2020-01-18 - Handout – Sliding Window

- The problem will involve a data structure that is ordered and iteratable like an array or a string or linked list
- You are looking for some subrange in that array/string, like a longest, shortest or target value.

Types:

- Fixed Length Window
- Dynamic Length Window
- Dynamic Length with an auxiliary data structure

1. Problem Statement

Given an array of positive numbers and a positive number ‘k’, find the **maximum sum of any contiguous subarray of size ‘k’**.

Example 1:

```
Input: [2, 1, 5, 1, 3, 2], k=3
                  |____|
Output: 9
Explanation: Subarray with maximum sum is [5, 1, 3].
```

Example 2:

```
Input: [2, 3, 4, 1, 5], k=2
Output: 7
Explanation: Subarray with maximum sum is [3, 4].
```

2. Problem Statement

Given an array of positive numbers and a positive number ‘S’, find the length of the **smallest contiguous subarray whose sum is greater than or equal to ‘S’**. Return 0, if no such subarray exists.

Example 1:

```
Input: [2, 1, 5, 2, 3, 2], S=7.
          |__|
Output: 2
Explanation: The smallest subarray with a sum great than or equal to '7' is [5, 2].
```

Example 2:

```
Input: [2, 1, 5, 2, 8], S=7
Output: 1
Explanation: The smallest subarray with a sum greater than or equal to '7' is [8].
```

Example 3:

```
Input: [3, 4, 1, 1, 6], S=8
Output: 3
Explanation: Smallest subarrays with a sum greater than or equal to '8' are [3, 4, 1] or [1, 1, 6].
```

3. Problem Statement

Given a string, find the length of the **longest substring** in it **with no more than K distinct characters**.

Example 1:

```
Input: String="araaci", K=2
Output: 4
Explanation: The longest substring with no more than '2' distinct characters is "araa".
```

Example 2:

```
Input: String="araaci", K=1
Output: 2
Explanation: The longest substring with no more than '1' distinct characters is "aa".
```

Example 3:

```
Input: String="cbbebi", K=3
Output: 5
Explanation: The longest substrings with no more than '3' distinct characters are "cbbeb" & "bbebi".
```

4. Problem Statement

https://leetcode.com/problems/grumpy-bookstore-owner/ [Fixed Length]

Example : -

```
Input: customers = [1,0,1,2,1,1,7,5], grumpy = [0,1,0,1,0,1,0,1], X = 3

Output: 16

Explanation: The bookstore owner keeps themselves not grumpy for the last 3 minutes.

The maximum number of customers that can be satisfied = 1 + 1 + 1 + 1 + 7 + 5 = 16.
```

5. Problem Statement

https://leetcode.com/problems/get-equal-substrings-within-budget/ [Dynamic Length]

Example 1:

```
Input: s = "abcd", t = "bcdf", maxCost = 3

Output: 3

Explanation: "abc" of s can change to "bcd". That costs 3, so the maximum length is 3.
```

Example 2:

```
Input: s = "abcd", t = "cdef", maxCost = 3

Output: 1

Explanation: Each character in s costs 2 to change to charactor in t, so the maximum length is 1.
```