3346. Maximum Frequency of an Element After Performing Operations I

Solved

Medium | Topics | Companies | Hint

You are given an integer array `nums` and two integers `k` and `numOperations`.

You must perform an **operation** `numOperations` times on `nums`, where in each operation you:

- Select an index `i` that was **not** selected in any previous operations.
- Add an integer in the range `[-k, k]` to `nums[i]`.

Return the **maximum** possible frequency of any element in `nums` after performing the **operations**.

-i

0

Leetcode
POTD

Code + PDF
in Desc.

eg: nums : [1, 4, 5]   k = 1   m = 2

numoperations

0 2 3 5 4 6   [-1, 1]

nums[i] += [-k, k]   {-1, 0, 1}

[1, 4+1, 5]   [1, 4, 5-1]

5 → 2   4 → 2

2

eg: $[5, 11, 20, 20]$

$k = 5 \rightarrow [-5, 5]$

nums[i]

0 10 6 16 15 25 15 25

+0 +0

$m = 1$

$[20, 20]$

5+5, 11-1

$[10, 10] \rightarrow 2$

20, 20

2

2

freq → repetition

20, 20

[20, 5, 10, 20]

↓ sort

[5, 10, 20, 20]

Binary Search

Two Pointers

[-K, K]

↓

within range

target

Range

$$\begin{array}{cccccc} & 0 & 1 & 2 & 3 & \\ & & & & r & r \\ & [5, & 10, & 20, & 20] & \end{array}$$

$\uparrow$

l

$\pm k$

$[-k, k]$

$\checkmark$

$20 + 5 \geq 20 \to T$

nums[l]

l → target value

r → explore and check which of the elements can converge to my nums[l]

1. $nums[l] + k \geq nums[r]$
2. $r < n$

$x+k$

x $\qquad$ $\bigcirc$ $\qquad$ $nums[r] \geq nums[l]$

$\uparrow$ $\qquad$ $\uparrow r$

l

$\longrightarrow$ sort

```
while (r < n and l < n) {

    while (r < n and nums[l] + K >= nums[r]) {
        if (nums[r] == nums[l]) continue
        else {   if (ops > 0) ops--
                 else break
        }
        r++ → Expanding
    }

    ans = max(ans, r - l + 1)

    l++ → Shrink
}
```

l → r

1e5   O(N)
       Time

Sliding window

k = 6

r

5 , 11 20 , 20

l

$\rightarrow$

numops - 1

$$[\underline{\underline{88}}, 5\underline{\underline{3}}]$$

$k = 17$

$m = 1$

It is not essential that element should be a part of array.

$88 + 17$ ✗

$-17 = 71$

$53 + 17 = 70$ ✗

-17 ✗

r

[88, 53]

l

1

71

27

88

[88, 53]

−27 +27

X

53

61

80

88

$m = 2 \rightarrow 3$

$k = 27$

$[-27, 27]$

$[53, 88]$

$+17$ -18

70 70

$[70, 70]$

70

target

avg:

$(53, 88)$

1, 4, 7, 9, 18, ...

$x = 3 \quad k = 1$

$x - k = \quad x - k = 2$

Eg:

$$\begin{array}{ccccccc} 0 & 1 & 2 & 3 & 4 & 5 & 6 \\ \end{array}$$

$$[1, \boxed{2}, 2, \boxed{3}, 4, \boxed{4}, 5]$$

to $x + k$

$k = 1, \; m = 4$

$[1, 3, 3, 3, 3, 3, 5]$ $\quad 5$

$5 - 1 + 1 = 5$

$m = 5$ ✓ $\qquad m = 4$

k = 1 , m = 4

[-1, 1]

[1, 2, 2, 4, 4, 5]

let's consider all elements

nums[0] , nums[n-1]

$x = 3$

$x - k$

2

$x + k$

4

left

find last value $\geq x - k$

give me the smallest index whose value $\geq x - k$.

right

find last value $\leq x + k$

give me largest idx whose value $\leq x + k$

So ~~they~~ have potential for conversion.

$\boxed{2}$ $\boxed{3}$ $\boxed{4}$

first

$x-k$

bigger

$x+k$

smaller

binary search

lower bound

upper bound

for each x

lowbs = smallest idx with value $\geq x-K$

highbs = biggest idx with value $\leq x+K$

$m \geq 4$

$$\begin{array}{ccccccc} 0 & 1 & 2 & 3 & 4 & 5 & 6 \\ 1, & \boxed{2}, & \boxed{2}, & 3, & \boxed{4}, & \boxed{4}, & 5 \end{array}$$

lowbs = 1

highbs = 5

max possible ans = highbs − lowbs + 1

$= 5 - 1 + 1 = 5$

K const.

map

$3 \rightarrow \boxed{4}$

1, 2, 2, 3, 3, 3, 3, 4, 5

$x = 3$

− mp[x]

freq = (high bs - low bs + 1)

freq - subtract

$\underline{\text{max possible}}$ = (high bs - low bs + 1)

−

$\underline{\text{mp}}$ [x] → 0

ops = min (m, max possible)

Made with Goodnotes

0 1 2 3 4 5 6 7

1, 2, 2, 3, 3, 4, 4, 5

lowbs highbs

$mp[x] = \cancel{2}$

$m = \cancel{4}$ 3

highbs − lowbs + 1 = cnt = $6 - 1 + 1 = 6$

− mp[x] $6 - 2 = 4$

m, □

ops = $\boxed{\min}$ (3, 4) = 3

ans = $\boxed{mp[x] + ops}$ =

$ans = \max(ans, mp[x] + ops)$

original

can be converted

return $\boxed{}$