**Sliding window / 2 pointer**

* Pattern 1 : Constant window
* Pattern 2 : Longest sub-array / sub-string where <<condition>> (dynamic window)
  + Sum <= 12
* No. of sub-arrays where <<condition>> (using pattern 2)
* Shortest window where <<condition>>
  + Once valid window obtained -> shrink

Sliding Window / Two Pointer Patterns

----------------------------------------

**Pattern 1: Constant Window**

Used when the window size is fixed (e.g., length = k).

Example: Maximum average of subarray of size k (LeetCode 643).

Process:

1. Compute the first window of size k.

2. Slide the window → add one element, remove one element.

3. Track max/min/whatever you need.

**Pattern 2: Dynamic Window**

Used when the window size is variable, and you’re trying to satisfy some condition.

Examples:

Longest subarray with sum ≤ 12.

Longest substring with at most K distinct characters.

Sub-patterns inside dynamic window:

**1. Longest subarray/substring where <\>**

Expand the right pointer to grow the window.

If the condition breaks, shrink from the left until valid again.

Track the maximum valid length.

Example: Longest substring with at most 2 distinct characters.

**2. Number of subarrays where <\>**

Similar to above, but instead of only max length, count all valid windows.

Example: Count subarrays with product less than k (LC 713).

**3. Shortest window where <\>**

Expand until condition is satisfied.

Once valid, shrink from the left to minimize size.

Track the minimum length.

Example: Minimum size subarray sum ≥ target (LC 209).

👉 Key idea: Once a valid window is obtained → shrink from the left to find the shortest.

Questions -

|  |
| --- |
| ~~[https://leetcode.com/problems/longest-substring-with-at-least-k-repeating-characters/](https://www.google.com/url?q=https://leetcode.com/problems/longest-substring-with-at-least-k-repeating-characters/&sa=D&source=editors&ust=1745874937101193&usg=AOvVaw0HUCkXGe3dr4pSWh-COnso" \t "https://docs.google.com/spreadsheets/u/0/d/1-wKcV99KtO91dXdPkwmXGTdtyxAfk1mbPXQg81R9sFE/_blank)~~ |
| ~~[https://leetcode.com/problems/max-consecutive-ones-iii/](https://www.google.com/url?q=https://leetcode.com/problems/max-consecutive-ones-iii/&sa=D&source=editors&ust=1745874937101309&usg=AOvVaw3KjkZMXUFxJDJOcGH7S_YB" \t "https://docs.google.com/spreadsheets/u/0/d/1-wKcV99KtO91dXdPkwmXGTdtyxAfk1mbPXQg81R9sFE/_blank)~~ |
| ~~[https://leetcode.com/problems/grumpy-bookstore-owner/](https://www.google.com/url?q=https://leetcode.com/problems/grumpy-bookstore-owner/&sa=D&source=editors&ust=1745874937101416&usg=AOvVaw13-2KZ4MMPUVDdQd-PTnkP" \t "https://docs.google.com/spreadsheets/u/0/d/1-wKcV99KtO91dXdPkwmXGTdtyxAfk1mbPXQg81R9sFE/_blank)~~ |
| ~~[https://leetcode.com/problems/sliding-window-median/](https://www.google.com/url?q=https://leetcode.com/problems/sliding-window-median/&sa=D&source=editors&ust=1745874937101524&usg=AOvVaw3ZHW12M9LIQbgJjLk1P6Nl" \t "https://docs.google.com/spreadsheets/u/0/d/1-wKcV99KtO91dXdPkwmXGTdtyxAfk1mbPXQg81R9sFE/_blank)~~  [lengthy] |
| ~~[https://leetcode.com/problems/partition-labels/](https://www.google.com/url?q=https://leetcode.com/problems/partition-labels/&sa=D&source=editors&ust=1745874937087632&usg=AOvVaw2we5ah7W-lmPBuqeGLH6Jp" \t "https://docs.google.com/spreadsheets/u/0/d/1-wKcV99KtO91dXdPkwmXGTdtyxAfk1mbPXQg81R9sFE/_blank)~~ |
| ~~[https://leetcode.com/problems/sort-colors/](https://www.google.com/url?q=https://leetcode.com/problems/sort-colors/&sa=D&source=editors&ust=1745874937087740&usg=AOvVaw2SmMru8JEyKkJ7CTLUpDbi" \t "https://docs.google.com/spreadsheets/u/0/d/1-wKcV99KtO91dXdPkwmXGTdtyxAfk1mbPXQg81R9sFE/_blank)~~ |
| ~~[https://leetcode.com/problems/longest-repeating-character-replacement/](https://www.google.com/url?q=https://leetcode.com/problems/longest-repeating-character-replacement/&sa=D&source=editors&ust=1745874937087856&usg=AOvVaw1sHAFK2kUpbRjfnXkdeedR" \t "https://docs.google.com/spreadsheets/u/0/d/1-wKcV99KtO91dXdPkwmXGTdtyxAfk1mbPXQg81R9sFE/_blank)~~ |
| [https://leetcode.com/problems/maximum-number-of-visible-points/](https://www.google.com/url?q=https://leetcode.com/problems/maximum-number-of-visible-points/&sa=D&source=editors&ust=1745874937087966&usg=AOvVaw01hDA8fCf6fPr6Z24v_QG2" \t "https://docs.google.com/spreadsheets/u/0/d/1-wKcV99KtO91dXdPkwmXGTdtyxAfk1mbPXQg81R9sFE/_blank) |
| ~~[https://leetcode.com/problems/subarrays-with-k-different-integers/](https://www.google.com/url?q=https://leetcode.com/problems/subarrays-with-k-different-integers/&sa=D&source=editors&ust=1745874937088073&usg=AOvVaw21TwaZ8voSaadbgabMRYoi" \t "https://docs.google.com/spreadsheets/u/0/d/1-wKcV99KtO91dXdPkwmXGTdtyxAfk1mbPXQg81R9sFE/_blank)~~ |