

## ARRAYS - Assignment

**Question 1:** Given an integer array `nums`, return `true` if any value appears at least twice in the array, and return `false` if every element is distinct.

Example 1:

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

Output: `true`

Example 2:

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

Output: `false`

Example 3:

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

Output: `true`

Constraints:

- $1 \leq \text{nums.length} \leq 10^5$
- $-10^9 \leq \text{nums}[i] \leq 10^9$

**Question 2:** There is an integer array `nums` sorted in ascending order (with distinct values). Prior to being passed to your function, `nums` is possibly rotated at an unknown pivot index `k` ( $1 \leq k < \text{nums.length}$ ) such that the resulting array is `[nums[k], nums[k+1], ..., nums[n-1], nums[0], nums[1], ..., nums[k-1]]` (0-indexed). For example, `[0,1,2,4,5,6,7]` might be rotated at pivot index 3 and become `[4,5,6,7,0,1,2]`.

Given the array `nums` after the possible rotation and an integer `target`, return *the index of target if it is in `nums`, or -1 if it is not in `nums`.*

You must write an algorithm with  $O(\log n)$  runtime complexity.

Example 1:

Input: `nums = [4, 5, 6, 7, 0, 1, 2], target = 0`

Output: `4`

Example 2:

Input: `nums = [4, 5, 6, 7, 0, 1, 2], target = 3`

Output: `-1`

Example 3:

Input: `nums = [1], target = 0`

Output: `-1`

Constraints:

- $1 \leq \text{nums.length} \leq 5000$
- $-10^4 \leq \text{nums}[i] \leq 10^4$
- All values of `nums` are unique.
- `nums` is an ascending array that is possibly rotated.
- $-10^4 \leq \text{target} \leq 10^4$

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**Question 3:** You are given an array `prices` where `prices[i]` is the price of a given stock on the  $i^{\text{th}}$  day.

Return the maximum profit you can achieve from this transaction. If you cannot achieve any profit, return 0.

Example 1:

Input: `prices = [7, 1, 5, 3, 6, 4]`

Output: `5`

**Explanation:** Buy on day 2 (price = 1) and sell on day 5 (price = 6), profit =  $6 - 1 = 5$ .  
Note that buying on day 2 and selling on day 1 is not allowed because you must buy before you sell.

Example 2:

Input: `Prices = [7, 6, 4, 3, 1]`

Output: `0`

**Explanation:** In this case, no transactions are done and the max profit = 0.

Constraints:

- $1 \leq \text{prices.length} \leq 10^5$
  - $0 \leq \text{prices}[i] \leq 10^4$
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**Question 4:** Given  $n$  non-negative integers representing an elevation map where the width of each bar is 1, compute how much water it can trap after raining.



**Example 1:**

**Input:** height = [0, 1, 0, 2, 1, 0, 1, 3, 2, 1, 2, 1]

**Output:** 6

**Explanation:** The above elevation map (black section) is represented by array [0,1,0,2,1,0,1,3,2,1,2,1]. In this case, 6 units of rain water (blue section) are being trapped.

**Example 2:**

**Input:** height = [4, 2, 0, 3, 2, 5]

**Output:** 9

**Constraints:**

- $n == \text{height.length}$
- $1 \leq n \leq 2 \times 10^4$
- $0 \leq \text{height}[i] \leq 10^5$

**Question 5:** Given an integer array `nums`, return all the triplets `[nums[i], nums[j], nums[k]]` such that  $i \neq j$ ,  $i \neq k$ , and  $j \neq k$ , and  $\text{nums}[i] + \text{nums}[j] + \text{nums}[k] == 0$ . Notice that the solution set must not contain duplicate triplets.

**Example 1:**

**Input:** nums = [-1, 0, 1, 2, -1, -4]

**Output:** [[-1, -1, 2], [-1, 0, 1]]

Example 2:

Input: `nums = []`

Output: `[]`

Example 3:

Input: `nums = [0]`

Output: `[]`

Constraints:

- $0 \leq \text{nums.length} \leq 3000$
- $-10^5 \leq \text{nums}[i] \leq 10^5$

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