July 26, 2025

Doubt Session

Ques 1. Diversify the Array

https://maang.in/problems/Diversify-the-Array-97

Description

You have given an array *A*. The diversity of the array *A* is defined as the number of pairs *i*, *j*, *i* < *j* such that $A_i \neq A_j$.
You want to maximize the diversity of the array. For that, you are allowed to make at most *K* operations on it, in any of which, you can select a particular element and change its value to any integer in the range 1 to 10^9, both inclusive. Find out the maximum diversity of the array that you can obtain.

Only K changes can be done!

i<j
a[i] != a[j]
→ decrease duplicates and increase diversity.

Ex 1: 1 2 3, already 3 different elements resulting in max. diversity
So ${}^3C_2 = 3$ Ans

Ex 2: 1 1 2 2 K=2 changes allowed
{1:2, 2:2} we can use this to diversify the array
So, ${}^4C_2 = 6$ Ans

Ex 3: 2 3 3 2 4 4 , K=2
{2:2, 3:2, 4:2} Out of 6 elements, convert K elements.
→ Only 3 unique elements
→ We can make 2 out of 3 duplicates into different number to increase diversity
⇒ Resulting in 5 unique, 1 duplicate.
Overall pair ${}^5C_2 = \frac{5 \times 4}{2} = 10$ pairs

4 non equal ← (5) → 1 leftover duplicate
↓
This can pair up with the abv. existing duplicate, Hence Ans = 10 + 4 = 14 Ans

AlgoZenith

Generalising :

Total el=18 $1\ 2\ 5\ 3$ → $2\ 3\ 6\ 7$

$(2,2), (3,3), (4,4)$ cannot contribute to the diversity

→ Maximise unique element

Out of K operations, we can decrease K from existing duplicates and add to unique.

unique / Duplicate

$+K$ $\quad -K$

convert duplicate to unique

$\Rightarrow {}^{n}C_2 - d$

Total pair = ${}^{18}C_2$

K=3

Newly introduced (just take randomly)

$1\ 2\ 5\ 3\ \ 4\ 7\ 8$

$\downarrow\ \downarrow\ \downarrow\ \downarrow\ \ \downarrow\ \downarrow\ \downarrow$

$2\ 3\ 6\ 7\ \ 1\ 1\ 1$

$1\ 1$

$(K-1)(K-1)$

$=3-1 \quad =2-2$

$=2 \quad =0$

Instead of reducing each duplicate, we can reduce the duplicate all at once too. like

$1\ 2\ 5\ 3$

$\downarrow\ \downarrow\ \downarrow\ \downarrow$

$2\ 3\ 6\ 4$

$7-3$

$\Rightarrow 4$

Substracted from most occurring (increases diversity most)

Now,

1 : 2

2 : 3

5 : 6

3 : 4

$Ans = {}^{18}C_2 - {}^{2}C_2 - {}^{3}C_2 - {}^{4}C_2 - {}^{6}C_2$

Substracting the duplicate pairs from total number of pair

→ Maintain priority queue of pairs for maintaining frequency.
pq.top() → second will give us access to the most occurring element which has highest frequency.

→ Reduce this freq by freq − K

→ If we still have K left, continue to remove for other pairs.

Ques 2. Height of N soldiers

https://maang.in/problems/Height-of-Soldiers-88

There are N soldiers standing in a row, numbered 1 through N. The height of i-th soldier is Hi. For each non-empty contiguous segment of the line, strength is defined as the minimum height of the soldier in that segment.
You have to tell the maximum strength for each x size group, for all groups of size x between 1 to N.

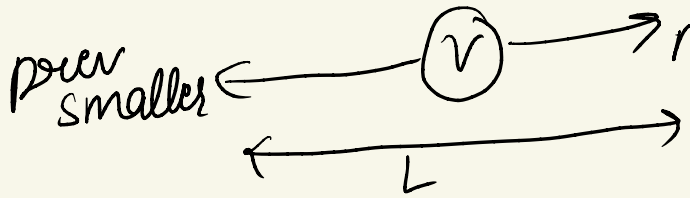
Example 1 2 (3) 4 6 3 2

Imagine subarray is ending here.

We can try to think like where will 3 contribute as max element.

For each element, we can assume that its contributing as max and we will try to figure out no. of subarrays that will have the i-th element as max.

Case i:



V smallest element: [L] [L-1] [L-2] ... 1

O(N)

0	1	2	3	4	5
1	5	2	9	6	3

Ex1

→ for 1

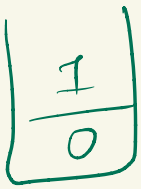
{1:1}

→ For 5

Can 5 replace 1 on stack?

5 can def contribute to min element of subarray w size = 1

{1:5}



→ For 2

{1:5 9

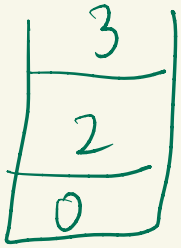
pop on comparision with incoming idx

pop idx 1 as 5>2.

→ for 9

{1:9

2:2

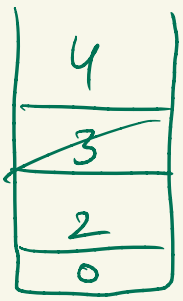


→ for 6

{1:9

2:6

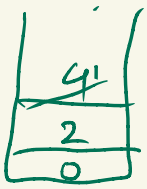
4:2



→ for 3

{1:9, 2:6, 4:2, 3:5

5:2



Ex2

2 5 1 3 2

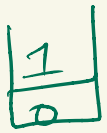
→ For 2

{1:2

→ For 5

{1:2 5

2:2

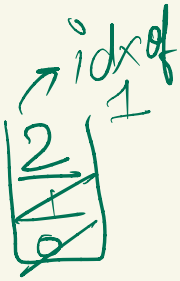


→ for 1, i=2

{1:5

2:2

3:1

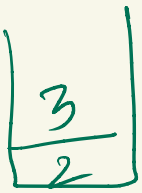


1 is dominating as max when compared with a[1] and a[0].

1 will be min in this window.

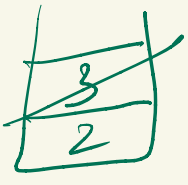
→ for 3

{1:5, 2:2, 3:1, 4:1}



→ for 2

{1:5, 2:2, 3:1, 4:1, 5:1}



2 won't be able to extend till a[2], can only do that till a[3].