Longest Consecutive

For this problem we need an $O(n)$ solution, so sorting ($O(n \log n)$) is not allowed.

Key Idea:

Hash set + Sequence Start Detection

1. Store all numbers in hash set for $O(1)$ lookups.
2. For each number num:
   - Only start counting if num - 1 is not in the set (meaning num is the start of sequence).
   - Count consecutive numbers num+1, num+2, ..., until they are missing from the set.
3. Track the maximum length found.

Algorithm:

- Insert all numbers into unordered_set<int>.
- Iterate through numbers:
  - If num-1 not in set:
    - Initialize currentNum = num and currentLength = 1.
    - While currentNum+1 is in set:
      - Increment both currentNum and currentLength.
    - Update maxLength with currentLength.

Complexity:

- Time: $O(n)$ - each number is processed at most thrice (check start, extend sequence).
- Space: $O(n)$ - hash set stores all numbers.