

Programming in Java Lab

Assignment 1

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AIML-B1

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2022-26

Q1 Implement a menu-driven Java program (like fib or factorial) to implement these input methods in java (command line args, Scanner, BufferedReader, DataInputStream, Console) Code:

```
// Sahil Goyal  
// AIML-B1  
// 22070126094
```

```
package Assign1;
```

```
import java.util.Scanner;
```

```
// Class to calculate and print Fibonacci  
numbers public class FibonacciScanner {
```

```
// Main method to initiate program execution  
public static void main(String args[]) {
```

```
// Create a Scanner object to take user input  
Scanner scan = new Scanner(System.in);
```

```
// Prompt the user to enter the number of Fibonacci terms to generate  
System.out.print("Enter the number of Fibonacci numbers to generate: ");
```

```

int n = scan.nextInt();

// Print the first n Fibonacci
numbers for (int i = 0; i < n; i++) {
    System.out.print(fibonacci(i) + " ");
}

// Close the Scanner
resource scan.close();
}

// Recursive method to calculate the nth Fibonacci
number public static int fibonacci(int n) {

    // Base cases: 0th and 1st Fibonacci numbers are 0 and 1,
    respectively if (n <= 1) {

        return
n; } else {

        // Iteratively calculate Fibonacci
        numbers int a = 0, b = 1, c = 0;

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

            c = a + b; // Calculate the next Fibonacci number

            a = b;    // Update variables for the next iteration

            b = c;

        }

        return b; // Return the calculated Fibonacci number

    }

}
}

```

Output:

```
Enter the number of Fibonacci numbers to generate: 5
0 1 1 2 3
```

Q2 Implement a simple menu driven calculator in java to implement add, sub, mul, div, sqrt, power, mean, variance. Implement a separate Calculator class to include all related function inside that class.

Code:

```
//Main.java
```

```
/*Sahil Goyal
```

```
AIML-B1
```

```
22070126094
```

```
*/
```

```
package Assign1;
```

```
public class Main {
```

```
    public static void main(String[] args) {
```

```
        // Create an instance of UserInput to handle user
```

```
        input UserInput userInput = new UserInput();
```

```
        // Get the user's choice of operation
```

```
        String choice = userInput.getStringInput("Choose Operation: +, -, /, *, ^, var, stddev, avg");
```

```
        // Check if the chosen operation is a basic arithmetic operation (+, -, *, /, ^)
```

```
        if (choice.equals("+") || choice.equals("-") || choice.equals("*") || choice.equals("/")
            || choice.equals("^")) {
```

```
            // Get user input for two numbers
```

```
            double n1 = userInput.getDoubleInput("Enter First Number:"); double n2
```

```
            = userInput.getDoubleInput("Enter Second Number:");
```

```
            userInput.closeScanner(); // Close the scanner since input is complete
```

```
            // Perform the chosen operation and display the
```

```
            result if (choice.equals("+")) {
```

```

        System.err.println(Calculator.add(n1, n2));
    } else if (choice.equals("-")) {
        System.err.println(Calculator.subtract(n1, n2));
    } else if (choice.equals("*")) {
        System.err.println(Calculator.multiply(n1, n2));
    } else if (choice.equals("/")) {
        System.out.println(Calculator.divide(n1, n2));
    } else if (choice.equals("^")) {
        System.out.println(Calculator.power(n1, n2));
    } else {
        System.out.println("Invalid Operation");
    }
} else {
    // For statistical operations (var, stddev, avg), get an array input
    double[] arr = userInput.getArrayInput(); userInput.closeScanner(); //
    Close the scanner since input is complete

    // Perform the chosen statistical operation and display the result
    if (choice.equals("var")) {
        System.out.println(Calculator.variance(arr));
    } else if (choice.equals("stddev")) {
        System.out.println(Calculator.stddev(arr));
    } else if (choice.equals("avg")) {
        System.out.println(Calculator.mean(arr));
    } else {
        System.out.println("Invalid Operation");
    }
}
}
}

```

```
// userInput.java
package Assign1;

import java.util.Scanner;

public class UserInput {

    // Scanner object for reading
    private Scanner scanner;

    // Constructor initializes the
    Scanner public UserInput() {
        scanner = new Scanner(System.in);
    }

    // Method to get a double input from the user with a prompt
    message public double getDoubleInput(String message) {

        System.out.println(message);
        return scanner.nextDouble();
    }

    // Method to get a string input from the user with a prompt
    message public String getStringInput(String message) {

        System.out.println(message);
        return scanner.nextLine();
    }

    // Method to get an array input from the user with a prompt
    message public double[] getArrayInput() {

        Scanner sc = new Scanner(System.in);

        // Prompt user for the size of the array
```

```

System.out.println("Enter the size of the array:");

int size = sc.nextInt();

// Create an array to store the input
elements double[] array = new double[size];

// Prompt user to enter each element of the
array System.out.println("Enter elements:");
for (int i = 0; i < size; i++) {

    // Check if the next input is a
    double if (sc.hasNextDouble()) {
        array[i] = sc.nextDouble();
    }
}

sc.close(); // Close the inner scanner
return array;
}

// Method to close the Scanner when it is no longer
needed public void closeScanner() {
    scanner.close();
}
}

```

```
// Calculator.java
```

```
package Assign1;
```

```
import java.util.Arrays;
```

```
public class Calculator {
```

```
    // Method to add two numbers
```

```
public static double add(double n1, double n2){  
    return n1 + n2;  
}
```

```
// Method to subtract two numbers
```

```
public static double subtract(double n1, double  
    n2){ return n1 - n2;  
}
```

```
// Method to multiply two numbers
```

```
public static double multiply(double n1, double  
    n2){ return n1 * n2;  
}
```

```
// Method to divide two numbers
```

```
public static double divide(double n1, double n2){  
    return n1 / n2;  
}
```

```
// Method to calculate the mean (average) of an array of
```

```
numbers public static double mean(double[] arr){  
    return Arrays.stream(arr).sum() / arr.length;  
}
```

```
// Method to calculate the square root of a number
```

```
public static double sqrt(double n){  
    return Math.pow(n, 0.5);  
}
```

```
// Method to calculate the standard deviation of an array of
```

```
numbers public static double stddev(double[] arr){
```

```

double standardDeviation = 0.0;

// Calculate the sum of squared differences from the
mean for (double num : arr) {
    standardDeviation += Math.pow(num - mean(arr), 2);
}

// Calculate the square root of the average of squared
differences return Math.sqrt(standardDeviation / arr.length);
}

// Method to calculate the variance of an array of
numbers public static double variance(double[] arr){
    // Variance is the square root of the standard deviation
    return sqrt(stddev(arr));
}

// Method to calculate the power of a number raised to another
number public static double power(double n1, double n2){
    return Math.pow(n1, n2);
}
}

```

Output:

```

Choose Operation: +, -, /, *, ^, var, stddev, avg
avg
Enter the size of the array:
6
Enter elements:
3 4 5 7 8 9
6.0

```

Checkout the codes on my github and follow for more updates.

<https://github.com/sahilgoyal7214/programming-in-java>