



C++ Assignments | Prefix sum | Week 12

Given an integer array `nums`, handle multiple queries of the following type:

1. Calculate the **sum** of the elements of `nums` between indices `left` and `right` **inclusive** where `left <= right`.

Implement the `NumArray` class:

- `NumArray(int[] nums)` Initializes the object with the integer array `nums`.
- `int sumRange(int left, int right)` Returns the **sum** of the elements of `nums` between indices `left` and `right` **inclusive** (i.e. `nums[left] + nums[left + 1] + ... + nums[right]`). [Leetcode 303]

Example 1:

Input

```
["NumArray", "sumRange", "sumRange", "sumRange"]  
[[[-2, 0, 3, -5, 2, -1]], [0, 2], [2, 5], [0, 5]]
```

Output

```
[null, 1, -1, -3]
```

Explanation

```
NumArray numArray = new NumArray([-2, 0, 3, -5, 2, -1]);  
numArray.sumRange(0, 2); // return (-2) + 0 + 3 = 1  
numArray.sumRange(2, 5); // return 3 + (-5) + 2 + (-1) = -1  
numArray.sumRange(0, 5); // return (-2) + 0 + 3 + (-5) + 2 + (-1) = -3
```

2. Given an array of integers `nums`, calculate the **pivot index** of this array.

The **pivot index** is the index where the sum of all the numbers **strictly** to the left of the index is equal to the sum of all the numbers **strictly** to the index's right.

If the index is on the left edge of the array, then the left sum is `0` because there are no elements to the left. This also applies to the right edge of the array.

Return the **leftmost pivot index**. If no such index exists, return `-1`. [Leetcode 724]

Example 1:

Input: `nums = [1,7,3,6,5,6]`

Output: `3`

Explanation:

The pivot index is 3.

Left sum = $\text{nums}[0] + \text{nums}[1] + \text{nums}[2] = 1 + 7 + 3 = 11$

Right sum = $\text{nums}[4] + \text{nums}[5] = 5 + 6 = 11$

Example 2:

Input: $\text{nums} = [1, 2, 3]$

Output: -1

Explanation:

There is no index that satisfies the conditions in the problem statement.

Example 3:

Input: $\text{nums} = [2, 1, -1]$

Output: 0

Explanation:

The pivot index is 0.

Left sum = 0 (no elements to the left of index 0)

Right sum = $\text{nums}[1] + \text{nums}[2] = 1 + -1 = 0$

3. We define the **conversion array** conver of an array arr as follows:

- $\text{conver}[i] = \text{arr}[i] + \max(\text{arr}[0..i])$ where $\max(\text{arr}[0..i])$ is the maximum value of $\text{arr}[j]$ over $0 \leq j \leq i$.

We also define the **score** of an array arr as the sum of the values of the conversion array of arr .

Given a **0-indexed** integer array nums of length n , return an array ans of length n where $\text{ans}[i]$ is the score of the prefix $\text{nums}[0..i]$. [Leetcode 2640]

Example 1:

Input: $\text{nums} = [2, 3, 7, 5, 10]$

Output: $[4, 10, 24, 36, 56]$

Explanation:

For the prefix $[2]$, the conversion array is $[4]$ hence the score is 4

For the prefix $[2, 3]$, the conversion array is $[4, 6]$ hence the score is 10

For the prefix $[2, 3, 7]$, the conversion array is $[4, 6, 14]$ hence the score is 24

For the prefix $[2, 3, 7, 5]$, the conversion array is $[4, 6, 14, 12]$ hence the score is 36

For the prefix $[2, 3, 7, 5, 10]$, the conversion array is $[4, 6, 14, 12, 20]$ hence the score is 56

Example 2:

Input: $\text{nums} = [1, 1, 2, 4, 8, 16]$

Output: $[2, 4, 8, 16, 32, 64]$

Explanation:

For the prefix $[1]$, the conversion array is $[2]$ hence the score is 2

For the prefix $[1, 1]$, the conversion array is $[2, 2]$ hence the score is 4

For the prefix [1, 1, 2], the conversion array is [2, 2, 4] hence the score is 8

For the prefix [1, 1, 2, 4], the conversion array is [2, 2, 4, 8] hence the score is 16

For the prefix [1, 1, 2, 4, 8], the conversion array is [2, 2, 4, 8, 16] hence the score is 32

For the prefix [1, 1, 2, 4, 8, 16], the conversion array is [2, 2, 4, 8, 16, 32] hence the score is 64

4. There are n flights that are labeled from 1 to n .

You are given an array of flight bookings `bookings`, where `bookings[i] = [firsti, lasti, seatsi]` represents a booking for flights `firsti` through `lasti` (**inclusive**) with `seatsi` seats reserved for **each flight** in the range.

Return an array `answer` of length n , where `answer[i]` is the total number of seats reserved for flight i . [Leetcode 1109]

Example 1:

Input: `bookings = [[1,2,10],[2,3,20],[2,5,25]]`, $n = 5$

Output: `[10,55,45,25,25]`

Explanation:

Flight labels: 1 2 3 4 5

Booking 1 reserved: 10 10

Booking 2 reserved: 20 20

Booking 3 reserved: 25 25 25 25

Total seats: 10 55 45 25 25

Hence, `answer = [10,55,45,25,25]`

Example 2:

Input: `bookings = [[1,2,10],[2,2,15]]`, $n = 2$

Output: `[10,25]`

Explanation:

Flight labels: 1 2

Booking 1 reserved: 10 10

Booking 2 reserved: 15

Total seats: 10 25

Hence, `answer = [10,25]`

Note:- Please try to invest time doing the assignments which are necessary to build a strong foundation. Do not directly Copy Paste using Google or ChatGPT. Please use your brain 😊.