1. Given an unsorted array of integers containing duplicate elements. Your task is to find if there exist any integer x (if it exists) that appears more than n/2 times in an array A[0...n-1] of size n, otherwise prints "No such integer"(there is at most one such element). **You are not allowed to sort the array.** You may consider the choice of data structure when write program. Write a program that implement an $O(n^2)$ time algorithm and consider following two cases :

a) an array

b) a sorted array

Input :

The given array is : {3, 3, 4, 2, 4, 4, 2, 4, 4}

Output : 4

Input :

The given array is : {3, 3, 4, 2, 4, 4, 2, 4}

Output : No such integer in the given array

Input :

The given array is : {1, 3, 3, 7, 4, 3, 2, 3, 3}

Output : 3

Input :

The given array is : {4, 8, 4, 6, 7, 4, 4, 8}

Output :

No such integer in the given array.

2. Suppose you are given an array A[0 . . . n-1] of integers, some of the integers may be negative, containing at least one positive integer. A sub-array A[i, j] of A, where $i \leq j$, is defined by the sequence A[i], A[i + 1], . . . , A[j]. Your task is to find the contiguous subarray (containing at least one integer) which has the largest sum.
Write a program to implement an $O(n^3)$ time or $O(n^2)$ time algorithm.

Input :

The given array is : {8, 3, 8, -5, 4, 3, -4, 3, 5}

Output :

The largest sum of contiguous subarray is : 21 (8+3+8+(-5)+4+3)

Input :

The given array is : {-2, 1, -3, 4, -1, 2, 1, -5, 4}

Output :

The largest sum of contiguous subarray is : 6 (4, -1, 2, 1)

Input :

The given array is : {3, -5, 3, 8, 2, -4, 9, -6,3,-2,-8,3,-5,1,7,-9}

Output :

The largest sum of contiguous subarray is : 18 (3, 8, 2, -4, 9)

3. We are given an integer array A[0,…..,n-1] consisting of 0's 1's in some random sequence. We wish to rearrange the elements so that all 0's will occupy the positions before all 1's numbers. There is no need to sort the array. Write a program to re-arrange 0's 1's. Implement an O(n) time algorithm. You are not allowed to count the number of 0's and 1's in the given array and then store all the 0's followed by all the 1's.

Input : {1, 0, 1, 1, 0, 0, 1, 0, 0}

Output : {0, 0, 0, 0, 0, 1, 1, 1, 1}

4. Given an array consisting of 0's, 1's and 2's only. Arrange the array so that place all 0's first, then all 1's and all 2's in last. Write a program to implement an O(n) algorithm. You are not allowed to count the number of 0's, 1's and 2's in the given array and then store all the 0's in the beginning followed by all the 1's then all the 2's.

Input : {2, 0, 1, 1, 0, 1, 2, 1, 2, 0, 0, 1, 0}

Output : {0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 2, 2, 2}

5. Given an unsorted array of characters containing duplicate elements, write a program where user should be able to read the characters to a dynamic array thereby removing the duplicate elements and rearrange them in alphabetical order and display new array without any duplicate elements.

Input :

Enter the size of the array : 5

Enter the array of 5 characters : p a n b a

Output :

Array in Alphabetical order : a b n p

Input :

Enter the size of the array : 10

Enter the array of 5 characters : t o a c u a l o r b

Output :

Array in Alphabetical order : a b c l o r t u