RUTHLESS DSA STRING & TWO-POINTER STUDY SHEET (UPDATED)

PHASE 1 — FOUNDATIONAL TECHNIQUES (MUST BE PERFECT)

1. Reverse a String

- Technique: Two Pointers, in-place swap

- Importance: High

- Notes: Convert to char[] and swap manually. Avoid library shortcuts.

2. Check if a String is a Palindrome

- Technique: Two Pointers

- Importance: High

- Notes: Handle non-alphanumeric & case insensitivity.

3. Implement strStr()

- Technique: Brute Force $\rightarrow$ Rabin-Karp/KMP

- Importance: CRITICAL

- Notes: Know O(NM) brute force, mention O(N+M) KMP.

4. Check if Two Strings Are Anagrams

- Technique: Frequency Array (size 26)

- Importance: High

- Notes: Must be O(N), avoid HashMap.

5. First Non-Repeating Character

- Technique: Frequency Array (Two-pass)

- Importance: High

- Notes: O(N), O(1) space.

6. Count Vowels/Consonants

- Technique: Single O(N) loop

- Importance: Low

PHASE 2 — TWO POINTERS & SLIDING WINDOW (THE REAL CORE)

1. Valid Palindrome II

- Technique: Two Pointers + Decision Branching

- Importance: CRITICAL

- Notes: Use helper to skip left or right.

2. Longest Substring Without Repeating Characters

- Technique: Variable Sliding Window + HashMap/Set

- Importance: CRITICAL

3. Minimum Window Substring (LC 76)

- Technique: Variable Window + Frequency Maps + Match Counter

- Importance: CRITICAL

- Notes: Hardest sliding window problem.

4. Check if String Contains Permutation (LC 567)

- Technique: Fixed Window + Frequency Array + Match Counter

- Importance: High

5. Longest Substring with At Most K Distinct Characters

- Technique: Variable Sliding Window (Shrink on >K)

- Importance: High

6. Longest Palindromic Substring

- Technique: Expand Around Center

- Importance: CRITICAL

PHASE 3 — ADVANCED / DP (2 YOE EXPECTATION)

1. Word Break I & II

- Technique: DFS + Memo (Top-Down DP)

- Importance: CRITICAL

2. Print All Permutations

- Technique: Backtracking + Visited Array

- Importance: High

3. LCS / LPS

- Technique: 2D DP Table

- Importance: High

4. Restore IP Addresses

- Technique: DFS Backtracking

- Importance: Medium

PHASE 4 — ENCODING & MATHS (IMPLEMENTATION SKILLS)

1. String Compression (aaabb -> a3b2)

- Technique: Two Pointers / Group Counting

- Importance: High

2. Add Binary Strings

- Technique: Two Pointers + Carry

- Importance: High

3. Multiply Strings (LC 43)

- Technique: Array Simulation of long multiplication

- Importance: Medium

4. Encode & Decode Strings (LC 271)

- Technique: Custom delimiter, robust parsing

- Importance: Medium

IMMEDIATE TASKS (MANDATORY)

1. Re-do: Find All Anagram Indices using O(N) frequency + match counter.

2. Solve: Longest Substring Without Repeating Characters using O(N) window.