IITM-CS2705 : Programming and Data Structures
Assignment #0

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Aug 4, 2022

- It is strongly encouraged that you solve all the problems by Aug 7, 2022.
- Solve the problems on your own, without consulting any sources.
- Feel free to contact your TA if you face any difficulties.
- This is an **ungraded** assignment.
- Programming language: C++

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1. In this question you will implement two functions each of which computes the n-th Fibonacci number. Let $fib[i]$ denote the i-th Fibonacci number. Then $fib[0] = 0$, $fib[1] = 1$ and for $i \geq 2$, $fib[i] = fib[i-1] + fib[i-2]$.

   You need to implement two functions: the function *computeFib* computes the n-th Fibonacci number using a simple recursion while the function *smartFib* uses additional storage to *re-use* the computed values.

   You need to *time* the execution of both the functions and report the results.

   Input format: the value of n

   Output format: the n-th Fibonacci number, followed by the execution time for *computeFib* **in seconds**, followed by the execution time for *smartFib* **in seconds**, each separated by a white-space.

   Example:

   Input:

   8

   Output:

   21 0 0

   Test your program with the following inputs: 5, 10, 20, 30, 50, 100.

   Find the minimum value n_0 such that for $n < n_0$ both the functions take the same time and at $n \geq n_0$ *smartFib* is significantly faster.

2. Given an array of n distinct integers between 1 and $n+1$, find the missing number.

   Input format: the value of n, followed by the array values, each separated by a white-space.

   Output format: the missing number.

   Example:

   Input:

   8 5 1 2 9 8 3 6 4

   Output:

   7

   Does your algorithm use an additional array? If so, can you design an algorithm without using an additional array?

3. Given an array of integers, print the number of sub arrays whose product is divisible by 5. A sub array is a contiguous part of the original array.

   Input format: First line of the input contains a single integer N (≥ 2), denoting the size of the array. Next line contains N white-space separated integers.

   Output format: a single integer denoting the number of such sub arrays

   Example

   Input:

   3

   1 2 5

   Output:

   3