

2023-06-18 - Handout – Recursion

Q1. Power of Two

Link: <https://leetcode.com/problems/power-of-two/>

Given an integer n , return true if it is a power of two. Otherwise, return false.
An integer n is a power of two if there exists an integer x such that $n = 2^x$.

Input: $n = 16$	Input: $n = 3$
Output: true	Output: false
Explanation: $2^4 = 16$	

Q2. Add Two Numbers

Link: <https://leetcode.com/problems/add-two-numbers/>

You are given two **non-empty** linked lists representing two non-negative integers. The digits are stored in **reverse order**, and each of their nodes contains a single digit. Add the two numbers and return the sum as a linked list. You may assume the two numbers do not contain any leading zero, except the number 0 itself.

Input: $l1 = [2,4,3]$, $l2 = [5,6,4]$	Input: $l1 = [0]$, $l2 = [0]$
Output: $[7,0,8]$	Output: $[0]$
Explanation: $342 + 465 = 807$.	

Input: $l1 = [9,9,9,9,9,9,9]$, $l2 = [9,9,9,9]$
Output: $[8,9,9,9,0,0,0,1]$

Constraints:

- The number of nodes in each list is in range $[1, 100]$.
- $0 \leq \text{Node.val} \leq 9$
- list represents a number that does not have leading zeros.

Q3. Predict The Winner

Link: <https://leetcode.com/problems/predict-the-winner/>

You are given an integer array `nums`. Two players are playing a game with this array: player 1 and player 2. Both players take turns, with player 1 starting first. Both players start the game with a score of 0. At each turn, the player takes one of the numbers from either end of the array (i.e., `nums[0]` or `nums[nums.length - 1]`) which reduces the size of the array by 1. The player adds the chosen number to their score. The game ends when there are no more elements in the array. Return true if Player 1 can win the game. If the scores of both players are equal, then player 1 is still the winner, and you should also return true. You may assume that both players are playing optimally.

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Input: nums = [1,5,2]
Output: false
Explanation: Initially, player 1 can choose between 1 and 2.
If he chooses 2 (or 1), then player 2 can choose from 1 (or 2) and 5. If player 2 chooses 5,
then player 1 will be left with 1 (or 2).
So, final score of player 1 is  $1 + 2 = 3$ , and player 2 is 5.
Hence, player 1 will never be the winner and you need to return false.
```

Input: nums = [1,5,233,7]

Output: true

Explanation: Player 1 first chooses 1. Then player 2 has to choose between 5 and 7. No matter which number player 2 choose, player 1 can choose 233.

Finally, player 1 has more score (234) than player 2 (12), so you need to return True representing player1 can win.

Constraints:

- $1 \leq \text{nums.length} \leq 20$
- $0 \leq \text{nums}[i] \leq 10^7$

Q4. Wildcard Matching

Link: <https://leetcode.com/problems/wildcard-matching/>

Given an input string (s) and a pattern (p), implement wildcard pattern matching with support for “?” and “*” where:

- “?” Matches any single character.
- “*” Matches any sequence of characters (including the empty sequence).

The matching should cover the **entire** input string (not partial).

Input: s = "aa", p = "a"

Output: false

Explanation: "a" does not match the entire string "aa".

Input: s = "aa", p = "*"

Output: true

Explanation: '*' matches any sequence.

Input: s = "cb", p = "?a"

Output: false

Explanation: '?' matches 'c', but the second letter is 'a', which does not match 'b'.

Constraints:

- $0 \leq \text{s.length}, \text{p.length} \leq 2000$
- s contains only lowercase English letters.
- p contains only lowercase English letters, “?” or “*”