Array

Question 1

Given two arrays a[] and b[] of size n and m respectively. The task is to find union between these two arrays.

Union of the two arrays can be defined as the set containing distinct elements from both the arrays. If there are repetitions, then only one occurrence of element should be printed in the union.

Example 1:

Input:
5 3
1 2 3 4 5
1 2 3
Output:
5
Explanation:
1, 2, 3, 4 and 5 are the
elements which comes in the union set
of both arrays. So count is 5.
Example 2:

Input:
6 2
85 25 1 32 54 6
85 2
Output:
7
Explanation:
85, 25, 1, 32, 54, 6, and
2 are the elements which comes in the
union set of both arrays. So count is 7.

Question 2

Given an unsorted array arr[] of size N having both negative and positive integers. The task is place all negative element at the end of array without changing the order of positive element and negative element.

Example 1:

Input :

N = 8
arr = [1, -1, 3, 2, -7, -5, 11, 6]
Output :
1 3 2 11 6 -1 -7 -5

Example 2:

Input :
N=8
arr =[-5, 7, -3, -4, 9, 10, -1, 11]
Output :
7 9 10 11 -5 -3 -4 -1

Question 3

Given an unsorted array A of size N that contains only non-negative integers, find a continuous sub-array which adds to a given number S.

In case of multiple subarrays, return the subarray which comes first on moving from left to right.

Example 1:

Input:
N = 5, S = 12
A = [1,2,3,7,5]
Output: 2 4
Explanation: The sum of elements
from 2nd position to 4th position
is 12.

Example 2:

Input:
N = 10, S = 15
A = [1,2,3,4,5,6,7,8,9,10]
Output: 1 5
Explanation: The sum of elements
from 1st position to 5th position
is 15.

Question 4

Given an array of N positive integers and an integer X. The task is to find the frequency of X in the array.

Example 1:

Input:
N = 5
arr = [1, 1, 1, 1, 1]
X = 1
Output:
5
Explanation: The frequency of 1 is 5.

Question 5

Given an array arr and an integer K where K is smaller than size of array, the task is to find the Kth smallest element in the given array. It is given that all array elements are distinct.

Example 1:

Input:
N = 6
arr = [7, 10, 4, 3, 20, 15]
K = 3
Output : 7
Explanation :
3rd smallest element in the given
array is 7.
Example 2:

Input:
N = 5
arr = [7, 10, 4, 20, 15]
K = 4
Output : 15
Explanation :
4th smallest element in the given
array is 15.

Question 6

Given an array of size N containing only 0s, 1s, and 2s; sort the array in ascending order.

Example 1:

Input:
N = 5
arr = [0, 2, 1, 2, 0]
Output:
0 0 1 2 2
Explanation:
0s 1s and 2s are segregated
into ascending order.
Example 2:

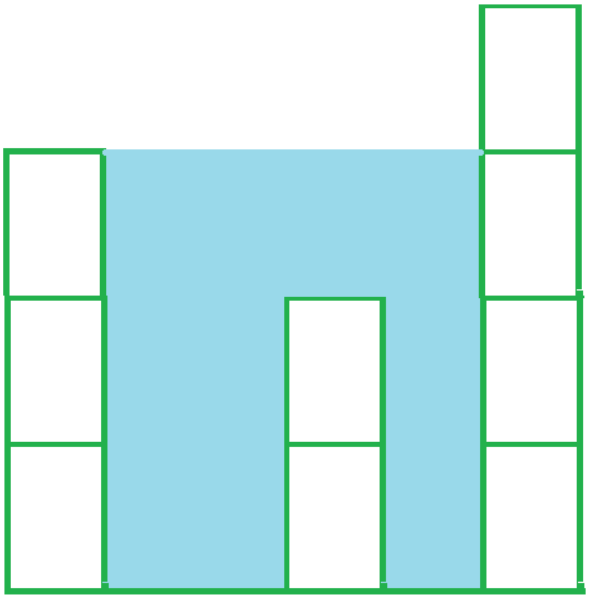
Input:
N = 3
arr = [0, 1, 0]
Output:
0 0 1
Explanation:
0s 1s and 2s are segregated
into ascending order.

Question - 07

Given an array arr of N non-negative integers representing the height of blocks. If the width of each block is 1, compute how much water can be trapped between the blocks during the rainy season.

Example 1:
Input:
N = 6
arr = [3,0,0,2,0,4]
Output:
10

Explanation:



Bars for input {3, 0, 0, 2, 0, 4}
Total trapped water = 3 + 3 + 1 + 3 = 10

Example 2:
Input:
N = 4
arr = [7,4,0,9]
Output:
10
Explanation:
Water trapped by above
block of height 4 is 3 units and above
block of height 0 is 7 units. So, the
total unit of water trapped is 10 units.

Example 3:
Input:
N = 3
arr = [6,9,9]
Output:
0
Explanation:
No water will be trapped.

Question - 08

Given a sorted array arr of distinct integers. Sort the array into a wave-like array(In Place).
In other words, arrange the elements into a sequence such that arr[1] >= arr[2] <= arr[3] >= arr[4] <= arr[5].....

If there are multiple solutions, find the lexicographically smallest one.

Example 1:
Input:
n = 5
arr = [1,2,3,4,5]
Output: 2 1 4 3 5
Explanation: Array elements after
sorting it in wave form are
2 1 4 3 5.

Example 2:
Input:
n = 6
arr = [2,4,7,8,9,10]
Output: 4 2 8 7 10 9
Explanation: Array elements after
sorting it in wave form are
4 2 8 7 10 9.

Question - 09

Given an array A of N elements. Find the majority element in the array. A majority element in an array A of size N is an element that appears more than N/2 times in the array.

Example 1:
Input:
N = 3
A = [1,2,3]
Output:
-1
Explanation:
Since, each element in
[1,2,3] appears only once so there
is no majority element.

Example 2:
Input:
N = 5
A = [3,1,3,3,2]
Output:
3
Explanation:
Since, 3 is present more
than N/2 times, so it is
the majority element.

Question - 10

Given an array of N integers arr where each element represents the max length of the jump that can be made forward from that element. Find the minimum number of jumps to reach the end of the array (starting from the first element). If an element is 0, then you cannot move through that element.

Note: Return -1 if you can't reach the end of the array.

Example 1:
Input:
N = 11
arr = [1, 3, 5, 8, 9, 2, 6, 7, 6, 8, 9]
Output: 3
Explanation:
First jump from 1st element to 2nd
element with value 3. Now, from here
we jump to 5th element with value 9,
and from here we will jump to the last.

Example 2:
Input :
N = 6
arr = [1, 4, 3, 2, 6, 7]
Output: 2
Explanation:
First we jump from the 1st to 2nd element
and then jump to the last element.

Question - 11

Given an array arr denoting heights of N towers and a positive integer K.

For each tower, you must perform exactly one of the following operations exactly once.

- Increase the height of the tower by K
- Decrease the height of the tower by K

Find out the minimum possible difference between the height of the shortest and tallest towers after you have modified each tower.

Note: It is compulsory to increase or decrease the height by K for each tower. After the operation, the resultant array should not contain any negative integers.

Example 1:
Input:
K = 2, N = 4
Arr = [1, 5, 8, 10]
Output:
5
Explanation:
The array can be modified as
[3, 3, 6, 8]. The difference between
the largest and the smallest is 8-3 = 5.

Example 2:
Input:
K = 3, N = 5
Arr = [3, 9, 12, 16, 20]
Output:
11
Explanation:
The array can be modified as
[6, 12, 9, 13, 17]. The difference between
the largest and the smallest is 17-6 = 11.

Question - 12

Given arrival and departure times of all trains that reach a railway station. Find the minimum number of platforms required for the railway station so that no train is kept waiting.
Consider that all the trains arrive on the same day and leave on the same day. Arrival and departure time can never be the same for a train but we can have arrival time of one train equal to departure time of the other. At any given instance of time, same platform can not be used for both departure of a train and arrival of another train. In such cases, we need different platforms.

Note: Time intervals are in the 24-hour format(HHMM) , where the first two characters represent hour (between 00 to 23) and the last two characters represent minutes (this may be > 59).

Example 1:
Input: n = 6
arr = [0900, 0940, 0950, 1100, 1500, 1800]
dep = [0910, 1200, 1120, 1130, 1900, 2000]
Output: 3
Explanation:
Minimum 3 platforms are required to
safely arrive and depart all trains.

Example 2:
Input: n = 3
arr = [0900, 1100, 1235]
dep = [1000, 1200, 1240]
Output: 1
Explanation: Only 1 platform is required to
safely manage the arrival and departure
of all trains.

Question - 13

Given an array A of positive integers of size N, where each value represents the number of chocolates in a packet. Each packet can have a variable number of chocolates. There are M students, the task is to distribute chocolate packets among M students such that :
1. Each student gets exactly one packet.
2. The difference between maximum number of chocolates given to a student and minimum number of chocolates given to a student is minimum.

Example 1:
Input:
N = 8, M = 5
A = [3, 4, 1, 9, 56, 7, 9, 12]
Output: 6
Explanation: The minimum difference between maximum chocolates and minimum chocolates is 9 - 3 = 6 by choosing following M packets : [3, 4, 9, 7, 9].

Example 2:
Input:
N = 7, M = 3
A = [7, 3, 2, 4, 9, 12, 56]
Output: 2
Explanation: The minimum difference between maximum chocolates and minimum chocolates is 4 - 2 = 2 by choosing following M packets : [3, 2, 4].

Question - 14

Given an array of positive integers. Find the length of the longest sub-sequence such that elements in the subsequence are consecutive integers, the consecutive numbers can be in any order.

Example 1:
Input:
N = 7
a = [2,6,1,9,4,5,3]
Output:
6
Explanation:
The consecutive numbers here are 1, 2, 3, 4, 5, 6. These 6 numbers form the longest consecutive subsquence.

Example 2:
Input:
N = 7
a = [1,9,3,10,4,20,2]
Output:
4
Explanation:
1, 2, 3, 4 is the longest
consecutive subsequence.

Question - 15

Given two sorted arrays nums1 and nums2 of size m and n respectively, print the median of the two sorted arrays.

Example 1:
Input: nums1 = [1,3], nums2 = [2]
Output: 2.00000
Explanation: merged array = [1,2,3] and median is 2.

Example 2:
Input: nums1 = [1,2], nums2 = [3,4]
Output: 2.50000
Explanation: merged array = [1,2,3,4] and median is (2 + 3) / 2 = 2.5.

Circular Array

Question 1

Given a circular array A of N elements(the next element of the last element is the first element of the array), print the Next Greater Number for every element. The Next Greater Number of a number x is the first greater number to its traversing-order next in the array, which means you could search circularly to find its next greater number. If it doesn't exist, output -1 for this number.

Input

The first line contains N, the following line contains N space separated integers.

Output

Print the next greater number of each element of the array (space separated).

Sample Input
```
3
1 2 1
```

Sample Output
```
2 -1 2
```

Explanation
The first 1's next greater number is 2; The number 2 can't find next greater number; The second 1's next greater number needs to search circularly, which is also 2.

Question 2

Ninja has a circular array ‘Nums’ containing ‘N’ positive integers. An array is called circular if we consider the first element as next of the last element.

Ninja wants you to find the first greater number to the right of each element in the array, if there is no greater element to the right of an element, then output -1 for this element.

Example :
If N = 5 and the array is: [1, 6, 4, 3, 5]

We will return [6, -1, 5, 5, 6]
because 6 is the first element to the right of 1 that is greater than 1,
no element exists that is greater than 6,
5 is the first element to the right of 4 that is greater than 4,
5 is the first element to the right of 3 that is greater than 3,
6 is the first element to the circular-right of 5 that is greater than 5.

Input Format :
The first line contains a single integer ‘T’ denoting the number of test cases, then each test case follows:

The first line of each test case contains a single integer ‘N’ denoting the size of the array.

The second line of each test case contains N positive integers denoting the array elements ‘Nums[i]’.
Output Format:
For each test case, print the next greater elements for each element in the circular array.

Output for each test case will be printed in a separate line.

Question 3

Given an array of n elements. Consider array as circular array i.e element after an is a1. The task is to find maximum sum of the difference between consecutive elements with rearrangement of array element allowed i.e after rearrangement of element find |a1 – a2| + |a2 – a3| + …… + |an – 1 – an| + |an – a1|.

Examples:

Input : arr = [4, 2, 1, 8]
Output : 18
Rearrange given array as : [1, 8, 2, 4]
Sum of difference between consecutive element
= |1 - 8| + |8 - 2| + |2 - 4| + |4 - 1|
= 7 + 6 + 2 + 3
= 18.

Input : arr = [10, 12, 15]
Output : 10

Question 4

Given a circular array arr[] of length N, the task is to find the minimum absolute difference between any adjacent pair. If there are many optimum solutions, output any of them.

Examples:

Input: arr = [10, 12, 13, 15, 10]
Output: 0
Explanation: |10 – 10| = 0 is the minimum possible difference.

Input: arr = [10, 20, 30, 40]
Output: 10
Explanation: |10 – 20| = 10 is the minimum, 20 30 or 30 40 could be the answer too.

Question 5

You are playing another computer game, and now you have to slay n monsters. These monsters are standing in a circle, numbered clockwise from 1 to n. Initially, the i-th monster has ai health.

You may shoot the monsters to kill them. Each shot requires exactly one bullet and decreases the health of the targeted monster by 1 (deals 1 damage to it). Furthermore, when the health of some monster i becomes 0 or less than 0, it dies and explodes, dealing bi damage to the next monster (monster i+1, if i<n, or monster 1, if i=n). If the next monster is already dead, then nothing happens. If the explosion kills the next monster, it explodes too, damaging the monster after it and possibly triggering another explosion, and so on.

You have to calculate the minimum number of bullets you have to fire to kill all n monsters in the circle.

Input
The first line contains one integer T (1≤T≤150000) — the number of test cases.

Then the test cases follow, each test case begins with a line containing one integer n (2≤n≤300000) — the number of monsters. Then n lines follow, each containing two integers ai and bi (1≤ai, bi≤10^{12}) — the parameters of the i-th monster in the circle.

It is guaranteed that the total number of monsters in all test cases does not exceed 300000.

Output
For each test case, print one integer — the minimum number of bullets you have to fire to kill all of the monsters.

Example
input
1
3
7 15
2 14
5 3
output
6

Question 6

Omkar is playing his favorite pixelated video game, Bed Wars! In Bed Wars, there are n players arranged in a circle, so that for all j such that $2 \le j \le n$, player $j-1$ is to the left of the player j, and player j is to the right of player $j-1$. Additionally, player n is to the left of player 1, and player 1 is to the right of player n.

Currently, each player is attacking either the player to their left or the player to their right. This means that each player is currently being attacked by either 0, 1, or 2 other players. A key element of Bed Wars strategy is that if a player is being attacked by exactly 1 other player, then they should logically attack that player in response. If instead a player is being attacked by 0 or 2 other players, then Bed Wars strategy says that the player can logically attack either of the adjacent players.

Unfortunately, it might be that some players in this game are not following Bed Wars strategy correctly. Omkar is aware of whom each player is currently attacking, and he can talk to any amount of the n players in the game to make them instead attack another player — i. e. if they are currently attacking the player to their left, Omkar can convince them to instead attack the player to their right; if they are currently attacking the player to their right, Omkar can convince them to instead attack the player to their left.

Omkar would like all players to be acting logically. Calculate the minimum amount of players that Omkar needs to talk to so that after all players he talked to (if any) have changed which player they are attacking, all players are acting logically according to Bed Wars strategy.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \le t \le 10^4$). The descriptions of the test cases follows.

The first line of each test case contains one integer n ($3 \le n \le 2 \cdot 10^5$) — the amount of players (and therefore beds) in this game of Bed Wars.

The second line of each test case contains a string s of length n. The j-th character of s is equal to L if the j-th player is attacking the player to their left, and R if the j-th player is attacking the player to their right.

It is guaranteed that the sum of n over all test cases does not exceed $2 \cdot 10^5$.

Output

For each test case, output one integer: the minimum number of players Omkar needs to talk to to make it so that all players are acting logically according to Bed Wars strategy.

It can be proven that it is always possible for Omkar to achieve this under the given constraints.

Example

input
5
4
RLRL
6
LRRRRL
8
RLLRRRLL
12
LLLLRRLRRRLL
5
RRRRR
output
0
1
1
3
2
Note
In the first test case, players 1 and 2 are attacking each other, and players 3 and 4 are attacking each other. Each player is being attacked by exactly 1 other player, and each player is attacking the player that is attacking them, so all players are already being logical according to Bed Wars strategy and Omkar does not need to talk to any of them, making the answer 0.

In the second test case, not every player acts logically: for example, player 3 is attacked only by player 2, but doesn't attack him in response. Omkar can talk to player 3 to convert the attack arrangement to LRLRRL, in which you can see that all players are being logical according to Bed Wars strategy, making the answer 1.

Question 7

The round carousel consists of n figures of animals. Figures are numbered from 1 to n in order of the carousel moving. Thus, after the n-th figure the figure with the number 1 follows. Each figure has its own type — the type of the animal corresponding to this figure (the horse, the tiger and so on). The type of animal of the i-th figure equals ti.

The example of the carousel for n=9 and t=[5,5,1,15,1,5,5,1,1].
You want to color each figure in one of the colors. You think that it's boring if the carousel contains two different figures (with the distinct types of animals) going one right after another and colored in the same color.

Your task is to color the figures in such a way that the number of distinct colors used is the minimum possible and there are no figures of the different types going one right after another

and colored in the same color. If you use exactly k distinct colors, then the colors of figures should be denoted with integers from 1 to k.

Input
The input contains one or more test cases.

The first line contains one integer q ($1 \le q \le 10^4$) — the number of test cases in the test. Then q test cases follow. One test case is given on two lines.

The first line of the test case contains one integer n ($3 \le n \le 2 \cdot 10^5$) — the number of figures in the carousel. Figures are numbered from 1 to n in order of carousel moving. Assume that after the n-th figure the figure 1 goes.

The second line of the test case contains n integers $t_1, t_2, \ldots, t_n$ ($1 \le t_i \le 2 \cdot 10^5$), where t_i is the type of the animal of the i-th figure.

The sum of n over all test cases does not exceed $2 \cdot 10^5$.

Output
Print q answers, for each test case print two lines.

In the first line print one integer k — the minimum possible number of distinct colors of figures.

In the second line print n integers $c_1, c_2, \ldots, c_n$ ($1 \le c_i \le k$), where c_i is the color of the i-th figure. If there are several answers, you can print any.

Example
input
4
5
1 2 1 2 2
6
1 2 2 1 2 2
5
1 2 1 2 3
3
10 10 10
output
2
1 2 1 2 2
2
2 1 2 1 2 1
3
2 3 2 3 1

1
1 1 1

Reference:

1. https://www.geeksforgeeks.org/top-50-array-coding-problems-for-interviews/
2. https://www.csinfo360.com/p/array-practice-problems.html
3. https://www.hackerearth.com/problem/algorithm/circular-nge/
4. https://www.codingninjas.com/codestudio/problem-details/ninja-s-circular-array_2221409
5. https://leetcode.com/problems/circular-array-loop/ (Special problem. Interesting but can not provide it due to graph knowledge limitation)
6. https://codeforces.com/contest/1334/problem/C
7. https://codeforces.com/contest/1392/problem/D
8. https://codeforces.com/contest/1328/problem/D
9. https://leetcode.com/problems/median-of-two-sorted-arrays/
10.