

Binary Search

Assignment Questions



1. Given a sorted array of n elements and a target 'x'. Find the last occurrence of 'x' in the array. If 'x' does not exist return -1.

Input 1: arr[] = {1,2,3,3,4,4,4,5} , x = 4
 Output 1: 6

2. Given a sorted binary array, efficiently count the total number of 1's in it.

Input 1: a = [0,0,0,0,1,1]
 Output 1: 2

3. Given a matrix having 0-1 only where each row is sorted in increasing order, find the row with the maximum number of 1's.

Input matrix : 0 1 1 1
 0 0 1 1
 1 1 1 1 // this row has maximum 1s
 0 0 0 0
 Output: 2

4. Given an array of integers nums containing n + 1 integers where each integer is in the range [1, n] inclusive in sorted order. There is only one repeated number in nums, return this repeated number.

Input 1: arr[] = {1,2,3,3,4}
 Output 1: 3

Input 2: arr[] = {1,2,2,3,4,5}
 Output 2: 2

5. Given a number 'n'. Predict whether 'n' is a valid perfect square or not.

Input 1: n = 36
 Output 1: yes

Input 2: n = 45
 Output 2: no

6. You have n coins and you want to build a staircase with these coins. The staircase consists of k rows where the ith row has exactly i coins. The last row of the staircase may be incomplete.

Given the integer n, return the number of complete rows of the staircase you will build.

Example 1:

Input: n = 5

Output: 2

Explanation: Because the 3rd row is incomplete, we return 2.

Example 2:

Input: n = 8

Output: 3

Explanation: Because the 4th row is incomplete, we return 3.

- 7. Write a program to apply binary search in array sorted in decreasing order.**
- 8. You have a sorted array of infinite numbers, how would you search an element in the array?**

- 9. You are given an $m \times n$ integer matrix matrix with the following two properties:**

- Each row is sorted in non-decreasing order.
- The first integer of each row is greater than the last integer of the previous row.

Given an integer target , return true if target is in matrix or false otherwise.

You must write a solution in $O(\log(m * n))$ time complexity.

Example 1:

Input: matrix = [[1,3,5,7],[10,11,16,20],[23,30,34,60]], target = 3

Output: true

Example 2:

Input: matrix = [[1,3,5,7],[10,11,16,20],[23,30,34,60]], target = 13

Output: false

- 10. There is an integer array nums sorted in non-decreasing order (not necessarily with distinct values).**

Before being passed to your function, nums is rotated at an unknown pivot index k ($0 \leq k < \text{nums.length}$) 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, [0,1,2,4,4,4,5,6,6,7] might be rotated at pivot index 5 and become [4,5,6,6,7,0,1,2,4,4]. Given the array nums after the rotation and an integer target , return true if target is in nums , or false if it is not in nums .

You must decrease the overall operation steps as much as possible.

Example 1:

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

Output: true

Example 2:

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

Output: false