The **Sliding Window** technique is a powerful algorithmic approach used to solve problems involving arrays or sequences, especially when you need to find a subarray or substring that satisfies certain conditions. Below is a comprehensive list of common **Sliding Window** questions categorized by type:

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1. Fixed-Size Sliding Window

These problems involve finding a subarray or substring of a fixed size that meets specific criteria.

1. **Maximum Sum Subarray of Size K**
   - Problem: Given an array of integers, find the maximum sum of any contiguous subarray of size k.
   - Example:
     - Input: [1, 4, 2, 10, 2, 3, 1, 0, 20], k = 4
     - Output: 17 (from subarray [4, 2, 10, 1])
2. **Minimum Sum Subarray of Size K**
   - Problem: Given an array of integers, find the minimum sum of any contiguous subarray of size k.
   - Example:
     - Input: [1, 4, 2, 10, 2, 3, 1, 0, 20], k = 3
     - Output: 3 (from subarray [2, 3, 1])
3. **First Negative Number in Every Window of Size K**
   - Problem: Given an array of integers, find the first negative number in every window of size k.
   - Example:
     - Input: [12, -1, -7, 8, -15, 30, 16, 28], k = 3
     - Output: [-1, -1, -7, -15, -15, 0]
4. **Count Occurrences of Anagrams**
   - Problem: Given a string and a pattern, count the number of anagrams of the pattern in the string.
   - Example:
     - Input: s = "forxxorfxdofr", pattern = "for"
     - Output: 3 (anagrams: for, orf, ofr)
5. **Maximum of All Subarrays of Size K**
   - Problem: Given an array of integers, find the maximum of all subarrays of size k.

- o   Example:
    - ▪   Input: [1, 3, -1, -3, 5, 3, 6, 7], k = 3
    - ▪   Output: [3, 3, 5, 5, 6, 7]

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2. Variable-Size Sliding Window

These problems involve finding a subarray or substring of variable size that meets specific criteria.

6. **Longest Subarray with Sum K**
   - o   Problem: Given an array of integers, find the length of the longest subarray with a sum equal to k.
   - o   Example:
       - ▪   Input: [10, 5, 2, 7, 1, 9], k = 15
       - ▪   Output: 4 (subarray [5, 2, 7, 1])
7. **Longest Substring with K Distinct Characters**
   - o   Problem: Given a string, find the length of the longest substring with at most k distinct characters.
   - o   Example:
       - ▪   Input: s = "aabacbebebe", k = 3
       - ▪   Output: 7 (substring "cbebebe")
8. **Longest Substring Without Repeating Characters**
   - o   Problem: Given a string, find the length of the longest substring without repeating characters.
   - o   Example:
       - ▪   Input: s = "abcabcbb"
       - ▪   Output: 3 (substring "abc")
9. **Minimum Window Substring**
   - o   Problem: Given two strings s and t, find the minimum window in s that contains all characters of t.
   - o   Example:
       - ▪   Input: s = "ADOBECODEBANC", t = "ABC"
       - ▪   Output: "BANC"
10. **Smallest Subarray with Sum ≥ K**
    - o   Problem: Given an array of positive integers, find the smallest subarray with a sum ≥ k.
    - o   Example:

- Input: [2, 1, 5, 2, 3, 2], k = 7
- Output: 2 (subarray [5, 2])

11. **Longest Subarray with Ones After Replacement**

   o Problem: Given an array of 0s and 1s, find the length of the longest subarray with all 1s after replacing at most k 0s.
   o Example:

   - Input: [1, 1, 0, 0, 1, 1, 1, 0, 1, 1], k = 2
   - Output: 7 (subarray [1, 1, 1, 0, 1, 1, 1])

12. **Fruit Into Baskets**

   o Problem: Given an array of fruit types, find the maximum number of fruits you can collect with at most 2 types of fruits.
   o Example:

   - Input: [1, 2, 1, 3, 4, 3, 5, 1, 2]
   - Output: 4 (subarray [1, 2, 1, 3])

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3. Sliding Window with Frequency Maps

These problems involve maintaining a frequency map or hashmap to track characters or elements.

13. **Permutation in String**

   o Problem: Given two strings s1 and s2, check if any permutation of s1 exists in s2.
   o Example:

   - Input: s1 = "ab", s2 = "eidbaooo"
   - Output: True (permutation "ba" exists in s2)

14. **Find All Anagrams in a String**

   o Problem: Given two strings s and p, find all starting indices of p's anagrams in s.
   o Example:

   - Input: s = "cbaebabacd", p = "abc"
   - Output: [0, 6] (anagrams at indices 0 and 6)

15. **Longest Repeating Character Replacement**

   o Problem: Given a string and an integer k, find the length of the longest substring with the same character after at most k replacements.
   o Example:

   - Input: s = "AABABBA", k = 1

▪ Output: 4 (substring "AABA")

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4. Sliding Window with Two Pointers

These problems involve using two pointers to maintain a window.

16. **Subarray Product Less Than K**
    o Problem: Given an array of positive integers, find the number of subarrays with a product less than k.
    o Example:
        ▪ Input: [10, 5, 2, 6], k = 100
        ▪ Output: 8
17. **Longest Substring with At Most Two Distinct Characters**
    o Problem: Given a string, find the length of the longest substring with at most two distinct characters.
    o Example:
        ▪ Input: s = "eceba"
        ▪ Output: 3 (substring "ece")
18. **Longest Substring with At Most K Distinct Characters**
    o Problem: Given a string, find the length of the longest substring with at most k distinct characters.
    o Example:
        ▪ Input: s = "aabacbebebe", k = 3
        ▪ Output: 7 (substring "cbebebe")

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5. Miscellaneous Sliding Window Problems

19. **Maximum Consecutive Ones III**
    o Problem: Given a binary array, find the maximum number of consecutive 1s after flipping at most k 0s.
    o Example:
        ▪ Input: [1, 1, 0, 0, 1, 1, 1, 0, 1, 1], k = 2
        ▪ Output: 7
20. **Grumpy Bookstore Owner**

- Problem: Given an array of customers and a grumpy array, find the maximum number of satisfied customers if the owner is not grumpy for k minutes.
- Example:
  - Input: customers = [1, 0, 1, 2, 1, 1, 7, 5], grumpy = [0, 1, 0, 1, 0, 1, 0, 1], k = 3
  - Output: 16

21. **Sliding Window Median**
- Problem: Given an array of integers, find the median of every window of size k.
- Example:
  - Input: [1, 3, -1, -3, 5, 3, 6, 7], k = 3
  - Output: [1, -1, -1, 3, 5, 6]

These problems cover a wide range of applications for the sliding window technique. Let me know if you'd like detailed explanations or solutions for any of these!