First Missing Positive

This problem is requiring O(n) time and O(1) extra space; we will use the index placement (cyclic sort/ hashing in-place) approach.

Key Insight:

- The smallest missing positive must lie in range [1, ..., n+1] where n = nums.length:
  - If all numbers 1...n exist, answer is n+1.
  - Otherwise, answer is the smallest missing in 1...n.

Steps:

1. Place each number x in its correct index x-1:
   - While 1 <= nums[i] <= n and nums[i] != nums[nums[i]-1]:
     - Swap nums[i] with nums[nums[i]-1].
2. Find first missing positive:
   - Iterate array; first index i where nums[i] != i+1 → return i+1.
3. If all correct → return n+1.

Complexity:

- Time: O(n) (each number placed at most once).
- Space: O(1) (in place)