

CS593: Data structure and Database Lab
Take Home Assignment - 1 (12 Questions, 100 Points)

Submission Dead Line: 20-Aug-2021 23:59 Hours

Level: Easy

(2×5 = 10 points)

1. Twenty-five numbers are entered from the keyboard into an array. The number to be searched is entered through the keyboard by the user. Write a program to find if the number to be searched is present in the array and if it is present, display the number of times it appears in the array.
2. Twenty-five numbers are entered from the keyboard into an array. Write a program to find out how many of them are positive, how many are negative, how many are even and how many odd.
3. If an array arr contains n elements, then write a program to check if $\text{arr}[0] = \text{arr}[n-1]$, $\text{arr}[1] = \text{arr}[n-2]$ and so on.
4. For the following set of sample data, compute the standard deviation and the mean.
-6, -12, 8, 13, 11, 6, 7, 2, -6, -9, -10, 11, 10, 9, 2
5. Given an array of size N. there are two input numbers LEFT_ROTATE and RIGHT_ROTATE. you are supposed to rotate the given array by LEFT_ROT and RIGHT_ROT. Return the both rotated arrays.

Input: $\text{ARR}[n] = \{3, 2, 4, 5, 6, 7, 1\}$ LEFT_ROTATE = 3 RIGHT_ROTATE = 2

Output: Left rotated array: {5,6,7,1,3,2,4} Right rotated array: {7,1,3,2,4,5,6}

Level: Medium

(15× 2 = 30 points)

6. Write a program to print all the LEADERS in the array. An element is leader if it is greater than all the elements to its right side. And the rightmost element is always a leader.
Example: 16, 17, 4, 3, 5, 2
leaders are 17, 5 and 2.
7. Write an efficient program to find the sum of contiguous subarray within a one-dimensional array of numbers that has the largest sum.
-2, -3, 4, -1, -2, 1, 5, -3
 $4 + (-1) + (-2) + 1 + 5 = 7$
8. An array of N elements contains positive integers from 1 to N. Due to some mistakes a number has been deleted and a new number has been inserted. Return the array storing the missing number as well as duplicate number.
9. There are n rods of some length. You are supposed to update the length of rod so that each rod become of equal length. You can increase or decrease the length of the rod. Both task of increasing or decreasing length of rod costs C, where C is difference between original length and new length.

Input

The first input line contains an integer n: the number of sticks.

Then there are n integers: p_1, p_2, \dots, p_n : the lengths of the sticks.

Output

Print one integer: the minimum total cost.

Example:**Input:**

5

2 3 1 5 2

Output:

5

Level: Advanced

(20× 3 = 60 points)

10. Prison Break: John Doe, the infamous convict has been imprisoned in the Guwahati Central Jail, Assam. The Police have got a secret tip from an agent that a plan has been set-up to help John flee from the prison. The plan is based on the fact that there exist some dark corners in front of the jail. The head of Assam Police chose you to prevent the escape of John.

Given are n light-bulbs, some of which are faulty, and others are in working condition. Each bulb is of intensity k , and a bulb at index i can light up the area from index $i-k$ to $i+k$. These bulbs are arranged in the corridor in the form of a 1-D Boolean array, where 0 indicates a faulty bulb and 1 indicates a working bulb. Find if there exists a dark spot [light does not reach that index] in the corridor. Print the index r [print any one index if there exists multiple dark spots] if dark spot exists at that index, and -1 if the entire corridor can be lit.

Optional: If the entire corridor could be lit, find the minimum number of light bulbs required without creating any dark spots.

Example 1:

Input: $A[n] = [0,0,1,0,1,0,1,1,1,0,1]$; $k=2$

Output: -1

Example 2:

Input: $A[n] = [1,1,0,0,1,0,0,0,1]$; $k=1$

Output: 6

Explanations: Bulb at index 4 lights up indices 3,4,5, while bulb at index 8 lights up indices 7 and 8, leaving 6 as the dark spot.

11. Bob the builder, along with Wendy, require ' k ' metres of wood to finish an important project. Wendy has acquired an advanced machine for this project, which takes in a positive integer R as input, sets its height to R meters, and cuts off all the wood above R meters [height of trees having length less than or equal to R would not be affected].

Given an array of varying tree lengths [non negative integers in meters], find the maximum integer height for the machine, such that at least k meters of wood is obtained.

Example 1:

Input: $A[n] = [40, 4, 42, 46, 26, 19]$; $k=20$

Output: $R = 36$

Explanations: We would obtain 4 meters of wood [40-36] from tree 0, 6 meters of wood from tree 2, 10 meters of wood from tree 3, giving us 20 meters of wood. Trees 1, 4 and 5 have height less than R , and would not be cut.

Example 2:**Input:** $A[n] = [10, 18, 2, 37, 18, 26, 13]; k=30$ **Output:** $R=17$ **Explanations:** By keeping $R=17$, we obtain $1+20+1+9=31$ from trees 1,3,4,5 respectively. Keeping $R=18$ would have given us 29 meters of wood.

12. Inconspicuous!

Alice and Bob constantly text each other, but are suspicious of people having to decode their text. They have developed a system, where a given string might or might not have a hidden meaning to it.

Given a string containing words[series of alphabets, separated by a space] and digits, identify if the sentence has a hidden meaning to it. A sentence has a hidden meaning if the length of the word is followed by its length in digits[0-9].

Print "Hidden" if the sentence has a hidden meaning

Print "Not hidden" if the sentence doesn't have a hidden meaning.

Note: The hidden meaning is only known to Alice and Bob, and is not to be discovered.

Length of each word would range from 1 to 9

Digits can range from 1 to 9

Example 1:**Input:** $S = \text{"Hello 5 World 8"}$ **Output:** Hidden**Explanations:** String $S = \text{"Hello 5 World 8"}$ has a hidden meaning to it as length of the word "Hello" is 5 and the digit 5 comes immediately after the word Hello.**Example 2:****Input:** $S = \text{"You 2 are 1 truly 7 amazing 3"}$ **Output:** Not Hidden**Explanations:** String $S = \text{"You 2 are 1 truly 7 amazing 3"}$ doesn't have a hidden meaning as the length of the words is different than the digit right after it.

Submission instruction

File Naming Convention: Create a directory with your roll number. Inside this directory, place all the programs and input files. Prefix the file name with your roll number followed by "_" followed by question number followed by ".c". Example: 194161000_q1. c.

README.txt Write a short note on sequence of steps involved to run your programs. Include what is the input for the program (with an example) and what will be the output from the program (with an example).

tar gzip Create (roll number). tar.gz file using the above directory. This directory must contain the above program.

Submission Email the above tar gzip file to the CS593 head TA kumar.sujit474@gmail.com as per the above given dead line.

Submission does not follow above file naming convention and instruction shall not be evaluated.

Copying You should avoid indulging in copying. Every submission will be subject to plagiarism check. Do not copy code from any source including coding websites. Two submissions having similarity score equal to or more than 20.0% will be declared copied. If you are found involved in copying act, serious actions will be taken along with penalty decided by course instructor. Therefore, you are requested to place individual efforts and avoid copying.

Marking Scheme: Your implementation will be evaluated as described below.

- I. Maximum points: 100
- II. Easy Level: 2 points for each question. Medium level and advanced level questions will be evaluated if and only if all the questions of easy level question are attempted. If Easy level question are not attempt then medium and advanced level questions shall not be evaluated.
- III. Medium level: Only two questions from medium level will be consider for evaluation. These two questions will be randomly picked. Therefore, you are recommended to solve all the questions.
- IV. Advanced Level: 20 points for each question. All the questions are mandatory.