­­  **23CSE111**

**OBJECT ORIENTED PROGRAMMING**

**LAB REPORT**



**Department computer science and engineering**

**Amrita school of computing**

**Amrita vishwa vidyapeetham, Amaravati campus**

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INDEX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S no | **Title** | **Page no** | **Date** | **Signature** |
|  | **WEEK -1** |  |  |  |
| **1** | Explain the process of download & Installation of JDK | **4** |  |  |
| **2** | Write a program to print Student’s name, Roll no, Section | **7** |  |  |
|  | **WEEK-2** |  |  |  |
| **1** | Write a simple java program to calculate factorial of a number | **9** |  |  |
| **2** | Write a simple java program to find the simple interest by taking iinputs from the user | **10** |  |  |
| **3** | Write a program to calculate the Fibonacci sequence and take the input from the user | **13** |  |  |
| **4** | Write a program to find the area of triangle using hereon’s formula  . | **15** |  |  |
| **5** | Write a program to convert temperature from celssius to fahrenheit | **17** |  |  |
|  | **WEEK-3** |  |  |  |
| **1** | Write a java program with following instructions | **19** |  |  |
| **2** | Write a java program with following instructions | **26** |  |  |
|  | **WEEK-4** |  |  |  |
| **1** | Write a java program with following instructions | **34** |  |  |
| **2** | Write a java program with following instructions | **38** |  |  |
|  | WEEK-5 |  |  |  |
| **1** | Write a java program with following instructions |  |  |  |
| **2** | Write a java program with following instructions |  |  |  |
|  | WEEK -6 |  |  |  |
| **1** | Write a java program with following instructions |  |  |  |
| **2** | Write a java program with following instructions |  |  |  |
| **3** | Write a java program with following instructions |  |  |  |
| **4** | Write a java program with following instructions |  |  |  |

**WEEK-1**

**1) AIM:**

**The process of download & installation of JDK(java development kit)**

**Download the JDK:**

1. Visit the official Oracle website and click on JDK 21 version and select our operating system type of your Desktop .
2. Click the link to download file description /product.

**Install JDK:**

1. Once downloaded, run the installer.

2. Follow the instructions and keep clicking "Next" until it's done.

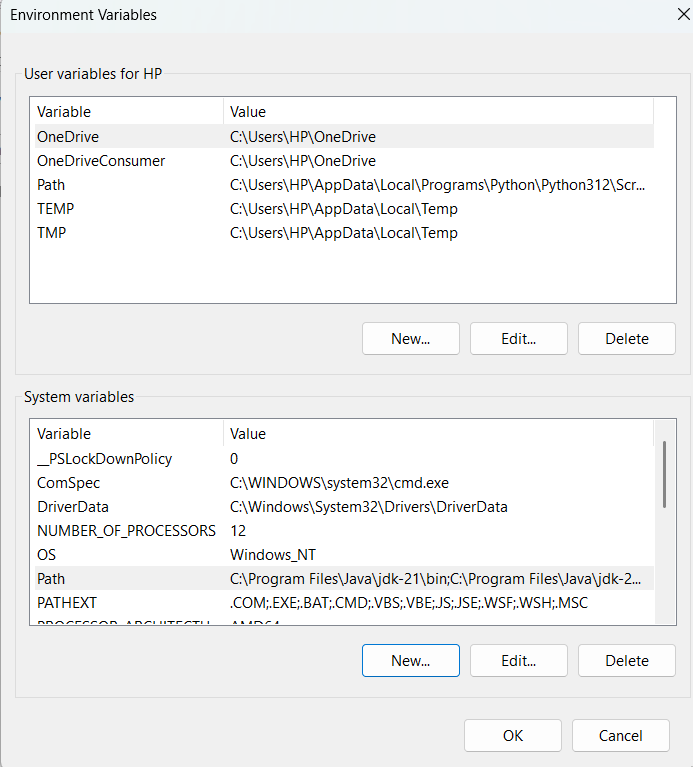
**Set Environment Variables (Windows):**

1. Open the Start Menu and search for "Environment Variables".

2. Click "Edit the system environment variables".

3. In the System Properties window, click "Environment Variables".

4. Under "System variables," Double click the path variable click the "New" and Add the bin directory of your JDK (C:\Program Files\Java\jdk-21\bin) to the path.

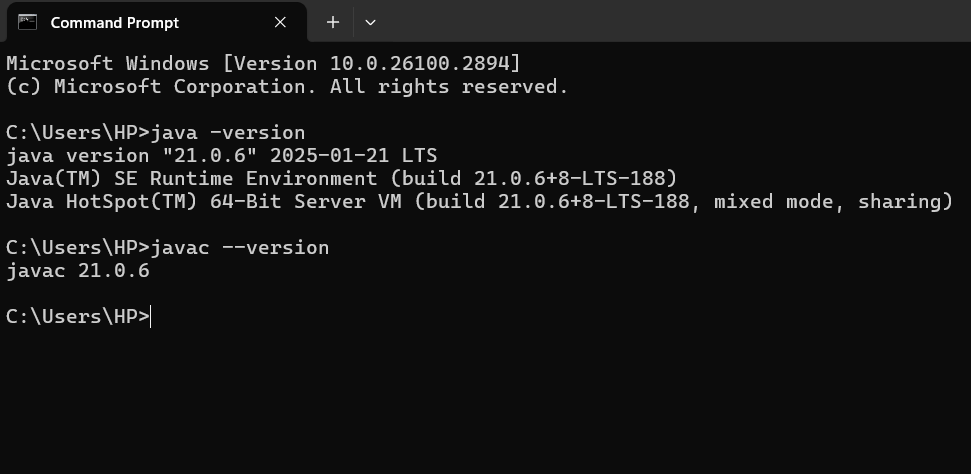
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**Checking the JDK version:**

1. Open the start menu and search command prompt open it.
2. To check the java version

Type java –version and click enter (or)

Type javac –version and click enter to check the version



**2) AIM: Write a program to print Student’s name, Roll no and Section.**

Write our program in notepad and execute in Command prompt

**Program:**

class Demo

{

public static void main(String[] args)

{

System.out.println("NAME:k.Divya teja");

System.out.println("ROLL NO:av.sc.u4cse24148");

System.out.println("Section: CSE-B");

}

}

**OUTPUT:**

****

**ERRORS:**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Error** | **Error rectification** |
| 1 | path error | Using correct path and  Absence of ‘-‘ symbol |
| 2 | Syntax error | Use Captial S in System.out.println() |

**WEEK-2**

**1) AIM:**

**Write a simple program to calculate factorial of a number and read the input from user**

**PROGRAM :**

class Test {

static int factorial(int n)

{

int res = 1, i;

for (i = 2; i <= n; i++)

res \*= i;

return res;

}

public static void main(String[] args)

{

int num = 5;

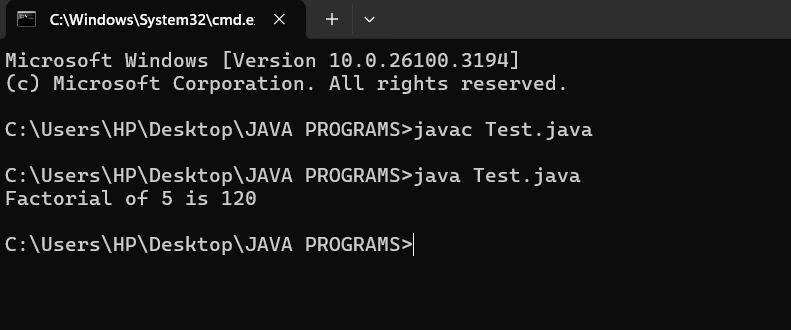
System.out.println("Factorial of " + num + " is "

+ factorial(5));

}

}

**OUTPUT :**

****

|  |  |  |  |
| --- | --- | --- | --- |
| **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 |

**2) AIM : Simple Java Program for finding simple interest by taking input from**

**PROGRAM :**

import java.util.Scanner;

class simple {

public static void main(String[] args) {

Scanner input = new Scanner(System.in);

System.out.print("Enter p :");

int p = input.nextInt();

System.out.print("Enter t :");

int t = input.nextInt();

System.out.print("Enter r :");

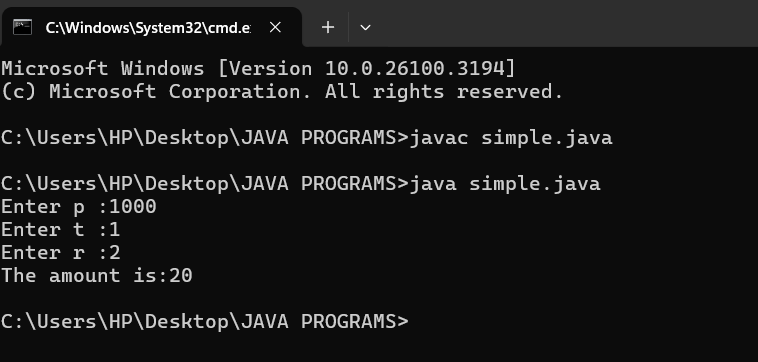
int r = input.nextInt();

System.out.println("The amount is:" + (p\*t\*r)/100);

}

}

**OUTPUT :**

****

**ERROR :**

|  |  |  |  |
| --- | --- | --- | --- |
| **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 | Formula rectified |

**3) AIM : Write a program to to calculate the fibonacii sequence and take the input from user**

**PROGRAM :**

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);

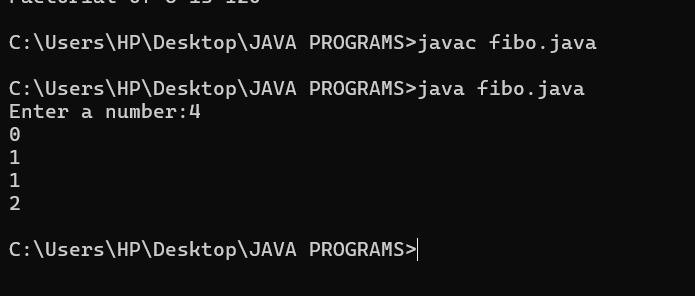
i = i+1;

}

}

}

**OUTPUT :**

****

**ERROR :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | Logical error | Incorrect formula | Formula rectified |
| 2 | Run-time error | Incorrect path | Added correct path |

**4) AIM : Write a java program to find area of triangle using heron’s formula and area of triangle**

**PROGRAM :**

import java.util.Scanner;

class Area {

public static void main(String args[]) {

Scanner input= new Scanner(System.in);

System.out.print("Enter the length of side a: ");

double a = input.nextDouble();

System.out.print("Enter the length of side b: ");

double b = input.nextDouble();

System.out.print("Enter the length of side c: ");

double c = input.nextDouble();

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

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

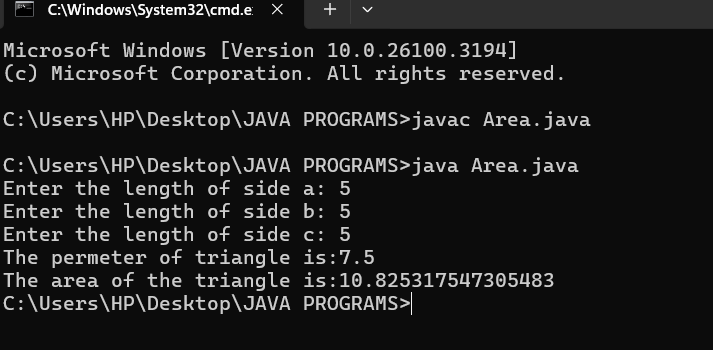
System.out.println("The permeter of triangle is:" + s);

System.out.printf("The area of the triangle is:" + area);

}

}

**OUTPUT :**

****

**ERRORS :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S no** | **Error type** | **Reason for error** | **Rectification** |
| 1 | Syntax error | Semicolon missing | Semi colon added |
| 2 | Missing Scanner | Creating scanner input | Scanner added |

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

**PROGRAM :**

class celsiustofahrenheit {

    public static void main(String[] args)

    {

        double celsius = 10.0, fahrenheit = 0.0;

        fahrenheit = (celsius \* 1.8) + 32;

        System.out.println(

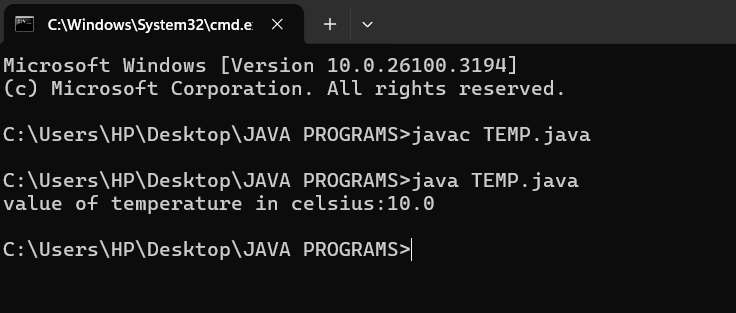
            " value of temperature in fahrenheit:"

            + fahrenheit);

    }

}

**OUTPUT :**

****

**ERRORS :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | Runtime error | Incorrect path selection | Correct path added |
| 2 | Logical error | Incorrect logic | Correct logic |

**WEEK-3**

1. **AIM :**

**Write a java program with following instructions**

1. **Create a class with name car**
2. **Create four attributes named, car colour, car brand , fuel type , mileage.**
3. **Create 3 methods named start , stop, service .**
4. **Create 3 objects named c1,c2,c3**
5. **Create a constructor with parameters , car colour , car brand , fuel type and mileage.**

**PROGRAM :**

class car {

String car\_brand;

String car\_colour;

String fuel\_type;

int mileage;

public car(String car\_brand,String car\_colour,String fuel\_type,int mileage){

this.car\_brand = car\_brand;

this.car\_colour = car\_colour;

this.fuel\_type = fuel\_type;

this.mileage = mileage;

}

public void start() {

System.out.println("CAR IS STARTED");

}

public void stop() {

System.out.println("CAR IS STOPPED");

}

public void service() {

System.out.println("CAR IS I SERVICE");

}

public void car\_details() {

System.out.println("CAR BRAND IS :" + car\_brand);

System.out.println("CAR COLOUR IS :" + car\_colour);

System.out.println("CAR FUEL TYPE IS :" + fuel\_type);

System.out.println("CAR MILEAGE IS :" + mileage);

}

public static void main(String[] args) {

// CREATING OBJECTS FOR CLASS CAR

car c1 = new car("MCLAREN","GREEN","PETROL",12);

car c2 = new car("FERRARI","RED","PETROL",18);

car c3 = new car("LAMBORGHINI","ORANGE","PETROL",20);

c1.car\_details();

System.out.println(" ");

c2.car\_details();

System.out.println(" ");

c3.car\_details();

}

}class car {

String car\_brand;

String car\_colour;

String fuel\_type;

int mileage;

public car(String car\_brand,String car\_colour,String fuel\_type,int mileage){

this.car\_brand = car\_brand;

this.car\_colour = car\_colour;

this.fuel\_type = fuel\_type;

this.mileage = mileage;

}

public void start() {

System.out.println("CAR IS STARTED");

}

public void stop() {

System.out.println("CAR IS STOPPED");

}

public void service() {

System.out.println("CAR IS I SERVICE");

}

public void car\_details() {

System.out.println("CAR BRAND IS :" + car\_brand);

System.out.println("CAR COLOUR IS :" + car\_colour);

System.out.println("CAR FUEL TYPE IS :" + fuel\_type);

System.out.println("CAR MILEAGE IS :" + mileage);

}

public static void main(String[] args) {

// CREATING OBJECTS FOR CLASS CAR

car c1 = new car("MCLAREN","GREEN","PETROL",12);

car c2 = new car("FERRARI","RED","PETROL",18);

car c3 = new car("LAMBORGHINI","ORANGE","PETROL",20);

c1.car\_details();

System.out.println(" ");

c2.car\_details();

System.out.println(" ");

c3.car\_details();

}

}

**CLASS DIAGRAM :**

|  |
| --- |
| **CAR** |
| car\_brand : String  car\_colour : String  fuel\_type : String  mileage : int |
| + car (String, String, String,int)  +start() : void  +stop() : void  +service() : void  + car\_details : void |

**OUTPUT :**

****

**ERROR :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | Runtime error | Incorrect symbol in main program | { symbol is added |
| 2 | Logical error | Incorrect logic | Correct logic |

**4) AIM :**

**create a class named bankaccount with method deposit and with draw where the deposit method should accepts a parameter and when this method is called the deposited amount should be current balance .In addition to that when a withdraw method is called it has to verify whether withdraw amount is less than the current balance .If not display a message saying insufficient funds.Use the constructer to display the details of the customer (Customer name,account number , IFSC,branch) .Also create two customer objects c1,c2**

**PROGRAM :**

class bank {

    String name;

    String number;

    String IFSC;

    String branch;

    int balance;

public bank(String name, String number, String IFSC, String branch, int balance) {

    this.name = name;

    this.number = number;

    this.IFSC = IFSC;

    this.branch = branch;

    this.balance = balance;

}

public void bank\_details() {

        System.out.println("Customer Name: " + name);

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

        System.out.println("IFSC Code: " + IFSC);

        System.out.println("Branch: " + branch);

        System.out.println("Current Balance: "+ balance);

    }

public void deposit(int amount) {

    if (amount >0) {

    balance += amount;

    System.out.println("Total balance is :" + balance);

    } else {

    System.out.println("ERROR");

    }

}

public void withdrawal(int amount) {

    if (amount < balance) {

        balance -= amount;

        System.out.println("WITHDRAW AMOUNT IS:" + amount);

        System.out.println("UPDATED BALANCE IS: " + balance);

        } else {

            System.out.println("INSUFFICIENT BALANCE");

        }

    }

public static void main(String[] args) {

    bank c1 = new bank("Rahul", "1234567890", "SBI1997","GUNTUR",0);

    bank c2 = new bank("Iyer", "1234567890", "SBI1996","GUNTUR",0);

    System.out.println("CUSTOMER 1 DETAILS");

    System.out.println("    ");

    c1.bank\_details();

    System.out.println("    ");

    System.out.println("CUSTOMER 1 DEPOSIT");

    c1.deposit(1000);

    System.out.println("    ");

    System.out.println("CUSTOMER 1 WITHDRAW");

    c1.withdrawal(500);

    System.out.println("    ");

    System.out.println("    ");

    System.out.println("CUSTOMER 2 DETAILS");

    System.out.println("    ");

    c2.bank\_details();

    System.out.println("    ");

    System.out.println("CUSTOMER 2 DEPOSIT");

    c2.deposit(5000);

    System.out.println("    ");

    System.out.println("CUSTOMER 2 WITHDRAW");

    c2.withdrawal(600);

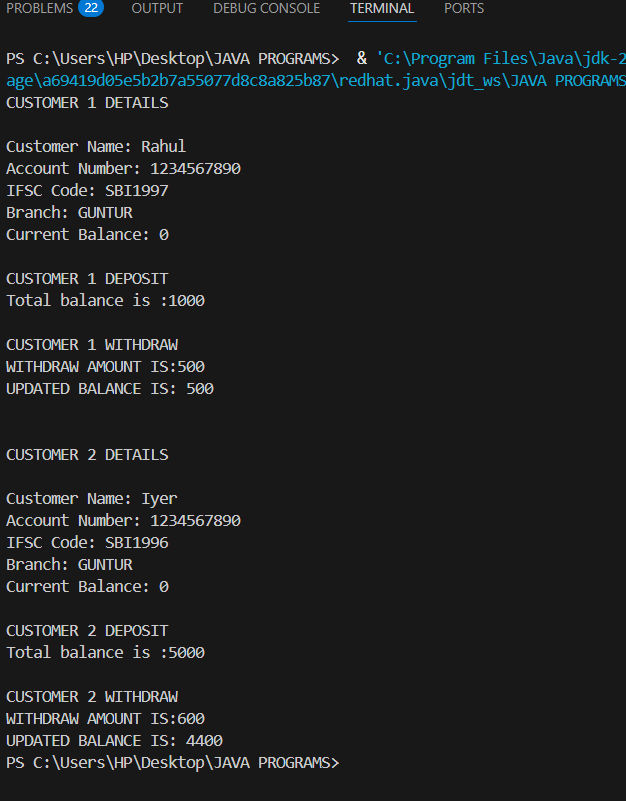
}

}

**CLASS DIAGRAM :**

|  |
| --- |
| bank |
| name:String  number:String  IFSC:String  branch:String  balance:int |
| bank(name:String , number:String, IFSC:String, +branch:String, balance:int)  +bank\_details():void  +deposit(amount:int):void  +withdrawl(amount:int):void |

**OUTPUT :**

****

**ERROR :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | syntax error | Forgot to keep main word in main program | Main is added |
| 2 | Logical error | Incorrect logic | Correct logic |

**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 with initializes title ,author and year of publication . create a method which displays the details of the book (display the details of two book i.e, create two books and objects with details).**

**PROGRAM:**

class book {

    String title;

    String author;

    int year;

public book(String title, String author, int year) {

    this.title = title;

    this.author = author;

    this.year = year;

}

public void details() {

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

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

    System.out.println("year of publication: " + year);

}

public static void main(String[] args) {

    //CREATING OBJECTS

    book b1 = new book("OPERATING SYSTEMS", "Galvin & Gange", 1997);

    book b2 = new book("DATABASE SYSTEMS", "Ramez Elmasri", 2004);

    System.out.println("BOOK 1 DETAILS");

    System.out.println("    ");

    b1.details();

 System.out.println("    ");

    System.out.println("BOOK 2 DETAILS");

 System.out.println("    ");

    System.out.println("    ");

    b2.details();

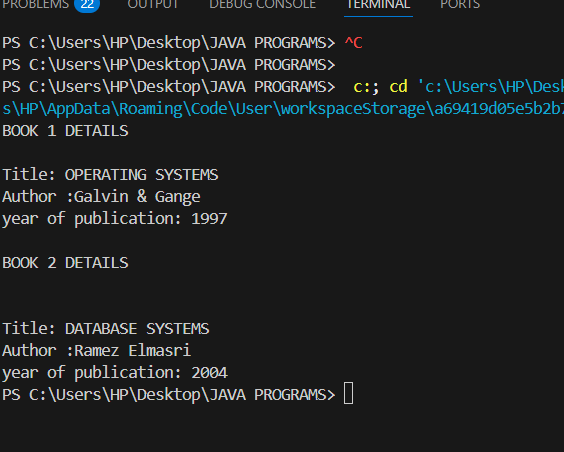
}

}

**CLASS DIAGRAM :**

|  |
| --- |
| book |
| title : String  author : String  year : int |
| + book(title: String, author: String, year: int)  + details(): void |

**OUTPUT :**

****

**ERROR :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | syntax error | Forgot to keep }  At last | } is added |
| 2 | Logical error | Incorrect logic | Correct logic |

1. **AIM : write a java program to create a class named myclass with a static variable count of int type and initialize to zero and a constant variable pie of double data type ,initialize to 3.1415 as attributes of that class now define a constructor for my class that increments the count variables each time an object of my class is created variable each time an object of myclass is created. Finally print the final values of count and pie variables.**

**PROGRAM :**

class MyClass {

    static int count = 0;

    final double PIE = 3.1415;

public MyClass() {

        count++;

    }

    public static void main(String[] args) {

        MyClass obj1 = new MyClass();

        MyClass obj2 = new MyClass();

        MyClass obj3 = new MyClass();

        System.out.println("Final count value: " + count);

        System.out.println("PIE constant value: " + obj1.PIE);

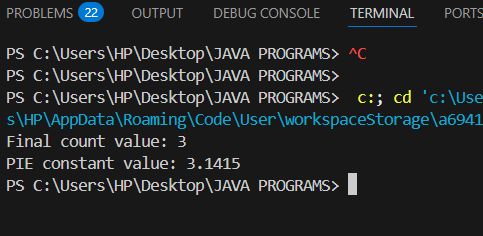
    }

}

**CLASS DIAGRAM :**

|  |
| --- |
| Myclass |
| Count : int  PIE : double |
| +Myclass() |

**OUTPUT :**

****

**ERROR :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | syntax error | String forgot in main function | String is added |
| 2 | Logical error | Incorrect logic | Correct logic |

**WEEK-5**

**1)Aim :** create a calculator using the operations including addition, subtraction, multiplication and division using multilevel inheritance and display the desired output .

**Program :**

public class calculator {

    int a = 18;

    int b = 1;

void addition(){

    System.out.println("Addition is :" + (a+b));

}

}

class multi1 extends calculator{

    void subtraction(){

        System.out.println("Subtraction is :" + (a-b));

    }

}

class multi2 extends calculator{

    void multiplication(){

        System.out.println("Multiplication is :" + (a\*b));

    }

}

class multi3 extends calculator{

    void division(){

        System.out.println("Division is :" + (a/b));

    }

}

class multipleinheritance {

    public static void main(String[] args) {

        multi1 m1 = new multi1();

        multi2 m2 = new multi2();

        multi3 m3 = new multi3();

        m1.addition();

        System.out.println("    ");

        m1.subtraction();

        System.out.println("    ");

        m2.multiplication();

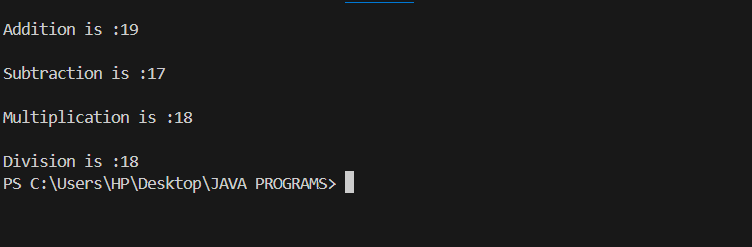
        System.out.println("    ");

        m3.division();

}

}

**OUTPUT :**

****

**ERROR :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | syntax error | String forgot in main function | String is added |
| 2 | Logical error | Incorrect logic | Correct logic |

**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 variable such as brand and speed.

• Cars should have an additional property: numbers of doors, seating capacity.

• 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 & indicates when a vehicle is starting.

• Every class should have constructor.

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)Aim: Implement the truck class and update the main method to create a truck object & also create an object for car & bike sub classed. Finally display its details

**Program :**

class vehicle{

    String brand;

    int speed;

    vehicle(String brand,int speed){

        this.brand=brand;

        this.speed=speed;

    }

    void Details(){

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

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

    }

}

class CARS extends vehicle{

    int doors;

    int capacity;

    public CARS(String brand,int speed,int doors,int capacity){

        super(brand, speed);

        this.doors=doors;

        this.capacity=capacity;

    }

    void cardetails(){

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

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

    }

}

class Bikes extends vehicle{

    Boolean gears;

    Bikes(String brand,int speed,Boolean gears){

        super(brand, speed);

        this.gears=gears;

    }

    void bikedetails(){

        if (gears==true)

        System.out.println("This bike has gears.");

        else

        System.out.println("This bike does not have gear system.");

    }

}

class Trucks extends vehicle{

    int tons;

    Trucks(String brand,int speed,int tons){

        super(brand, speed);

        this.tons=tons;

    }

    void truckdetails(){

        System.out.println("The capacity of truck is: "+tons);

    }

}

class Rent{

    public static void main(String[] args){

        CARS c=new CARS("MCLaren",250,2,20);

        System.out.println("    ");

        c.cardetails();

        System.out.println("    ");

        c.Details();

        System.out.println("    ");

        Bikes b=new Bikes("Kawasaki",300,true);

        b.bikedetails();

        System.out.println("    ");

        b.Details();

        System.out.println("    ");

        Trucks t=new Trucks("TATA",80,2);

        t.truckdetails();

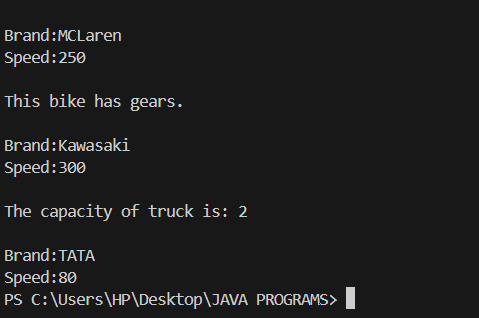
        System.out.println("    ");

        t.Details();

    }

}

**OUTPUT :**

****

**ERROR :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | syntax error | String forgot in main function | String is added |
| 2 | Logical error | Incorrect logic | Correct logic |

**WEEK - 6**

1. **Aim : Write a Java program to create a Vehicle class with a method displayInfo(). Override this method in the Car subclass to provide specific information about a car.**

**Program :**

class Vehicle {

    String company;

    String model;

    String fuel;

    int capacity;

    void setInfo(String company, String model, String fuel, int capacity) {

        this.company = company;

        this.model = model;

        this.fuel = fuel;

        this.capacity = capacity;

    }

    void displayInfo() {

        System.out.println("The details of the vehicle:");

        System.out.println("Company: " + company);

        System.out.println("Model: " + model);

        System.out.println("Fuel: " + fuel);

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

    }

}

class Car extends Vehicle {

    @Override

    void displayInfo() {

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

        System.out.println("Company: " + company);

        System.out.println("Model: " + model);

        System.out.println("Fuel: " + fuel);

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

    }

}

public class Cars {

    public static void main(String[] args) {

        Car c = new Car();

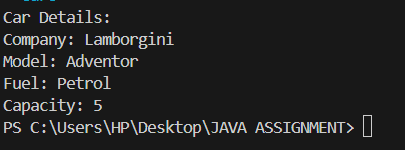
        c.setInfo("Lamborgini", "Adventor", "Petrol", 5);

        c.displayInfo();

    }

}

**OUTPUT :**

****

**ERRORS :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | Syntax error | [] is missed | [] is added |
| 2 | Logical error | Incorrect logic | Correct logic |

**2) Aim :** A college is developing an automated admission system that verifies students' eligibility for undergraduate (UG) and postgraduate (PG) programs. Each program has different eligibility criteria based on the students' percentage in their previous qualifications.

(i)UG admissions require a minimum of 60%.

(ii)PG admissions require a minimum of 70%

**Program :**

class College{

    String name;

    int percentage;

    void geteligibility(String name,int percentage){

        this.name=name;

        this.percentage=percentage;

    }

}

class UG extends College{

    void geteligibility(String name,int percentage){

        if (percentage>=60){

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

        }

        else{

            System.out.println(name+" is not eligible");

        }

    }

}

class PG extends College{

    void geteligibility(String name,int percentage){

        if (percentage>=70){

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

        }

        else{

            System.out.println(name+" is not eligible");

        }

    }

}

class poly2{

    public static void main(String[] args){

        UG ug=new UG();

        ug.geteligibility("Person-1",40);

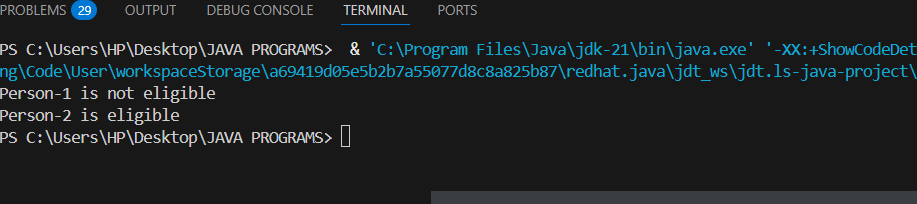
        PG pg=new PG();

        pg.geteligibility("Person-2",80);

    }

}

**OUPUT :**

****

**ERROR :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | syntax error | String forgot in main function | String is added |
| 2 | Logical error | Incorrect logic | Correct logic |

**3) Aim :** Create a Calculator class with overloaded methods to perform addition:

(i) Add two integers.

(ii) Add two doubles.

(iii) Add three integers.

**Program :**

class Calcee{

    public int add(int a,int b){

        return a+b;

    }

    public double add(double a,double b){

        return a+b;

    }

    public int add(int a,int b,int c){

        return a+b+c;

    }

}

class poly3{

    public static void main(String[] args){

        Calcee C1=new Calcee();

        System.out.println("Sum of 2 and 5 is: "+C1.add(2,5));

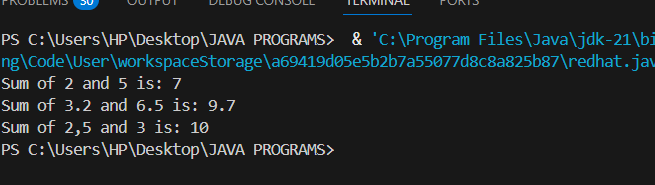
        System.out.println("Sum of 3.2 and 6.5 is: "+C1.add(3.2,6.5));

        System.out.println("Sum of 2,5 and 3 is: "+C1.add(2,5,3));

    }

}

**OUTPUT :**

****

**ERROR :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | syntax error | String forgot in main function | String is added |
| 2 | Logical error | Incorrect logic | Correct logic |

**4)Aim :** Create a Shape class with a method calculateArea() that is overloaded for different shapes (e.g., square, rectangle). Then, create a subclass Circle that overrides the calculateArea() method for a circle.

**Program :**

class Shape {

    void calculateArea( int a) {

        System.out.println("The area of Square is :" + (a\*a) );

    }

    void calculateArea(int a , int b) {

        System.out.println("The area of rectangle is :" + (a\*b));

    }

}

class circle extends Shape {

    void calculateArea(double a){

        System.out.println("The area of circle is :" + (3.14\*a\*a));

  } }

class main {

    public static void main(String[] args) {

        Shape s = new Shape();

        circle c = new circle();

        s.calculateArea(4);

        System.out.println("    ");

        s.calculateArea(4, 5);

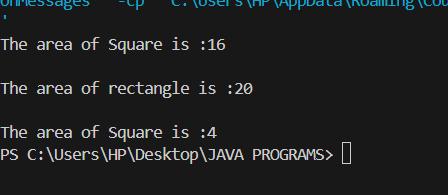
        System.out.println("    ");

        c.calculateArea(2);

    }

}

**OUTPUT :**

****

**ERRORS :**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | Syntax error | ; is missed | ; is added |
| 2 | Logical error | Incorrect logic | Correct logic |

**WEEK-7**

1. **Aim:** Write a Java program to create an abstract class Animal with an abstract method called sound(). Create subclasses Lion and Tiger that extend the Animal class and implement the sound() method to make a specific sound for each animal.

**PROGRAM:**

abstract class Animal {

    abstract void sound();

}

class Lion extends Animal {

    void sound() {

        System.out.println("Lion Roar...!");

    }

}

class Tiger extends Animal {

    void sound() {

        System.out.println("Tiger Roar...!");

    }

}

class Sound {

    public static void main(String[] args) {

        Lion l = new Lion();

        Tiger t = new Tiger();

        System.out.println("Name : K Divya teja"  + "Roll No : AV.SC.U4CSE24138" + "Section : CSE-B");

        System.out.println("    ");

        l.sound(); // calling sub class method

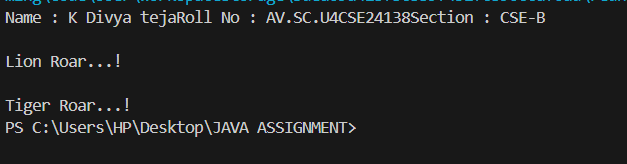
        System.out.println("    ");

        t.sound();// calling sub class method

    }

}

**OUTPUT:**

****

**ERRORS:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | Syntax error | Abstract key word is missed before method | Abstract keyword is added |
| 2 | Logical error | Incorrect logic in subclass method | Corrected logic in subclass method |

**2)Aim :** Write a Java program to create an abstract class Shape3D with abstract methods calculateVolume() and calculateSurfaceArea(). Create subclasses Sphere and Cube that extend the Shape3D class and implement the respective methods to calculate the volume and surface area of each shape.

**PROGRAM :**

import java.math.\*;

abstract class Shapes3D {

    abstract void CalculateVolume();

    abstract void CalculateSurfaceArea();

}

class Sphere extends Shapes3D {

    int radius;

    Sphere(int radius) {

        this.radius = radius;

    }

    void CalculateVolume() {

        System.out.println("Volume of sphere is: " + (4.0 / 3.0) \* Math.PI \* radius \* radius \* radius);

    }

    void CalculateSurfaceArea() {

        System.out.println("Surface area of sphere is: " + 4 \* Math.PI \* radius \* radius);

    }

}

class Cube extends Shapes3D {

    int side;

    Cube(int side) {

        this.side = side;

    }

    void CalculateVolume() {

        System.out.println("Volume of cube is: " + side \* side \* side);

    }

    void CalculateSurfaceArea() {

        System.out.println("Surface area of cube is: " + 6 \* side \* side);

    }

}

public class Shapes18 {

    public static void main(String[] args) {

        Sphere sp = new Sphere(5);

        Cube c = new Cube(4);

        System.out.println("Name : K.Divya Teja  Section : CSE-B  Roll no : AV.SC.U4CSE24138");

        System.out.println("    ");

        sp.CalculateSurfaceArea();

        System.out.println("    ");

        sp.CalculateVolume();

        System.out.println("    ");

        c.CalculateSurfaceArea();

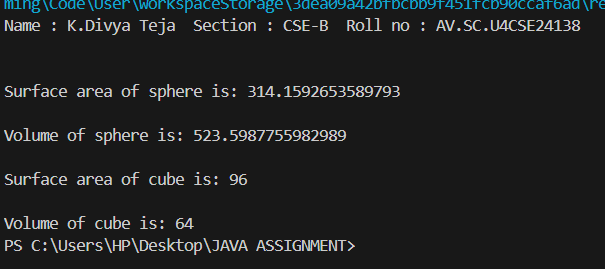
        System.out.println("    ");

        c.CalculateVolume();

    }

}

**OUTPUT:**

****

**ERROR:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | Syntax error | package is missed before abstract class | Package is imported |
| 2 | Logical error | Incorrect logic in subclass method | Corrected logic in subclass method |

**3)Aim :** Write a java program using an abstract class to define a method for pattern printing Create an abstract class named pattern printer with an abstract method printpattern(int n) and a concrete method to display the pattern title.

Implement two subclasses:

1) Star pattern - Prints a right-angled triangle of stars(\*).

2) Number pattern - Prints a right- angled triangles of increasing numbers.

In the main() method, create Objects

Star Pattern Number pattern

\* 1

\*\* 1 2

\*\*\* 1 2 3

\*\*\*\* 1 2 3 4

\*\*\*\*\* 1 2 3 4 5

**PROGRAM :**

abstract class PatternPrinter {

    abstract void printPattern(int n);

    void displayTitle(String title) {

        System.out.println(title);

    }

}

class StarPattern extends PatternPrinter {

    void printPattern(int n) {

        for (int i = 1; i <= n; i++) {

            for (int j = 1; j <= i; j++) {

                System.out.print("\* ");

            }

            System.out.println();

        }

    }

}

class NumberPattern extends PatternPrinter {

    void printPattern(int n) {

        for (int i = 1; i <= n; i++) {

            for (int j = 1; j <= i; j++) {

                System.out.print(j + " ");

            }

            System.out.println();

        }

    }

}

 class PatternProgram {

    public static void main(String[] args) {

        StarPattern sp = new StarPattern();

        NumberPattern np = new NumberPattern();

        System.out.println("Name:K.Divya Teja  Roll no:AV.SC.U4CSE24138  Section:CSE-B");

        System.out.println("    ");

        sp.displayTitle("Star Pattern");

        sp.printPattern(5);

        System.out.println("    ");

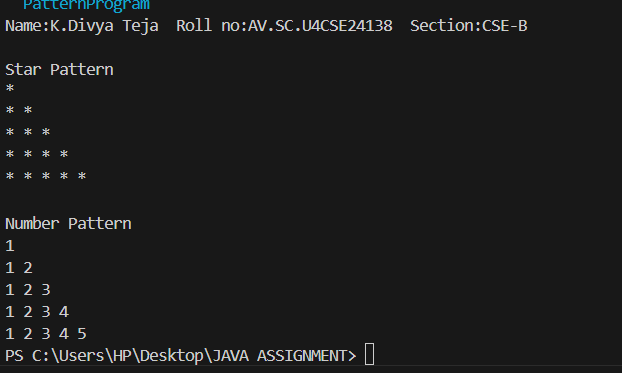
        np.displayTitle("Number Pattern");

        np.printPattern(5);

    }

}

**OUTPUT:**

****

**ERROR:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **Rectification** |
| 1 | Syntax error | For loop increment condition is missed in subclass method | Increment condition is added in subclass method |
| 2 | Logical error | Incorrect logic in subclass method | Corrected logic in subclass method |