# **Leetcode 128 – Longest Consecutive Sequence**

## Problem Understanding

You're given an **unsorted** array of integers nums.  
Your task is to **return the length** of the **longest sequence of consecutive integers** (in any order, no duplicates needed).

**Important notes**:

* The sequence must be **consecutive**, but **doesn't need to be contiguous** in the array.
* You must solve it in **O(n)** time.

### Example

Input: nums = [100, 4, 200, 1, 3, 2]

Output: 4

Explanation: The longest consecutive sequence is [1, 2, 3, 4]

## Optimized Java Solution (Using HashSet)

We use a HashSet for constant time lookups and start expanding only when a number is the **start of a sequence**.

class Solution {

public int longestConsecutive(int[] nums) {

Set<Integer> set = new HashSet<>();

for (int num : nums) set.add(num);

int maxLen = 0;

for (int num : nums) {

// Only expand when it's the start of a sequence

if (!set.contains(num - 1)) {

int curr = num;

int streak = 1;

while (set.contains(curr + 1)) {

curr++;

streak++;

}

maxLen = Math.max(maxLen, streak);

}

}

return maxLen;

}

}

## Dry Run Using Table

### Input:

nums = [100, 4, 200, 1, 3, 2]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| num | Is num - 1 in set? | Start new seq? | Expands to... | Length | maxLen |
| 100 | ❌ (99 not in set) | ✅ | 100 | 1 | 1 |
| 4 | ✅ (3 is in set) | ❌ | — | — | 1 |
| 200 | ❌ | ✅ | 200 | 1 | 1 |
| 1 | ❌ | ✅ | 1 → 2 → 3 → 4 | 4 | 4 ✅ |
| 3 | ✅ | ❌ | — | — | 4 |
| 2 | ✅ | ❌ | — | — | 4 |

✅ Final Answer: **4**

## Time / Space Complexity

|  |  |
| --- | --- |
| Metric | Value |
| Time | O(n) |
| Space | O(n) |

* Each number is inserted and looked up in constant time using a HashSet.
* The loop only runs once per number in the worst case.

## Alternate Approaches

|  |  |  |  |
| --- | --- | --- | --- |
| Approach | Time | Space | Notes |
| ✅ HashSet | O(n) | O(n) | Best & required by constraints |
| ❌ Sort + Linear | O(n log n) | O(1) | Easy but violates time constraint |
| Union-Find (DSU) | O(n α(n)) | O(n) | Complicated but possible |