Faculty of Engineering, University of Jaffna

Department of Computer Engineering

EC4070: Data Structures and algorithms

Lab 01

Chapter 1: Running time and time complexity

Duration : 3 Hours Lecturer : M.Sujanthika

Instructions

i. Submit the code files and screenshot of the outputs in a zipped folder by naming as 2022EAAA_Lab01(AAA – Your Registration Number)
ii. Submit your file on before given deadline.
iii. Any plagiarized work will be given 0 marks.

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1. Write a java programme that reads an array of length **N** and target integer **x**. the program should determine whether the target integer **x** is present in the array. If x is found, program should return true. Otherwise, it should return false.

2. Consider an array of integers. You are required to sort the array in ascending order using the Bubble Sort algorithm. The Bubble Sort algorithm works by repeatedly stepping through the list to be sorted, comparing each pair of adjacent items and swapping them if they are in the wrong order. This process is repeated until the array is sorted. After sorting the array, perform the following.
    a) Print the sorted array.
    b) Count the total number of swaps made during the sorting process.
    c) Identify the first element in the sorted array.
    d) Identify the last element in the sorted array.

3. Implement a program to count the number of shifts required to sort an array using the insertion sort algorithm.
    a) Define a method named ***countShifts*** that accepts an array of integers as a parameter and returns the total number of shifts needed to sort the array using insertion sort.
    b) The program should read an integer **n**, representing the number of test cases.
    c) For each test case:
        - Read an integer ***m***, the length of the array.

- Read ***m*** space-separated integers representing the elements of the array.

d) For each test case, output the original array followed by the total number of shifts required to sort it, formatted as:

original_array : number of shifts

Sample Input :

```
Number of test cases: 2
Array length: 5
Enter the numbers:
1 2 2 3 4
Array length: 5
Enter the numbers:
3 2 1 4 1
```

Sample Output :

```
Outputs:
1 2 2 3 4 : 0
1 1 2 3 4 : 6
```