

Problem 3520: Minimum Threshold for Inversion Pairs Count

Problem Information

Difficulty: Medium

Acceptance Rate: 55.22%

Paid Only: Yes

Tags: Array, Binary Search, Binary Indexed Tree, Segment Tree

Problem Description

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

An inversion pair with a **threshold** x is defined as a pair of indices (i, j) such that:

$i < j$ and $\text{nums}[i] > \text{nums}[j]$ and The difference between the two numbers is **at most** x (i.e. $|\text{nums}[i] - \text{nums}[j]| \leq x$).

Your task is to determine the **minimum** integer min_threshold such that there are **at least** k inversion pairs with threshold min_threshold .

If no such integer exists, return -1 .

Example 1:

Input: $\text{nums} = [1, 2, 3, 4, 3, 2, 1]$, $k = 7$

Output: 2

Explanation:

For threshold $x = 2$, the pairs are:

1. $(3, 4)$ where $\text{nums}[3] == 4$ and $\text{nums}[4] == 3$.
2. $(2, 5)$ where $\text{nums}[2] == 3$ and $\text{nums}[5] == 2$.
3. $(3, 5)$ where $\text{nums}[3] == 4$ and $\text{nums}[5] == 2$.
4. $(4, 5)$ where $\text{nums}[4] == 3$ and $\text{nums}[5] == 2$.

`== 3` and `nums[5] == 2` . 5. `(1, 6)` where `nums[1] == 2` and `nums[6] == 1` . 6. `(2, 6)`
where `nums[2] == 3` and `nums[6] == 1` . 7. `(4, 6)` where `nums[4] == 3` and `nums[6] == 1` .
8. `(5, 6)` where `nums[5] == 2` and `nums[6] == 1` .`

There are less than `k` inversion pairs if we choose any integer less than 2 as threshold.

Example 2:

Input: nums = [10,9,9,9,1], k = 4

Output: 8

Explanation:

For threshold `x = 8`, the pairs are:

1. `(0, 1)` where `nums[0] == 10` and `nums[1] == 9` . 2. `(0, 2)` where `nums[0] == 10` and
`nums[2] == 9` . 3. `(0, 3)` where `nums[0] == 10` and `nums[3] == 9` . 4. `(1, 4)` where
`nums[1] == 9` and `nums[4] == 1` . 5. `(2, 4)` where `nums[2] == 9` and `nums[4] == 1` . 6. `(3,
4)` where `nums[3] == 9` and `nums[4] == 1` .

There are less than `k` inversion pairs if we choose any integer less than 8 as threshold.

Constraints:

`* `1 <= nums.length <= 104` * `1 <= nums[i] <= 109` * `1 <= k <= 109``

Code Snippets

C++:

```
class Solution {  
public:  
    int minThreshold(vector<int>& nums, int k) {  
        }  
    };
```

Java:

```
class Solution {  
public int minThreshold(int[] nums, int k) {  
}  
}  
}
```

Python3:

```
class Solution:  
    def minThreshold(self, nums: List[int], k: int) -> int:
```