2023-04-20 - Handout – Arrays 2

Q1. Partition Array According to Given Pivot

Link: https://leetcode.com/problems/partition-array-according-to-given-pivot/

You are given a 0-indexed integer array nums and an integer pivot. Rearrange nums such that the following conditions are satisfied:

Every element less than pivot appears before every element greater than pivot.

Every element equal to pivot appears in between the elements less than and greater than pivot. The relative order of the elements less than pivot and the elements greater than pivot is maintained.

More formally, consider every pi, pj where pi is the new position of the ith element and pj is the new position of the jth element. For elements less than pivot, if i < j and nums[i] < pivot and nums[j] < pivot, then pi < pj. Similarly for elements greater than pivot, if i < j and nums[i] > pivot and nums[j] > pivot, then pi < pj.

Return nums after the rearrangement.

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Example 1:
Input: nums = [9,12,5,10,14,3,10], pivot = 10

Output: [9,5,3,10,10,12,14]
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Example 2:
Input: nums = [-3,4,3,2], pivot = 2

Output: [-3,2,4,3]
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Q2. Watering Plants

Link: https://leetcode.com/problems/watering-plants/

You want to water n plants in your garden with a watering can. The plants are arranged in a row and are labeled from 0 to n - 1 from left to right where the ith plant is located at x = i. There is a river at x = -1 that you can refill your watering can at. Each plant needs a specific amount of water. You will water the plants in the following way:

Water the plants in order from left to right. After watering the current plant, if you do not have enough water to completely water the next plant, return to the river to fully refill the watering can.

You cannot refill the watering can early. You are initially at the river (i.e., x = -1). It takes one step to move one unit on the x-axis.

Given a 0-indexed integer array plants of n integers, where plants[i] is the amount of water the ith plant needs, and an integer capacity representing the watering can capacity, return the number of steps needed to water all the plants.

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Example 1:
Input: plants = [2,2,3,3], capacity = 5

Output: 14
```

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Example 2:
Input: plants = [1,1,1,4,2,3], capacity = 4

Output: 30
```

Q3. Number of Laser Beams in a Bank

Link: https://leetcode.com/problems/number-of-laser-beams-in-a-bank/

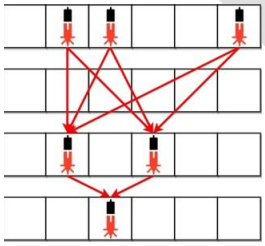
Anti-theft security devices are activated inside a bank. You are given a 0-indexed binary string array bank representing the floor plan of the bank, which is an m x n 2D matrix. bank[i] represents the ith row, consisting of '0's and '1's. '0' means the cell is empty, while'1' means the cell has a security device.

There is one laser beam between any two security devices if both conditions are met:

The two devices are located on two different rows: r1 and r2, where r1 < r2.

For each row i where r1 < i < r2, there are no security devices in the ith row.

Laser beams are independent, i.e., one beam does not interfere nor join with another.



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Input: bank = ["011001","000000","010100","001000"]

Output: 8

Explanation: Between each of the following device pairs, there is one beam. In total,
there are 8 beams:

 * bank[0][1] -- bank[2][1]

 * bank[0][1] -- bank[2][3]

 * bank[0][2] -- bank[2][1]

 * bank[0][2] -- bank[2][3]

 * bank[0][5] -- bank[2][1]

 * bank[0][5] -- bank[2][3]

 * bank[2][1] -- bank[3][2]

 * bank[2][3] -- bank[3][2]

Note that there is no beam between any device on the 0th row with any on the 3rd row.
This is because the 2nd row contains security devices, which breaks the second
condition.
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Return the total number of laser beams in the bank.

Q4. K-th Symbol in Grammar

Link: https://leetcode.com/problems/k-th-symbol-in-grammar/

We build a table of n rows (1-indexed). We start by writing 0 in the 1st row. Now in every subsequent row, we look at the previous row and replace each occurrence of 0 with 01, and each occurrence of 1 with 10.

For example, for n = 3, the 1st row is 0, the 2nd row is 01, and the 3rd row is 0110.

Given two integer n and k, return the kth (1-indexed) symbol in the nth row of a table of n rows.

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Example 1:
Input: n = 1, k = 1

Output: 0

Explanation: row 1: 0
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Example 2:
Input: n = 2, k = 1

Output: 0

Explanation:

row 1: 0

row 2: 01
```