**Sum Of Infinite Array**

**Problem Statement**

**Given an array “A” of N integers and you have also defined the new array “B” as a concatenation of array “A” for an infinite number of times.**

**For example, if the given array “A” is [1,2,3] then, infinite array “B” is [1,2,3,1,2,3,1,2,3,.......].**

**Now you are given Q queries, each query consists of two integers “L“ and “R”. Your task is to find the sum of the subarray from index “L” to “R” (both inclusive) in the infinite array “B” for each query.**

**Note :**

The value of the sum can be very large, return the answer as modulus 10^9+7.

**Input Format :**

The first line of input contains a single integer T, representing the number of test cases or queries to be run.

Then the T test cases follow.

The first line of each test case contains a single integer N, denoting the size of the array “A”.

The second line of each test case contains N single space-separated integers, elements of the array “A”.

The third line of each test case contains a single integer Q, denoting the number of queries.

Then each of the Q lines of each test case contains two single space-separated integers L, and R denoting the left and the right index of the infinite array “B” whose sum is to be returned.

**Output Format :**

For each test case, print Q space-separated integers that denote the answers of the given Q queries.

Print the answer to each test case in a separate line.

**Note :**

You do not need to print anything, it has already been taken care of. Just implement the given function.

**Constraints :**

1 <= T <= 100

1 <= N <= 10^4

1 <= A[i] <= 10^9

1 <= Q <= 10^4

1 <= L <= R <= 10^18

Time Limit: 1sec

**Sample Input 1 :**

1

3

1 2 3

2

1 3

1 5

**Sample Output 1 :**

6 9

Sample Input 2 :

1

4

5 2 6 9

3

1 5

10 13

7 11

Sample Output 2 :

27 22 2

**N-th Fibonacci Number**

**Problem Statement**

**You are given an integer ‘N’, your task is to find and return the N’th Fibonacci number using matrix exponentiation.**

**Since the answer can be very large, return the answer modulo 10^9 +7.**

**Fibonacci Number Is Calculated Using The Following Formula:**

F(n) = F(n-1) + F(n-2),

Where, F(1) = F(2) = 1.

**For Example:**

For ‘N’ = 5, the output will be 5.

**Input Format:**

The first line contains a single integer ‘T’ denoting the number of test cases to be run. Then the test cases follow.

The first line of each test case contains a single integer ‘N’, representing the integer for which we have to find its equivalent Fibonacci number.

**Output Format:**

For each test case, print a single integer representing the N’th Fibonacci number.

Return answer modulo 10^9 + 7.

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

**Note:**

You are not required to print anything; it has already been taken care of. Just implement the function.

**Constraints:**

1 <= T <= 10

1 <= N <= 10^5

Time Limit: 1 sec.

**Follow Up:**

Can you solve it in Time Complexity better than O(N)?

**Sample Input 1:**

2

10

7

**Sample Output 1:**

55

13

**Explanation For Sample Output 1:**

For the first test case, the 10th Fibonacci number is 55.

For the second test case, the 7th Fibonacci number is 13.

**Sample Input 2:**

2

1

3

**Sample Output 2:**

1

2

**Painter's Partition Problem**

**Problem Statement**

**Suggest Edit**

**Given an array/list of length ‘N’, where the array/list represents the boards and each element of the given array/list represents the length of each board. Some ‘K’ numbers of painters are available to paint these boards. Consider that each unit of a board takes 1 unit of time to paint.**

**You are supposed to return the area of the minimum time to get this job done of painting all the ‘N’ boards under a constraint that any painter will only paint the continuous sections of boards.**

**For Example :**

In the below figure where array/list elements are {2, 1, 5, 6, 2, 3}.

A painter can paint blocks {5,6} or {1,5,6,2} together but not {2,5,6} or {5,6,3}.

##### Input Format :

The first line contains a single integer ‘T’ denoting the number of test cases.

The first line of each test case contains two integers ‘N’ and ‘K’ denoting the number of elements in the array/list and number of painters available.

The second line contains ‘N’ single space-separated integers denoting the elements of the array/list.

##### Output Format :

For each test case, print the minimum time required to get the job done.

##### Note :

You do not need to print anything; it has already been taken care of.

##### Constraints :

1 <= T <= 5

1 <= N <= 10^4

1 <= K <= N

1 <= ARR[i] <= 10^5

Where ‘T’ is the number of test cases.

'N' is the length of the given array/list (boards).

‘K’ is the number of painters available.

And, ARR[i] denotes the i-th element in the array/list.

Time Limit: 1 sec.

##### Sample Input 1 :

2

4 2

5 5 5 5

4 2

10 20 30 40

##### Sample Output 1 :

10

60

##### Explanation For Sample Input 1 :

In the first test case, we can divide the boards into 2 equal-sized partitions, so each painter gets 10 units of the board and the total time taken is 10.

In the second test case, we can divide the first 3 boards for one painter and the last board for the second painter.

##### Sample Input 2 :

2

2 2

48 90

4 2

1 2 3 4

##### Sample Output 2 :

90

6

**Valid String**

**Problem Statement**

**Suggest Edit**

**You have been given a string 'S' containing only three types of characters, i.e. '(', ')' and '\*'.**

**A Valid String is defined as follows:**

1. Any left parenthesis '(' must have a corresponding right parenthesis ')'.

2. Any right parenthesis ')' must have a corresponding left parenthesis '('.

3. Left parenthesis '(' must go before the corresponding right parenthesis ')'.

4. '\*' could be treated as a single right parenthesis ')' or a single left parenthesis '(' or an empty string.

5. An empty string is also valid.

**Your task is to find out whether the given string is a Valid String or not.**

**Input Format:**

The first line of input contains an integer 'T' representing the number of test cases or queries to run. Then the test case follows.

The only line of each test case contains a string 'S'.

**Output Format:**

For each test case print 'Yes' if the string 'S' is a valid string otherwise print 'No' otherwise.

The output of each test case will be printed in a separate line.

**Note:**

You are not required to print the expected output; it has already been taken care of. Just implement the function.

**Constraints:**

1 <= T <= 100

1 <= N <= 5000

Where 'N' is the length of the string 'S'.

Time Limit: 1 sec

**Sample Input 1:**

3

\*())

(\*)

())\*

**Sample Output 1:**

Yes

Yes

No

**Explanation Of Sample 1:**

In the first test case, we can replace '\*' with '(' so that the string becomes "(())"

In the second test case, we can replace '\*' with an empty string so that the string becomes "()"

In the third test case, there is no way to make the string a valid string.

**Sample Input 2:**

1

((\*\*\*

**Sample Output 2:**

Yes

**Longest Increasing Subsequence**

**Problem Statement**

**For a given array with N elements, you need to find the length of the longest subsequence from the array such that all the elements of the subsequence are sorted in strictly increasing order.**

**Strictly Increasing Sequence is when each term in the sequence is larger than the preceding term.**

**For Example:**

[1, 2, 3, 4] is a strictly increasing array, while [2, 1, 4, 3] is not.

**Input Format:**

The first line of input contains an integer 'N', representing the size of the array.

The second line of input contains 'N' space-separated integers, representing the elements of the array.

**Output Format:**

The only output line contains one integer representing the length of the longest increasing subsequence.

**Note:**

You do not need to print anything; it has already been taken care of. Just implement the given functions.

**Input Constraints**

1 <= N <= 10^5

-10^5 <= element <= 10^5

Time Limit: 1sec

**Sample Input :**

6

5 4 11 1 16 8

**Sample Output 1 :**

3

**Explanation Of Sample Input 1:**

Length of longest subsequence is 3 i.e. [5, 11, 16] or [4, 11, 16].

**Sample Input 2:**

3

1 2 2

**Sample Output 2 :**

2