**23CSE111**

**OBJECT ORIENTED PROGRAMMING**

**LAB REPORT**

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**Amrita School of Computing**

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**OBJECT ORIENTED PROGRAMMING LAB REPORT**

**TASK 1: JAVA INSTALLATION ON WINDOWS**

**STEP 1:** Go to the official website.

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STEP 2: Install JDK 21.

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STEP 2: Environmental Variable Set-Up.

STEP 3: Set the path to C:\Program Files\Java\JDK 21\Bin

(The files will be stored in the bin)

STEP 4: Search for the environmental variables in the Environmental Variable Set-Up.

STEP 5: Select the path in system variables for multiple users.

STEP 7: Paste the above selected path in the “New” section.

STEP 8: Go to the Command Prompt Window and verify the installation by typing “—version” or “javac –version”.

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**TASK 2: First Java Program**

AIM: **Execute First Java Program with Student Details.**

**PROGRAM:**

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**OUTPUT:**

**A screen shot of a computer

AI-generated content may be incorrect.**

**ERRORS:**

|  |  |  |
| --- | --- | --- |
| **1** | Syntax error | Semicolon Added |
| **2** | Runtime Error | Copied correct path |
| **3** | Name Error | Rectified |

**WEEK-2**

**AIM: WRITE A JAVA PROGRAM TO CALCULATE THE SIMPLE INTEREST WITH INPUTS**

**PROGRAM:**

public class SimpleInterest {

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the principal amount: ");

        double principal = scanner.nextDouble();

        System.out.print("Enter the rate of interest (in %): ");

        double rate = scanner.nextDouble();

        System.out.print("Enter the time period (in years): ");

        double time = scanner.nextDouble();

        double simpleInterest = (principal \* rate \* time) / 100;

        System.out.println("The Simple Interest is: " + simpleInterest);

        scanner.close();

    }

}

**OUTPUT:**

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**NEGATIVE CASE:**

**A screen shot of a computer code

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1.When we give input in decimal form for principal value it will show error.

2.It can’t compile the code and can’t show the output

**IMPORTANT POINTS:**

1.We have used scanner method to give input to the code

2.Formula of simple interest is (P\*T\*R)/100

3.We have assigned values for P,T,R

**Errors:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error Type** | **Reason for error** | **Rectification** |
| 1 | Runtime error | Incorrect path | Copied correct path |
| 2 | Syntax error | { missing | { added |

1. **AIM: WRITE A JAVA PROGRAM TO FIND THE FACTORIAL OF A NUMBER**

**PROGRAM:**

import java.util.Scanner;

public class FactorialCalculator {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

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

int number = scanner.nextInt();

int result = factorial(number);

System.out.println("Factorial of " + number + " is: " + result);

scanner.close();

}

public static int factorial(int n) {

if (n == 0) {

return 1;

} else {

return n \* factorial(n - 1);

}

}

}

OUTPUT:

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**NEGATIVE CASE:**

A screen shot of a computer program

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1.When we give input in decimal form for principal value it will show error.

2.It can’t compile the code and can’t show the output.

**ERROR:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **rectification** |
|  | Logical error | Incorrect input | Correcting input |
|  | Runtime error | Incorrect path | Using correct path |

**IMPORTANT POINTS:**

1. **Importing Scanner:**
   * The code imports the Scanner class from the java.util package to read user input.
2. **Main Method:**
   * The main method is the entry point of the program. It creates a Scanner object to read user input and prompts the user to enter a number**.**
3. **Factorial Calculation: The factorial method is defined as a static method that takes an integer n and returns the factorial of n.**
   * method uses recursion to calculate the factorial. If n is 0, it returns 1 (base case). Otherwise, it returns n \* factorial (n - 1).
4. **Closing Scanner:**
   * The scanner.close() method is called to close the Scanner object and release the resources associated with it.
5. **Recursion:**

The use of recursion in the factorial method is a key point. It repeatedly calls itself with decremented values of n until it reaches the base case

**3 . AIM:WRITE A JAVA PROGRAM TO CONVERT CELCIUS TO FAHRENHEIT**

**PROGRAM :**

import java.util.Scanner;

public class CelsiusToFahrenheit {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter temperature in Celsius: ");

double celsius = scanner.nextDouble();

double fahrenheit = celsiusToFahrenheit(celsius);

System.out.println("Temperature in Fahrenheit: " + fahrenheit);

scanner.close();

}

public static double celsiusToFahrenheit(double celsius) {

return (celsius \* 9/5) + 32;

}

}

**OUTPUT:**

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**NEGATIVE CASE:**

**A screen shot of a computer program

AI-generated content may be incorrect.**

**IMPORTANT POINTS TO NOTE:**

**1. Importing Scanner Class:**

* The Scanner class is imported from java.util.Scanner to take user input.

**2. Class Declaration:**

* The class name CelsiusToFahrenheit follows Java naming conventions (PascalCase).

**3. Main Method:**

* The public static void main(String[] args) method is the entry point of the program

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **rectification** |
| **1.** | **Logical error** | **Incorrect input** | **Correcting input** |
| **2.** | **Runtime errror** | **Incorrect path** | **Using correct path** |

**3.AIM: JAVA PROGRAM TO CONVERT FAHRENHEIT TO CELCIUS**

**PROGRAM:**

import java.util.Scanner;

public class FahrenheitToCelsius {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter temperature in Fahrenheit: ");

double fahrenheit = scanner.nextDouble();

double celsius = fahrenheitToCelsius(fahrenheit);

System.out.println("Temperature in Celsius: " + celsius);

scanner.close();

}

public static double fahrenheitToCelsius(double fahrenheit) {

return (fahrenheit - 32) \* 5/9;

}

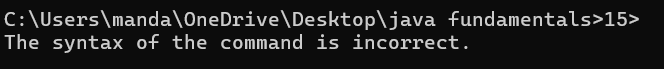
}

**OUTPUT:**

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**NEGATIVE CASE:**

****

**IMPORTANT POINTS:**

* import java.util.Scanner; is used to include the Scanner class to take user input.

**1.Class Declaration:**

* The class is named FahrenheitToCelsius which follows Java naming conventions.

**2. Main Method:**

* The program execution starts from the main() method:

public static void main(String[] args)

**3.Scanner Class:**

* The Scanner object is created to take input from the user:

Scanner scanner = new Scanner(System.in);

**ERRORS:**

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

**5 . AIM: WRITE A JAVA PROGRAM TO FIND THE AREA OF A TRIANGLE**

**PROGRAM:**

import java.util.Scanner;

public class TriangleArea {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

System.out.print("Enter the base of the triangle: ");

double base = scanner.nextDouble();

System.out.print("Enter the height of the triangle: ");

double height = scanner.nextDouble();

double area = calculateArea(base, height);

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

scanner.close();

}

public static double calculateArea(double base, double height) {

return (base \* height) / 2;

}

}

**OUTPUT:**

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**A screen shot of a computer program

AI-generated content may be incorrect.**

**IMPORTANT POINTS:**

**User Input:**

* The user is prompted to enter:
  + Base of the triangle
  + Height of the triangle

**Method Call:**

* The method calculateArea(base, height) is called to calculate the area of the triangle.

**Return Value:**

* The method returns the area value to the main() method.

**ERRORS:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Error type** | **Reason for error** | **rectification** |
| **2.** | **Runtime errror** | **Incorrect path** | **Using correct path** |
| **3.** | **Syntax error** | **No semicoln** | **Using semicoln** |

**6. AIM: WRITE A JAVA PROGRAM TO FIND THE AREA OF A RECTANGLE**

**PROGRAM:**

import java.util.Scanner;

public class RectangleArea {

public static void main(String[] args) {

Scanner scanner = new Scanner(System.in);

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

double length = scanner.nextDouble();

System.out.print("Enter the width of the rectangle: ");

double width = scanner.nextDouble();

double area = calculateArea(length, width);

System.out.println("The area of the rectangle is: " + area);

scanner.close();

}

public static double calculateArea(double length, double width) {

return length \* width;

}

}

**OUTPUT:**

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**NEGATIVE CASE:**

**A screen shot of a computer code

AI-generated content may be incorrect.**

**IMPORTANT POINTS:**

**1. Purpose:** The program calculates the area of a rectangle based on the user-provided length and width.

**2. User Input:**

* It prompts the user to input the rectangle's length and width.
* The input is read using the Scanner class and stored as double values to allow for decimal measurements.

**3.Modularity:**

* The calculation logic is placed in a separate method, calculateArea(), which takes length and width

**ERRORS:**

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

**7.AIM: WRITE A JAVA PROGRAM FOR FIBONACCI SEQUENCE**

**PROGRAM:**

import java.util.Scanner;

public class Fibonacci {

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;

}

sc.close();

}

}

**OUTPUT:**

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**NEGATIVE CASE:**

**A screen shot of a computer program

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1.I have rearranged the starting two elements from 0 and 1 to 1 and 0.

2.Therefore, the order of Fibonacci series is changed.

**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 | Semicolon added |
| 3 | Runtime error | Incorrect path | Copied correct path |

**IMPORTANT POINTS:**

1. Importing Scanner:

* The code imports the Scanner class from the java.util package to read user input.

2. Class Declaration:

* The code declares a class named fibo.

3. Main Method:

* The main method is the entry point of the program. It creates a Scanner object to read user input and prompts the user to enter a number.

4. Variable Initialization:

* The code initializes variables:
  + num: The number of Fibonacci terms to be generated.
  + f3: Used to store the next Fibonacci term.
  + f1 and f2: The first two terms of the Fibonacci sequence, initialized to 0 and 1, respectively.
  + i: Counter variable initialized to 2 since the first two terms are already known.

**WEEK-3**

**Aim:**

**To create 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 three methods named start(), stop(). Service()**

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

**PROGRAM:**

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("\nNishanth\n\n");

       car car1 = new car();

       car1.Car\_color = "Black";

       car1.Car\_brand = "Mercedes";

       car1.fuel\_type = "Diesel";

       car1.mileage = 100;

      car1.start();

       car car2 = new car();

       car2.Car\_color = "White";

       car2.Car\_brand = "BMW";

       car2.fuel\_type = "Petrol";

       car2.mileage = 200;

       car2.stop();

       car car3 = new car();

       car3.Car\_color = "Red";

       car3.Car\_brand = "Skoda";

       car3.fuel\_type = "Petrol";

       car3.mileage = 300;

      car3.service();

    }

}

**OUTPUT:**

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**CLASS DIAGRAM:**

|  |
| --- |
| car |
| - Car\_color: String  - Car\_brand: String  - fuel\_type: String  - mileage: int |
| + start(): void  + service(): void  + stop(): void |

**IMPORTANT POINTS**:

1. The car class has four attributes: Car\_color, Car\_brand, fuel\_type, and mileage.

2. It also has three methods: start(), service(), and stop().

3. The start(), service(), and stop() methods all print the same details about the car.

4. Each method prints the car's color, brand, fuel type, and mileage to the console

5. The main method creates three instances of the car class: car1, car2, and car3.

6. Each car object is assigned specific values for Car\_color, Car\_brand, fuel\_type, and mileage**.**

**AIM:**

**WRITE A JAVA CLASS FOR A BANK ACCOUNT WITH DEPOSIT() AND WITHDRAW() AS METHODS.**

**PROGRAM:**

class BankAccount {

    private double balance;

    public BankAccount(double initialBalance) {

        if (initialBalance > 0) {

            this.balance = initialBalance;

        } else {

            this.balance = 0;

        }

    }

    public void deposit(double amount) {

        if (amount > 0) {

            balance += amount;

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

        } else {

            System.out.println("Deposited amount must be positive");

        }

    }

    public double getBalance() {

        return balance;

    }

}

public class Main1 {

    public static void main(String args[]) {

        BankAccount account = new BankAccount(50000);

        account.deposit(25000);

        System.out.println("Current Balance is:" + account.getBalance());

    }

}

**OUTPUT:**

**A computer screen shot of a black screen

AI-generated content may be incorrect.**

**CLASS DIAGRAM:**

|  |
| --- |
| **BankAccount** |
| -balance: double |
| +BankAccount(doubleinitialBalance  +deposit(doubleamount): void  + getBalance(): double |

**IMPORTANT POINTS:**

The Bank Account class has a private attribute balance to store the account balance.

* The class has a constructor, BankAccount(double initialBalance), which initializes the balance. If the initial balance is not positive, it sets the balance to 0.
* The deposit(double amount) method adds a positive amount to the balance and prints a message. If the deposit amount is not positive, it prints an error message.
* The getBalance() method returns the current balance of the account.
* The Main1 class contains the main method, which serves as the entry point of the program.
* In the main method, an instance of Bank Account is created with an initial balance of 1000.

**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.**

**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("Math", "Ramanujan", 1950);

Book b2 = new Book("Physics", "CV Raman", 1960);

b1.displayDetails();

b2.displayDetails();

}

}

**OUTPUT:**

****

**NEGATIVE CASE:**

**A black screen with white text

AI-generated content may be incorrect.**

**ERROR:**

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

**CLASS DIAGRAM:**

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

**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.**

**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();

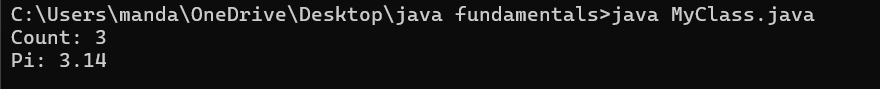
System.out.println("Count: " +count);

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

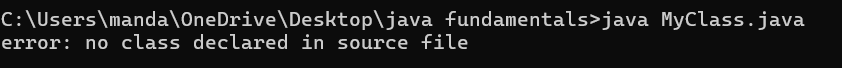
}

}

**OUTPUT:**

****

**NEGATIVE 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’ |

**CLASS DIAGRAM:**

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

**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.