

## Lab 4 - Task 1

```
package Lab4.Tasks;

import java.util.Scanner;

public class Task1
{
    public static void main(String[] args)
    {
        Scanner scanner = new Scanner(System.in);

        double[] numbers = new double[5];
        System.out.println("Enter 5 numbers: ");
        for (int i = 0; i < 5; i++)
        {
            numbers[i] = getNumber(scanner);
        }

        System.out.printf("Sum: %.2f\n", getSum(numbers));
        scanner.close();
    }

    private static double getNumber(Scanner scanner)
    {
        double out = 0.0f;

        boolean validInputFromUser = true;
        System.out.print("Enter a number: ");
        do
        {
            try
            {
                out = scanner.nextDouble();
                validInputFromUser = true;
            }
            catch (Exception ignored)
            {
                scanner.nextLine(); // discard next line
                System.out.println("Please enter a valid decimal number! ");
                validInputFromUser = false;
            }
        } while (!validInputFromUser);

        return out;
    }

    private static double getSum(double[] numbers)
    {
        double sum = 0;
        for (double number : numbers)
        {
            sum += number;
        }
    }
}
```

```
        return sum;  
    }  
}
```

## Program Output

```
Enter 5 numbers:  
Enter a number: 10  
Enter a number: 20  
Enter a number: 30  
Enter a number: 40  
Enter a number: 50  
Sum: 150.00
```

## Lab 4 - Task 2

```
package Lab4.Tasks;

import java.util.Scanner;

public class Task2
{
    public static void main(String[] args)
    {
        Scanner scanner = new Scanner(System.in);

        double[] numbers = new double[5];
        System.out.println("Enter 5 numbers: ");
        for (int i = 0; i < 5; i++)
        {
            numbers[i] = getNumber(scanner);
        }

        System.out.printf("Largest: %.2f\n", getLargest(numbers));
        scanner.close();
    }

    private static double getNumber(Scanner scanner)
    {
        double out = 0.0f;

        boolean validInputFromUser = true;
        System.out.print("Enter a number: ");
        do
        {
            try
            {
                out = scanner.nextDouble();
                validInputFromUser = true;
            }
            catch (Exception ignored)
            {
                scanner.nextLine(); // discard next line
                System.out.println("Please enter a valid decimal number! ");
                validInputFromUser = false;
            }
        } while (!validInputFromUser);

        return out;
    }

    private static double getLargest(double[] numbers)
    {
        double largest = 0;
        for (double number : numbers)
        {
            largest = (number > largest) ? number : largest;
        }
    }
}
```

```
        return largest;  
    }  
}
```

## Program Output

```
Enter 5 numbers:  
Enter a number: 10  
Enter a number: 20  
Enter a number: 30  
Enter a number: 40  
Enter a number: 50  
Largest: 50.00
```

## Lab 4 - Task 3

```
package Lab4.Tasks;

import java.util.Scanner;

public class Task3
{
    public static void main(String[] args)
    {
        Scanner scanner = new Scanner(System.in);

        int[] numbers = new int[5];
        System.out.println("Enter 5 numbers: ");
        for (int i = 0; i < numbers.length; i++)
        {
            numbers[i] = getNumber(scanner);
        }

        System.out.printf("Number of even: %d\n", countEven(numbers));
        System.out.printf("Number of odd : %d\n", countOdd(numbers));
        scanner.close();
    }

    private static int getNumber(Scanner scanner)
    {
        int out = 0;

        boolean validInputFromUser = true;
        System.out.print("Enter a number: ");
        do
        {
            try
            {
                out = scanner.nextInt();
                validInputFromUser = true;
            }
            catch (Exception ignored)
            {
                scanner.nextLine(); // discard next line
                System.out.println("Please enter a valid decimal number! ");
                validInputFromUser = false;
            }
        } while (!validInputFromUser);

        return out;
    }

    private static int countEven(int[] numbers)
    {
        int evenCount = 0;
        for (int number : numbers)
        {
            if (isEven(number))
            {
                evenCount++;
            }
        }
        return evenCount;
    }

    private static boolean isEven(int number)
    {
        return number % 2 == 0;
    }
}
```

```
        evenCount++;
    }
    return evenCount;
}

private static int countOdd(int[] numbers)
{
    int oddCount = 0;
    for (int number : numbers)
    {
        if (!isEven(number))
            oddCount++;
    }
    return oddCount;
}

private static boolean isEven(int number)
{
    return number % 2 == 0;
}
}
```

## Program Output

```
Enter 5 numbers:
Enter a number: 10
Enter a number: 20
Enter a number: 30
Enter a number: 40
Enter a number: 50
Number of even: 5
Number of odd : 0
```

## Lab 4 - Task 4

```
package Lab4.Tasks;

import java.util.Scanner;

public class Task4
{
    public static void main(String[] args)
    {
        Scanner scanner = new Scanner(System.in);

        Student[] students = new Student[10];

        for (int i = 0; i < students.length; i++)
        {
            System.out.print("Enter student name: ");
            String name = scanner.nextLine();
            int marks = getMarks(scanner);

            scanner.nextLine(); // consume newline to allow next string input

            students[i] = Student.from(name, marks);
        }

        printStats(students);
    }

    private static void printStats(Student[] students)
    {
        int total = calculateTotalMarks(students);
        float average = calculateAverageMarks(students);
        int highest = getHighest(students);
        int lowest = getLowest(students);
        int numAboveAverage = studentsAboveAverage(students, average);

        System.out.println("\n\n>-- STUDENT MARKS DETAILS --<\n");
        System.out.println("Students Count: " + students.length + "\n");
        for (Student student : students)
            System.out.println(student.getPrintableLine());

        System.out.println("\n\n>-- STUDENT MARKS STATISTICS --<\n");
        System.out.println("Students Count: " + students.length + "\n");

        System.out.println("Total Marks: " + total);
        System.out.println("Average Marks: " + average);
        System.out.println("Highest Marks: " + highest);
        System.out.println("Lowest Marks: " + lowest);
        System.out.println("Number of Students Above Average: " + numAboveAverage);
    }

    /* INPUTS */

    private static int getMarks(Scanner scanner)
```

```

{
    int marks;
    do
    {
        // catch invalid input such as letters
        try
        {
            System.out.print("Enter marks obtained: ");
            marks = scanner.nextInt();
        }
        catch (Exception e)
        {
            System.out.println("Invalid marks entered. Please try again.");
            scanner.next(); // clear invalid input
            continue;
        }

        if (marks < -1 || marks > 100)
            System.out.println("Invalid marks entered. Please try again.");
        else
            break;

    } while (true);
    return marks;
}

/* FUNCTIONS */

private static int calculateTotalMarks(Student[] students)
{
    int total = 0;
    for (Student student : students)
    {
        total += student.marks();
    }
    return total;
}

private static float calculateAverageMarks(Student[] students)
{
    int total = calculateTotalMarks(students);
    return (float) total / students.length;
}

private static int getHighest(Student[] students)
{
    int highest = Integer.MIN_VALUE;
    for (Student student : students)
    {
        if (student.marks() > highest)
        {
            highest = student.marks();
        }
    }
}

```

```

        return highest;
    }

    private static int getLowest(Student[] students)
    {
        int lowest = Integer.MAX_VALUE;
        for (Student student : students)
        {
            if (student.marks() < lowest)
            {
                lowest = student.marks();
            }
        }
        return lowest;
    }

    private static int studentsAboveAverage(Student[] students, float average)
    {
        int count = 0;
        for (Student student : students)
        {
            if (student.marks() > average)
            {
                count++;
            }
        }
        return count;
    }

    /* PRIVATE CLASSES */

    private record Student(String name, int marks)
    {
        public static Student from(String name, int marks)
        {
            return new Student(name, marks);
        }

        public String getPrintableLine()
        {
            return "Name: " + name.strip() + ", Marks: " + marks;
        }
    }
}

```

## Program Output

```

Enter student name: Ali
Enter marks obtained: 90
Enter student name: Hamza
Enter marks obtained: 45
Enter student name: Musta      Hassan
Enter marks obtained: 86

```

```
Enter student name: Fauz  izan
Enter marks obtained: 75
Enter student name: Ahmad
Enter marks obtained: 48
Enter student name: Imran
Enter marks obtained: 68
Enter student name: Kahn  han
Enter marks obtained: 75
Enter student name: Nawaz
Enter marks obtained: 87
Enter student name: Bhutto
Enter marks obtained: 90
Enter student name: Zar  Asif
Enter marks obtained: 63
```

```
>-- STUDENT MARKS DETAILS -- <
```

```
Students Count: 10
```

```
Name: Ali, Marks: 90
Name: Hamza, Marks: 45
Name: Hassan, Marks: 86
Name: Faizan, Marks: 75
Name: Ahmad, Marks: 48
Name: Imran, Marks: 68
Name: Khan, Marks: 75
Name: Nawaz, Marks: 87
Name: Bhutto, Marks: 90
Name: Asif, Marks: 63
```

```
>-- STUDENT MARKS STATISTICS --<
```

```
Students Count: 10
```

```
Total Marks: 727
Average Marks: 72.7
Highest Marks: 90
Lowest Marks: 45
Number of Students Above Average: 6
```