# The "Sum and Average Calculation" Java Program

**1. Introduction**

The purpose of this Java program is to calculate the **sum** and **average** of a set of numbers entered by the user. It allows the user to:

* Input how many numbers they wish to enter.
* Enter those numbers.
* Automatically calculate and display the sum and average of those numbers.

The program uses basic Java concepts such as:

* **Scanner** for input,
* **ArrayList** for storing numbers dynamically,
* **Loops** for iterating over the list of numbers, and
* **Arithmetic operations** to calculate the sum and average.

**2. Key Components and Concepts**

**Scanner Class (Input Handling)**

Scanner scanner = new Scanner(System.in);

* The Scanner class is used to capture user input. By passing System.in as an argument, we enable the program to read input from the console.
* nextInt() method is used to read integers from the user input.

**ArrayList (Dynamic List of Numbers)**

List<Integer> numbers = new ArrayList<>();

* An ArrayList is a type of list in Java that allows dynamic sizing, meaning that you can add as many elements as needed without worrying about the fixed size of an array.
* ArrayList is preferred when the size of the collection may change, as it automatically resizes when elements are added.

**User Input for List Size**

System.out.print("Enter the number of elements in the list: ");

int n = scanner.nextInt();

* The program first asks the user how many numbers they want to enter (n).
* The value n will determine how many times the user will be asked to input a number.

**Loop for Inputting Numbers**

for (int i = 0; i < n; i++) {

numbers.add(scanner.nextInt());

}

* A for loop is used to read n numbers from the user. The user enters one number each time, and it is added to the numbers list using the add() method.
* This loop ensures that the program collects exactly the number of inputs specified by the user.

**Calculating the Sum**

int sum = 0;

for (int num : numbers) {

sum += num;

}

* After collecting all the numbers, we calculate the sum. This is done using an enhanced for loop, which iterates over each element in the numbers list. For each number, it adds the number to the sum variable.
* The sum accumulates the values of all numbers entered by the user.

**Calculating the Average**

double average = (double) sum / n;

* The average is calculated by dividing the sum of all numbers by the total number of numbers (n).
* Since division may result in a non-integer value, we cast sum to a double to ensure that the result of the division is a decimal number, rather than an integer (which would round down the result).

**Outputting the Results**

System.out.println("Sum of the numbers: " + sum);

System.out.println("Average of the numbers: " + average);

* After the calculations, the program outputs the **sum** and **average** to the console using System.out.println.

import java.util.Scanner;

import java.util.List;

import java.util.ArrayList;

public class Main {

public static void main(String[] args) {

// Create a scanner object to read input

Scanner scanner = new Scanner(System.in);

// Ask for the number of elements in the list

System.out.print("Enter the number of elements in the list: ");

int n = scanner.nextInt();

// Create a list to store the numbers

List<Integer> numbers = new ArrayList<>();

// Ask for the numbers to enter into the list

System.out.print("Enter the numbers: ");

for (int i = 0; i < n; i++) {

numbers.add(scanner.nextInt());

}

// Find the maximum and minimum values in the list

int max = numbers.get(0);

int min = numbers.get(0);

for (int num : numbers) {

if (num > max) {

max = num;

}

if (num < min) {

min = num;

}

}

// Display the maximum and minimum values

System.out.println("Maximum value: " + max);

System.out.println("Minimum value: " + min);

}

}

Output :

Enter the number of elements in the list: 4

Enter the numbers: 10 20 30 40

Sum of the numbers: 100

Average of the numbers: 25.0

**Conclusion**

The program provides a simple yet effective example of basic Java concepts, including:

* **Handling user input** using Scanner.
* **Using collections** such as ArrayList to store dynamic data.
* **Performing arithmetic operations** like sum and average.
* **Displaying results** using System.out.println().

This is a basic, but important, exercise in Java programming for beginners to learn how to manipulate data, perform calculations, and work with user input.

If you want to enhance this project, you could add functionality like:

* Handling invalid input (non-integer values).
* Displaying the numbers entered by the user.
* Allowing users to enter additional types of numbers, such as floating-point values (to calculate averages of non-integer numbers).