install.
6. Wait for the installation to complete.
7. Click Close once the installation is finished.



**Step 3: Setting up the path**

1) Go to “Windows C” Drive on Desktop

2) Choose Program Files, select Java, then JDK 21, then select Bin.

3) Select and copy the path at the address bar.



**Step 4: Open System Properties**

1. Press Windows + R, type sysdm.cpl , and click Ok-
2. The System Properties window will open.
3. Navigate to the Advanced tab.
4. Click on Environment Variables at the bottom.



**Step 5: Set JAVA\_HOME**

1)Under System Variables, click New.

2)Set the Variable name as JAVA\_HOME.

3)Set Variable value as C:\Program Files\Java\jdk-21 (or your installation path).

4)Click OK.



**Step 6: Update PATH Variable**

1)In System Variables, find Path and click Edit.

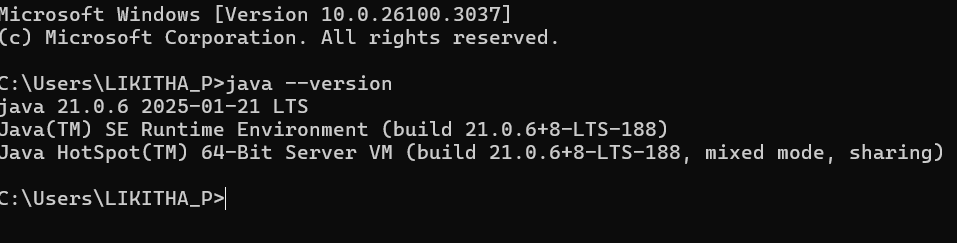
2)Click New and add: C:\Program Files\Java\jdk-21\bin

3)Click OK to save.

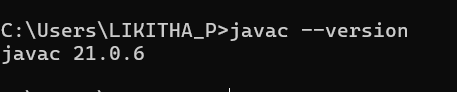


**Step 7:Verify Installation**

1. Open Command Prompt.
2. Type the following command: **java --version** and press Enter.



1. To check the java compiler type: **javac –version.**



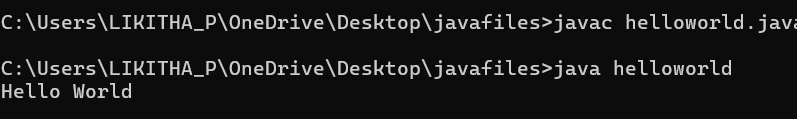
**PROGRAM-2:**

**AIM:** Write a Java program to print the message “Welcome to Java Programming.”

**CODE:**



**OUTPUT:**



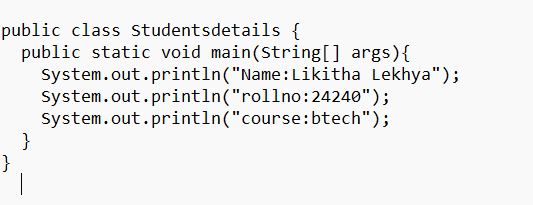
**ERRORS:** None found

**PROGRAM-3:**

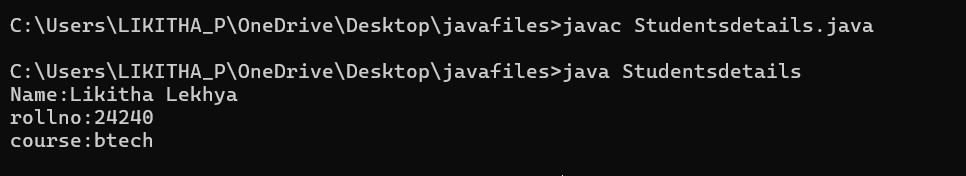
**AIM:** Write a Java Program that prints Name, Roll No, Section of a student.

**CODE:**

**STUDENT DETAILS:**



**OUTPUT:**



**ERROR TABLE:**

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1. writing small “S”in place of”S”   In system.out.println()  2)not giving strings to the name and scetion | 1. code is rectified by keeping capital “S” 2. Giving strings to name and section |

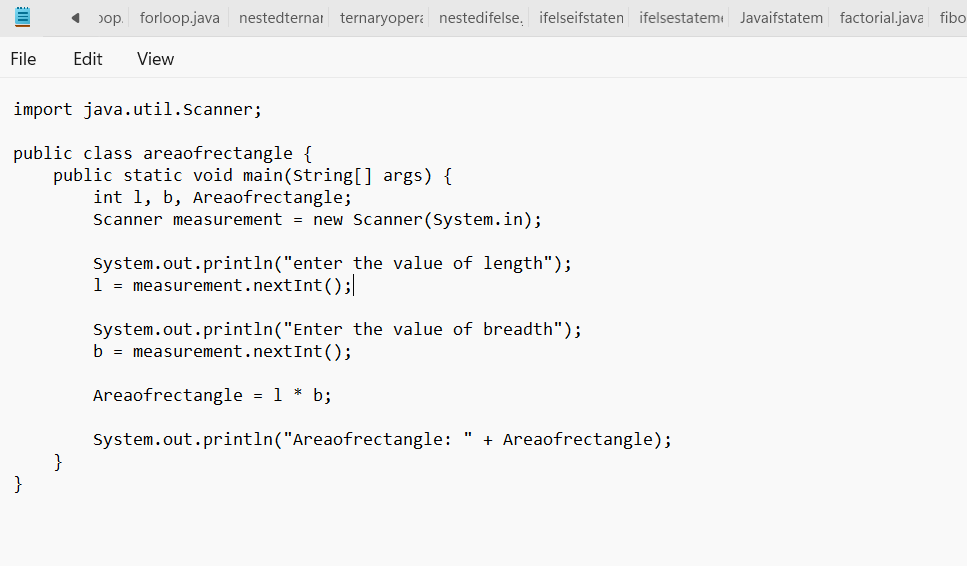
**IMPORTANT POINTS:**

1. When printing the statements, everything should be inside double quotes.

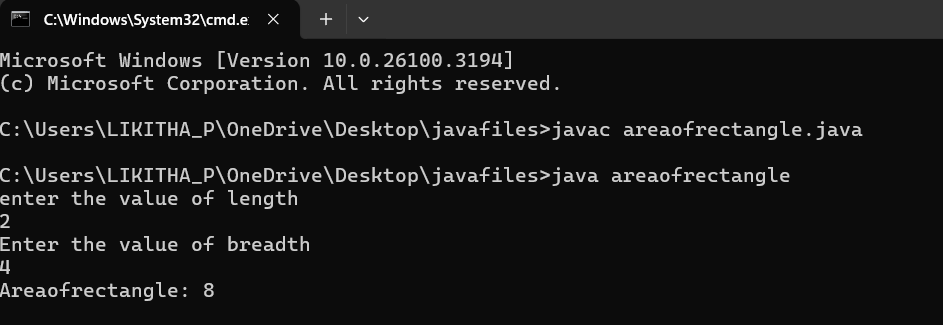
**WEEK-2:**

**1.AIM:** Write a Java Program for calculating area of rectangle

**PROGRAM:**



**OUTPUT:**



**ERROR TABLE:**

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1.While using for iteration, not giving the conditions correctly.  2.Declaring the data type as double instead of int. | 1.We should give iterative statements correctly.  2.We should give the data type as int for integers. |

**IMPORTANT POINTS:**

1.Area of a rectangle is area = l\*b, where

L = length of a side of the rectangle,

B= breadth of a side of the rectangle.

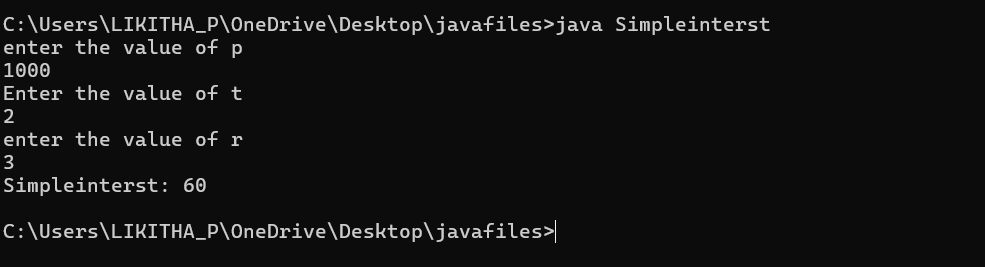
2.Here, we must be sure that all the expressions/conditions inside for the for loop must be given correctly.

**2.AIM:** Write a Java Program for calculating simple intrest

**PROGRAM:**

****

**OUTPUT:**



**ERROR TABLE:**

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1.Giving space between next and Double.  2.Not giving parenthesis after closing the input. | 1.Should not give space between next and Double.  2.We must put parenthesis after closing the input. |

**IMPORTANT POINTS:**

1.Simple interest formula is: (p\*t\*r)/100, where:

P: Principal amount

R: Rate of interest

T: Time period

2.The data type double indicates the floating points in the integers.

3.The line “import java.util.Scanner” indicates:

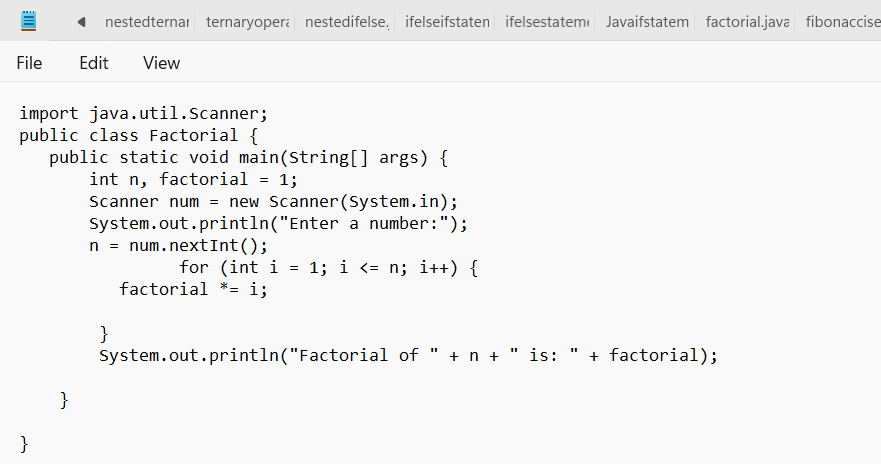
Import: tells the java compiler that we want to use a specific class or package in your code.

Java.util : This is the package that contains utility classes for Java programming, including the “Scanner” class.

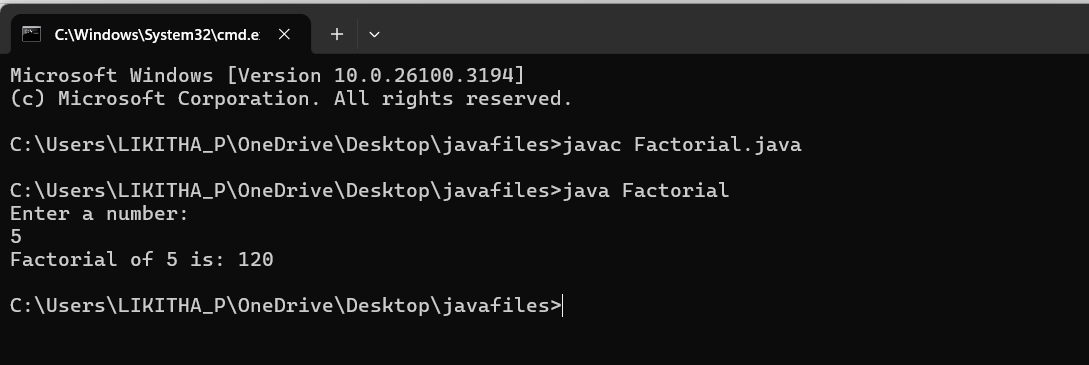
Scanner: this is the class that allows you to read input from the keyboard.

**3.AIM:** Write a Java Program for finding factorial of a number

**PROGRAM:**



**OUTPUT:**



**ERROR TABLE:**

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1.While using for iteration, not giving the conditions correctly.  2.Declaring the data type as double instead of int. | 1.We should give iterative statements correctly.  2.We should give the data type as int for integers. |

**IMPORTANT POINTS:**

1.While the for loop the data inside the parenthesis indicates the Initial expression

Test expression and

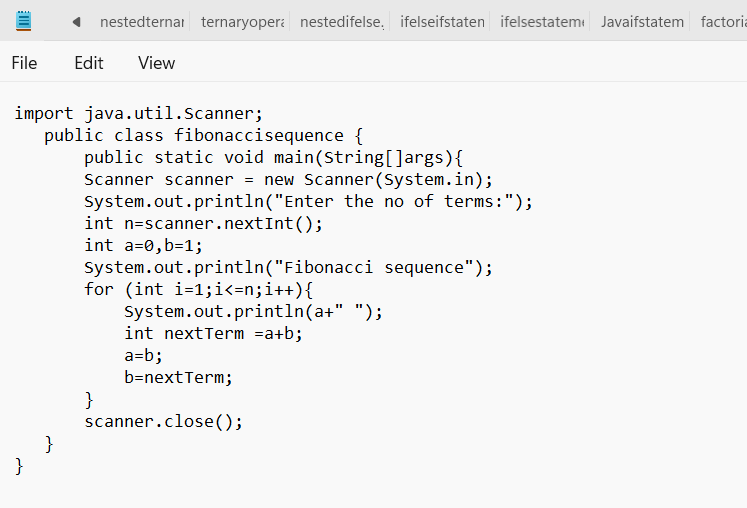
Update expression.

2.Here “factorial\*=I” means factorial = factorial\*I.

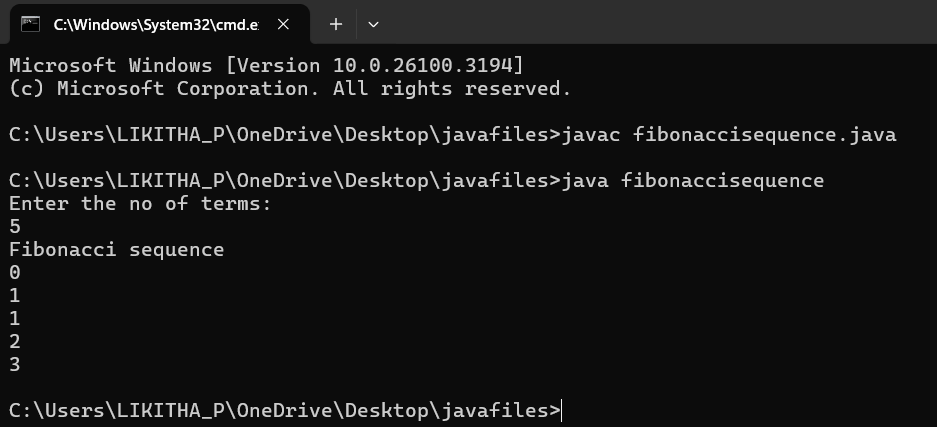
3.Here we are using the data type “int” just to calculate the integer values and it doesn’t support floating points.

**4.AIM:** Write a Java Program for finding Fibonacci series of a number

**PROGRAM:**

****

**OUTPUT:**



**ERROR TABLE:**

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1.Giving space between next and Double.  2.Not giving parenthesis after closing the input. | 1.Should not give space between next and Double.  2.We must put parenthesis after closing the input. |

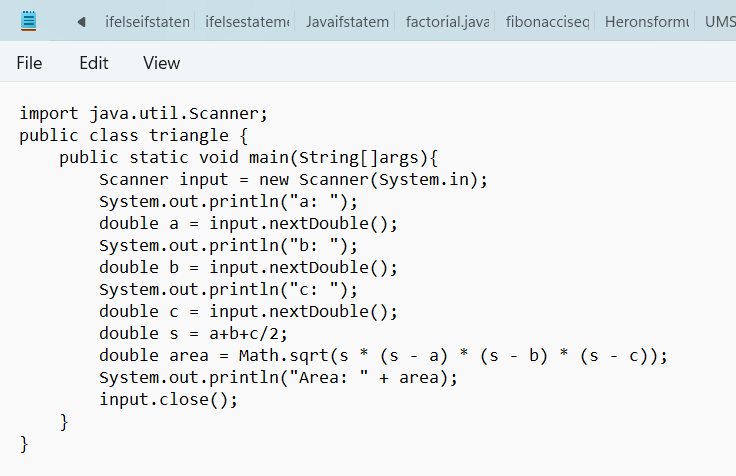
**IMPORTANT POINTS:**

1.In the Fibonacci sequence, the sum value is given to the second variable, and the value of the second variable is given to the first variable.

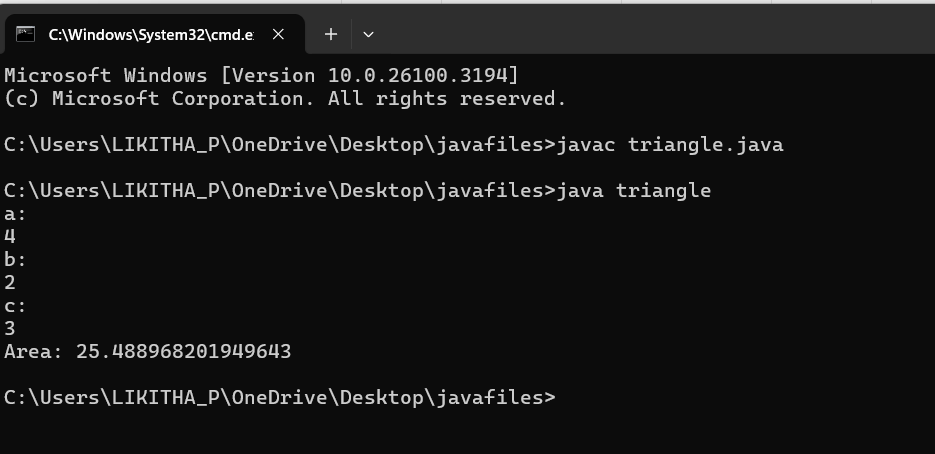
2.This process is repeated a certain number of times until the conditions are met.

**5.AIM**: Write a Java Program for calculating area of triangle using herons formula

**PROGRAM:**

****

**OUTPUT:**

****

**ERROR TABLE:**

|  |  |
| --- | --- |
| **Code Error** | Code rectification |
| 1.While printing the variable not giving + sign.  2.Not closing the scanner. | 1.We should give correct indentation.  2.Closing the scanner is must. |

**IMPORTANT POINTS:**

1.Here, we’re finding the area of a triangle using heron’s formula.

2.Heron’s formula for finding a triangle is:

S = (a +b +c)/2

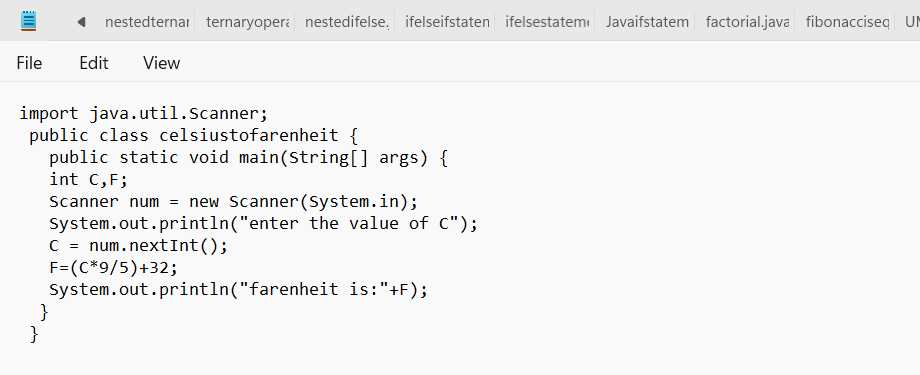
Where S is the semi-perimeter of the triangle.

Now the area formula is:

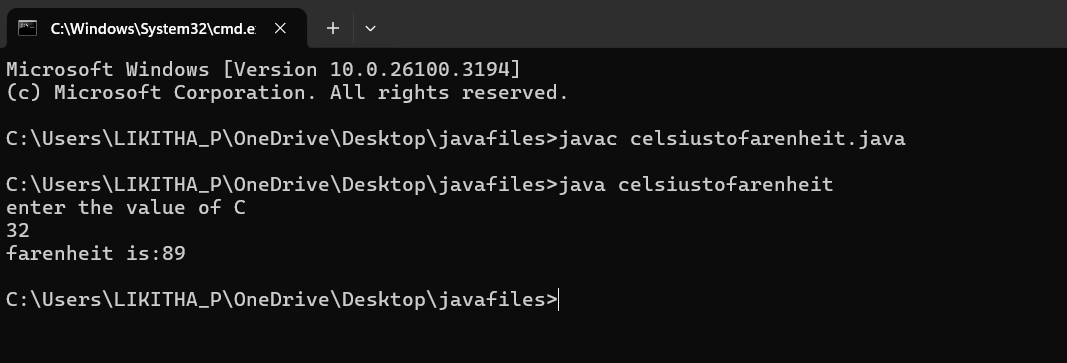
Area = sqrt(s\*(s-a)\*(s-b)\*(s-c)).

**6. I.) AIM:** Write a Java Program for conversion from Celsius to farenheit

**PROGRAM:**

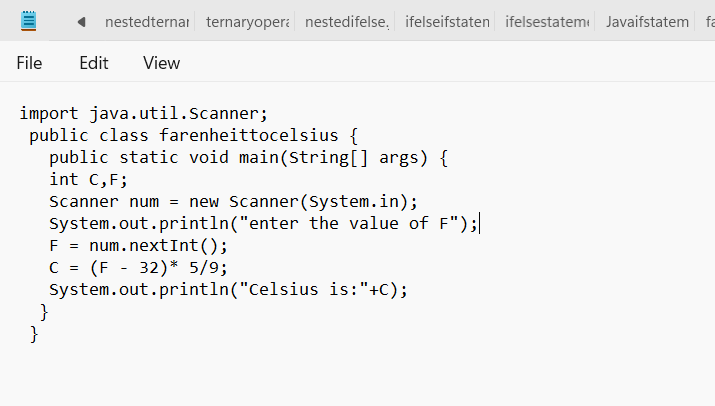


**OUTPUT:**

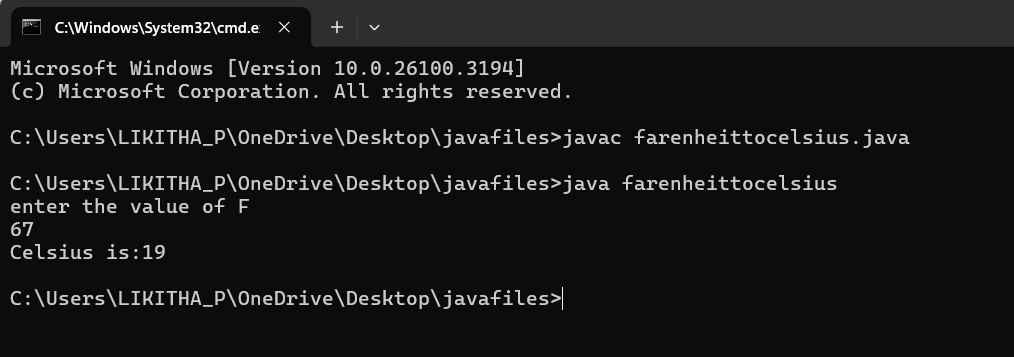


**II.) AIM:** Write a Java Program for conversion from farenheit to celsius

**PROGRAM:**

****

**OUTPUT:**



**ERROR TABLE:**

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1.While printing the variable not giving + sign.  2.Not closing the scanner. | 1.We should give correct indentation.  2.Closing the scanner is must. |

**IMPORTANT POINTS:**

1.The formula to convert a Fahrenheit to Celsius is

Celsius = (Fahrenheit-32)\*5/9

2.The formula to convert a Celsius to Fahrenheit is

Fahrenheit = (Celsius\*9/5)+32.

3.The line “Scanner input = new Scanner(System.in),” tends to create a new Scanner object named “input” that reads input from the standard input stream (System.in), like keyboard.

**WEEK -3:**

**1.AIM:** To create java program with following instructions :

1.Create a class with name Car

2.Create four attributes named car\_color,car\_brand, fuel\_type, mileage

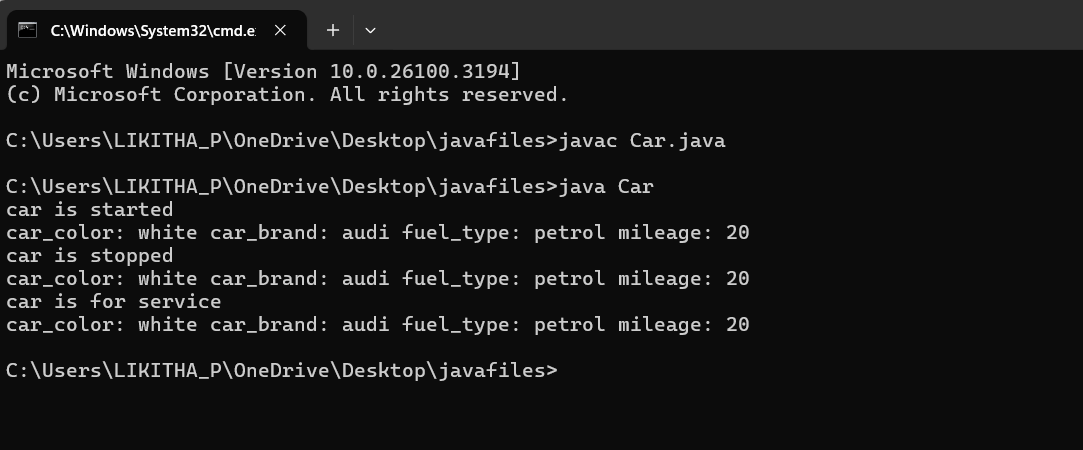
3.Create these methods named start(),stop(),service()

4.Create the objects named car, car1,car2

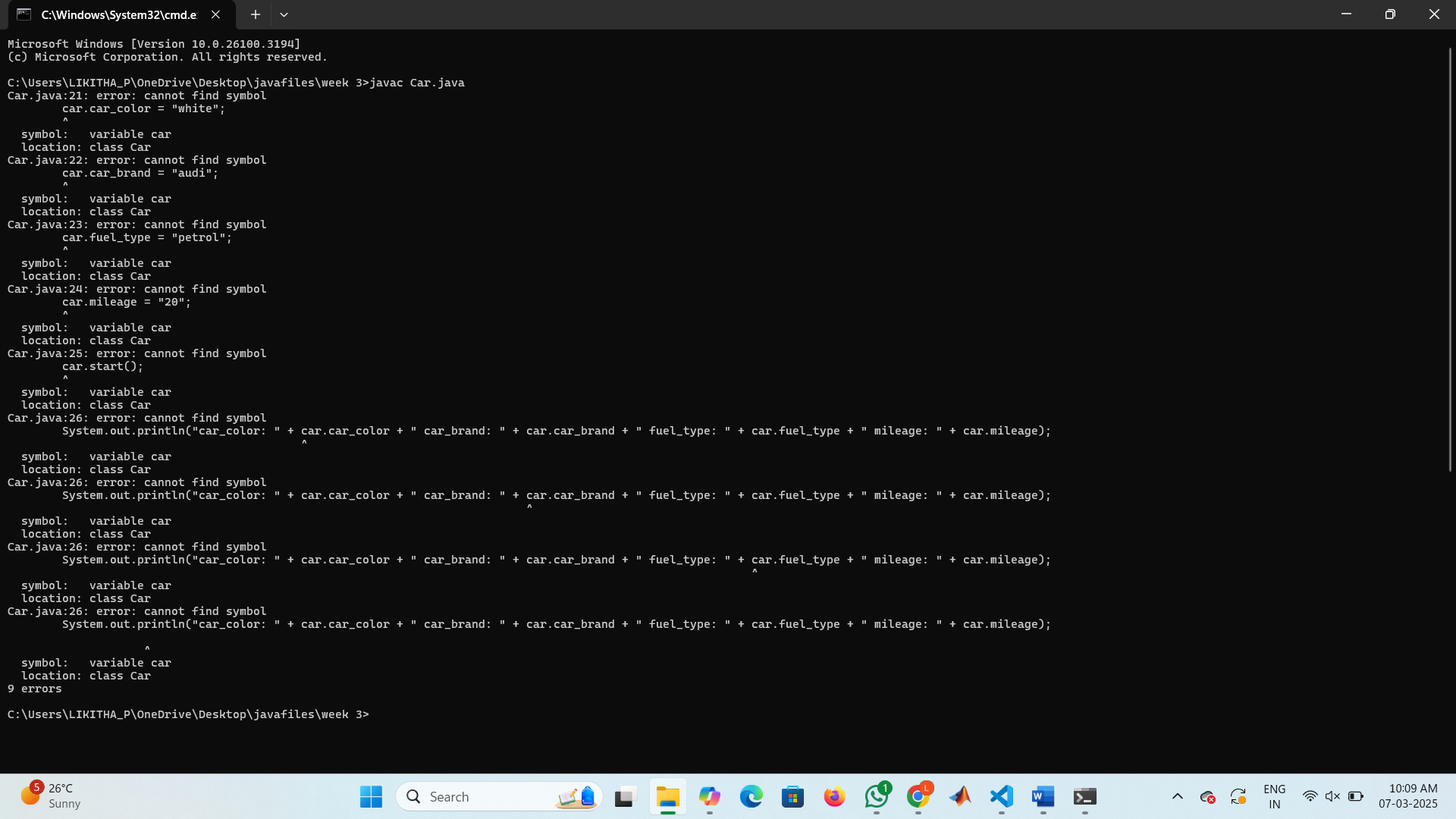
**PROGRAM:**

****

**OUTPUT:**



**NEGATIVE CASE:**



ERROR TABLE:

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1. Not putting the semi-colon; after calling the function. 2. After Start, Stop, Service not giving the parenthesis ( ). | 1. Put the semi-colon after the writing the code. 2. After every method, put the parenthesis ( ). |

**IMPORTANT POINTS:**

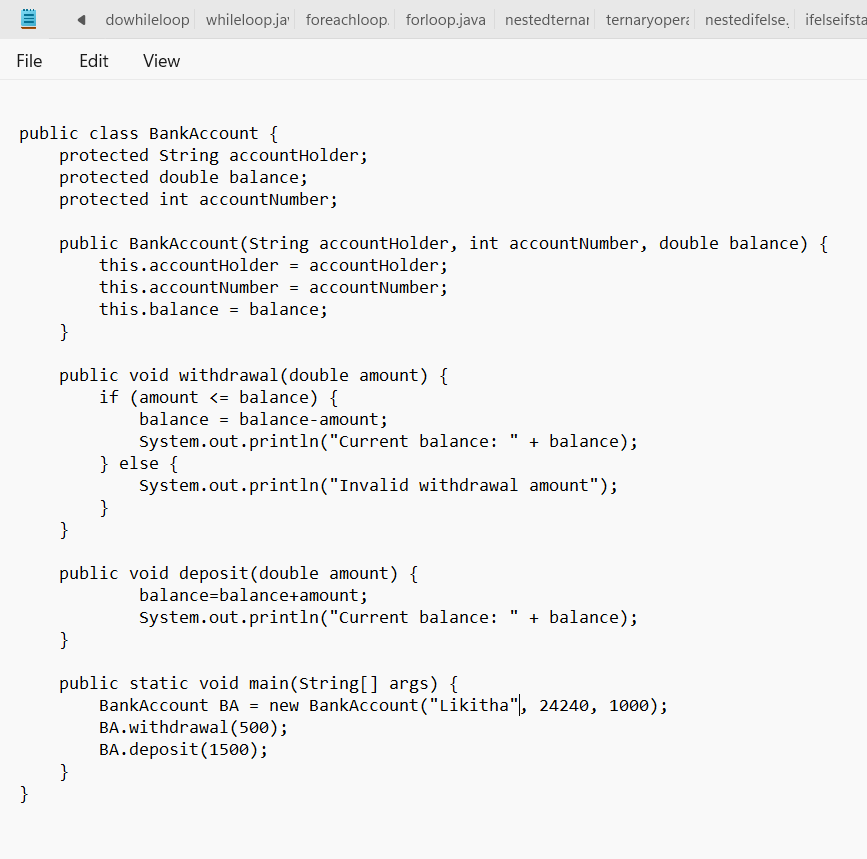
1. Before calling the function we should write the method properly.
2. Here, the “public void start( )” indicates that we are writing a method to call the function.
3. When we call a certain method, the process inside it will be printed as an output of the code.
4. Here the details inside the function are called objects, we can give any objects

**Class diagram:**

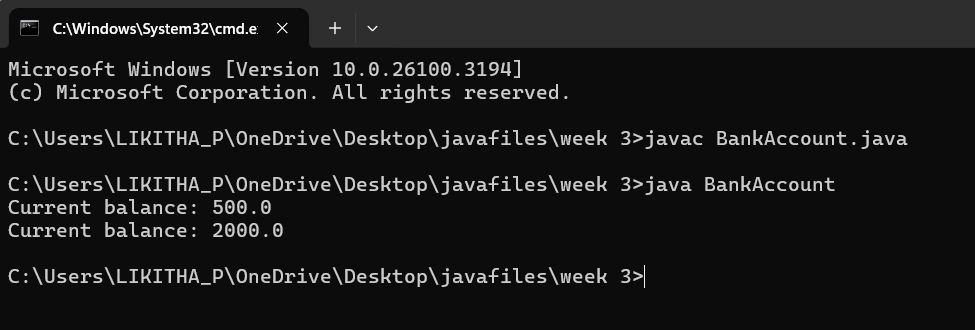
|  |
| --- |
| car  ------------------  -car\_color:string  -car\_brand:string  -fuel\_type:string  -milage:double  ------------------  +start():void  +stop():void  +service():void |

**2.AIM:** To create a class BankAccount with methods deposit() and withdraw() . create two subclasses savingsaccount and checkingaccount override the withdraw () method in each subclass to impose different withdrawal limits and fees

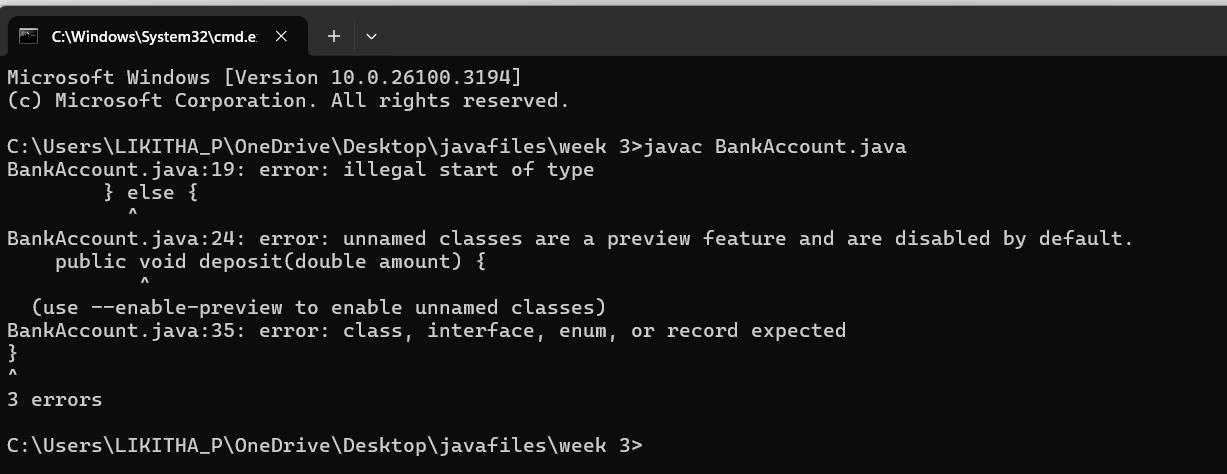
**PROGRAM:**

****

**OUTPUT:**



**NEGATIVE CASE:**

**** ERROR TABLE:

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1. Not putting the semi-colon; after calling the function. 2. After Withdrawal,deposit not giving the parenthesis ( ). | 1. Put the semi-colon after the writing the code. 2. After every method, put the parenthesis ( ). |

**IMPORTANT POINTS:**

1. The condition inside the if statement must be correct.
2. It explains that if the withdrawal money is less than the money in the bank account, then we can withdraw the amount.

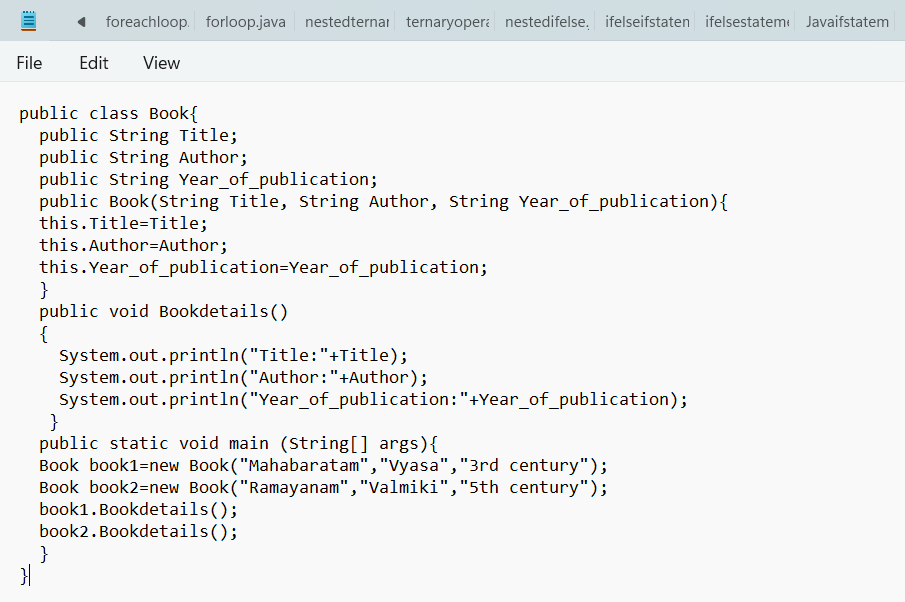
**Class diagram:**

|  |
| --- |
| BankAccount  ------------------------------------  -balance: double  ------------------------------------  +BankAccount(intialBalance: double)  +deposit(amount: double):void  +withdraw(amount: double):void |

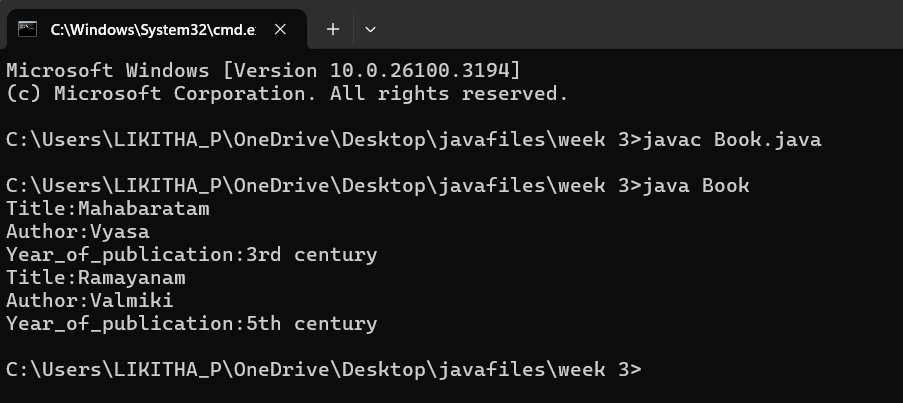
**WEEK -4:**

**1.AIM:**Write a java program with class named Book.The class should contain various attributes such as title,author,year of publication.It should also contain a constructor with parameters which initializes title,author and year of publication and create a method which displays the details of the book.Display the details of two books.

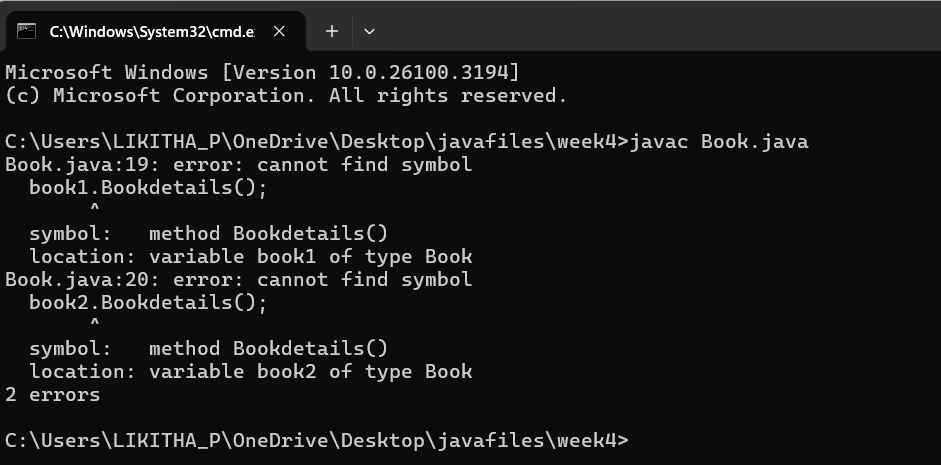
**PROGRAM:**

****

**OUTPUT:**

****

**NEGATIVE CASE:**

****

ERROR TABLE:

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1. Not defining the function in a file. 2. Two public class files should not be saved in the same file. | 1. To call the method we must define a function in a file. 2. Two public class files should be saved in different files. |

**IMPORTANT POINTS:**

1. While defining two classes for a code, we must be sure that we save both the classes in separate files.
2. While defining a method we should also define a function to call that method.

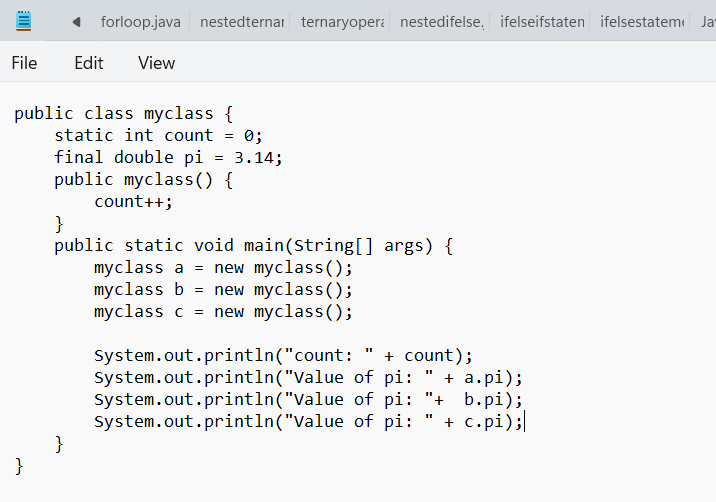
**CLASS DIAGRAM:**

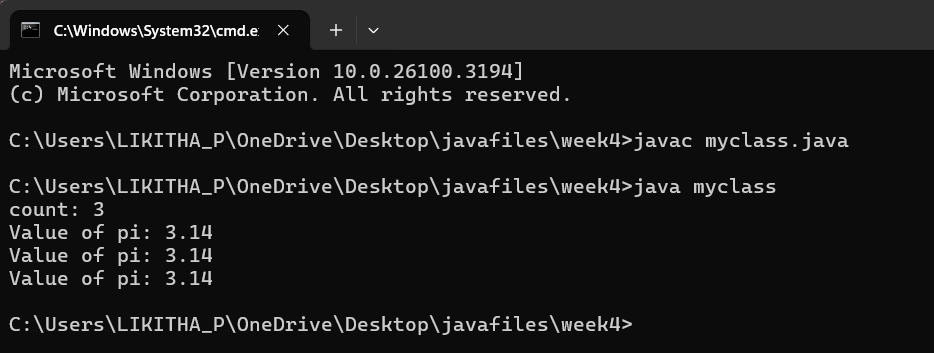
|  |
| --- |
| Book  -Title: String  -Author: String  -Year of publication: int  + Book(title: String,  Author: String;  Year of publication: int  + displayDetails( ): void |

**PROGRAM – 2:**

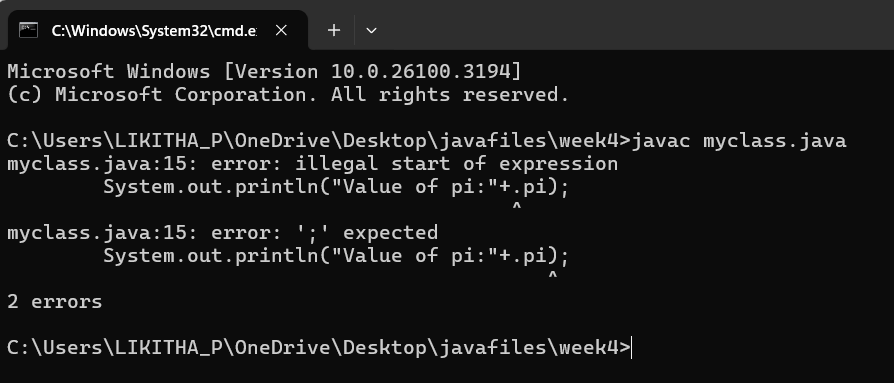
**AIM:** Create a java Program with class named myclass with static variable count of int type, initialized to zero and a constant variable “pi” of type double initialized to 3.14 as attributes of the class, ow define a constructor for “myclass” that increments the count variable each time an object of my class is created (count++), finally print the final values of count and pi variables create three objects.

**CODE:**

****

**OUTPUT:** ****

**NEGATIVE CASE:**

ERROR TABLE:

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1. Not Putting the semi-colon after calling a function, 2. Not giving the indentation properly. | 1. Put the semi-colon after calling a function. 2. All the indentation must be correct to run the code correct. |

**IMPORTANT POINTS:**

1. We must declare the initial value of the variable before declaring the final one.
2. Here the main objective is to increase the count according to the number of objects we make, i.e the count increases when the no.of objects are increasing.

**CLASS DIAGRAM:**

|  |
| --- |
| Myclass  -Count: int  -Pi: double  + myclass( )  + main(args: String[]): void |

**WEEK-5**

**PROGRAM-1:**

**AIM:** Create a calculator using the operations including addition, subtraction, multiplication, and division using multi-level inheritance and display the desired output.

Hint: collect required variables using super class,Create each class for a parameter and each class must contain a method.

**CODE:**

class calculator {

protected double a, b;

public calculator(double a, double b) {

this.a = a;

this.b = b;

}

}

class Addition extends calculator {

public Addition(double a, double b) {

super(a, b);

}

public double add() {

return a + b;

}

}

class Subtraction extends Addition {

public Subtraction(double a, double b) {

super(a, b);

}

public double subtract() {

return a - b;

}

}

class Multiplication extends Subtraction {

public Multiplication(double a, double b) {

super(a, b);

}

public double multiply() {

return a \* b;

}

}

class Division extends Multiplication {

public Division(double a, double b) {

super(a, b);

}

public double divide() {

if (b != 0) {

return a / b;

} else {

System.out.println("Error");

return Double.NaN;

}

}

}

class Final extends Division {

public Final(double a, double b) {

super(a, b);

}

public void displayResults() {

System.out.println("Addition: " + add());

System.out.println("Subtraction: " + subtract());

System.out.println("Multiplication: " + multiply());

System.out.println("Division: " + divide());

}

}

import java.util.Scanner;

public class allcalculator {

public static void main(String[] args) {

Scanner input = new Scanner(System.in);

System.out.println("Enter a number: ");

double a = input.nextDouble();

System.out.println("Enter b number: ");

double b = input.nextDouble();

Final calc = new Final( a, b);

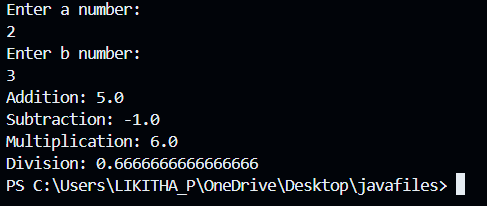
calc.displayResults();

input.close();

}

}

**OUTPUT:**

****

**CLASS DIAGRAM:**

|  |
| --- |
| Calulator  -a : double  -b : double  + Calculator(a,b) |

|  |
| --- |
| Addition  + add(): double |

|  |
| --- |
| Subtraction  + subtract(): double |

|  |
| --- |
| Multiplication  +multiply(): double |

|  |
| --- |
| Division  +divide(): double |

ERROR TABLE:

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1. not providing the return method correctly. 2. Not mentioning super to obtain the super class constructor. | 1. After declaring methods, we must provide the return method correctly. 2. To obtain the super class we need to mention super. |

**NEGATIVE CASE:**

****

**IMPORTANT POINTS:**

1. To get the inputs from the user we use import java.util.Scanner; this is a package.
2. Scanner class is used to get the user input.
3. in java.util.Scanner, the java.util is a package while Scanner is a class of the java.util package.
4. to import a whole package, end the sentence with an asterisk sign(\*).

**PROGRAM-2**

**AIM:** A vehicle rental company wants to develop a system that maintains information about different types of vechicles 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( should be in super class)

1. cars should have an additional property: no.of doors
2. Bikes should have a property indicating whether they have gears or not.
3. The system should also include a function to display details about each vehicle and indicate when a vehicle is starting.
4. Every class should have a constructor

**Question:**

1. Which oops concept is used in the above program
2. If the company decides to add a new type of vehicle, Truck, how would you modify the program?
3. Truck should include an additional property capacity (in tons)
4. Create a showTruckdetails() method to display the truck’s capacity.
5. Write a constructor for Truck that initializes all properties
6. Implement the truck class and update the main method to create a Truck object and also create an object for car and bike sub classes Finally, display the details.

**CODE:**

public class vehicle {

public String brand;

public int speed;

public vehicle(String brand, int speed) {

this.brand = brand;

this.speed = speed;

}

public void start() {

System.out.println(brand + " is starting");

}

public void showDetails() {

System.out.println("Brand: " + brand);

System.out.println("Speed: " + speed + " km/h");

}

}

class Car extends vehicle {

private int noOfDoors;

public Car(String brand, int speed, int noOfDoors) {

super(brand, speed);

this.noOfDoors = noOfDoors;

}

public void showDetails() {

super.showDetails();

System.out.println("Number of Doors: " + noOfDoors);

}

}

class Bike extends vehicle {

private boolean hasGears;

public Bike(String brand, int speed, boolean hasGears) {

super(brand, speed);

this.hasGears = hasGears;

}

public void showDetails() {

super.showDetails();

System.out.println("Has Gears: " + (hasGears ? "Yes" : "No"));

}

}

class Truck extends vehicle {

private int capacity;

public Truck(String brand, int speed, int capacity) {

super(brand, speed);

this.capacity = capacity;

}

public void showTruck() {

super.showDetails();

System.out.println("Capacity: " + capacity + " tons");

}

}

public class rent {

    public static void main(String[] args) {

        Car car = new Car("Toyota", 150, 4);

        Bike bike = new Bike("Yamaha", 120, true);

        Truck truck = new Truck("Volvo", 90, 10);

        System.out.println("Car Details");

        car.start();

        car.showDetails();

        System.out.println("Bike Details");

        bike.start();

        bike.showDetails();

        System.out.println("Truck Details");

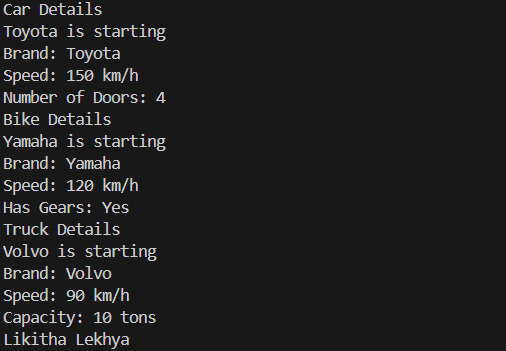
        truck.start();

        truck.showTruck();

    }

}

**OUTPUT:**



**CLASS DIAGRAM:**

|  |
| --- |
| Vehicle  -Brand : str  -Speed: int  + init (brand, speed)  +start\_vehicle()  +display\_details() |

Car Bike Truck

-no.of.doors: int -has gears: bool -capacity: float

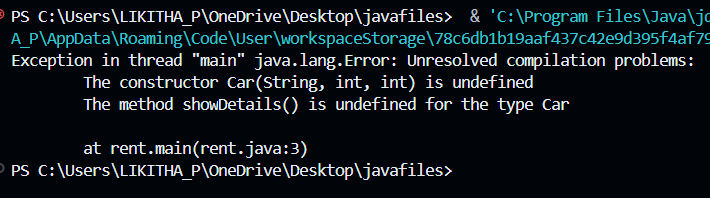
+init (brand, speed +init (brand, speed - displaydetails()

, no.of.doors) , has gears)

ERROR TABLE:

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1. Declaring two superclasses inside the same file. 2. Not declaring the variable using ‘this’ keyword inside the constructor. | 1. Make two separate files to save the two super classes. 2. Declare the variable using this keyword to run the program. |

**NEGATIVE CASE:**

****

**IMPORTANT POINTS:**

1. a constructor helps in initializing an object that doesn't exist.
2. a method performs functions on pre-constructed or already developed objects.
3. a double method can represent more decimal point numbers than float method.
4. the void keyword in java is used to specify that a method does not return any value. it is a return type that indicates the method performs a function and doesn't produce a result.

**Answer:**

The oops concepts used in the above program are:

Inheritance, encapsulation, polymorphism, abstraction.

To add a new vehicle type truck we need to create a truck class that will:

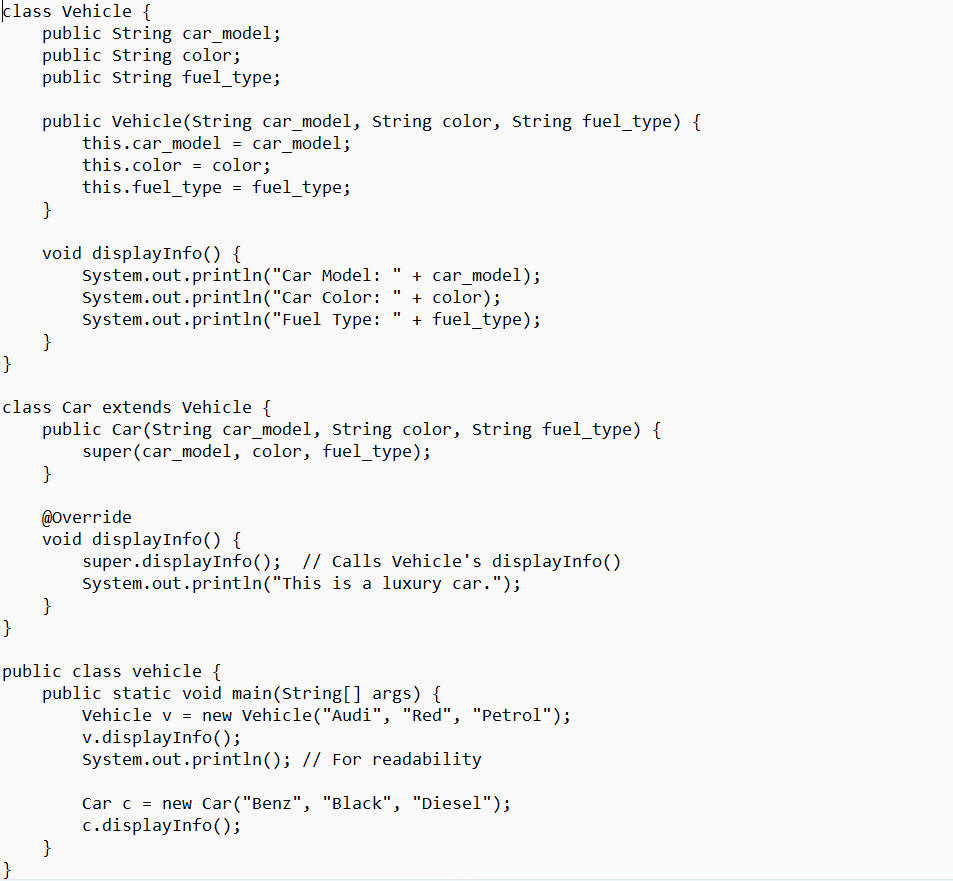
* Include an additional property capacity (in tons).
* Implement a showtruckdetials() method to display the truck's capacity.
* Implement a constructor for the truck class to initialize all its properties.

**WEEK-6**

**PROGRAM-1:**

**AIM:**

**CODE:**



**CLASS DIAGRAM:**

Vehicle

──────────────

- brand: String

- speed: int

───────────────

+ Vehicle(brand: String,

speed: int)

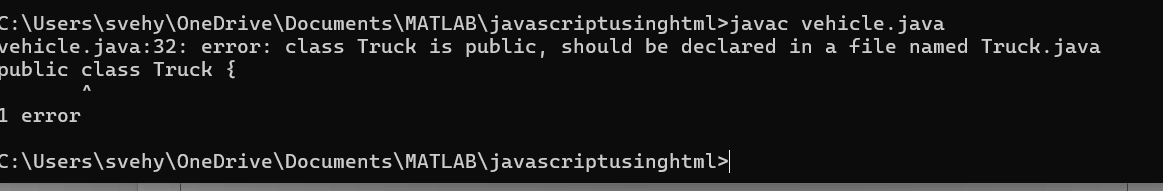
+ startVehicle(): void

+ displayDetails(): void

ERROR TABLE:

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| |  | | --- | | **1.Incorrect class name for** main **method (**Truck**)** | | **2.Inconsistent car model output in** displayInfo() | | |  | | --- | | 1.Rename Truck to Main or place main inside Car or Vehicle. | | 2.Ensure Car correctlypasses  Benz" to super(car\_model,  color, fuel\_type);. | |

**NEGATIVE CASE:**



**IMPORTANT POINTS:**

**Inheritance:** The Car class extends the Vehicle class, demonstrating **inheritance** in Java.

**Constructor Chaining:**The Car class calls the parent constructor using super(car\_model, color, fuel\_type); to initialize inherited attributes.

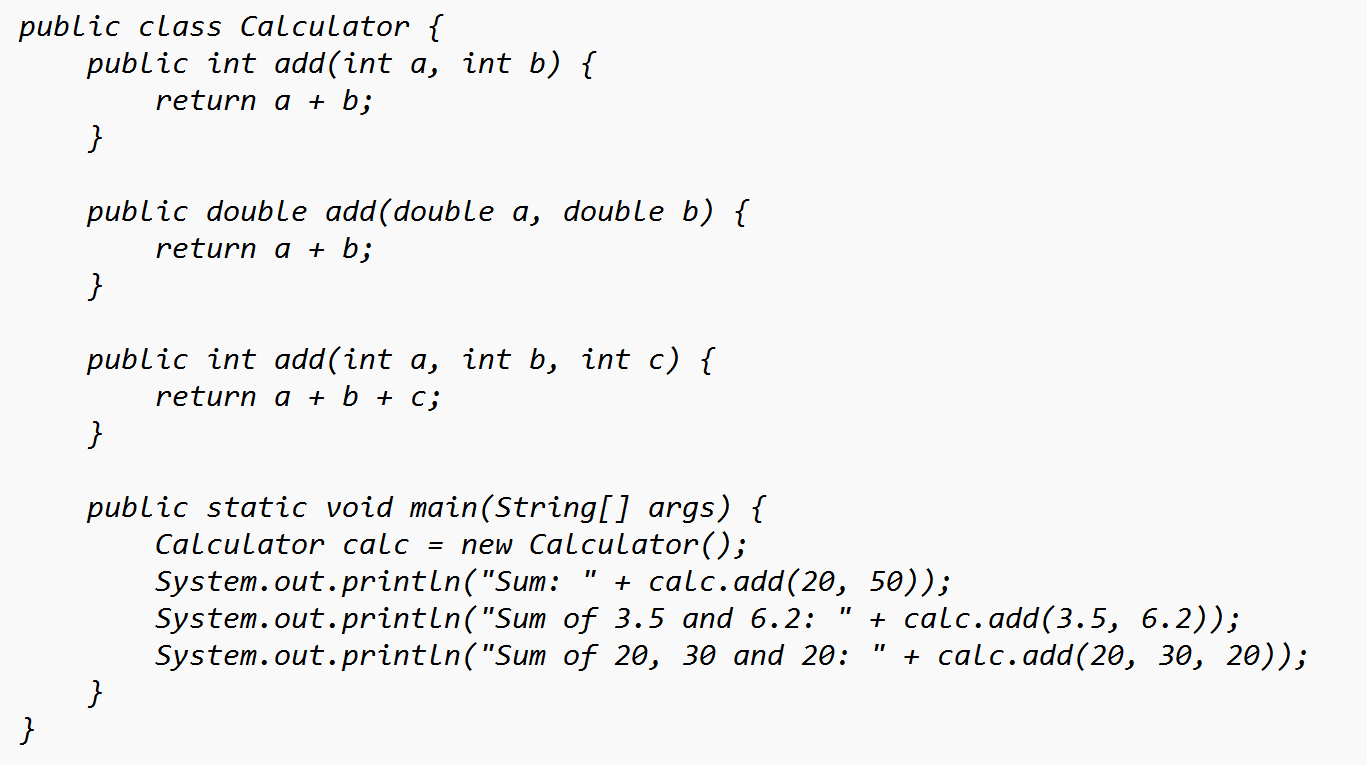
**Method Overriding:**The Car class overrides the displayInfo() method from Vehicle and calls super.displayInfo() to reuse the parent method before adding its own output.

**Incorrect** main **Class Name:**The main method is inside Truck, which is unrelated to Vehicle and Car. The class should be renamed for clarity.

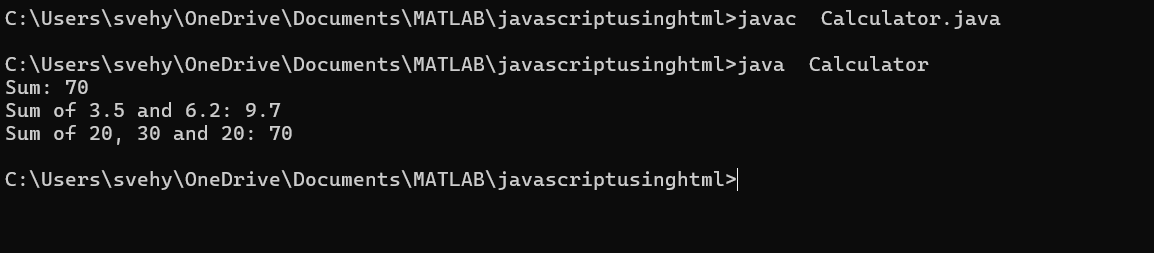
**PROGRAM-2:**

**AIM:**

**CODE:**



OUTPUT:



**CLASS DIAGRAM:**

Calculator

+add(int, int): int

+add(double, double): double

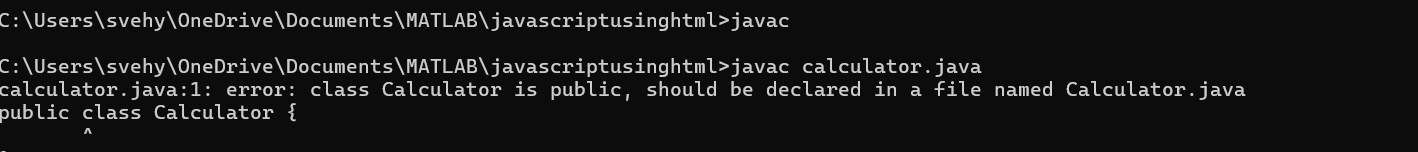
+add(int, int, int): int

+main(String[]): void

ERROR TABLE:

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| 1. Method parameters missing spaces   2. Inconsistent indentation in method bodies | 1. Add proper spacing between 2.Fix indentation |

**NEGATIVE CASE:**



**IMPORTANT POINTS:**

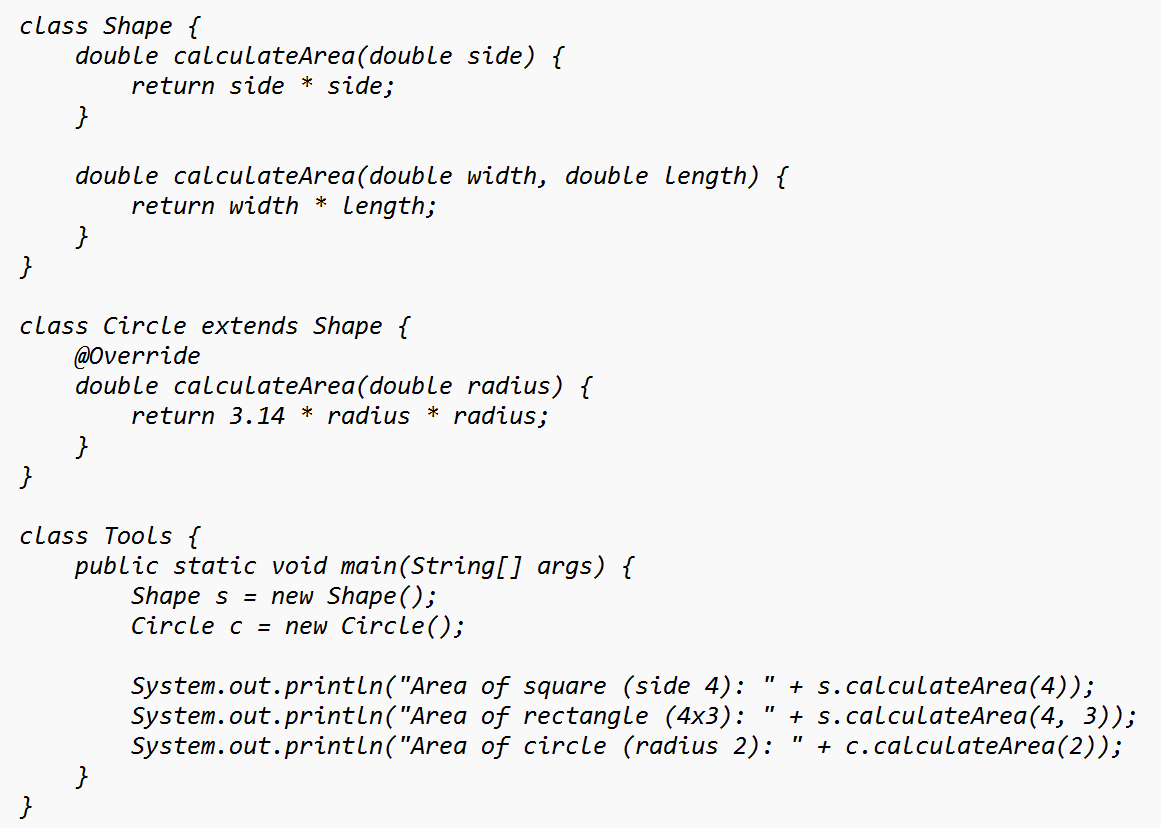
**1.Method Overloading:** The add method is overloaded with different parameter types and counts, demonstrating compile-time polymorphism.

**2.Automatic Method Selection:** Java selects the appropriate add method based on the argument types during compilation.

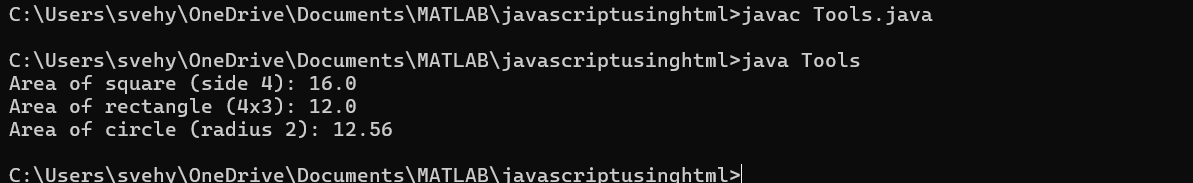
**PROGRAM-3:**

**AIM:**

**CODE:**



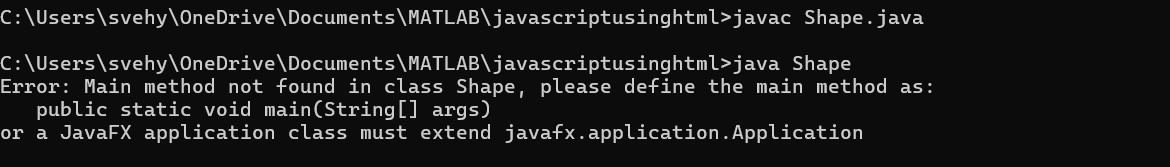
**OUTPUT:**



ERROR TABLE:

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| |  | | --- | | **1.Method calls in main are missing an object reference** | | **2.Circle class method does not override theparent class method properly.** | | |  | | --- | | 1.Use s.calculateArea(4) and c.calculateArea(2) to call the method correctly. | | 2.Ensure @Override is used, and  the method signature should match correctly. | |

**NEGATIVE CASE:**

****

**IMPORTANT POINTS:**

**1.Inheritance**: Circle class extends Shape, inheriting its methods.

**2.Method Overloading**: Shape has multiple calculateArea methods with different parameters.

**3.Method Overriding**: Circle overrides calculateArea from Shape to implement its own formula.

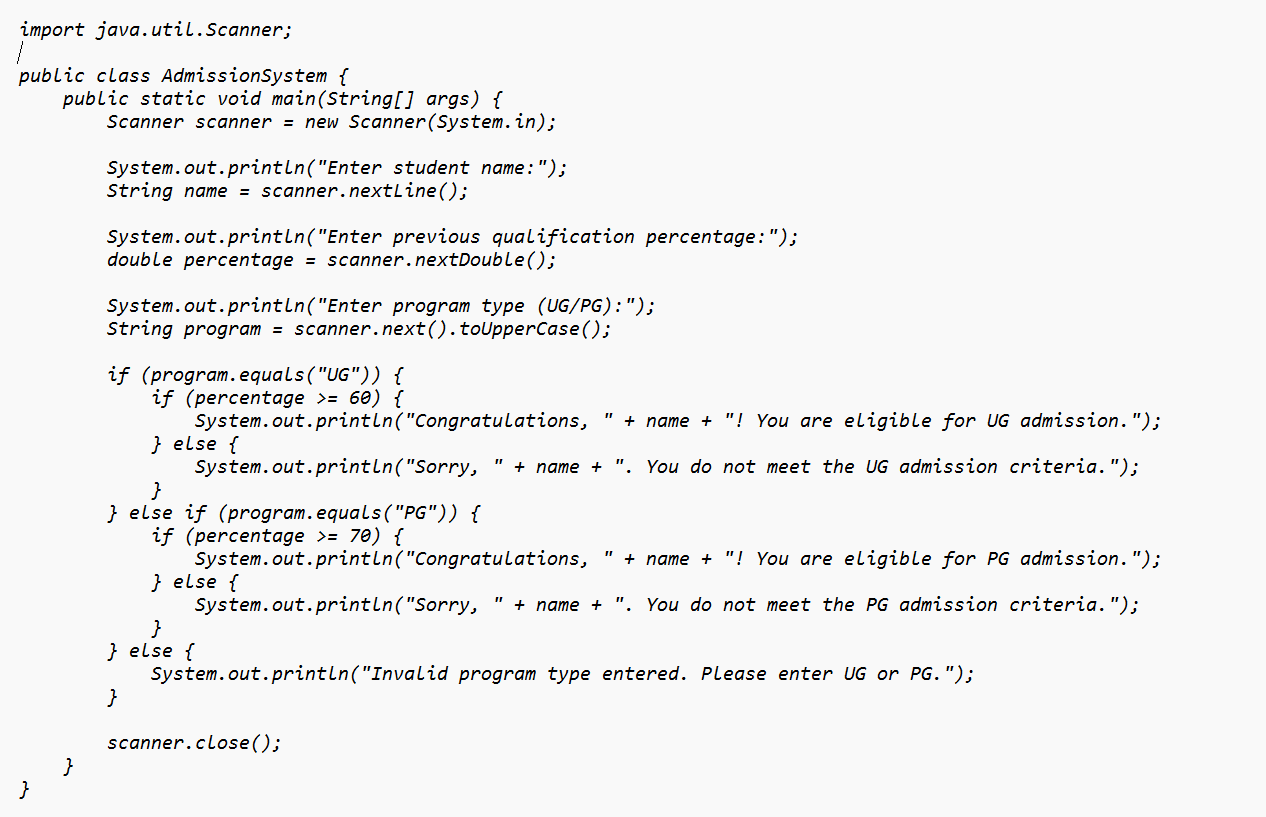
**4.Polymorphism**: The overridden method in Circle demonstrates runtime polymorphism.

**5.Proper Object Reference**: Methods should be called using an object (s.calculateArea(4), c.calculateArea(2)).

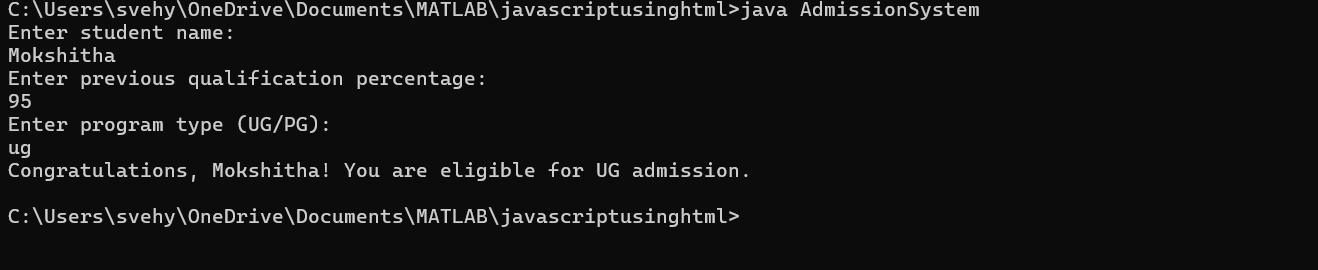
**PROGRAM-4:**

**AIM:**

**CODE:**



OUTPUT:



**CLASS DIAGRAM:**

AdmissionSystem

- scanner: Scanner

- name: String

- percentage: double

- program: String

+ main(args: String[]): void

+ takeInput(): void

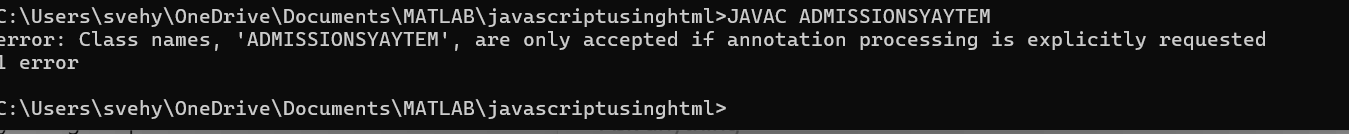
+ checkEligibility(): void

+ closeScanner(): void

ERROR TABLE:

|  |  |
| --- | --- |
| **Code Error** | **Code rectification** |
| |  | | --- | | **1.Scanner nextLine() issue after nextDouble()**: After scanner.nextDouble(), the newline character remains in the buffer, causing nextLine() to be skipped. | | **2.Program type input case sensitivity issue**: If the user enters ug or pg in lowercase, it may cause incorrect comparisons. | | |  | | --- | | 1.Add scanner.nextLine(); after nextDouble(); to consume the leftover newline. | | 2.Use program.toUpperCase() to ensure case-insensitive comparison. | |

**NEGATIVE CASE:**



**IMPORTANT POINTS:**

**User Input Handling:** Uses Scanner to take user input for name, percentage, and program type.

Decision Making with Conditions**:** Uses if-else statements to check eligibility criteria.

**String Handling:** Converts program input to uppercase (toUpperCase()) to handle case variations.

**Closing Scanner:** Properly closes scanner using scanner.close(); to prevent resource leaks.