

Round 1:

- ✓ 1. Given a string containing just the characters '(' and ')', find the length of the longest valid (well-formed) parentheses substring.

<https://leetcode.com/problems/longest-valid-parentheses/>

- ✓ 2. Given a boolean 2D array, where each row is sorted. Find the row with the maximum number of 1s.

Example:

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

<https://www.geeksforgeeks.org/find-the-row-with-maximum-number-1s/>

- ✓ 3. An integer has sequential digits if and only if each digit in the number is one more than the previous digit. Return a **sorted** list of all the integers in the range [low, high] inclusive that have sequential digits.

<https://leetcode.com/problems/sequential-digits/>

- ✓ 4. Given an array of n elements, where each element is at most k away from its target position, devise an algorithm that sorts in $O(n \log k)$ time. For example, let us consider k is 2, an element at index 7 in the sorted array, can be at indexes 5, 6, 7, 8, 9 in the given array.

Devise a sorting algorithm

5. Race Car

Your car starts at position 0 and speed +1 on an infinite number line. Your car can go into negative positions. Your car drives automatically according to a sequence of instructions 'A' (accelerate) and 'R' (reverse):

- When you get an instruction 'A', your car does the following:
 - position += speed
 - speed *= 2
- When you get an instruction 'R', your car does the following:
 - If your speed is positive then speed = -1
 - otherwise speed = 1

for every row, find the first occurrence of 1 using binary search

Sort every

from 1 to 9
min heap

Your position stays the same.

For example, after commands "AAR", your car goes to positions $0 \rightarrow 1 \rightarrow 3 \rightarrow 3$, and your speed goes to $1 \rightarrow 2 \rightarrow 4 \rightarrow -1$.

Given a target position `target`, return the length of the shortest sequence of instructions to get there.

<https://leetcode.com/problems/race-car/>

6. Similar to nearest K coordinates from Origin. (Heap)
7. Given a binary grid of order $r * c$ and an initial position. The task is to find the minimum distance from the source to get to the any corner of the grid. A move can be made to a cell `grid[i][j]` only if `grid[i][j] = 0` and only **left**, **right**, **up** and **down** movements are permitted. If no valid path exists then print **-1**.
<https://www.geeksforgeeks.org/minimum-distance-to-the-corner-of-a-grid-from-source/>
8. Merge-Two-Sorted-linked-lists
<https://www.geeksforgeeks.org/merge-two-sorted-linked-lists/amp/>
9. Clone a linked list with next and random pointer
<https://www.geeksforgeeks.org/clone-linked-list-next-arbit-pointer-set-2/>
10. Given an $n \times n$ matrix and an integer x , find the position of x in the matrix if it is present. Otherwise, print "Element not found".
Every row and column of the matrix is sorted in increasing order. The designed algorithm should have linear time complexity.
<https://www.geeksforgeeks.org/search-in-row-wise-and-column-wise-sorted-matrix/>
11. <https://leetcode.com/problems/two-sum/>
12. There are n servers numbered from 0 to $n - 1$ connected by undirected server-to-server connections forming a network where `connections[i] = [ai, bi]` represents a connection between servers `ai` and `bi`. Any server can reach other servers directly or indirectly through the network.
A critical connection is a connection that, if removed, will make some servers unable to reach some other server.
Return all critical connections in the network in any order.
<https://leetcode.com/problems/critical-connections-in-a-network/>
13. Given a floor of dimensions $2 \times W$ and tiles of dimensions 2×1 , the task is to find the number of ways the floor can be tiled. A tile can either be placed horizontally i.e as a 1×2 tile or vertically i.e as 2×1 tile. Print the answer

$$solve(row + 1) + solve(col + 2);$$

modulo 10^9+7 .

Tiling Problem

- ✓ 14. Given a String of the form $ab2c3$ where the string preceding the integer is repeated that many times, you are supposed to find the Kth character of the string. Eg: $ab2c3 \Rightarrow ababc2 \Rightarrow ababcbabc$
- ✓ 15. Find the two smallest numbers in an array
<https://practice.geeksforgeeks.org/problems/find-the-smallest-and-second-smallest-element-in-an-array3226/1>
- ✓ 16. Given a max distance, find the two numbers that added together are closest to the max distance
- ✓ 17. Given an array which has elements in increasing order first, and then decreasing, suggest ~~an algorithm for searching an element in it.~~ Binary search.
- ✓ 18. Check whether a given tree is a BST or not.
- 19. Number of hops required to reach the end of an array, where the maximum hop is the value at index.
Tweaked question after this, to reach any node.
- ✓ 20. Print the path between any two given nodes in a binary tree
- ✓ 21. Given a grid of size $n*m$ (n is the number of rows and m is the number of columns in the grid) consisting of '0's (Water) and '1's (Land). Find the number of islands.

Note: An island is surrounded by water and is formed by connecting adjacent lands horizontally or vertically or diagonally i.e., in all 8 directions.

<https://practice.geeksforgeeks.org/problems/find-the-number-of-islands/1>

Round 2

1. Boundary Traversal of binary tree
<https://practice.geeksforgeeks.org/problems/boundary-traversal-of-binary-tree/1>
2. Given a singly linked list: $A_0 \rightarrow A_1 \rightarrow \dots \rightarrow A_{n-1} \rightarrow A_n$, reorder it to:
 $A_0 \rightarrow A_n \rightarrow A_1 \rightarrow A_{n-1} \rightarrow A_2 \rightarrow A_{n-2} \rightarrow \dots$
For example: Given $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5$ its reorder is $1 \rightarrow 5 \rightarrow 2 \rightarrow 4 \rightarrow 3$.
Note: It is recommended do this in-place without altering the nodes' values.
<https://practice.geeksforgeeks.org/problems/reorder-list/1>
3. Given a dictionary, a method to do lookup in dictionary and a $M \times N$ board where every cell has one character. Find all possible words that can be formed by a sequence of adjacent characters. Note that we can move to any of 8 adjacent characters, but a word should not have multiple instances of same cell.

<https://www.geeksforgeeks.org/boggle-find-possible-words-board-characters/>

4. Given a **binary tree** and a **leaf node** from this tree. It is known that in 1s all nodes connected to a given node (left child, right child, and parent) get burned in 1 second. Then all the nodes which are connected through one intermediate get burned in 2 seconds, and so on. The task is to find the minimum time required to burn the complete binary tree.

[Burn the binary tree](#)

5. Implement minStack using one stack.

- 6/ We have given a list of strings. So, we have to group the anagrams.

Ex: ["eat","fat","tae"]

sol: [{"eat","tae"}, {"fat"}]

7. [Two nodes of a BST are swapped, correct the BST.](#)

8. Given a number N, count the number of arrays that can be constructed such that the sum of elements is N. One constraint is that each element should be greater than 3.

Example:

Input: 6

Output: 2

Possible arrays: [3,3], [6]

9. Given a number n, the task is to check whether it can be expressed as a sum of two or more consecutive numbers or not.

<https://www.geeksforgeeks.org/check-number-can-expressed-sum-consecutive-numbers/>

10. A binary tree and a number k are given. Print every path in the tree with sum of the nodes in the path as k.

A path can start from any node and end at any node and must be downward only, i.e. they need not be root node and leaf node; and negative numbers can also be there in the tree.

<https://www.geeksforgeeks.org/print-k-sum-paths-binary-tree/>

11. Given an array of positive and negative integers, print x if +x and -x are present in the array. I asked for some clarifications whether I should print all distinct x's or if I should print an x if a pair of +x and -x is encountered. The first approach I told was to use a map and I was keeping a flag for +x and -x if it's found once. Later he asked me to print all pairs, so I stored the frequencies of all the elements in the map and iterated through the negative elements and for each element x, I would print x min(count[-x], count[+x]) times. He said he can't afford that much space and he wanted

me to optimise space further. So I told him a 2 pointer approach where I sort the array once and then keep two pointers to the start and end. I would move the start pointer forward if the sum is less than 0 and I'll move the end pointer backward if the sum is greater than 0. He was fine with the solution and asked me to code it in a paper. I wrote the code and walked him through it.

12. Design the logic for minimising cash flow in an app like 'Splitwise'. Here the interviewer told me about an app called splitwise which I had used once. In the application each user adds the amount he spends and how it's shared by other users of the app. The aim is to minimise the number of give and take operations. I initially thought of a very naive approach where I wanted to create classes for each person and expenditure and iterate through the expenditures of other people to find how much a person should give or take. When I took a closer look I got the idea of modelling it as a directed graph and adding directed edges for transactions. With the graph I thought of taking the difference between the pair of edges between two people to reduce a give and take operation to a single give/take operation. There was a catch, if A has to give B Rs.10, B has to give C Rs.10, and A has to give C Rs.10, the minimum operation to do is to give Rs.20 from A to C. B is not involved here as he has to spend all he gets. So I said we could preprocess the graph with the numbers on the incoming and outgoing edges. If the total flow is 0, we could remove that node. He seemed convinced with the approach. He gave me a graph after all the preprocessing done and finally asked me how to minimise it. So I used a greedy method. I was settling the amount of the person who has to get the largest amount by giving the amount of the people who has to give lesser amounts and he said that'll work.

13. Given an array of N strings, find the longest common prefix among all strings present in the array.

<https://practice.geeksforgeeks.org/problems/longest-common-prefix-in-an-array5129/1>

14. Maze traversal: A Maze is given as $N \times N$ binary matrix of blocks where source block is the upper left most block i.e., `maze[0][0]` and destination block is lower rightmost block i.e., `maze[N-1][N-1]`. A rat starts from source and has to reach the destination. The rat can move only in two directions: forward and down.

<https://www.geeksforgeeks.org/rat-in-a-maze-backtracking-2/>

15. Implement a vector in C, using any available data structure

16. Given **K** sorted arrays of size **N** each, merge them and print the sorted output.

<https://www.geeksforgeeks.org/merge-k-sorted-arrays/>

Round 3:

1. Interview questions revolved around CS fundamentals based questions. (Mostly about multithreading, deadlocks, OOP concepts, shared memory etc). Also some questions are asked where code snippet is given and output is asked (code was in java).
2. You are given the root of a binary tree with n nodes. Each node is uniquely assigned a value from 1 to n . You are also given an integer `startValue` representing the value of the start node s , and a different integer `destValue` representing the value of the destination node t . Find the shortest path starting from node s and ending at node t . Generate step-by-step directions of such path as a string consisting of only the uppercase letters 'L', 'R', and 'U'. Each letter indicates a specific direction:

'L' means to go from a node to its left child node.

'R' means to go from a node to its right child node.

'U' means to go from a node to its parent node.

Return the step-by-step directions of the shortest path from node s to node t .

<https://leetcode.com/problems/step-by-step-directions-from-a-binary-tree-node-to-another/>

3. Find the longest palindrome that can be built by using characters of a given string.
4. You are given an integer array `nums`. You are initially positioned at the array's **first index**, and each element in the array represents your maximum jump length at that position. Return `true` if you can reach the last index, or `false` otherwise.
<https://leetcode.com/problems/jump-game/>
5. Given are **N** ropes of different lengths, the task is to connect these ropes into one rope with **minimum** cost, such that the cost to connect two ropes is equal to the **sum** of their lengths.
<https://www.geeksforgeeks.org/connect-n-ropes-minimum-cost/>
6. Given a sorted array of n elements containing elements in range from 1 to $n-1$ i.e. one element occurs twice, the task is to find the repeating element

in an array.

<https://www.geeksforgeeks.org/find-repeating-element-sorted-array-size-n/>

7. Given a positive integer N , the task is to count the sum of the number of set bits in the binary representation of all the numbers from 1 to N .

<https://www.geeksforgeeks.org/count-total-set-bits-in-all-numbers-from-1-to-n-set-2/>

8. Topological Sorting

<https://www.geeksforgeeks.org/topological-sorting/>

9. We have to paint n boards of length $\{A_1, A_2 \dots A_n\}$. There are k painters available and each takes 1 unit of time to paint 1 unit of the board. The problem is to find the minimum time to get this job was done under the constraints that any painter will only paint continuous sections of boards, say board $\{2, 3, 4\}$ or only board $\{1\}$ or nothing but not board $\{2, 4, 5\}$.

<https://www.geeksforgeeks.org/painters-partition-problem/>

10. Given a generic tree, find the count of all special nodes. A node is a special node if there is a path from root to that node with all distinct elements. The input was not a pointer to a tree. He'd give me an adjacency list and an array of values where the value of i th node in the adjacency list is the i th element in the values array. He asked me not to create a tree out of the given information and rather do it with the adjacency list itself. I suggested to do a depth first search keeping a set which contains all elements upto a given node. Once I reach a particular node, I check if it's already in the set. If it's already in the set, I return because that element has already been visited and is not a special node. Otherwise I increase the count of a global variable by 1 and push that element to the set. Then I go through the adjacency list of that element and call this function recursively. Once I return from the element after visiting its neighbours, I pop the element from the set. I told him the approach and he asked me to write the code for it. He was convinced with the approach and he liked the code.

11. Given an integer array, find the longest subsequence with adjacent numbers having a digit in common. Eg: 1 12 44 29 33 96 89. The longest subsequence here is $\{1, 12, 29, 96, 89\}$ and the answer is 5. I initially tried a 2D DP solution where $dp[i][j]$ indicates the length of longest sequence with ending at i containing j as a digit. It's a [N X 10 DP](#) matrix. Interviewer asked me why I needed a 2D DP solution and I struggled to convince him. I wrote the code for it. It wasn't completely correct. I was missing something. After thinking for a while I narrowed down to a solution

containing only 10 elements $dp[0]$, $dp[1]$, $dp[2]$.. $dp[9]$ which is updated everytime I see a new number. I take a number, I go through all digits in the number, and find $val = 1 + \max(dp[d] \text{ for all digits } d \text{ in the number})$. Set this val to $dp[d]$ for all digits in the number. He gave a hint to take the max.

12. Construct a binary tree of size N using two given arrays **pre[]** and **preLN[]**. Array **pre[]** represents preorder traversal of a binary tree. Array **preLN[]** has only two possible values **L** and **N**. The value **L** in **preLN[]** indicates that the corresponding node in Binary Tree is a leaf node and value **N** indicates that the corresponding node is a non-leaf node.

Note: Every node in the binary tree has either 0 or 2 children.

[Given a pre-order traversal of a binary tree represented by , I for internal node and L for leaf, build the tree.](#)

13. Given an integer array **Arr** of size N . For each element in the array, check whether the right adjacent element (on the next immediate position) of the array is smaller. If next element is smaller, update the current index to that element. If not, then **-1**.

[Find the next smallest element for all the elements in a given array.](#)

Round 4:

1. Given an integer array **nums** and an integer k , return **true** if it is possible to divide this array into k non-empty subsets whose sums are all equal.
<https://leetcode.com/problems/partition-to-k-equal-sum-subsets/>

2. Some questions on hashing, BFS/DFS tradeoffs and sorting.

3. Given two numbers as strings $s1$ and $s2$. Calculate their Product.

Note: The numbers can be negative.

<https://practice.geeksforgeeks.org/problems/multiply-two-strings/1>

4. In a party of N people, only one person is known to everyone. Such a person **may be present** in the party, if yes, (s)he doesn't know anyone in the party. We can only ask questions like "**does A know B?**". Find the stranger (celebrity) in the minimum number of questions.

<https://www.geeksforgeeks.org/the-celebrity-problem/>

5. Given an array, print the Next Greater Element (NGE) for every element.

The **Next greater Element** for an element x is the first greater element on the right side of x in the array. Elements for which no greater element exist,

consider the next greater element as -1.

<https://www.geeksforgeeks.org/next-greater-element/>

6. We have given a text and some pattern, so we have to find a minimum length substring that contains all characters of the pattern.
7. Given the **head** of the [linked list](https://www.geeksforgeeks.org/next-greater-element/) representing a positive integer, the task is to print the updated linked list after subtracting 1 from it.
<https://www.geeksforgeeks.org/subtract-1-from-a-number-represented-as-linked-list/>
8. Given a square chessboard of $N \times N$ size, the position of Knight and position of a target is given. We need to find out the minimum steps a Knight will take to reach the target position
<https://www.geeksforgeeks.org/minimum-steps-reach-target-knight/>
9. Given a binary tree, modify the tree satisfying the following constraints:
 - a. Value at root must be the sum of left child and right child (not subtrees).
 - b. You can't reduce the value at any node. You can only increase it.
 - c. Value of root node must be minimum. I drew a few trees and asked him the output for those examples. He asked me to say it myself and I did. I thought of doing a post order traversal as we need to visit root's left and right child before visiting root. In the post order traversal, we keep the sum of root's left and right child in a variable sum. We take the difference of this sum and root's data. If the sum is greater than root's data, we replace root with the sum. Otherwise we have to distribute the root's value to root's left and right child so that all the three conditions are satisfied. (We can't reduce the value at any node). He asked me to write the code for it and I did. After that he gave me another problem.
10. [Given an array of 0s 1s and 2s, sort this array in one iteration.](#)
11. [Given a 2-D array, in which all the elements are either 0's or 1's, and all the rows are sorted, Give an algorithm for finding the row having the maximum number of 1's.](#)
12. There is a given set of colors, say $[1-N]$. Now, people are coming into a stadium wearing t-shirts of any of these colors. Write an algorithm to find the first person to come in, to have worn a unique color.
The question wasn't clear to me at first, so after a few examples, got what he was trying to ask.
For eg. Suppose we have colors R G B
and the stream of people are as,

G R B G G G G
the output should be R.

Round 5:

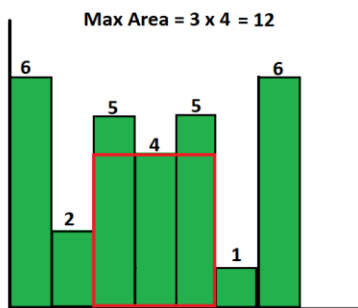
1. Given an integer a, b, m . Find $(a * b) \bmod m$, where a, b may be large and their direct multiplication may cause overflow. However they are smaller than half of the maximum allowed long long int value.

Problem:- <https://www.geeksforgeeks.org/multiply-large-integers-under-large-modulo/> (Logarithmic approach was expected)

2. Given an array of n numbers. Your task is to read numbers from the array and keep at-most K numbers at the top (According to their decreasing frequency) every time a new number is read. We basically need to print top k numbers sorted by frequency when input stream has included k distinct elements, else need to print all distinct elements sorted by frequency.

<https://www.geeksforgeeks.org/find-top-k-or-most-frequent-numbers-in-a-stream/>

3. Find the largest rectangular area possible in a given histogram where the largest rectangle can be made of a number of contiguous bars. For simplicity, assume that all bars have same width and the width is 1 unit. For example, consider the following histogram with 7 bars of heights $\{6, 2, 5, 4, 5, 1, 6\}$. The largest possible rectangle is 12 (see the below figure, the max area rectangle is highlighted in red)



<https://www.geeksforgeeks.org/largest-rectangle-under-histogram/>

4. Implement a queue using two stacks
5. Given an array `arr[]` of size N having distinct numbers sorted in increasing order and the array has been right rotated (i.e, the last element will be cyclically shifted to the starting position of the array) k number of times, the task is to find the value of k .

<https://www.geeksforgeeks.org/find-rotation-count-rotated-sorted-array/>

6. Given two strings **a** and **b** consisting of lowercase characters. The task is to check whether two given strings are an anagram of each other or not. An anagram of a string is another string that contains the same characters, only the order of characters can be different. For example, act and tac are an anagram of each other.

[Check if two words are anagrams.](#)

7. Write a function to generate all possible n pairs of balanced parentheses.
<https://www.geeksforgeeks.org/print-all-combinations-of-balanced-parentheses/>