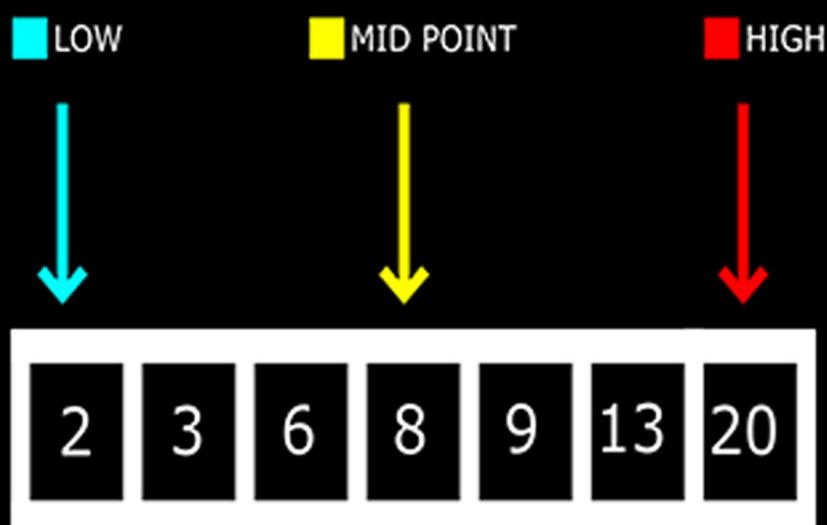


Master Binary Search

in Just 5 Days



Binary Search Algorithm

Challenge accepted?

Find additional problems on **PAGE 22**

Binary Search on Arrays

Search Insert Position

Easy

Given a sorted array of distinct integers and a target value, return the index if the target is found. If not, return the index where it would be if it were inserted in order.

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

Example 1:

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

Output: 2

Example 2:

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

Output: 1

Try problem

Questions asked in: **yahoo!**



Find First and Last Position of Element in Sorted Array

Medium

Given an array of integers `nums` sorted in non-decreasing order, find the starting and ending position of a given target value. If target is not found in the array, return `[-1, -1]`.

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

Example 1:

Input: `nums = [5,7,7,8,8,10]`, target = 8

Output: [3,4]

Example 2:

Input: `nums = [5,7,7,8,8,10]`, target = 6

Output: [-1,-1]

Try problem

Questions asked in:   Goldman Sachs



Find Peak Element

Medium

A peak element is an element that is strictly greater than its neighbors.

Given a 0-indexed integer array `nums`, find a peak element, and return its index. If the array contains multiple peaks, return the index to any of the peaks.

You may imagine that `nums[-1] = nums[n] = -∞`.

Example 1:

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

Output: 2

Explanation: 3 is a peak element and your function should return the index number 2.

Example 2:

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

Output: 5

Try problem

Questions asked in:  



Median of Two Sorted Arrays

Hard

Given two sorted arrays `nums1` and `nums2` of size m and n respectively, return the median of the two sorted arrays. The overall run time complexity should be $O(\log(m+n))$.

Example 1:

Input: `nums1 = [1,3]`, `nums2 = [2]`

Output: 2.00000

Explanation: merged array = `[1,2,3]` and median is 2.

Example 2:

Input: `nums1 = [1,2]`, `nums2 = [3,4]`

Output: 2.50000

Explanation: merged array = `[1,2,3,4]` and median is $(2 + 3) / 2 = 2.5$.

Try problem

Questions asked in:   



Binary Search on Rotated Sorted Array

Find Minimum in Rotated Sorted Array

Medium

Suppose an array of length n sorted in ascending order is rotated between 1 and n times. For example, the array nums = [0,1,2,4,5,6,7] might become:

- [4,5,6,7,0,1,2] if it was rotated 4 times.
- [0,1,2,4,5,6,7] if it was rotated 7 times.

Given the sorted rotated array nums of unique elements, return the minimum element of this array.

Example 1:

Input: nums = [3,4,5,1,2]

Output: 1

Example 2:

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

Output: 0

Try problem

Questions asked in:   



Find Minimum in Rotated Sorted Array II

Hard

Suppose an array of length n sorted in ascending order is rotated between 1 and n times. For example, the array $\text{nums} = [0,1,2,4,5,6,7]$ might become:

- $[4,5,6,7,0,1,2]$ if it was rotated 4 times.
- $[0,1,2,4,5,6,7]$ if it was rotated 7 times.

Given the sorted rotated array nums that may contain duplicates, return the minimum element of this array.

Example 1:

Input: $\text{nums} = [1,3,5]$

Output: 1

Example 2:

Input: $\text{nums} = [2,2,2,0,1]$

Output: 0

Try problem

Questions asked in:   



Search in Rotated Sorted Array

Medium

Suppose an array of length n sorted in ascending order is rotated between 1 and n times. For example, the array $\text{nums} = [0,1,2,4,5,6,7]$ might become:
[4,5,6,7,0,1,2] if it was rotated 4 times.
[0,1,2,4,5,6,7] if it was rotated 7 times.

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 .

Example 1:

Input: $\text{nums} = [4,5,6,7,0,1,2]$, target = 0

Output: 4

Example 2:

Input: $\text{nums} = [4,5,6,7,0,1,2]$, target = 3

Output: -1

Try problem

Questions asked in:   Bloomberg



Search in Rotated Sorted Array II

Hard

Suppose an array of length n sorted in ascending order is rotated between 1 and n times. For example, the array `nums` = [0,1,2,4,5,6,7] might become:

- [4,5,6,7,0,1,2] if it was rotated 4 times.
- [0,1,2,4,5,6,7] if it was rotated 7 times.

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`.

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

Try problem

Questions asked in:    



Binary Search on Answer

(Vimp for coding rounds and interviews)

Sqrt(x) Easy

Given a non-negative integer x , return the square root of x rounded down to the nearest integer. The returned integer should be non-negative as well.

You must not use any built-in exponent function or operator.

Example 1:

Input: $x = 4$

Output: 2

Explanation: The square root of 4 is 2, so we return 2.

Example 2:

Input: $x = 8$

Output: 2

Explanation: The square root of 8 is 2.82842..., and since we round it down to the nearest integer, 2 is returned.

Try problem

Questions asked in: 



Koko Eating Bananas

Medium

Koko loves to eat bananas. There are n piles of bananas, the ith pile has piles[i] bananas. Koko can decide her bananas-per-hour eating speed of k. Each hour, she chooses some pile of bananas and eats k bananas from that pile. If the pile has less than k bananas, she eats all of them instead and will not eat any more bananas during this hour.

Return the minimum integer k such that she can eat all the bananas within h hours.

Example 1:

Input: piles = [3,6,7,11], h = 8

Output: 4

Example 2:

Input: piles = [30,11,23,4,20], h = 5

Output: 30

Try problem

Questions asked in:    



Capacity To Ship Packages Within D Days

Mid

A conveyor belt has packages that must be shipped from one port to another within days days. The i th package on the conveyor belt has a weight of $\text{weights}[i]$. Each day, we load the ship with packages on the conveyor belt (in the order given by weights). We may not load more weight than the maximum weight capacity of the ship.

Return the least weight capacity of the ship that will result in all the packages on the conveyor belt being shipped within days days.

Example:

Input: $\text{weights} = [1,2,3,4,5,6,7,8,9,10]$, $\text{days} = 5$

Output: 15

Explanation: A ship capacity of 15 is the minimum to ship all the packages in 5 days like this:

1st day: 1, 2, 3, 4, 5

2nd day: 6, 7

3rd day: 8

4th day: 9

5th day: 10

Try problem

Questions asked in:  



Minimum Number of Days to Make m Bouquets

Medium

You are given an integer array `bloomDay`, an integer `m` and an integer `k`. You want to make `m` bouquets. To make a bouquet, you need to use `k` adjacent flowers from the garden. The garden consists of `n` flowers, the `i`th flower will bloom in the `bloomDay[i]` and then can be used in exactly one bouquet.

Return the minimum number of days you need to wait to be able to make `m` bouquets from the garden. If it is impossible to make `m` bouquets return -1.

Example:

Input: `bloomDay = [1,10,3,10,2]`, `m = 3`, `k = 1`

Output: 3

Explanation: Let us see what happened in the first three days.
`x` means flower bloomed and `_` means flower did not bloom in the garden.

We need 3 bouquets each should contain 1 flower.

After day 1: `[x, _, _, _, _]` - we can only make one bouquet.

After day 2: `[x, _, _, _, x]` - we can only make two bouquets.

After day 3: `[x, _, x, _, x]` - we can make 3 bouquets.

The answer is 3.

Try problem

Questions asked in: 



Find the Smallest Divisor Given a Threshold

Given an array of integers `nums` and an integer `threshold`, we will choose a positive integer divisor, divide all the array by it, and sum the division's result. Find the smallest divisor such that the result mentioned above is less than or equal to `threshold`.

Each result of the division is rounded to the nearest integer greater than or equal to that element. (For example: $7/3 = 3$ and $10/2 = 5$).

Example:

Input: `nums` = [1,2,5,9], `threshold` = 6

Output: 5

Explanation: We can get a sum to 17 ($1+2+5+9$) if the divisor is 1. If the divisor is 4 we can get a sum of 7 ($1+1+2+3$) and if the divisor is 5 the sum will be 5 ($1+1+1+2$).

Try problem

Questions asked in:  salesforce



Binary Search on Answer (Continued)

Split Array Largest Sum Medium

Given an integer array `nums` and an integer `k`, split `nums` into `k` non-empty subarrays such that the largest sum of any subarray is minimized.

Return the minimized largest sum of the split.

Example:

Input: `nums = [7,2,5,10,8]`, `k = 2`

Output: 18

Explanation: There are four ways to split `nums` into two subarrays.

The best way is to split it into `[7,2,5]` and `[10,8]`, where the largest sum among the two subarrays is only 18.

Try problem

Questions asked in:   



Allocate Books

Hard

There is an array of n books, ith book has books[i] number of pages. You have to allocate books to k number of students so that the maximum number of pages allocated to a student is minimum, following certain rules:

- A book will be allocated to exactly one student.
- Each student has to be allocated at least one book.
- Allotment should be in contiguous order, for example: A student cannot be allocated book 1 and book 3, skipping book 2.

Questions asked in:   Arcesium



Allocate Books

Hard

Example:

Input: books = [12, 34, 67, 90], k = 2

Output: 113

Explanation:

There are two students. Books can be distributed in following fashion:

- [12] and [34, 67, 90]

Max number of pages is allocated to student 2 with

$$34 + 67 + 90 = 191 \text{ pages}$$

- [12, 34] and [67, 90]

Max number of pages is allocated to student 2 with

- $67 + 90 = 157$ pages

- [12, 34, 67] and [90]

- Max number of pages is allocated to student 1 with

- $12 + 34 + 67 = 113$ pages

Of the 3 cases, Option 3 has the minimum pages = 113.

Try problem

Questions asked in:   Arcesium



Aggressive Cows

Hard

Farmer John has built a new long barn, with n stalls. The stalls are located along a straight line at positions $x_1 \dots x_n$.

His c cows don't like this barn layout and become aggressive towards each other once put into a stall. To prevent the cows from hurting each other, FJ wants to assign the cows to the stalls, such that the minimum distance between any two of them is as large as possible. What is the largest minimum distance?

Example:

Input: $n = 5$, $c = 3$, stalls = [1,2,8,4,9]

Output: 3

Explanation: FJ can put his 3 cows in the stalls at positions 1, 4 and 8, resulting in a minimum distance of 3.

Try problem

Questions asked in:   



Binary Search on 2-D Matrix

Count Negative Numbers in a Sorted Matrix

Easy

Given a $m \times n$ matrix grid which is sorted in non-increasing order both row-wise and column-wise, return the number of negative numbers in grid.

Example:

Input: grid = [[4,3,2,-1],[3,2,1,-1],[1,1,-1,-2],[-1,-1,-2,-3]]

Output: 8

Explanation: There are 8 negatives number in the matrix.

Try problem

Questions asked in:  amazon



Search a 2D Matrix

Medium

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:

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

Output: true

Try problem

Questions asked in: CISCO™ UBER



Search a 2D Matrix II

Medium

Write an efficient algorithm that searches for a value target in an $m \times n$ integer matrix matrix. This matrix has the following properties:

- Integers in each row are sorted in ascending from left to right.
- Integers in each column are sorted in ascending from top to bottom.

Example:

Input: matrix = [[1,4,7,11,15],[2,5,8,12,19],[3,6,9,16,22],[10,13,14,17,24],[18,21,23,26,30]], target = 5

Output: true

Try problem

Questions asked in:   



Kth Smallest Element in a Sorted Matrix

Hard

Given an $n \times n$ matrix where each of the rows and columns is sorted in ascending order, return the k th smallest element in the matrix.

Note that it is the k th smallest element in the sorted order, not the k th distinct element.

Example:

Input: matrix = [[1,5,9],[10,11,13],[12,13,15]], $k = 8$

Output: 13

Explanation: The elements in the matrix are [1,5,9,10,11,12,13,13,15], and the 8th smallest number is 13

Try problem

Questions asked in:  **WELLS FARGO**  **Walmart**





BONUS SECTION



Few additional problems for practice:

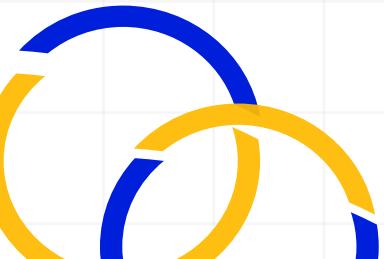
Time Based Key-Value Store

Medium

Design a time-based key-value data structure that can store multiple values for the same key at different time stamps and retrieve the key's value at a certain timestamp.

Implement the TimeMap class:

- `TimeMap()` Initializes the object of the data structure.
- `void set(String key, String value, int timestamp)` Stores the key `key` with the value `value` at the given time `timestamp`.
- `String get(String key, int timestamp)` Returns a value such that `set` was called previously, with `timestamp_prev <= timestamp`. If there are multiple such values, it returns the value associated with the largest `timestamp_prev`. If there are no values, it returns "".



Example:

Input:

```
["TimeMap", "set", "get", "get", "set", "get", "get"]
[], ["foo", "bar", 1], ["foo", 1], ["foo", 3], ["foo", "bar2", 4], ["foo", 4],
["foo", 5]
```

Output:

```
[null, null, "bar", "bar", null, "bar2", "bar2"]
```

Explanation:

```
TimeMap timeMap = new TimeMap();
timeMap.set("foo", "bar", 1); // store the key "foo" and value
"bar" along with timestamp = 1.
timeMap.get("foo", 1);      // return "bar"
timeMap.get("foo", 3);      // return "bar", since there is no
value corresponding to foo at timestamp 3 and timestamp 2,
then the only value is at timestamp 1 is "bar".
timeMap.set("foo", "bar2", 4); // store the key "foo" and value
"bar2" along with timestamp = 4.
timeMap.get("foo", 4);      // return "bar2"
timeMap.get("foo", 5);      // return "bar2"
```

Try problem

Questions asked in:   



Minimum Limit of Balls in a Bag

Medium

You are given an integer array `nums` where the i th bag contains `nums[i]` balls. You are also given an integer `maxOperations`.

You can perform the following operation at most `maxOperations` times:

Take any bag of balls and divide it into two new bags with a positive number of balls. For example, a bag of 5 balls can become two new bags of 1 and 4 balls, or two new bags of 2 and 3 balls.

Your penalty is the maximum number of balls in a bag. You want to minimize your penalty after the operations. Return the minimum possible penalty after performing the operations.



Example:

Input: nums = [2,4,8,2], maxOperations = 4

Output: 2

Explanation:

- Divide the bag with 8 balls into two bags of sizes 4 and 4.
[2,4,8,2] -> [2,4,4,4,2].
- Divide the bag with 4 balls into two bags of sizes 2 and 2.
[2,4,4,4,2] -> [2,2,2,4,4,2].
- Divide the bag with 4 balls into two bags of sizes 2 and 2.
[2,2,2,4,4,2] -> [2,2,2,2,2,4,2].
- Divide the bag with 4 balls into two bags of sizes 2 and 2.
[2,2,2,2,2,4,2] -> [2,2,2,2,2,2,2,2].

The bag with the most number of balls has 2 balls, so your penalty is 2, and you should return 2.

Try problem

Questions asked in:  WELLS FARGO



Ways to Split Array Into Three Subarrays

Medium

A split of an integer array is good if:

- The array is split into three non-empty contiguous subarrays - named left, mid, right respectively from left to right.
- The sum of the elements in left is less than or equal to the sum of the elements in mid, and the sum of the elements in mid is less than or equal to the sum of the elements in right.

Given `nums`, an array of non-negative integers, return the number of good ways to split `nums`.

Example:

Input: `nums = [1,2,2,2,5,0]`

Output: 3

Explanation: There are three good ways of splitting `nums`:

`[1] [2] [2,2,5,0]`

`[1] [2,2] [2,5,0]`

`[1,2] [2,2] [5,0]`

[Try problem](#)



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