Remove Duplicates from Sorted Array

Problem Statement:

Given an integer array `nums` sorted in `non-decreasing order`, remove the duplicates `in-place` such that each unique element appears only once. The relative order of the elements should be kept the same. Then return the number of unique elements in nums.

Consider the number of unique elements of `nums` to be `k`. To get accepted, you need to do the following things:

Change the array `nums` such that the first `k` elements of `nums` contain the unique elements in the order they were present in `nums` initially. The remaining elements of `nums` are not important, as well as the size of `nums`. eturn k.

Examples:

Example 1:

Input: nums = [1,1,2]

Output: 2, nums = [1,2,_]

`Explanation:` Your function should return k = 2, with the first two elements of nums being 1 and 2 respectively. It does not matter what you leave beyond the returned k (hence they are underscores).

Example 2:

Input: nums = [0,0,1,1,1,2,2,3,3,4]

Output: 5, nums = [0,1,2,3,4,_,_,_,_,_]

`Explanation:` Your function should return k = 5, with the first five elements of nums being 0, 1, 2, 3, and 4 respectively. It does not matter what you leave beyond the returned k (hence they are underscores).

Constraints:

$1 \leq$ `nums.length` $\leq 3 * 10^4$

$-100 \leq$ `nums[i]` ≤ 100

nums is sorted in non-decreasing order.

Important Points:

Non-decreasing order:

The array is sorted such that elements can stay the same or increase: `nums[i] <= nums[i+1]`.

Examples:

Valid: `[1, 1, 2, 3, 3, 5]`

Invalid: `[3, 2, 1]` (this is decreasing).

In-place:

You must modify the given `nums` array itself.

You are **not allowed** to use extra arrays for storing the result.

Approach:

`x = 0`: Pointer to track the last unique element's position.

Loop through the array from `i = 0` to `nums.length`.

If true (new unique value), increment `x` and update `nums[x] = nums[i]`.

This shifts the unique value forward in the array.

At the end, `x + 1` gives the count of unique elements.

Time Complexity:

•

The function uses a single loop that iterates through the entire array once.

Each iteration performs constant-time operations (comparisons and assignments).

Time Complexity = O(n), where `n = nums.length`.

Space Complexity:

•

The function modifies the array **in-place**.

Uses only a few extra variables: `x` and `i` .

Space Complexity = O(1)(constant extra space).

Dry Run

Input: `[1, 1, 2, 3, 3, 5]`

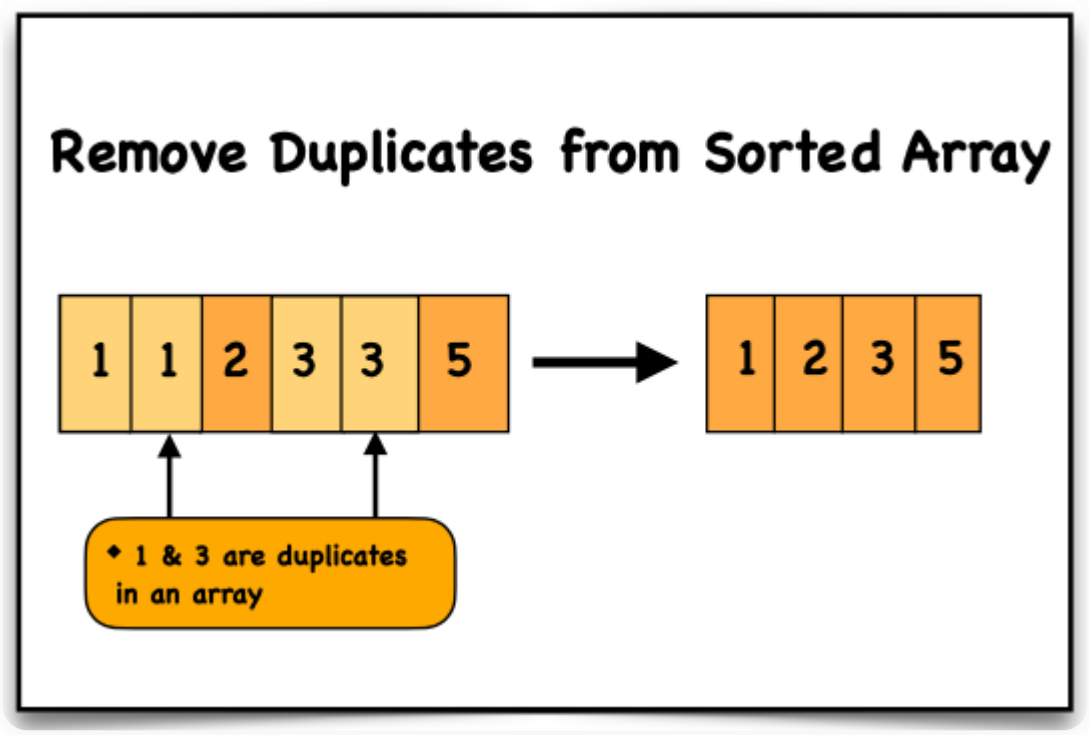
```
                  Initial state:
                    x = 0

                  i = 0: nums[i] = 1, nums[x] = 1 → NOT greater
→ skip
                  i = 1: nums[i] = 1, nums[x] = 1 → NOT greater
→ skip
                  i = 2: nums[i] = 2, nums[x] = 1 → GREATER →
x=1, nums[1] = 2
                  i = 3: nums[i] = 3, nums[x] = 2 → GREATER →
x=2, nums[2] = 3
                  i = 4: nums[i] = 3, nums[x] = 3 → NOT greater
→ skip
                  i = 5: nums[i] = 5, nums[x] = 3 → GREATER →
x=3, nums[3] = 5

                  Final array: [1, 2, 3, 5, 3, 5]
                  Unique count: x + 1 = 4
```

Output: `4` (First 4 elements are unique: [1, 2, 3, 5])

Visualisation:




```
var removeDuplicates = function(nums) {
    let x = 0;
    for (let i = 0; i < nums.length; i++) {
        if (nums[i] > nums[x]) {
            x++;
            nums[x] = nums[i];
        }
    }
    return x + 1;
};
```

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Remove Duplicates - DSA Notes

Remove Duplicates - DSA Notes

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Introduction

Warm Up

Time/Space Complexity

Arrays - Easy/Medium

- Remove Duplicates — 45m 5s — Resources — [x]
- Remove Element — 22m 46s — Resources — [x]
- Reverse String — 26m 45s — Resources — [x]
- Best Time to Buy and Sell Stocks — 28m 16s — Resources — [x]
- Merge Sorted Arrays — 41m 33s — Resources — [x]
- Move Zeros — 26m 31s — Resources — [ ]
- Max Consecutive Ones — 16m 29s — Resources — [ ]
- Missing Number — 16m 55s — Resources — [ ]
- Single Number