

# 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:

```
/* Sameer Khatwani
```

```
AIML-B1
```

```
22070126099
```

```
*/ 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
/*Sameer Khatwani
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*/ 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

```

**Github Repo**

[Jhttps://github.com/samv28/PIJ](https://github.com/samv28/PIJ)