

Count Unique Characters of all substrings.

Eg: A B A B

For a substring to be Unique, the characters
Should not repeat.

Char A:

idx 0: A, AB

idx : 2 : BAB, BA, A, AB

2

4

6

Char B:

idx:1 ABA, AB, B, BA

4

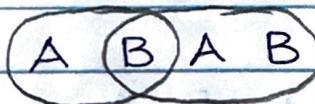
idx:3 AB, B

6

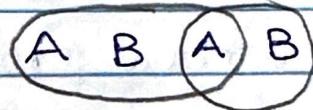
6

$$\text{Total} = 6 + 6 = 12$$

If we carefully observe, we have a window, start from the first occurrence of A, end at the second occurrence.



window for A



Window for B.

Eg: 2: A B C A B D A

0 1 2 3 4 5 6

A

0 → A, AB, ABC

3 → BCA, CA, A, AB, ABD, BCAB, CAB, CABD, BCABD

6 → BDA, DA, A

$$= 3 + 9 + 3 = 15$$

#B A B C A B D A
0 1 2 3 4 5 6

#A 15 can also be written, based on window

A B C A B D A

$$\text{Left} = 1, \text{right} = 3 \Rightarrow 1 * 3 = 3$$

A B C A B D A

$$\text{Left} = 3, \text{right} = 3 \Rightarrow 3 * 3 = 9$$

A B C A B D A

$$\text{Left} = 3, \text{right} = 1 \Rightarrow 3 * 1 = 3$$

$$3 + 9 + 3 = 15$$

Similarly for B

1 → B, AB, BC, ABC, BCA, ABCA

(4) → B, CABDA, CAB, AB, BD, ABD, BAA, ABDA, CABD

$$6 + 9 = 15$$

In Window form

A B C A B D A

$$\text{Left} = 2, \text{Right} = 3 \Rightarrow 2 * 3 = 6$$

A B C A B D A

$$\text{Left} = 3, \text{Right} = 3 \Rightarrow 3 * 3 = 9$$

$$6 + 9 = 15$$

#C
 A B C A B D A
 0 1 2 3 4 5 6

② → ABCABDA, ABC, BC, BCA, ABCA, ABCB, ABCABD
 BLAB, BCABD, BCADA, CA, C, CAB, CABD, CABDA
 $= 15$

In window format

A B C A B D A
 left = 3, right = 5 $\Rightarrow 5 * 3 = \boxed{15}$

#D

⑤ → ABCABDA, BCABDA, CABDA, ABDA, BDA, DA, D,
 ABCABD, BCABD, CABD, ABD, BD
 $= 12$

In window format

A B C A B D A
 left = 6, right = 2 $\Rightarrow 6 * 2 = 12$

Finally $\Rightarrow \#A + \#B + \#C + \#D$

$$= 15 + 15 + 15 + 12 = \boxed{57}$$

The core idea is to have a window with Unique character

Formula: Finding all possible substring having 'x' as unique character
 = Crossproduct of all substring(window) on left Uniquely containing x
 * Crossproduct of all substring(window) on right Uniquely containing x