Assignment 7

Topics:

1. Operating system
2. Backtrack
3. DP
4. Searching
5. Linked list

(Maximum marks -15)

Q-1) LRU Cache (3.75 marks)
https://leetcode.com/problems/lru-cache/

(Medium)

Design a data structure that follows the constraints of a Least Recently Used (LRU) cache.

Implement the `LRUCache` class:

- `LRUCache(int capacity)` Initialize the LRU cache with positive size `capacity`.
- `int get(int key)` Return the value of the `key` if the key exists, otherwise return `-1`.
- `void put(int key, int value)` Update the value of the `key` if the `key` exists. Otherwise, add the `key-value` pair to the cache. If the number of keys exceeds the `capacity` from this operation, evict the least recently used key.

The functions `get` and `put` must each run in `O(1)` average time complexity.

Example 1:

Input
["LRUCache", "put", "put", "get", "put", "get", "put", "get", "get", "get"]
[[2], [1, 1], [2, 2], [1], [3, 3], [2], [4, 4], [1], [3], [4]]
Output

[null, null, null, 1, null, -1, null, -1, 3, 4]

Q-2) Flipping an Image (3.75 marks)

https://leetcode.com/problems/flipping-an-image/

(Easy)

Given an n x n binary matrix image, flip the image horizontally, then invert it, and return *the resulting image*.

To flip an image horizontally means that each row of the image is reversed.

- For example, flipping [1,1,0] horizontally results in [0,1,1].

To invert an image means that each 0 is replaced by 1, and each 1 is replaced by 0.

- For example, inverting [0,1,1] results in [1,0,0].

Example 1:

Input: image = [[1,1,0],[1,0,1],[0,0,0]]

Output: [[1,0,0],[0,1,0],[1,1,1]]

Explanation: First reverse each row: [[0,1,1],[1,0,1],[0,0,0]].

Then, invert the image: [[1,0,0],[0,1,0],[1,1,1]]

Q-3) Richest Customer Wealth (3.75 marks)
https://leetcode.com/problems/richest-customer-wealth/
(Easy)
You are given an m x n integer grid accounts where accounts[i][j] is the amount of money the ith customer has in the jth bank. Return *the wealth that the richest customer has.*

A customer's wealth is the amount of money they have in all their bank accounts. The richest customer is the customer that has the maximum wealth.

Example 1:

Input: accounts = [[1,2,3],[3,2,1]]
Output: 6
Explanation:
1st customer has wealth = 1 + 2 + 3 = 6
2nd customer has wealth = 3 + 2 + 1 = 6
Both customers are considered the richest with a wealth of 6 each, so return 6.

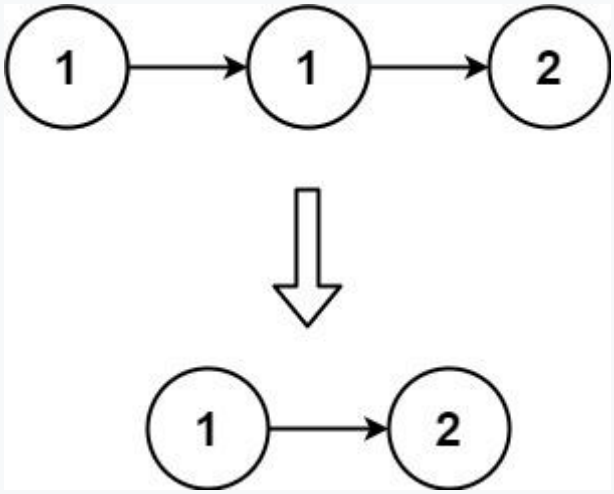
Q-4) Remove Duplicates from Sorted List (3.75 marks)

https://leetcode.com/problems/remove-duplicates-from-sorted-list/

(Easy)

Given the head of a sorted linked list, *delete all duplicates such that each element appears only once*. Return *the linked list sorted as well*.

Example 1:



Input: head = [1,1,2]

Output: [1,2]

Q-5) [BONUS QUESTION] Search a 2D Matrix (3.75 marks)

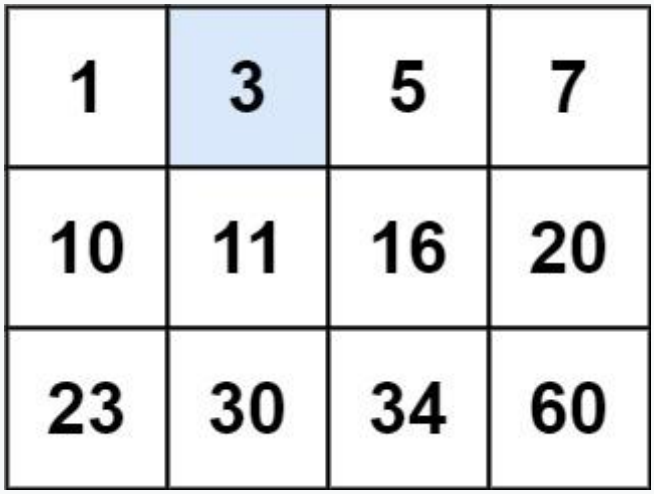
(Medium)

https://leetcode.com/problems/search-a-2d-matrix/

Write an efficient algorithm that searches for a value in an m x n matrix. This matrix has the following properties:

- **Integers in each row are sorted from left to right.**
- **The first integer of each row is greater than the last integer of the previous row.**

Example 1:



Input: matrix = [[1,3,5,7],[10,11,16,20],[23,30,34,60]], target = 3

Output: true

Marks distribution:
Question 1, 2, 3 and 4 carry 3.75 marks each.
Question 5 is a bonus question, that means if you leave that question you don't lose a mark, but if you solve it, you can get an extra 3.75 marks.

Remark: maximum marks you can get is 15, bonus question helps only if you are not able to solve another question.