

Programming in Java Lab

Assignment 1

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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:

```
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
```

```
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 input
```

```
    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

```

<https://github.com/Jayaditya177/PIJ>