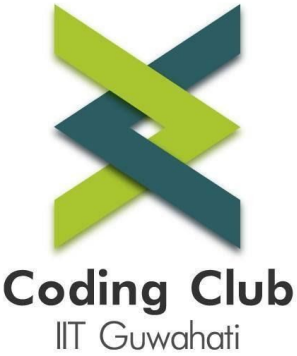

CRACKING THE PLACEMENT TESTS

A WEEKLY GUIDE CONTAINING TOPICS, QUESTIONS AND TRICKS COMMONLY ENCOUNTERED IN PLACEMENT TESTS

JULY 11, 2020
CODING CLUB, IIT GUWAHATI

Coding Club
IIT Guwahati

WEEK 2

SORTING

- VERY IMPORTANT TOPIC FOR PLACEMENTS. VERY IMPORTANT TO HAVE A FIRM GRIP ON ITS CONCEPTS.

READING MATERIALS

- Sorting Terminology
- Stability in sorting algorithms
- Time complexities of Standard Sorting Algorithms
- Selection Sort
- Bubble Sort
- Insertion Sort
- Merge Sort
- Quick Sort
- Heap Sort
- Counting Sort
- Radix Sort
- Bucket Sort
- Shell Sort
- External Sorting

We generally have inbuilt sorting functions in the library. This makes it easier when it comes to coding. For details, refer to the articles below

1. Know Your Sorting Algorithm | Set 1 (Sorting Weapons used by Programming Languages)
2. Know Your Sorting Algorithm | Set 2 (Introsort- C++'s Sorting Weapon)
3. Comparator function of qsort() in C
4. sort() in C++ STL
5. C qsort() vs C++ sort()

PRACTICE

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WEEK 2

(1) cses.fi [THIS CONTAINS QUESTIONS ON BOTH SORTING AND SEARCHING]

- Sorting Methods
- Distinct Numbers
- Apartments
- Ferris Wheel
- Concert Tickets
- Restaurant Customers
- Movie Festival
- Sum of Two Values
- Maximum Subarray Sum
- Stick Lengths
- Playlist
- Towers
- Traffic Lights
- Room Allocation
- Factory Machines
- Tasks and Deadlines
- Reading Books
- Sum of Three Values
- Sum of Four Values
- Nearest Smaller Values
- Subarray Sums I
- Subarray Sums II
- Subarray Divisibility
- Array Division
- Sliding Median
- Sliding Cost
- Movie Festival II
- Maximum Subarray Sum II

(2) InterviewBit

- Noble Integer
- Wave Array
- Hotel Bookings Possible
- Maximum Unsorted Subarray
- Max Distance

WEEK 2

(3) GFG [ONLY SORTING]

1. Sort elements by frequency | Set 1
2. Sort elements by frequency | Set 2
3. Count Inversions in an array | Set 1 (Using Merge Sort)
4. Sort an array of 0s, 1s and 2s
5. Find the Minimum length Unsorted Subarray, sorting which makes the complete array sorted
6. Find whether an array is subset of another array | Added Method 3
7. Sort a nearly sorted (or K sorted) array
8. Sort numbers stored on different machines
9. Sort a linked list of 0s, 1s and 2s
10. A Pancake Sorting Problem
11. Find number of pairs (x, y) in an array such that x^y > y^x
12. Count all distinct pairs with difference equal to k
13. C Program for Bubble Sort on Linked List
14. Sort n numbers in range from 0 to n^2 – 1 in linear time
15. C Program to Sort an array of names or strings
16. Sort an array according to the order defined by another array
17. Given a sorted array and a number x, find the pair in array whose sum is closest to x
18. Sort an array in wave form
19. Check if any two intervals overlap among a given set of intervals
20. How to efficiently sort a big list dates in 20's
21. Sort an almost sorted array where only two elements are swapped
22. Find the point where maximum intervals overlap
23. Sort a linked list that is sorted alternating ascending and descending orders?
24. C++ program for Sorting Dates using Selection Sort
25. How to sort an array of dates in C/C++?
26. Sorting Strings using Bubble Sort
27. Maximum product of a triplet (subsequnece of size 3) in array
28. Find missing elements of a range
29. Find a permutation that causes worst case of Merge Sort
30. Minimum sum of two numbers formed from digits of an array
31. Find minimum difference between any two elements
32. Convert an array to reduced form | Set 1 (Simple and Hashing)
33. Sorting Vector of Pairs in C++ | Set 1 (Sort by first and second)
34. Sorting Vector of Pairs in C++ | Set 2 (Sort in descending order by first and second)
35. Sorting 2D Vector in C++ | Set 1 (By row and column)
36. Sorting 2D Vector in C++ | Set 2 (In descending order by row and column)
37. Sorting 2D Vector in C++ | Set 3 (By number of columns)
38. Find Surpasser Count of each element in array
39. Rearrange positive and negative numbers with constant extra space
40. Sort an array according to count of set bits
41. Count distinct occurrences as a subsequence
42. Minimum number of swaps required to sort an array
43. Number of swaps to sort when only adjacent swapping allowed
44. Minimum swaps to make two arrays identical

WEEK 2

45. Find elements larger than half of the elements in an array
46. Count minimum number of subsets (or subsequences) with consecutive numbers
47. Sum of all elements between k1'th and k2'th smallest elements
48. Number of sextuplets (or six values) that satisfy an equation
49. Sort an array according to absolute difference with given value
50. Minimize the sum of product of two arrays with permutations allowed
51. Position of an element after stable sort
52. Chocolate Distribution Problem
53. Sort even-placed elements in increasing and odd-placed in decreasing order
54. Permute two arrays such that sum of every pair is greater or equal to K
55. Chose k array elements such that difference of maximum and minimum is minimized
56. Sort an array when two halves are sorted
57. Find pair with greatest product in array
58. Minimum swap required to convert binary tree to binary search tree
59. K-th smallest element after removing some integers from natural numbers
60. Check whether Arithmetic Progression can be formed from the given array
61. Bucket Sort to Sort an Array with Negative Numbers
62. Possible to form a triangle from array values
63. Maximum difference between frequency of two elements such that element having greater frequency is also greater
64. Check if reversing a sub array make the array sorted
65. Find all triplets with zero sum
66. Sort a Matrix in all way increasing order
67. Sort array after converting elements to their squares
68. Sort all even numbers in ascending order and then sort all odd numbers in descending order
69. Sorting Big Integers
70. Sort an array of large numbers
71. Sort 3 Integers without using if condition or using only max() function
72. Minimum difference between max and min of all K-size subsets
73. Minimum swaps to reach permuted array with at most 2 positions left swaps allowed
74. Convert an array to reduced form | Set 2 (Using vector of pairs)
75. Find sum of non-repeating (distinct) elements in an array
76. Minimum sum of absolute difference of pairs of two arrays
77. Find the largest multiple of 3 from array of digits | Set 2 (In O(n) time and O(1) space)
78. Noble integers in an array (count of greater elements is equal to value)
79. Find maximum height pyramid from the given array of objects
80. Program to check if an array is sorted or not (Iterative and Recursive)
81. Smallest Difference Triplet from Three arrays
82. Smallest Difference pair of values between two unsorted Arrays
83. Find whether it is possible to make array elements same using one external number
84. Sort an array of strings according to string lengths
85. Check if it is possible to sort an array with conditional swapping of adjacent allowed
86. Sort an array after applying the given equation
87. Print array of strings in sorted order without copying one string into another
88. Sort elements on the basis of number of factors

WEEK 2

FOR MORE: https://leetcode.com/tag/sort/

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WEEK 2

SEARCHING

Searching Algorithms are designed to check for an element or retrieve an element from any data structure where it is stored. Based on the type of search operation, these algorithms are generally classified into two categories:

1. **Sequential Search**: In this, the list or array is traversed sequentially and every element is checked. For example: Linear Search.
2. **Interval Search**: These algorithms are specifically designed for searching in sorted data-structures. These type of searching algorithms are much more efficient than Linear Search as they repeatedly target the center of the search structure and divide the search space in half. For Example: Binary Search.

- Linear Search
- Binary Search
- Ternary Search
- Ternary Search - cp algorithms
- Linear Search vs Binary Search
- Why is Binary Search preferred over Ternary Search?
- **Binary Search functions in C++ STL (binary_search, lower_bound and upper_bound) [IMPORTANT]**

[NOT SO IMPORTANT BUT MICROSOFT HAS ASKED THIS IN PREVIOUS CODING TESTS]

- Jump Search
- Interpolation Search
- Exponential Search

SEARCHING IS A VERY DIVERSE TOPIC AND IS PRESENT IN ALMOST EVERY TOPIC

e.g searching for a string in another string, searching in BST

BUT WE WILL COVER THESE UNDER THEIR RESPECTIVE HEADINGS

WE FOCUS MAINLY ON BINARY SEARCH AND TERNARY SEARCH HERE

ALSO, WE WILL LEARN ABOUT A TECHNIQUE CALLED

- BINARY SEARCH THE ANSWER

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WEEK 2

SOME USEFUL LINKS:

- Binary Search Tutorial (1) (Video)
- Binary Search Tutorial (2)
- Binary_search, Lower_bound, Upper_bound in C++
- Binary Search The Answer (Commonly known as BSTA)
- One-Side Binary Search
- Ternary Search (Advanced)
- Parallel Binary Search (Advanced)

PRACTICE

https://www.interviewbit.com/courses/programming/topics/binary-search/

https://www.codechef.com/LRNDSA04

1. Find the Missing Number
2. Search an element in a sorted and rotated array
3. Median of two sorted arrays
4. Two elements whose sum is closest to zero
5. Find the smallest and second smallest element in an array
6. Maximum and minimum of an array using minimum number of comparisons
7. k largest(or smallest) elements in an array | added Min Heap method
8. Ceiling in a sorted array
9. Count number of occurrences (or frequency) in a sorted array
10. Find the repeating and the missing | Added 3 new methods
11. Find a Fixed Point in a given array
12. Find the maximum element in an array which is first increasing and then decreasing
13. Find a pair with the given difference
14. Find the k most frequent words from a file
15. Median of two sorted arrays of different sizes
16. Find a peak element
17. Given an array of of size n and a number k, find all elements that appear more than n/k times
18. Find the minimum element in a sorted and rotated array
19. Kth smallest element in a row-wise and column-wise sorted 2D array | Set 1
20. Find k closest elements to a given value
21. Search in an almost sorted array
22. A Problem in Many Binary Search Implementations
23. Find the first repeating element in an array of integers
24. Find common elements in three sorted arrays
25. Count 1's in a sorted binary array
26. Given a sorted array and a number x, find the pair in array whose sum is closest to x
27. Find the closest pair from two sorted arrays
28. K'th Smallest/Largest Element in Unsorted Array | Set 1
29. K'th Smallest/Largest Element in Unsorted Array | Set 2 (Expected Linear Time)

WEEK 2

30. K'th Smallest/Largest Element in Unsorted Array | Set 3 (Worst Case Linear Time)
31. Find position of an element in a sorted array of infinite numbers
32. Given a sorted and rotated array, find if there is a pair with a given sum
33. Find the largest pair sum in an unsorted array
34. Find the nearest smaller numbers on left side in an array
35. K'th largest element in a stream
36. Find a pair with maximum product in array of Integers
37. Find the element that appears once in a sorted array
38. Find the odd appearing element in O(Log n) time
39. Find the largest three elements in an array
40. Search an element in an array where difference between adjacent elements is 1
41. Find three closest elements from given three sorted arrays
42. Find the element before which all the elements are smaller than it, and after which all are greater
43. Binary Search for Rational Numbers without using floating point arithmetic
44. Floor in a Sorted Array
45. Third largest element in an array of distinct elements
46. Second minimum element using minimum comparisons
47. Queries for greater than and not less than
48. Efficient search in an array where difference between adjacent is 1
49. Print all possible sums of consecutive numbers with sum N
50. Minimum time required to produce m items
51. Make all array elements equal with minimum cost
52. Check if there exist two elements in an array whose sum is equal to the sum of rest of the array
53. Check if reversing a sub array make the array sorted
54. Find all triplets with zero sum
55. Search, insert and delete in an unsorted array
56. Search, insert and delete in a sorted array
57. Move all occurrences of an element to end in a linked list
58. Search in an array of strings where non-empty strings are sorted
59. Smallest Difference Triplet from Three arrays
60. Best First Search (Informed Search)

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WEEK 2

RECURSION & BACKTRACKING

https://www.hackerearth.com/practice/basic-programming/recursion/recursion-and-backtracking/tutorial/

Introduction to Backtracking - Brute Force Approach

N Queens Problem using Backtracking

Sum Of Subsets Problem - Backtracking

PRACTICE

https://www.interviewbit.com/courses/programming/topics/backtracking/

GCD Strings

Lockdown Game

Hack the money

A Tryst With Chess

Its Confidential

N-Queens

Simran and stairs

biggest forest

Converting

Divide Number

Encrypted Love 2.O

Number of divisors

1. Backtracking | Set 1 (The Knight's tour problem)
2. Backtracking | Set 2 (Rat in a Maze)
3. Backtracking | Set 3 (N Queen Problem)
4. Backtracking | Set 4 (Subset Sum)
5. Backtracking | Set 5 (m Coloring Problem)
6. Backtracking | Set 6 (Hamiltonian Cycle)
7. Backtracking | Set 7 (Sudoku)
8. Backtracking | Set 8 (Solving Cryptarithmetic Puzzles)
9. Backtracking | Set 9 (Magnet Puzzle)
10. N Queen in O(n) space
11. Boggle | Set 2 (Using Trie)

12. Remove Invalid Parentheses
13. Prime numbers after prime P with sum S
14. Rat in a Maze with multiple steps or jump allowed
15. A backtracking approach to generate n bit Gray Codes
16. C++ program for Solving Cryptarithmetic Puzzles
17. Write a program to print all permutations of a given string
18. Print all possible paths from top left to bottom right of a mXn matrix

FOR MORE:

https://leetcode.com/tag/recursion/

https://leetcode.com/tag/backtracking/