**23CSE111**

**OBJECT ORIENTED PROGRAMMING**

**LAB REPORT**



**Department of Computer Science Engineering**   **Amrita School of Computing**

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**Roll No: 24220**

**Verified By**

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| --- | --- | --- | --- | --- | --- |
| **WEEK** | **SNO.** | **TITLE** | **DATE** | **PAGE** | **SIGNATURE** |
| **WEEK1** |  |  |  |  |  |
|  | **1** | **How to install jdk (java development kit) from Oracle.** |  |  |  |
|  | **2** | **Write a java program of student details.** |  |  |  |
|  |  |  |  |  |  |
| **WEEK2** | **1** | **Write a java program to calculate the area of a rectangle.** |  |  |  |
|  | **2** | **Write a java program to temperature from Celsius to Fahrenheit and vica-versa.** |  |  |  |
|  | **3** | **Write a java program to calculate the simple interest.** |  |  |  |
|  | **4** | **Write a java program to find the factorial of a number.** |  |  |  |
|  | **5** | **Write a java program to find the fibonacci sequence of a number.** |  |  |  |
|  |  |  |  |  |  |
| **WEEK-3** | **1** | **To create a java program with the following instructions:**   1. **Create a class with name “Car”** 2. **Create 4 attributes, named: car\_color, car\_brand, fuel\_type, mileage.** 3. **Create 3 methods, named: start(), service(), stop()** 4. **Create 3 objects, named: car1, car2, car3** 5. **Create a constructor, which should print, “Welcome to car garage” .** |  |  |  |
|  | **2** | **To write a java program to create a class named BankAccount, with 2 methods deposit() and withdraw().**   1. **deposit(): Whenever an amount is deposited, it has to be update the current amount.** 2. **withdraw(): Whenever an amount is withdrawn, it has to be less than the current amount , else print (“Insufficient funds”) .** |  |  |  |
|  |  |  |  |  |  |
| **WEEK-4** | **1** | **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.**  **Create a method which displays the details of the book and display the details of two books.** |  |  |  |
|  | **2** | **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.** |  |  |  |
|  |  |  |  |  |  |
| **WEEK-5** | **1** | **Create a calculator using the operations including addition, subtraction**  **Multiplication and division using multilevel inheritance and display the desired output.** |  |  |  |
|  | **2** | **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.**   1. **Cars should have an additional property: number of doors, seating capacity.** 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.**   **Questions**   1. **Which OOP concept is used in the above program? Explain why it is useful in this scenario?** 2. **If the company decides to add a new type of vehicle: Truck, how would you modify the program?**    * **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.** 3. **Implement the Truck class and update the main method to create a Truck object and also create an object for car and bike subclasses. Properly display its details.** |  |  |  |
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# WEEK-1

1. **Process of Installing JDK (Java Development Kit)**

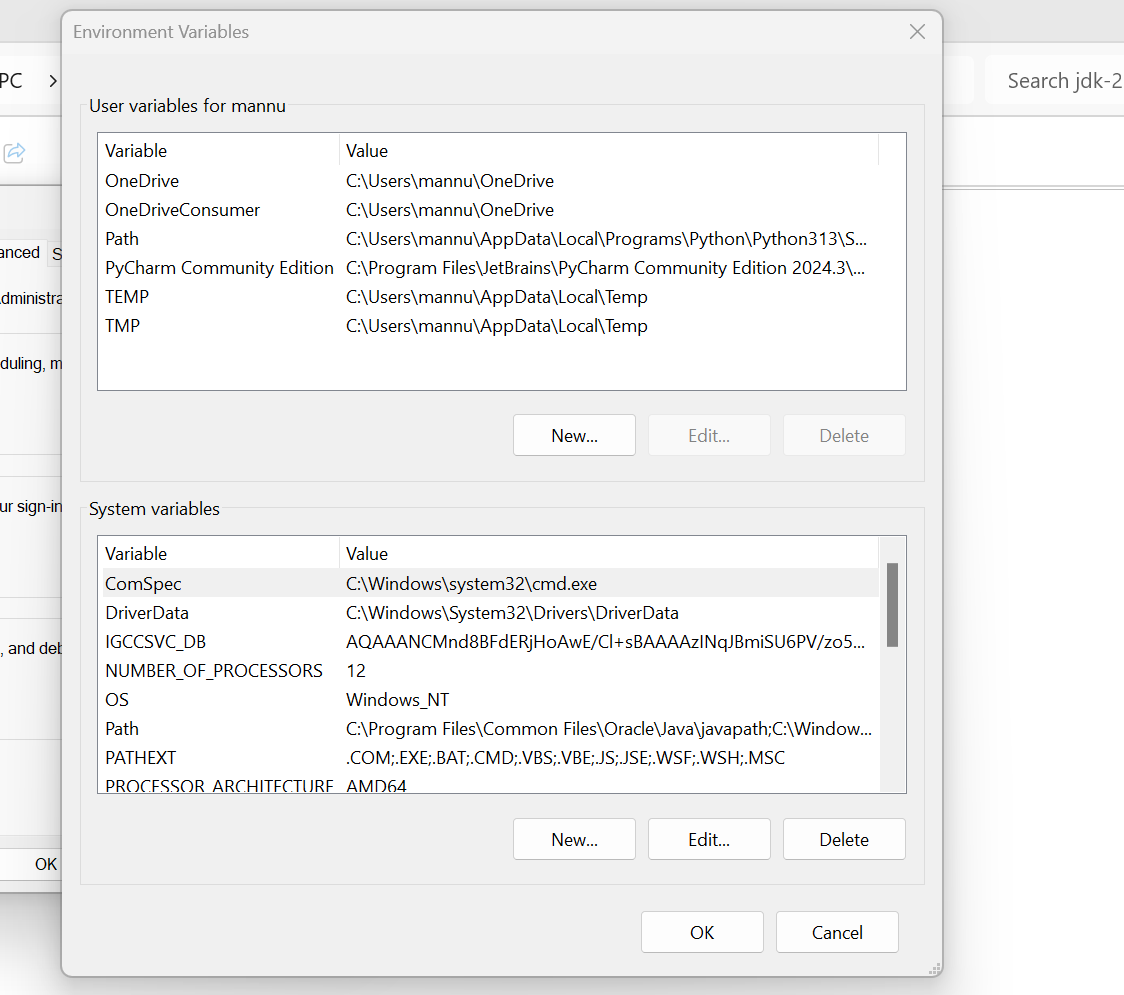
**Installing JDK (Java Development Kit):**

* 1. **Download JDK:**
* Go to the Oracle JDK download page in google and click on JDK-21 version which is Long term support (LTS) version.
* Click the download link as your operating system (Windows, macOS, or Linux).
  1. **Install JDK:**
* Once downloaded, run the installer.
* Follow the given instructions and keep clicking "Next" until it is done.
  1. **Set Environment Variables (Windows):**
* Open file explorer, then right click on This PC next select on properties then it will take you to the settings app then click on advanced system settings and then click on **Environment Variables**.
* Click on path and new under **System Variables**:

**Variable value:** The folder address where JDK is installed (like

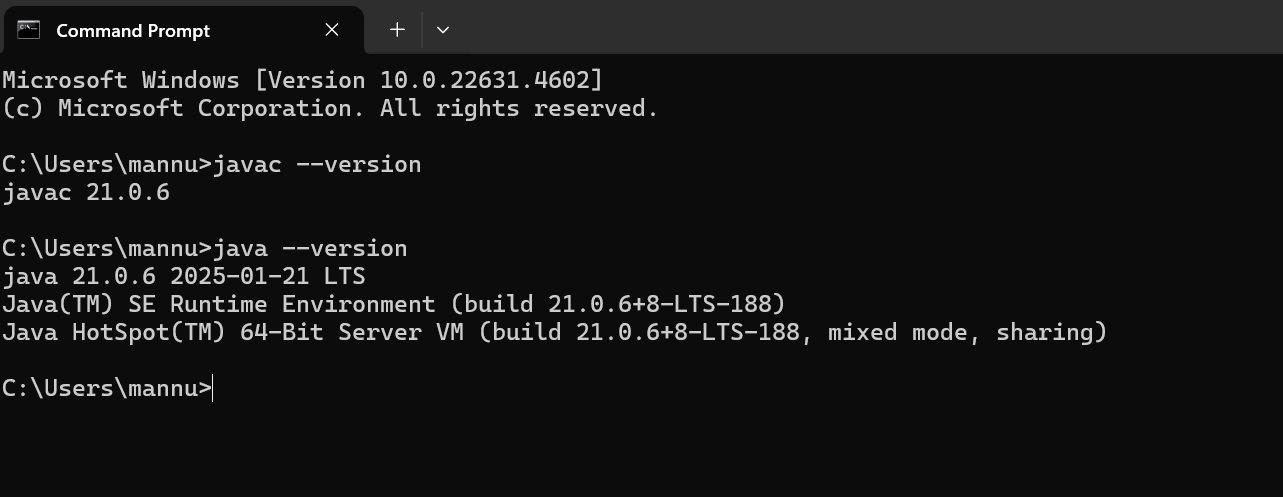
C:\Program Files\Java\jdk-21\bin)

* Find Path under **System Variables**, click **New**, and add the path of the jdk-21(C:\Program Files\Java\jdk-21\bin)



**Checking JDK Version: -**

* 1. **Open Command Prompt:**
* Presswin+R, typecmd, and press Enter.
  1. **Check Version:**
* Type java -version and press Enter.
* Type javac --version and press Enter.



1. **Simple Java Program for printing Name, Class, Roll No, of a Student**

Write your code in Notepad and execute it in cmd prompt

**CODE: -**

class Main

{

public static void main(String[] args)

{

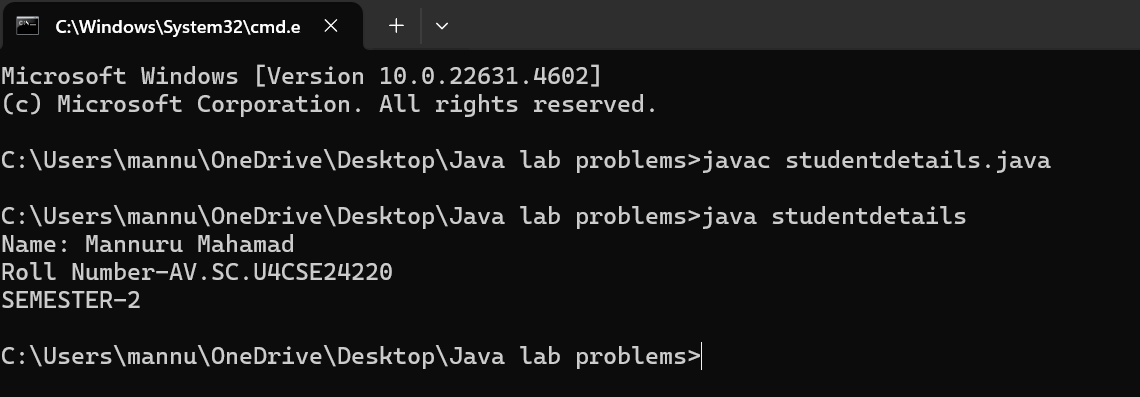
System.out.println("Name: Mannuru Mahamad");

System.out.println("Roll Number-AV.SC.U4CSE24220");

System.out.println("SEMESTER-2");

}

}

**Output: -**

Errors

|  |  |  |
| --- | --- | --- |
| 1 | Syntax error | Semicolon added |
| 2 | Runtime error | Copied correct path |
| 3 | Name error | rectified |

**WEEK -2**

**SIMPLE JAVA programs**

**1.Write a java program to calculate the area of rectangle:**

SYNTAX:

import java.util.\*;

classdemo

{

public static void main(String[] args)

{

Scanner sc = new Scanner(System.in);

System.out.println(“enter a number:”);

int l = sc.nextInt();

System.out.println(“enter a number;”);

int b = sc.nextInt();

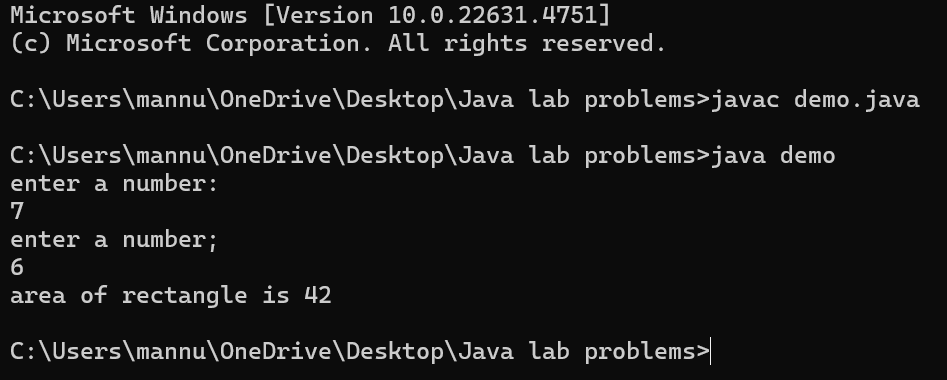
int a = l\*b;

System.out.println(“area of rectangle is “+a);

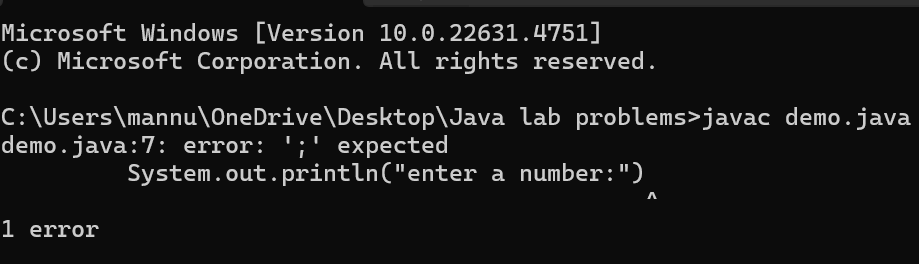
}

}

**OUTPUT:**



Negative Case:



**Errors:**

|  |  |  |
| --- | --- | --- |
| 1 | Syntax error | Semicolon added |
| 2. | Name error | rectified |

**2. Write a java program to find simple interest where all inputs are taken from user:**

Syntax:

import java.util.\*;

class test

{

public static void main(String[] args)

{

System.out.println(" taking input");

Scanner sc = new Scanner(System.in);

System.out.println("enter INTa number:");

float p = sc.nextFloat();

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

float t = sc.nextFloat();

System.out.println("enter a num:");

float r = sc.nextFloat();

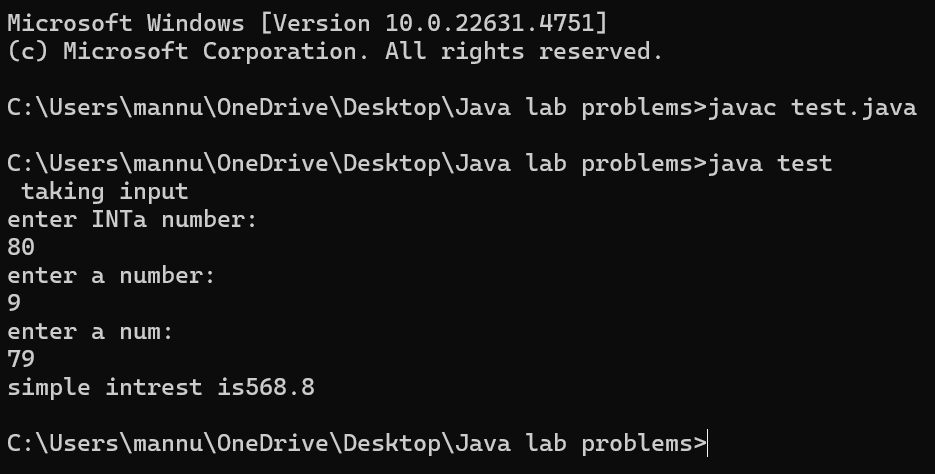
float s = (p\*t\*r)/100;

System.out.println("simple intrest is"+s);

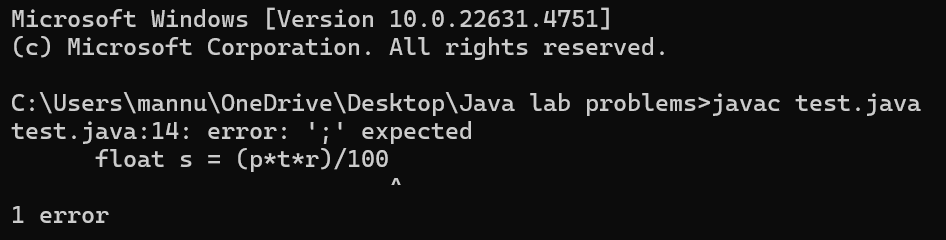
}

}

**OUTPUT:**



Negative Case:



**Errors:**

|  |  |  |  |
| --- | --- | --- | --- |
| S.No | Error type | Reason for error | rectification |
| 1 | Runtime error | Incorrect path | Copied correct path |
| 2 | Syntax error | { missing | { added |
| 3 | Logical error | Wrong formula | Formularectified |

**3.Write a java program to calculate the FibonacciSequence of a input taken from user:**

Syntax:

import java.util.\*;

class fibo

{

public static void main(String args[])

{

Scanner sc = new Scanner(System.in);

int num;

int f3;

int f1 = 0;

int f2 = 1;

int i = 2;

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

num = sc.nextInt();

System.out.println(f1);

System.out.println(f2);

while(i<num)

{

f3 = f1+f2;

f1 = f2;

f2 = f3;

System.out.println(f3);

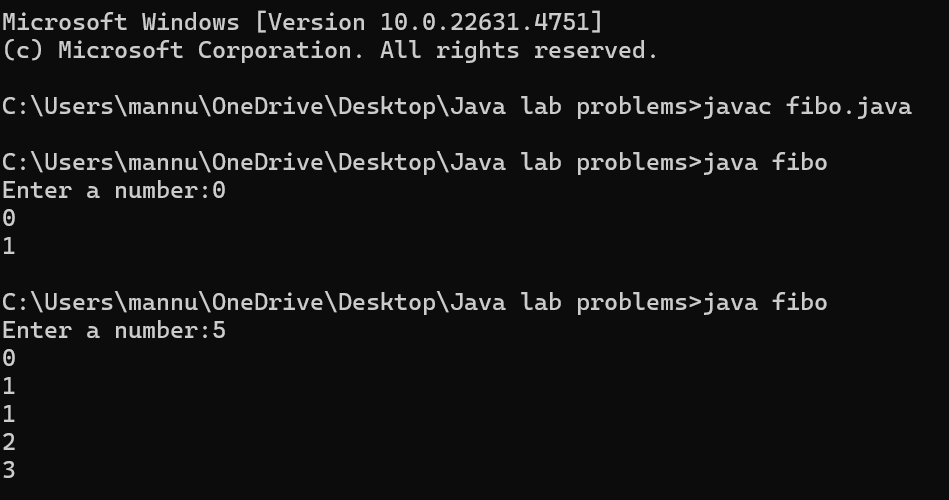
i = i+1;

}

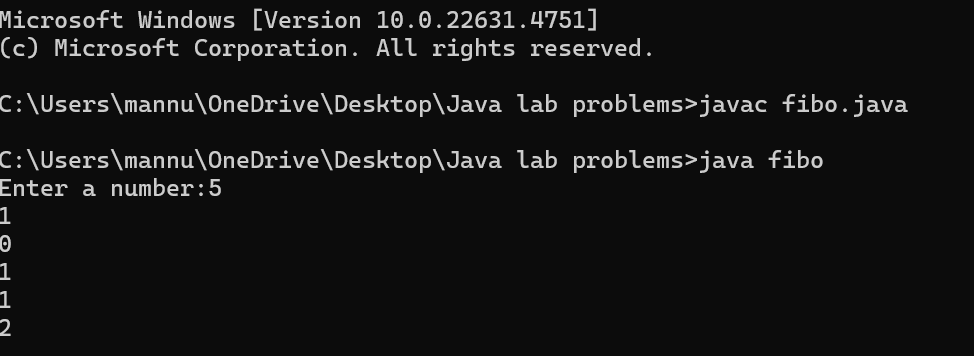
}

}

**OUTPUT:**



**Negative Case:**

****

**Errors:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| **1** | **Name error** | **Incorrect usage of function** | **Correcting by using correct formula** |
| **2** | **Syntax error** | **No semicolon** | **Acolnidded sem** |
| **3** | **Runtime error** | **Incorrect path** | **Copied correct path** |

**4.Write a java program to convert temperature from Celsius to Fahrenheit:**

**CODE:**

import java.util.\*;

class heat

{

public static void main(String args[])

{

Scanner sc = new Scanner(System.in);

float f;

System.out.println("Enter celsius temperature:");

float c = sc.nextFloat();

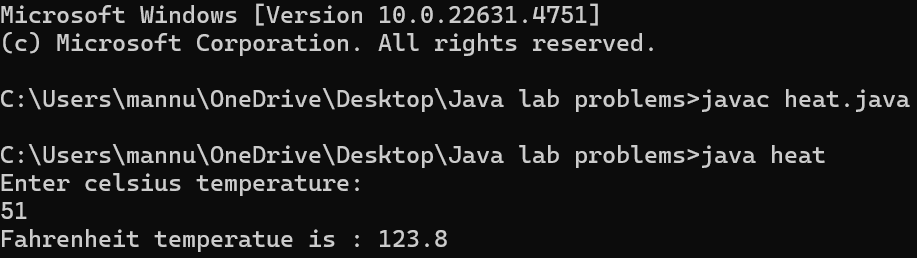
f = (c\*9/5)+32;

System.out.println("Fahrenheit temperatue is : "+f);

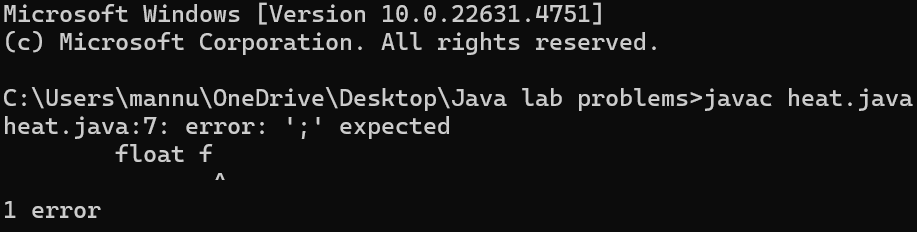
}

}

**OUTPUT:**



**Negative case:**

****

**ERROR:**

|  |  |  |  |
| --- | --- | --- | --- |
| S.No | Error type | Reason for error | Rectification |
| 1 | Runtime error | Incorrect path selection | Correct path added |
| 2 | Logical error | Incorrect formula | Correct formula  rectified |
| 3 | Import package error | Incorrect importing of  Packages | Imported util.\*;  Package |

**5.Write a java program to convert temperature from Fahrenheit to Celsius:**

import java.util.\*;

class far

{

public static void main(String[] args)

{

Scanner sc = new Scanner(System.in);

float c;

System.out.println(" Enter temperature in farienheit :");

float f = sc.nextFloat();

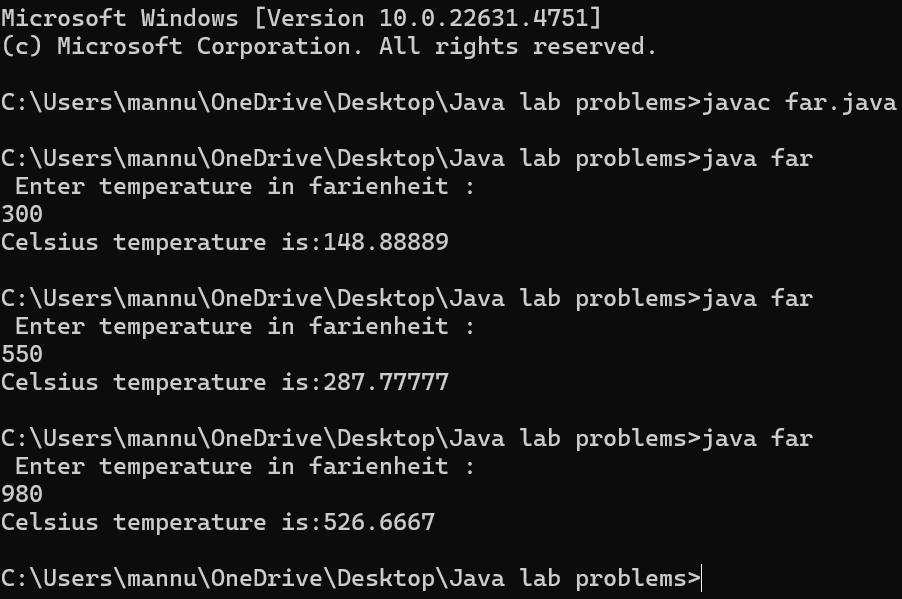
c = (f-32)\*5/9;

System.out.println("Celsius temperature is:"+c);

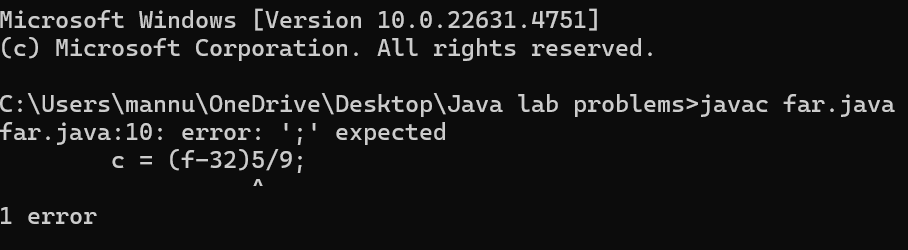
}

}

**OUTPUT:**

****

**Negative Case:**

****

**Error:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **rectification** |
| **1.** | **Syntax** | **No semicoln** | **Added semicoln** |
| **2.** | **Logical error** | **Due to incorrect input** | **Corrected by giving correct input** |
| **3.** | **Runtime error** | **Incorrect path** | **Using correct path** |

**6. Write a java program to calculate factorial of a number , read the input from user:**

Syntax:

import java.util.\*;

class factorial

{

public static void main(String[] args)

{

int number;

Scanner sc = new Scanner(System.in);

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

number= sc.nextInt();

int answer= factorial(number);

System.out.println("factorial of"+ number+ "is"+answer);

}

static int factorial(int n){

{

if (n == 1)

return 1;

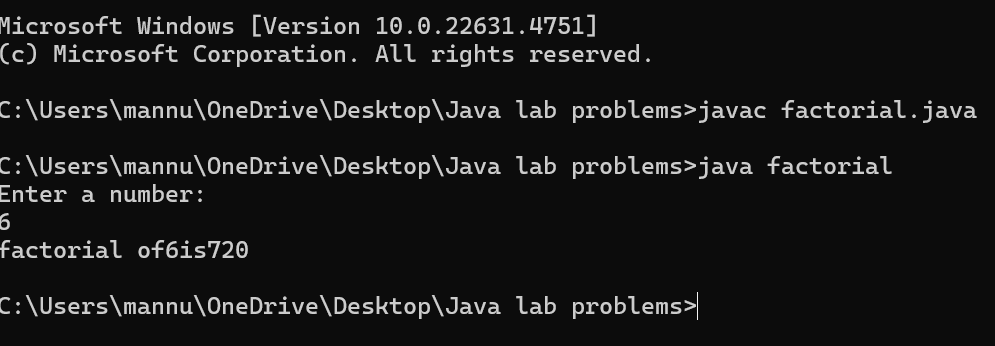
}

return n \* factorial(n - 1);

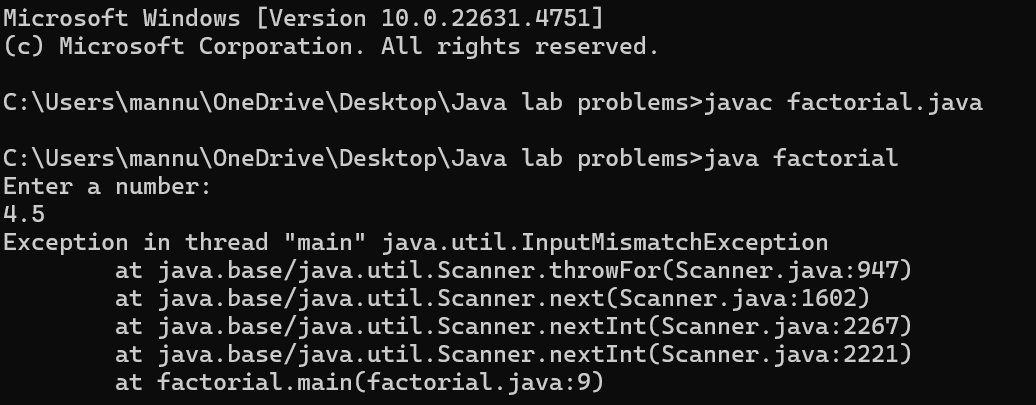
}

}

**OUTPUT:**

****

**Negative Case:**

****

**ERROR:**

|  |  |  |  |
| --- | --- | --- | --- |
| S.No | Error type | Reason for error | Rectification |
| 1 | Undeclared variable error | Missing variable | Variable declared |
| 2 | Missing import statement | Not importing packages | Packages imported |
| 3 | Logical error | Wrong formula | Formula rectified |

**7.Write a java program to calculate the area of triangle by using heron’s formula:**

import java.util.\*;

import java.lang.Math;

class heron

{

public static void main(String args[])

{

double s, c,a,b,p;

Scanner sc = new Scanner(System.in);

System.out.println("Enter the values of a , b and c:");

a = sc.nextDouble();

b = sc.nextDouble();

c = sc.nextDouble();

s = (a+b+c)/2;

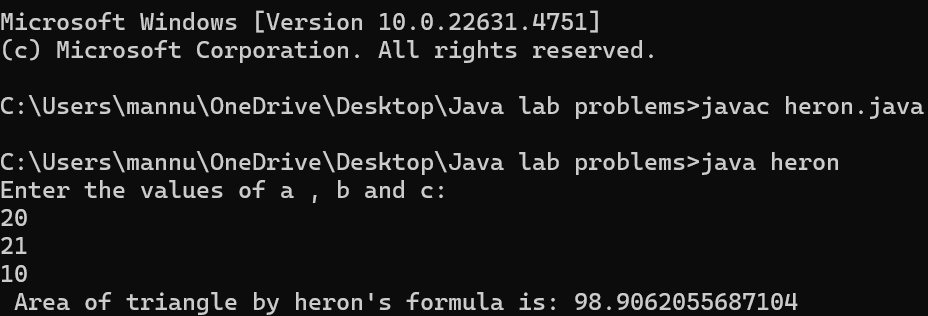
p = Math.sqrt(s\*(s-a)\*(s-b)\*(s-c));

System.out.println(" Area of triangle by heron's formula is: "+p);

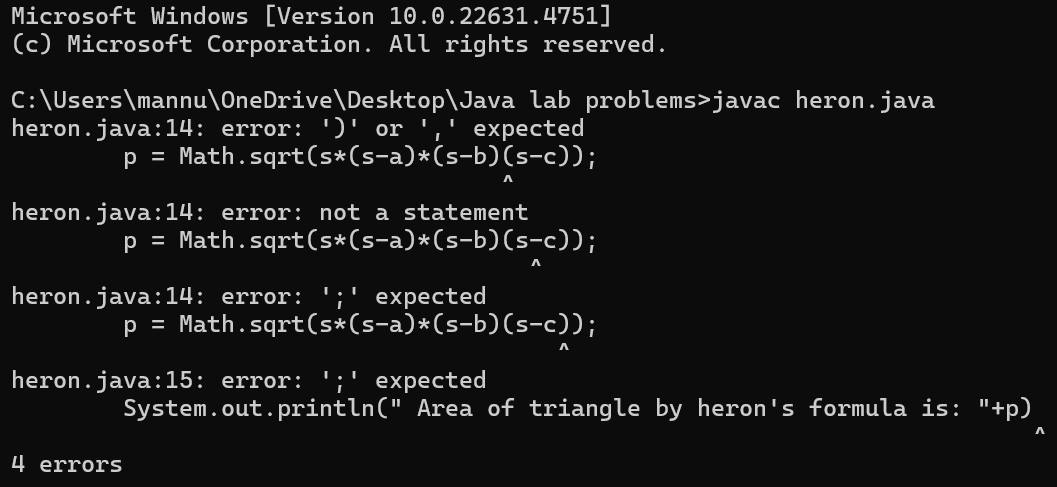
}

}

**OUTPUT:**

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**Negative Case:**

****

**ERROR:**

|  |  |  |  |
| --- | --- | --- | --- |
| S.No | Error type | Reason for error | Rectification |
| 1 | Logical error | Incorrect formula | Formula rectified |
| 2 | Name error | Undeclared variable | Variable declared |

**WEEK -3**

**Aim:**

**To create java program with following instructions**

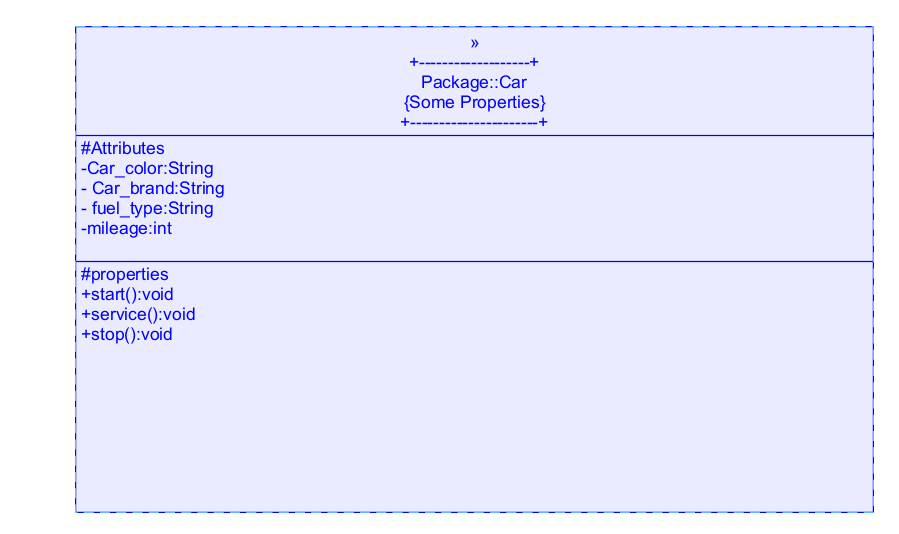
**1.Create a class with name car**

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

**3. Create three methods named start(), stop(). Service()**

**4. Create three objects named car1,car2 and car3**

**Class Diagram:**



**CODE:**

import java.util.\*;

class car

{

public String Car\_color;

public String Car\_brand;

public String fuel\_type;

public int mileage;

public void start()

{

System.out.println("Car Started:");

System.out.println("Car color is :"+Car\_color);

System.out.println("Car Brand is:"+Car\_brand);

System.out.println("Car fuel type is:"+fuel\_type);

System.out.println("Car mileage is:"+mileage);

}

public void service()

{

System.out.println("Car Started:");

System.out.println("Car color is :"+Car\_color);

System.out.println("Car Brand is:"+Car\_brand);

System.out.println("Car fuel type is:"+fuel\_type);

System.out.println("Car mileage is:"+mileage);

}

public void stop()

{

System.out.println("Car Started:");

System.out.println("Car color is :"+Car\_color);

System.out.println("Car Brand is:"+Car\_brand);

System.out.println("Car fuel type is:"+fuel\_type);

System.out.println("Car mileage is:"+mileage);

}

public static void main(String args[])

{ System.out.println("\nMahamad Mannuru\n\n");

car car1 = new car();

car1.Car\_color = "Blue";

car1.Car\_brand = "Audi";

car1.fuel\_type = "Deisel";

car1.mileage = 100;

car1.start();

car car2 = new car();

car2.Car\_color = "Red";

car2.Car\_brand = "Tesla";

car2.fuel\_type = "EV";

car2.mileage = 200;

car2.stop();

car car3 = new car();

car3.Car\_color = "Yellow";

car3.Car\_brand = "BMW";

car3.fuel\_type = "Petrol";

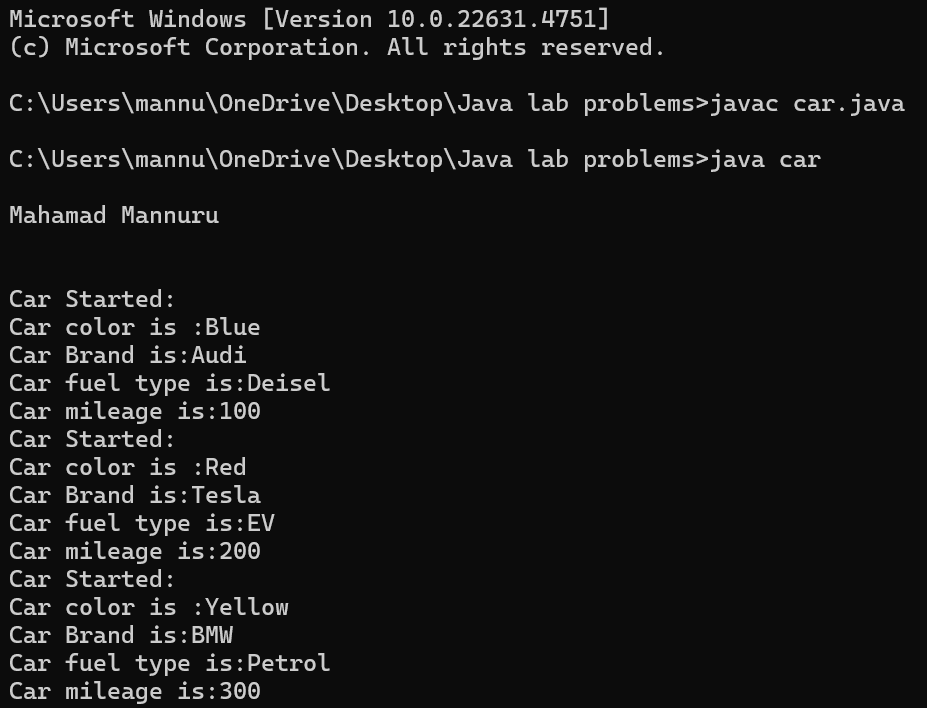
car3.mileage = 300;

car3.service();

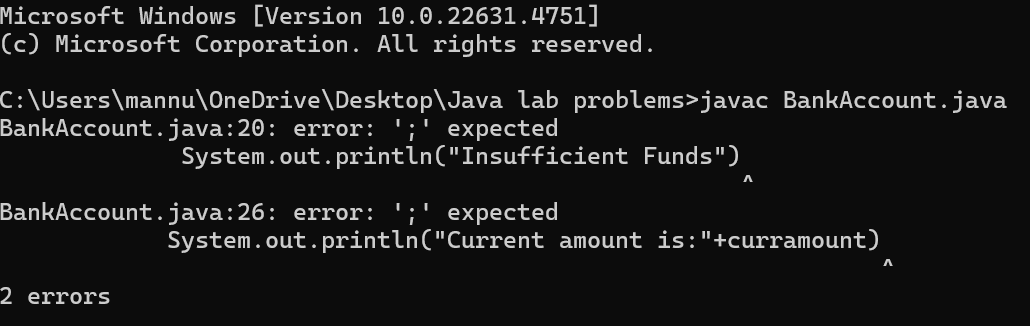
}

}

**OUTPUT:**

****

**Negative Case:**

****

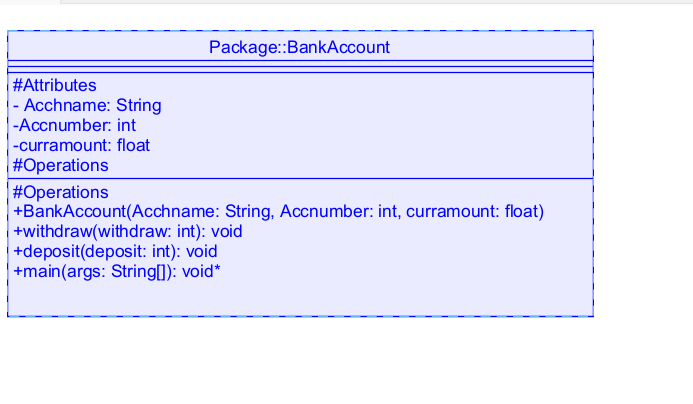
**ERROR:**

|  |  |  |  |
| --- | --- | --- | --- |
| S No | Error Type | Cause of error | Rectification |
| 1 | Syntax Error | Missing ‘{‘ | ‘{‘ added |
| 2 | Compile time Error | Mispelled Variable call | Rectified with  Correct variable name |

**2.**

**Aim: To create a class bankAccount with methods deposit() and withdrawl**

**Class Diagram:**



**Code:**

class BankAccount

{

public String Acchname;

public int Accnumber;

public float curramount;

BankAccount(String Acchname, int Accnum,float curramount)

{

this.Acchname = Acchname;

this.Accnumber = Accnumber;

this.curramount = curramount;

System.out.println("Enter Account holder name:"+Acchname);

System.out.println("Enter Account number:"+Accnum);

System.out.println("Enter current amount:"+curramount);

}

public void withdraw(int withdraw)

{

if(withdraw>curramount)

{

System.out.println("Insufficient Funds");

}

else

{

curramount = curramount-withdraw;

System.out.println("withdraw amount is:"+withdraw);

System.out.println("Current amount is:"+curramount);

}

}

public void deposit(int deposit)

{

System.out.println("Deposited amount is :");

curramount = curramount+deposit;

System.out.println("Deposited amount is:"+deposit);

System.out.println("Total current amount is:"+curramount);

}

public static void main(String args[])

{

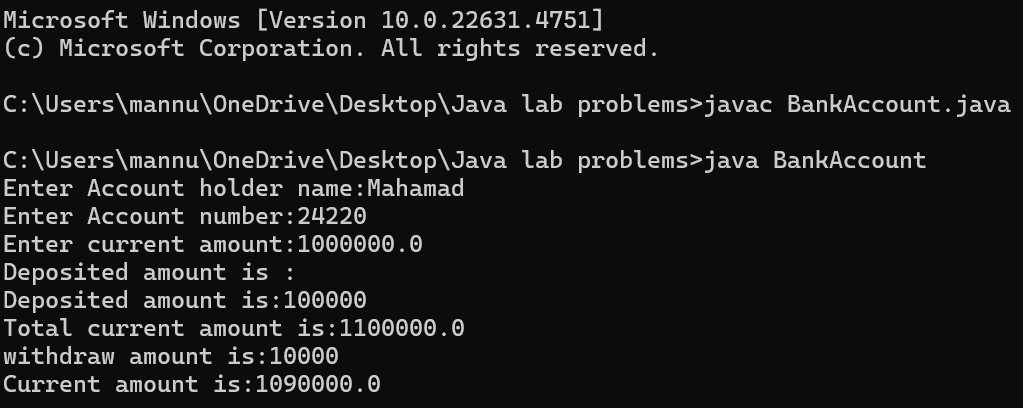
BankAccount b = new BankAccount("Hari",24210,100000);

b.deposit(10000);

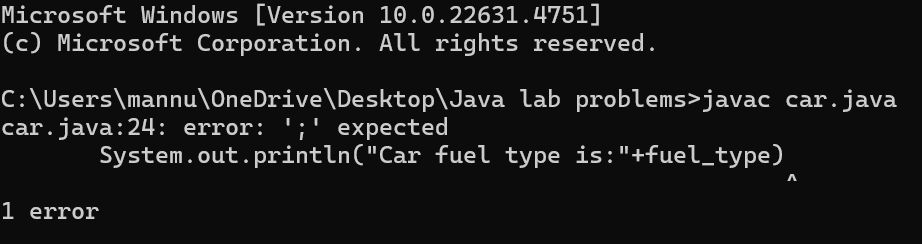
b.withdraw(500);

}}

**OUTPUT:**

****

**Negative Case:**

****

**ERROR:**

|  |  |  |  |
| --- | --- | --- | --- |
| s.no | Error name | Cause of error | Rectification |
| 1 | Name Error | Undefined name | Correct variable  Name replaced |
| 2 | Syntax Error | Missing Parenthesis | Parenthesis Added |
| 3 | Logical Error | Incorrect Condition | Condition Rectified |

**WEEK-4**

**1.AIM: WRITE A JAVA PROGRAM WITH CLASS NAMED “Book”. THE CLASS SHOUKD CONTAIN VARIOUS ATTRIBUTES SUCH AS TITLE, AUTHOR, YEAR OF PUBLICATION. IT SHOULD ALSO CONTAIN A CONSTRUCTOR WITH PARAMETERS WHICH INITIALIZES TITLE, AUTHOR, YEAR OF PUBLICATION AND CREATE A METHOD WHICH DISPLAYS THE DETAILS OF 2 BOOKS.**

**CLASS DIAGRAM:**

|  |
| --- |
| Book |
| -title: String  -author: String  -year: int |
| + Book(title: String, author:String, year: int) + displayDetails(): void |

**PROGRAM:**

public class Book {

public String title;

public String author;

public int year;

Book(String title, String author, int year) {

this.title = title;

this.author = author;

this.year = year;

}

public void displayDetails() {

System.out.println("Title: " +title);

System.out.println("Author: " +author);

System.out.println("Year of Publication" +year);

}

public static void main(String[] args) {

Book b1 = new Book("To Kill a Monkingbird", "Harper Lee", 1960);

Book b2 = new Book("The Great Gatsby", "F. Scott Fitzgerald", 1925);

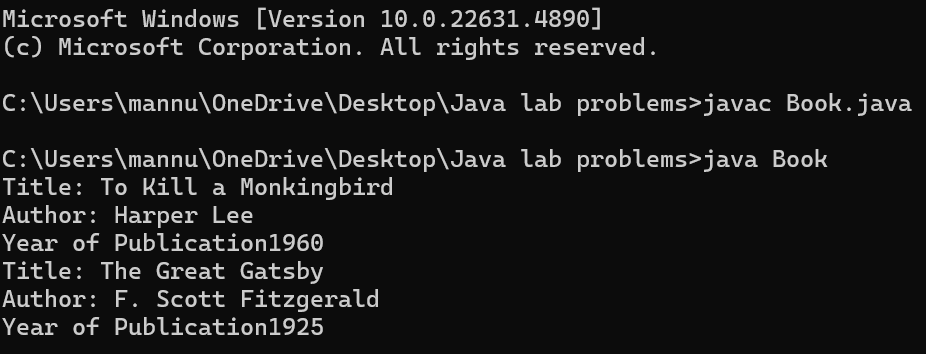
b1.displayDetails();

b2.displayDetails();

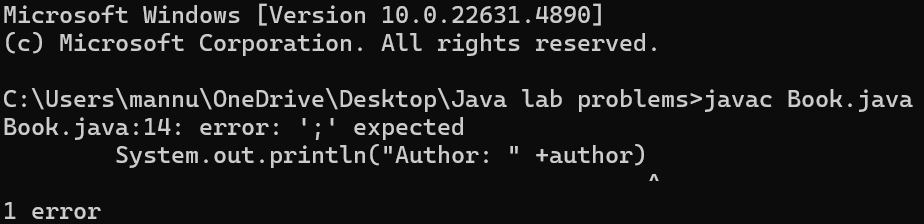
}

}

**OUTPUT:**



**NEGATIVE CASE:**



**ERROR:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **ERROR TYPE** | **Reason for error** | **Rectification** |
| **1.** | Syntax error | No semicolon | Semicolon added |
| **2.** | Runtime error | Incorrect path | Copied correct path |

**IMPORTANT POINTS:**

1. **Constructor**:

* The constructor Book(String, String, int) is used to initialize the object when it is created.
* The keyword **this** is used to differentiate between class attributes and constructor parameters.

2.**Method**:

* The method displayDetails() is used to display the book details.
* The **System.out.println()** method prints the details to the console.

3. **Object Creation**:

* Two objects b1 and b2 are created using the constructor.

**2.AIM: WRITE A JAVA PROGRAM WITH CLASS NAMED “MyClass” WITH A STATIC VARIABLE COUNT OF INT TYPE. INTIALIZE IT TO ZERO AND A CONSTANT VARIABLE “Pi” OF TYPE DOUBLE INITIALIZED TO “3.14” AS ATTRIBUTES OF THAT CLASS. NOW DEFINE A CONSTRUCTOR FOR “MyClass”, THAT INCREMENTS THE COUNT VARIABLE EACH TIME AN OBJECT OF “MyClass” IS CREATED. FINALLY, PRINT THE FINAL VALUES**

**OF ‘COUNT’ AND ‘PI’ VARIABLES AND CREATE 3 OBJECTS.**

**CLASS DIAGRAM:**

|  |
| --- |
| MyClass |
| -count: int (static)  -pi: double (static, final) |
| +MyClass()  +main(args: String[]):void |

**PROGRAM:**

public class MyClass {

static int count = 0;

static final double pi = 3.14;

MyClass() {

count++;

}

public static void main(String[] args) {

MyClass obj1 = new MyClass();

MyClass obj2 = new MyClass();

MyClass obj3 = new MyClass();

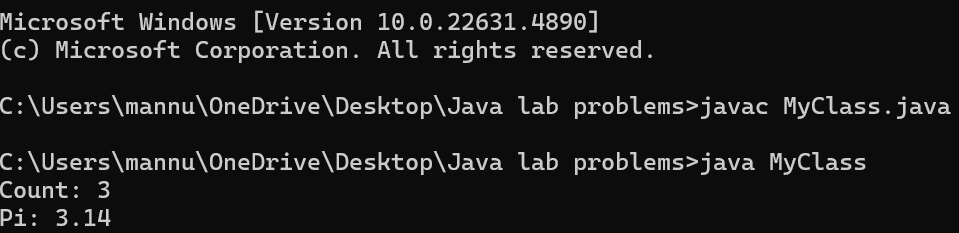
System.out.println("Count: " +count);

System.out.println("Pi: " +pi);

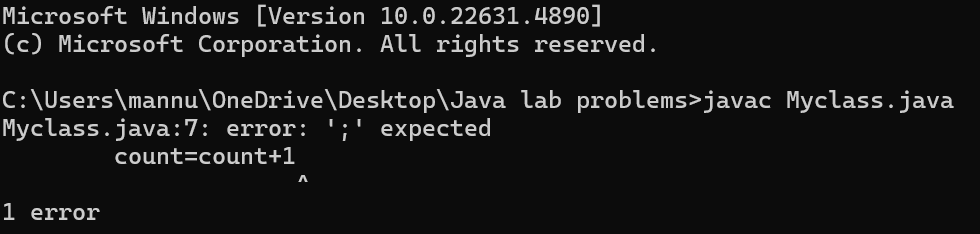
}

}

**OUTPUT:**

****

**sNEGATIVE CASE:**

****

**ERROR:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error Type** | **Reason for error** | **Rectification** |
| **1.** | No class | No class name declared | Created class named ‘MyClass’ |
| **2.** | Syntax error | Not added keyword | Added keyword named ‘new’ |

**IMPORTANT POINTS:**

**1.Static Keyword**

* Static members belong to the **class, not to individual objects**.
* Only one copy of the static variable is maintained for all objects.

**2.Static Variable**

* **static int count**:
  + Shared among all objects of the class.
  + It is initialized only once and not for every object.
  + It increments every time the constructor is called.

**3.Final Variable**

* **static final double pi**:
  + The **final** keyword makes the variable constant.
  + Its value **cannot be changed** once assigned.
  + It must be initialized at the time of declaration.

**WEEK-5**

**AIM: Create a calculator using the operations including addition, subtraction Multiplication and division using multilevel inheritance and display the desired Output**

**Class Diagram:**



**Code:**

class addition

{

public int add(int a, int b)

{

int addition = a+b;

return addition;

}

}

class subtraction extends addition

{

public int sub(int a, int b)

{

int subtraction = a-b;

return subtraction;

}

}

class multiplication extends subtraction

{

public int mult(int a, int b)

{

int multiplication = a\*b;

return multiplication;

}

}

class division extends multiplication

{

public int div(int a,int b)

{

int division = a/b;

return division;

}

}

class calculator

{

public static void main(String args[])

{

division obj = new division();

System.out.println("Addition is:"+ obj.add(10,2));

System.out.println ("Subtraction is:"+obj.sub(8,4));

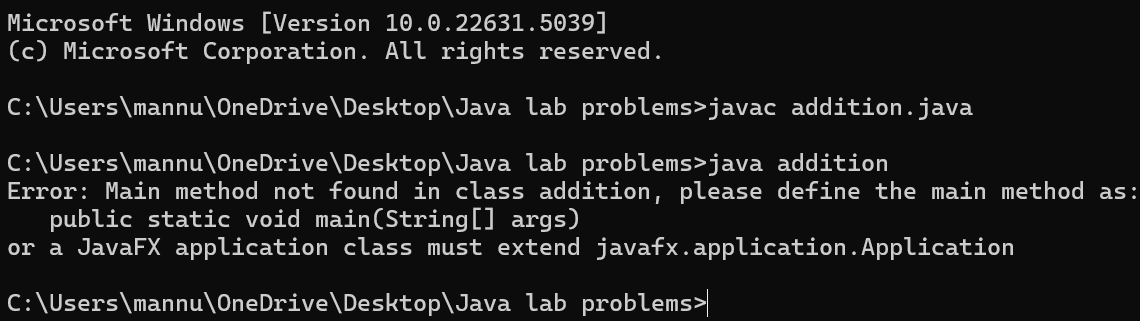
System.out.println("Multiplication is:"+obj.mult(12,4));

System.out.println("Division is:"+obj.div(8,4));

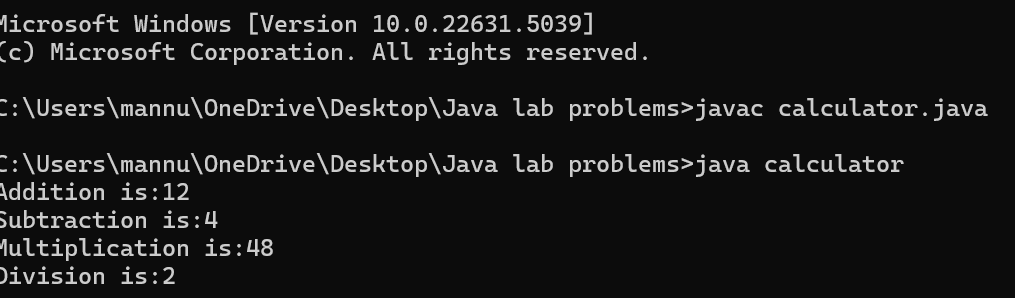
  }

}

**Negative Case:**



**OUTPUT:**



**Error Table:**

|  |  |  |  |
| --- | --- | --- | --- |
| S.No | Error Type | Cause | Rectification |
| 1 | Constructor error | Invalid name to method | Defined class name |
| 2 | Syntax error | Expected ‘(‘ | Added parenthesis |
| 3 | Logical error | Incorrect arithmetic  operation | Correct operation  rectified |

**Important Points:**

**Inheritence:**

The concept of OOP where a class inherits the properties and behaviours from

Another class (parent class) which promotes code reusability and hieratchical relationships

**Multilevel Inheritence:**

This is a type of inheritance in which a class inherited from another class, and

That superclass, in turn, inherits from yet another class, creating a chain of

inheritence

**extends:**

The extends keyword defines the relation of child class with the parent class

**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, bikes and truck and they need a program to**

**Store details about each vehicle, such as brand and speed**

**Cars should have an additional property: number of doors**

**Bikes should have a property indicating whether they have gears or not**

**The system should also include a function to display details about each vehicle**

**And indicate when a vehicle is starting**

**Class diagram**

**CLASS DIAGRAM:**



**Code:**

class vehicle{

String brand;

int speed;

public vehicle(String brand,int speed){

this.brand=brand;

this.speed=speed;

}

public static void main(String[] args) {

car obj1=new car("ford",34,4);

bike obj2=new bike("hero",100,true);

truck obj3=new truck("tata",60,40);

}

}

class car extends vehicle{

int noofdoors;

public car(String brand, int speed,int noofdoors) {

super(brand, speed);

this.noofdoors=noofdoors;

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

System.out.println("Speed of car is:"+speed);

System.out.println("no of doors of car:"+noofdoors);

}

}

class bike extends vehicle{

boolean gears;

public bike(String brand,int speed,boolean gears){

super(brand, speed);

this.gears=gears;

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

System.out.println("Speed of bike is:"+speed);

System.out.println("Gears of bike:"+gears);

}

}

class truck extends vehicle{

int weight;

public truck(String brand,int speed,int weight){

super(brand,speed);

this.weight=weight;

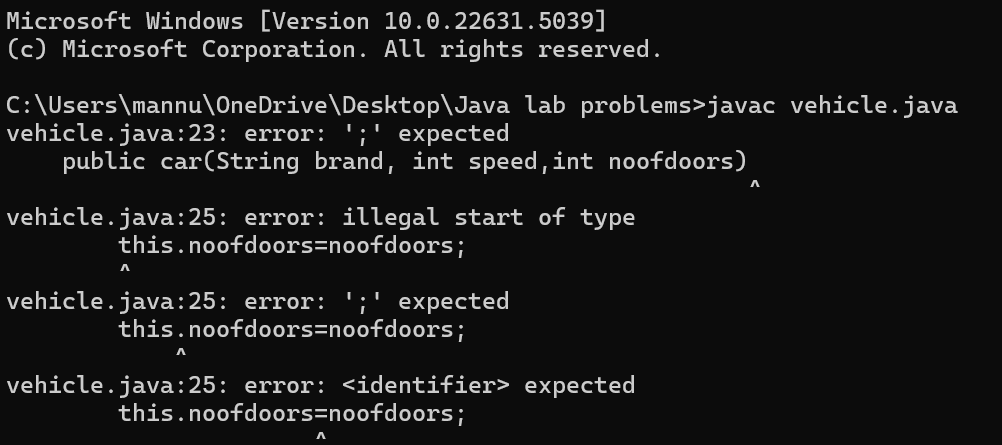
System.out.println("Brand name is:"+brand);

System.out.println("Speed of Truck is:"+speed);

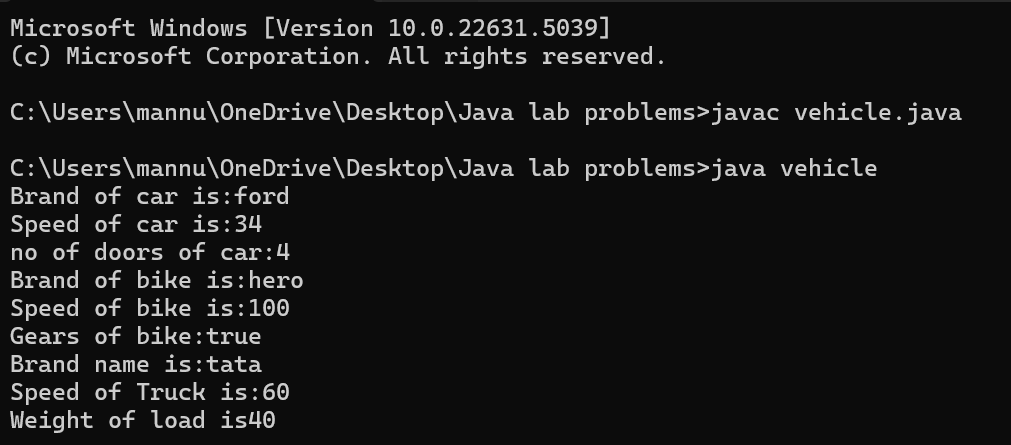
System.out.println("Weight of load is"+weight);

}

}

**NEGATIVE CASE:** ****

**OUTPUT:**



**Error Table:**

|  |  |  |  |
| --- | --- | --- | --- |
| S No | Error Type | Cause | Rectification |
| 1 | Syntax Error | Semicolon missing | Added ; |
| 2 |  |  |  |

**Important Points:**

**Hierarchical Inheritence:**

This is a type of inheritance occurs when multiple subclasses inherit from a

Single parent class