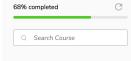


Grokking the Coding Interview: Patterns for **Coding Questions**



Pattern: Modified Binary Search

- Introduction Order-agnostic Binary Search (easy)
- Ceiling of a Number (medium) Next Letter (medium)
- Number Range (medium)
- Search in a Sorted Infinite Array (medium)
- Minimum Difference Element
- Bitonic Array Maximum (easy)
- Problem Challenge 1
- Solution Review: Problem Challenge 1
- Problem Challenge 2
- Solution Review: Problem Challenge 2
- Problem Challenge 3
- Solution Review: Problem Challenge 3

Pattern: Bitwise XOR

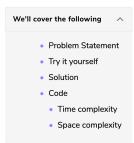
- Introduction Single Number (easy) Two Single Numbers (medium) Complement of Base 10 Number (medium)
- Problem Challenge 1
- Solution Review: Problem Challenge 1

Pattern: Top 'K' Elements

- Introduction Top 'K' Numbers (easy)
- Kth Smallest Number (easy)
- 'K' Closest Points to the Origin (easy)
- Connect Ropes (easy)
- Top 'K' Frequent Numbers (medium)
- Frequency Sort (medium)
- Kth Largest Number in a Stream (medium)
- 'K' Closest Numbers (medium)
- Maximum Distinct Elements (medium)
- Sum of Elements (medium)
- Rearrange String (hard) Problem Challenge 1
- Solution Review: Problem Challenge 1
- Problem Challenge 2
- Solution Review: Problem Challenge 2
- Problem Challenge 3
- Solution Review: Problem Challenge 3

Pattern: K-way merge

Bitonic Array Maximum (easy)



Problem Statement

Find the maximum value in a given Bitonic array. An array is considered bitonic if it is monotonically increasing and then monotonically decreasing. Monotonically increasing or decreasing means that for any index i in the array arr[i] != arr[i+1].

Example 1:

```
Input: [1, 3, 8, 12, 4, 2]
Explanation: The maximum number in the input bitonic array is '12'.
```

Example 2:

Example 3:

Example 4:

```
Input: [10, 9, 8]
Output: 10
```

Try it yourself

Try solving this question here:



Solution

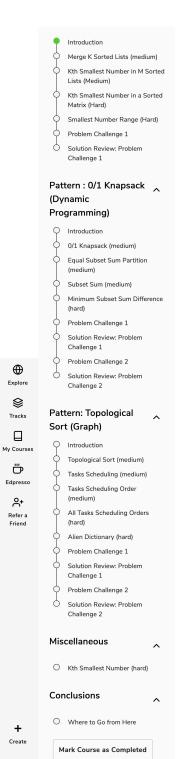
A bitonic array is a sorted array; the only difference is that its first part is sorted in ascending order and the second part is sorted in descending order. We can use a similar approach as discussed in Order-agnostic Binary Search. Since no two consecutive numbers are same (as the array is monotonically increasing or decreasing), whenever we calculate the middle, we can compare the numbers pointed out by the index middle and middle+1 to find if we are in the ascending or the descending part. So:

- 1. If arr[middle] > arr[middle + 1], we are in the second (descending) part of the bitonic array. Therefore, our required number could either be pointed out by middle or will be before middle. This means we will be doing: end = middle.
- 2. If arr[middle] < arr[middle + 1]</pre>, we are in the first (ascending) part of the bitonic array. Therefore, the required number will be after middle. This means we will be doing: start = middle + 1.

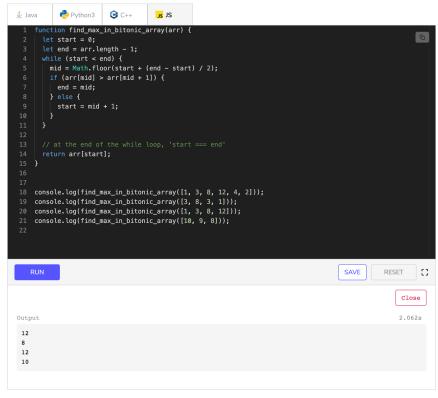
We can break when start == end . Due to the two points mentioned above, both start and end will be pointing at the maximum number of the bitonic array.

Code

Horo is what our algorithm will look like



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Time complexity

Since we are reducing the search range by half at every step, this means that the time complexity of our algorithm will be $O(\log N)$ where 'N' is the total elements in the given array.

Space complexity

The algorithm runs in constant space O(1).

Interviewing soon? We've partnered with Hired so that companies apply to you instead of you applying to them. See how \odot



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