Competitive Programming

Lec 5 - Binary Search

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Binary Search (logN)

https://www.mathwarehouse.com/programming/images/binary-vs-linear-search/binary-and-linear-search-animations.gif

- Two types, Recursive and Iterative
- Google's favorite algorithm for interview
- What is tough about Binary Search ?

  1. When and where to apply.

  2. Terminate condition

```
binary_search (start_pos, end_pos, target);
```

Binary Search

1. Upper bound

 - `upper_bound(start_pos, end_pos, target);`

[Return Value]
 - Iterator(ptr) to next greater value than target.
 - If no element in the range compares greater than val, the function returns last.

2. Lower bound

 - `lower_bound(start_pos, end_pos, target);`

[Return Value]
 - Iterator(ptr) to
 - If target found = iterator ptr at first occurence
 - Not found = iterator ptr at next greater than target element

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Count Element Occurence [Interviewbit]

Given a sorted array of integers, find the number of occurrences of a given target value.

Your algorithm's runtime complexity must be in the order of O(log n).

If the target is not found in the array, **return 0**

**Example : **

Given [5, 7, 7, 8, 8, 10] and target value 8,

return 2.

Solution Link

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Matrix Search [Interviewbit]

Write an efficient algorithm that searches for a value in an m x n matrix.

This matrix has the following properties:

1. Integers in each row are sorted from left to right.
2. The **first integer** of each row is greater than or equal to the **last integer** of the previous row.
3. Consider the following matrix:

```
[ [1,   3,  5,  7],

  [10, 11, 16, 20],

  [23, 30, 34, 50] ]
```

Given target = 3, return 1 (1 corresponds to true)

Solution Link

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Aggressive cows [SPOJ, IB]

Farmer John has built a new long barn, with N stalls.

Given an array of integers A of size N where each element of the array represents the location of the stall,

and an integer B which represent the number of cows.

His 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, John 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?

Solution Link

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Constraints

2 <= N <= 100000

0 <= A[i] <= 10^9

2 <= B <= N

Input 1:

    A = [1, 2, 8, 4, 9]

    B = 3

Output 1:

    3

Solution Link

Median of Array [Interviewbit]

There are two sorted arrays A and B of size m and n respectively.

Find the median of the two sorted arrays (The median of the array formed by merging both the arrays).

The overall run time complexity should be O(log (m+n)).

Sample Input

A : [1 4 5]

B : [2 3]

Sample Output: 3

NOTE: IF the number of elements in the merged array is even, then the median is the average of n / 2 th and n/2 + 1th element.

For example, if the array is [1 2 3 4], the median is (2 + 3) / 2.0 = 2.5

Solution Link

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HomeWork

Square Root of Integer	Easy	Interviewbit
Search for a Range	Easy	Interviewbit
Rotated Sorted Array Search	Easy	Interviewbit
Books	Easy	Codeforces