

# Special Force Lab Assignment Four

## Problem Statement 1:

Write a Java function that generates the Fibonacci series up to a given number 'n'. The function should meet the following requirements:

**Note :** Implement at least two different approaches to solve the problem.

The function should return the Fibonacci series as an array of integers.

The first two elements of the series should be 0 and 1.

The function should be able to handle the case where n is negative or zero. In this case, the function should return an empty array.

The function should also handle the case where n is a large number, such as 10000. In this case, the function should return the series up to the largest possible value without causing a stack overflow error.

**Approach 1:** The first approach is to generate the Fibonacci series iteratively by adding the previous two numbers to get the next number in the series. This approach can be implemented using a loop and an array to store the series.

**Approach 2:** The second approach is to use recursion to generate the Fibonacci series. In this approach, the function calls itself with the previous two numbers in the series to generate the next number. This approach is simpler but may be slower for large values of n.

### Example:

Input: n = 10

Output: [0, 1, 1, 2, 3, 5, 8, 13, 21, 34]

## Problem Statement 2:

You are given a positive integer n. Write a Java function that finds the factorial of n. The function should meet the following requirements:

Implement two different approaches to calculate the factorial of n.

Approach 1: Implement the factorial function using a recursive approach.

Approach 2: Implement the factorial function using an iterative approach.

The function should return the factorial of n as a long integer.

If n is less than or equal to 0, the function should return -1 to indicate an error.

### Example:

Input: n = 5

Output: 120

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### Problem Statement 3:

You are given a binary array consisting of zeros and ones. Write a Java program to find the maximum consecutive ones (or zeros) in the array. The program should meet the following requirements:

The length of the array should be between 1 and  $10^6$ .

The program should find the maximum number of consecutive ones (or zeros) in the array without using any built-in functions.

The program should output the maximum number of consecutive ones (or zeros) found in the array.

#### Example:

Input: [1, 0, 1, 1, 1, 0, 0, 1, 1, 0, 1]

Output: 3

### Problem Statement 4:

You are given an array of integers. Write a Java program to count the occurrences of each element in the array. The program should meet the following requirements:

The length of the array should be between 1 and  $10^6$ .

The program should count the occurrences of each element in the array without using any built-in functions.

The program should output an array of pairs, where each pair contains an element and its count.

The output array should be sorted in ascending order based on the element value.

If two elements have the same count, then they should be sorted in ascending order based on their value.

#### Example:

Input: [3, 1, 2, 3, 1, 2, 1, 4]

Output: [[1, 3], [2, 2], [3, 2], [4, 1]]

### Problem Statement 5:

You are given a year as an integer input. Write a Java function to determine whether the given year is a leap year or not. The function should meet the following requirements:

The function should take a single integer argument, which represents the year to be checked.

A leap year occurs on every year that is evenly divisible by 4, except for years that are both divisible by 100 and not divisible by 400.

The function should return a boolean value, true if the year is a leap year, and false if it is not.

The input year should be between 1 and  $10^9$  (inclusive).

If the input year is not within the specified range, the function should return an error message indicating that the input is out of range.

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Examples:

Input: 2000

Output: true

Input: 1900

Output: false

Input: 2022

Output: false

**Instructions : Submit Screenshots of Output of different test cases with the Code. (PDF or Direct)**