

Given an array of integers `nums` containing  $n + 1$  integers where each integer is in the range  $[1, n]$  inclusive.

There is only **one repeated number** in `nums`, return *this repeated number*.

#### Example 1:

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

Output: 2

#### Example 2:

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

Output: 3

#### Example 3:

Input: `nums = [1,1]`

Output: 1

#### Example 4:

Input: `nums = [1,1,2]`

Output: 1

#### Constraints:

- $2 \leq n \leq 3 * 10^4$
- `nums.length == n + 1`
- $1 \leq \text{nums}[i] \leq n$
- All the integers in `nums` appear only **once** except for **precisely one integer** which appears **two or more** times.

#### Follow up:

- How can we prove that at least one duplicate number must exist in `nums` ?
- Can you solve the problem **without** modifying the array `nums` ?
- Can you solve the problem using only constant,  $O(1)$  extra space?
- Can you solve the problem with runtime complexity less than  $O(n^2)$  ?