

# THRIVER ASHISH'S DATA STRUCTURES AND ALGORITHM SHEET

This 90 days Roadmap covers all the topics of DS-Algo which are most important for technical interviews and also important to become a good software engineer

This sheet also covers all the questions that are needed to be solved in order to crack tech giants interviews

## 90 DAYS



<https://www.youtube.com/c/thriverashish>

<https://www.youtube.com/c/thrivewithashish>



<https://www.linkedin.com/in/thriverashish>



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# ARRAYS

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## 10 DAYS



### DAY 1

Understand Big O notation (Time and Space complexity)

### DAY 2

-- Study Basic Concepts of Array and get familiar with List DS in the programming language you chose.

-- Reverse the array in place (space complexity should be constant)

Input --> 3,5,9,4,2

Output --> 2,4,9,5,3

-- Insert an element in between of array

### DAY 3 AND DAY 4

- Understand Quick Sort, Merge Sort, Insertion Sort and Selection Sort

- Implement them all in your fav programming language

### DAY 5

- Understand Binary Search Algorithm
- Search an element in the Sorted Array
- Leetcode Question 33 --> Search in Rotated Sorted Array
- Leetcode Question 50 --> Implement pow(x, n), which calculates x raised to the power n (i.e.,  $x^n$ )

### DAY 6

- Understand 2D matrix/ @D Arrays
- Search a 2D Matrix Leetcode 74
- Set Matrix to Zero --> Leetcode 73
- Pascals Triangle --> Leetcode 118
- Rotate Matrix --> Leetcode 48

### DAY 7

- Kadane's Algo --> Maximum Subarray Leetcode 73
- Sort Array of 0's 1's and 2's Leetcode 75
- Two Sum Problem --> Leetcode 1
- Find Duplicate



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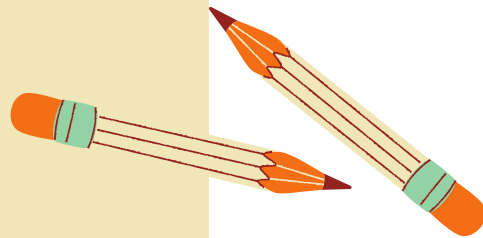
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## DAY 8

- Stock Buy and Sell --> Leetcode 121
- Next Permutation --> Leetcode 32
- Merge Intervals --> Leetcode 56
- Merge Sorted Arrays --> Leetcode 88



## DAY 9

- Reverse pairs --> Leetcode 493
- Grid Unique Paths --> Leetcode 62
- 3 Sum problem --> Leetcode 15
- 4 Sum Problem --> Leetcode 18

## DAY 10

- Repeat Missing Number Array --> InterviewBit  
<https://www.interviewbit.com/problems/repeat-and-missing-number-array/>
- Longest Consecutive Subsequence —> Leetcode 128
- Subarray with given Xor —> Interview Bit  
<https://www.interviewbit.com/problems/subarray-with-given-xor/>
- Longest Substring without repeat —>



# LINKED LIST

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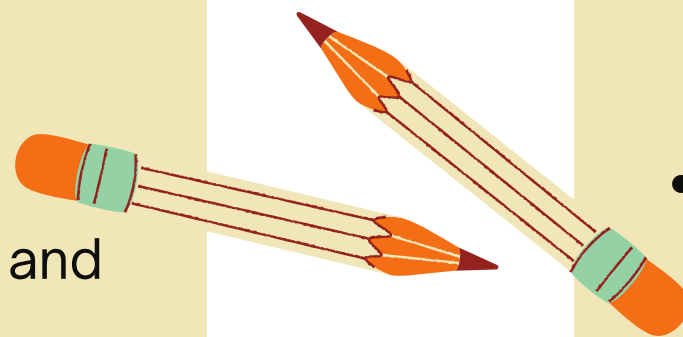
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04 DAYS



## DAY 11

- Understand the concept of Linked List
- Understand its Advantages and disadvantages over Arrays
- Implement the Linked list in the language you chose:
- Create Linked List class
  - Create a Node
  - Add Node
  - Remove Node
  - Find Node in Linked List



## DAY 13

- Add Two Numbers given in linked list
- Detect and remove Linked List Cycle
- Intersection of Two Linked Lists
- Palindrome Linked List

## DAY 14

- Reverse Nodes in k-Group
- Rotate List
- Flattening a Linked List
- Copy List with Random Pointer

## DAY 12

- Reverse Linked List
- Find Middle of the Linked List
- Remove Nth Node From End of List
- Merge Two Sorted Lists



# STACK

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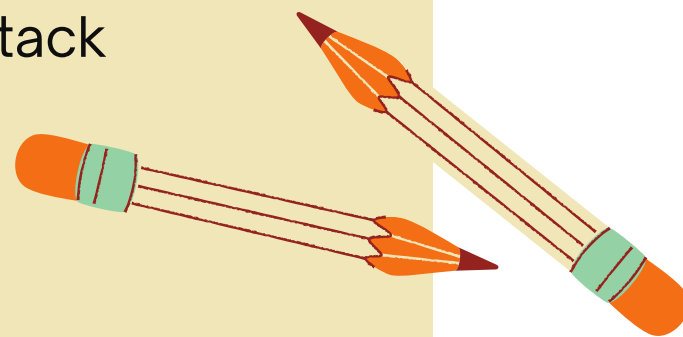
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03 DAYS



## DAY 15

- Understand the basics of Stack Data Structures
- Relate with some real-life examples like
  - Stack of Note books and Stack of coins
- Implement the Stack using Arrays (Push Pop etc functionalities )
- Implement the Stack with Linked List



## DAY 17 (LEVEL UP)

- Next Greater Element using Stack --> Leetcode 496
- Find largest rectangle in Histogram --> Leetcode 84

## DAY 16

- Sort a Stack
- Valid Parenthesis --> Leetcode 20
- Retrieve Minimum Element from the Stack --> Leetcode 155



# QUEUES

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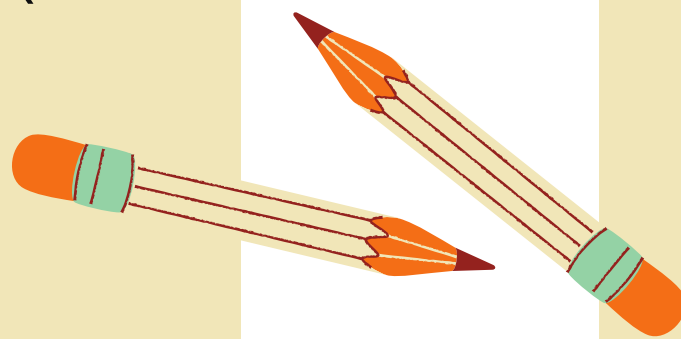
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03 DAYS



## DAY 18

- Understand the basics of Queue Data Structures
- Relate with some real-life examples
- Implement the Queue using Arrays
- Implement the Queue using the Linked List



## DAY 21

- Queue Reversal
- Implement LRU Cache
- Implement LFU Cache

## DAY 19

- Implement Queue using Stack
- Implement Stack using Queue
- Implement and understand Double Ended Queue

## DAY 22

- Learn Sliding window Coding Pattern
- Sliding Window Maximum Leetcode 239
- First negative integer in every window of size

## DAY 20

- Understand and Implement Circular Queue
- Find examples where circular Queues can be used.
- Implement Producer Consumer Problem

## DAY 23

- Trapping Rain Water (Stack-based) Leetcode 42
- Simplify Directory Path (Stack Based) Leetcode 71 (No Priority Queue for now)



# RECURSION

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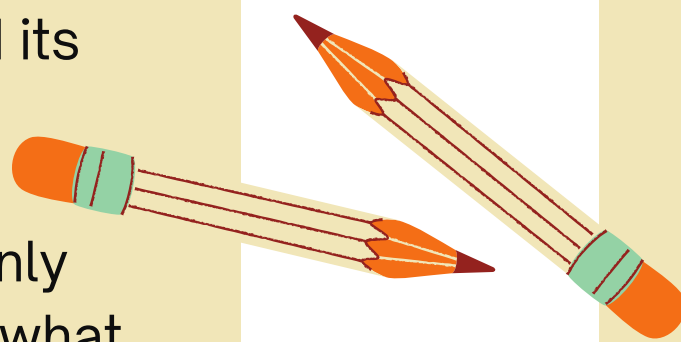
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04 DAYS



## DAY 24

- Understand Recursion and its base conditions etc.
- Understand in depth not only what recursion is but also what kind of Data str it uses internally etc.
- You will get to know how StackOverflow error occurs



## DAY 26

- Subset Sums
- Subsets II

## DAY 25

- Fibonacci Number
- Reverse the Linked List using the Recursive approach
- Reverse LinkedList in k-groups

## DAY 27

- Combination Sum
- Combination Sum II
- Palindrome Partitioning
- Permutation Sequence



# REVISION

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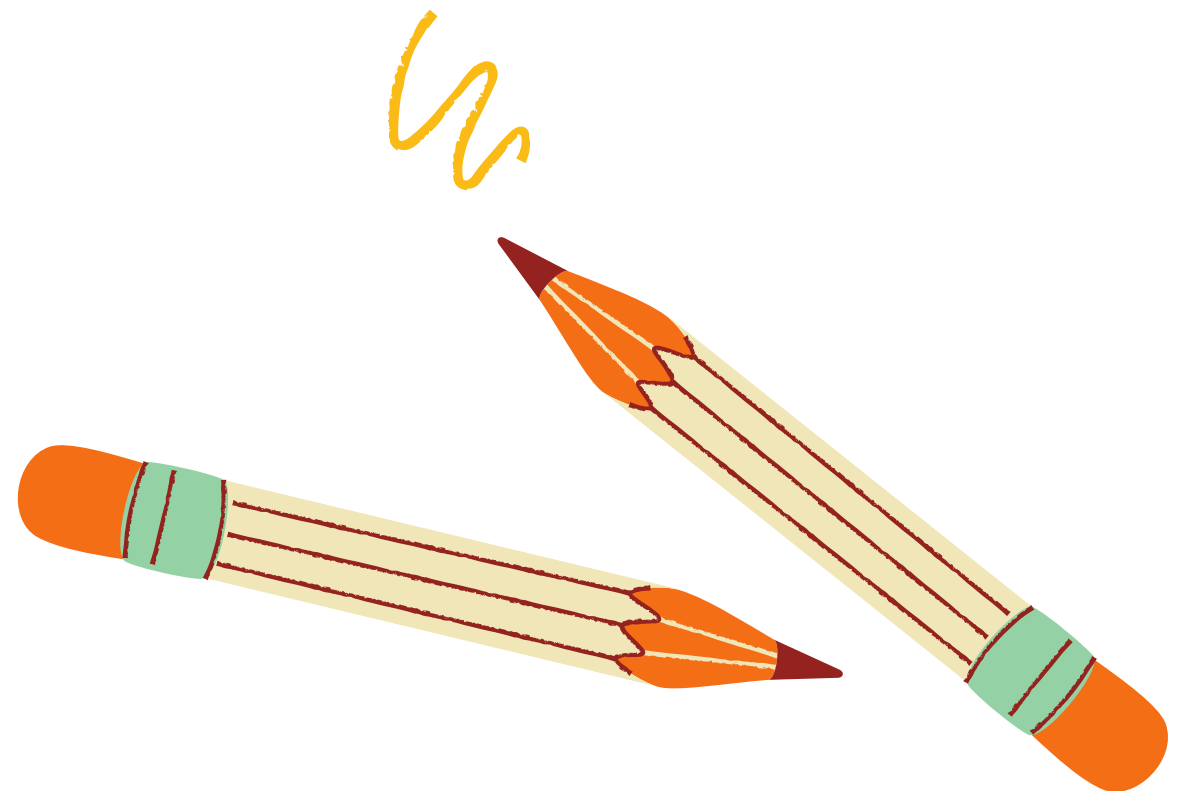
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03 DAYS



DAY 28

Revise Arrays  
and Linked List



DAY 29

Revise Queues  
and Stacks

DAY 30

Revise Recursion  
and practice



# HASHING AND HASH BASED DS

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04 DAYS

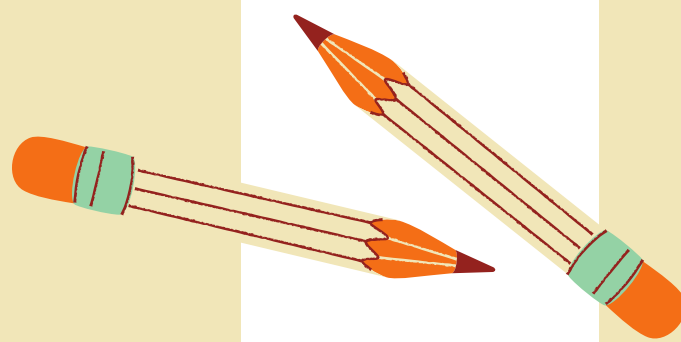
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## DAY 31

- Understand what exactly Hash-based Data structures are!
- What is hashing?
- What is a hash code?
- What is Hash Function?
- Understand the concept of ROLLING HASH
- Understand the usage and application of Hash Tables like
  - Used to implement database indexes.
  - Used to implement associative arrays.
  - Used to implement the different data structures like hashMap/HashSet etc



## DAY 33

- Design HashSet -- Leetcode 705
- Design HashMap -- Leetcode 706
- Two Sum -- Leetcode 1
- Running Sum of 1D Array Leetcode 1480

## DAY 32

- Understand the internals of HashMap and HashSet
- Read the code of the already implemented hashMap/HashSet library if the code is available like in Java.
- Do a bit of hands-on, iterate the hashMap/set etc

## DAY 34

- Check If a String Contains All Binary Codes of Size K -- Leetcode 1461
- K Divisible Elements Subarrays -- Leetcode 2261
- Number of Distinct Islands -- Leetcode 711



# TREES AND TRIES

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10 DAYS

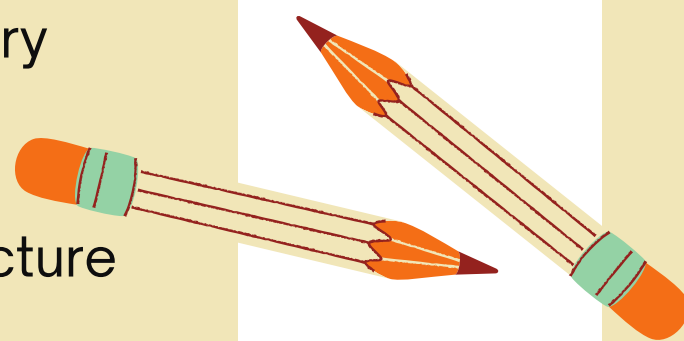


## DAY 35

- Read the theory of Binary Trees and different types of Binary Trees
- Understand the Node structure of Binary Tree

Understand and Write Iterative code for following Traversals

- Level Order Traversal
- Inorder Traversal - Leetcode 194
- PreOrder Traversal
- Postorder Traversal
- Zig Zag Level Order Traversal



## DAY 37

- Same Tree - Leetcode 100
- Invert Binary Tree - Leetcode 226
- Symmetric Binary Tree - Leetcode 101
- Left/Bottom/Top View of Binary Tree
- Vertical Order Traversal of a Binary Tree - Leetcode 987

## DAY 36

- Implement Binary Tree
- Add Node
- Remove Node
- Traverse Node
- Construct Binary Tree from Inorder and PostOrder - Leetcode 105

## DAY 38

- Maximum Width of Binary Tree - Leetcode 622
- Maximum Depth of Binary Tree - Leetcode 104
- Diameter of Binary Tree - Leetcode 543
- Balanced Binary Tree - Leetcode 110
- Lowest Common Ancestor of a Binary Tree - Leetcode 236

## DAY 39

- Identify the Path to the given Node
- Binary Tree Maximum Path Sum - Leetcode 124
- Flatten Binary Tree to Linked List - Leetcode 1114
- Mirror Binary Tree
- Serialize and Deserialize Binary Tree - Leetcode 297
- Vertical Sum of Nodes in Binary Tree



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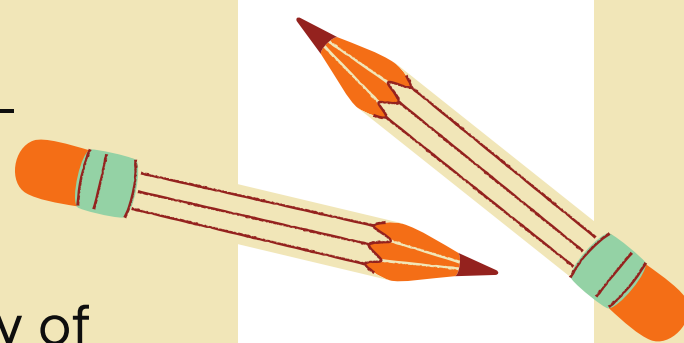
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10 DAYS



### DAY 40

- Understand Binary Search Tree
- Search an Element in BST - Leetcode 700
- Understand the Complexity of searching in BST
- Find Lowest Common Ancestor of a given node in BST - Leetcode 235
- Convert Sorted Array to Binary Search Tree - Leetcode 108
- Validate Binary Search Tree - Leetcode 98



### DAY 42

- Understand Self-Balancing Binary Search Trees
- Read and Understand Red Black Tree
- Read and Understand AVL Tree

### DAY 43

- Understand about Quad trees and N-Ary Trees
- Understand Trie Data Structure
- Implement Trie (Prefix Tree)

### DAY 41

- Construct BST from Preorder Traversal - Leetcode 1008
- Recover BST - Leetcode 99
- Identify Predecessor and Successor of a Node in BST
- Kth Smallest Element in a BST
- Two Sum - Input is BST - Leetcode 653

### DAY 44

- Maximum XOR of Two Numbers in an Array - Leetcode 421
- Maximum XOR With an Element From Array - Leetcode 1707
- Hotel Reviews - InterviewBit



# HEAP

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03 DAYS

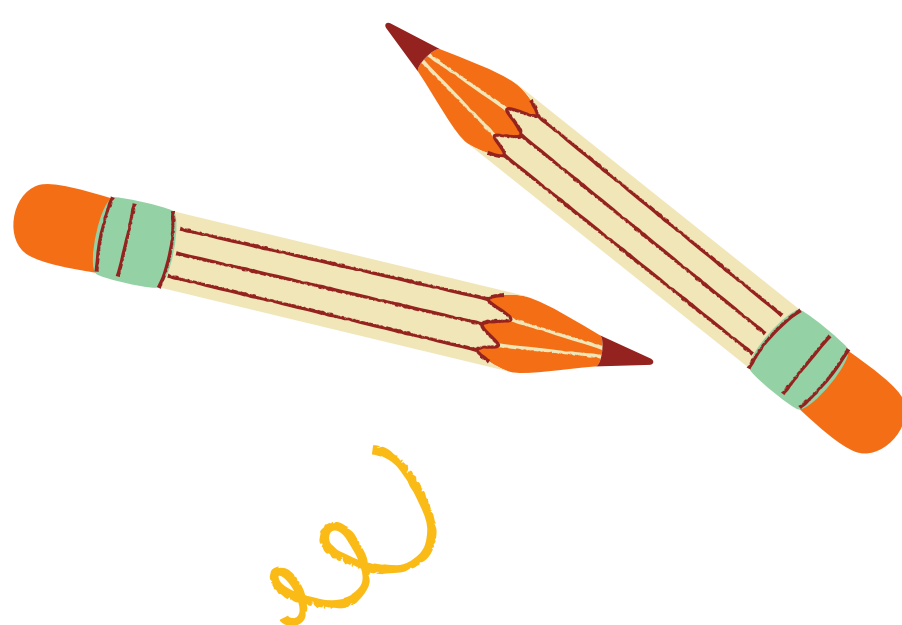
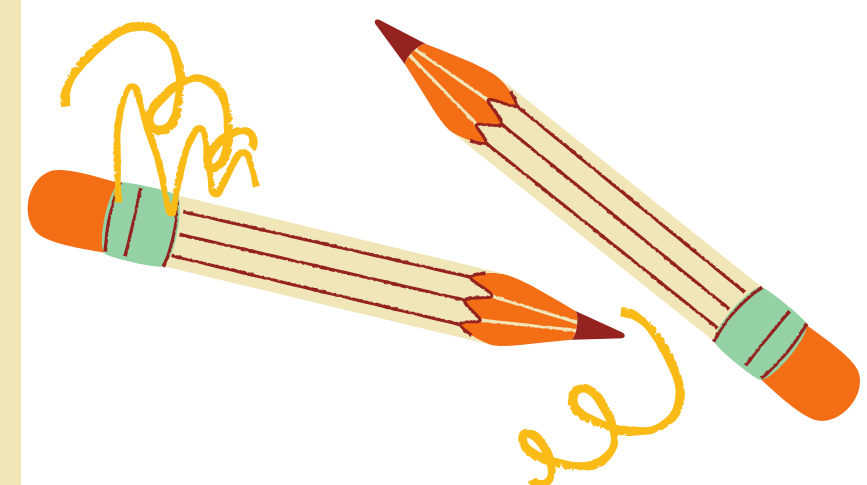
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## DAY 45

- Understand what HEAP DS is all about like properties and all (heap is a complete Binary Tree)
- Implement its Operations (Min and Max Heap)
  - Heapify
  - Insert Element into Heap
  - Delete Element from Heap
  - Peek
  - Extract Min/Max
- Understand and Read Heap Data Structure Applications
  - Heap is used while implementing a priority queue.
  - Dijkstra's Algorithm
  - Heap Sort



## DAY 46

- Distinct Numbers in the window (Interview Bit)
- Merge K Sorted Arrays
- Kth Largest Element in an Array - Leetcode 215

## DAY 47

- Top K Frequent Elements - Leetcode 347
- Maximum Sum Combinations - InterviewBit
- Find Median from Data Stream (Hard) - Leetcode 295



# GRAPH

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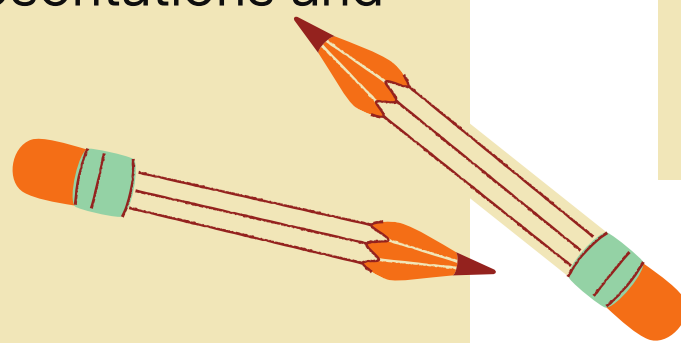
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10 DAYS



## DAY 48

- Understand Graphs
- Understand all three Graph representations and do hands-on
  - Edge list
  - Adjacency Matrix
  - Adjacency List
- Read and Understand Different types of Graphs
  - Directed Graphs
  - Weighted Graphs etc



## DAY 51

- Prims - Minimum spanning tree
- Kruskal - Minimum spanning tree

## DAY 52

- Topological sort
- Articulation points in a graph
- Bridges in a graph
- Johnsons algorithm

## DAY 49

- Breadth-first search (BFS)
- Depth-first search (DFS)

## DAY 50

- Dijkstra - The shorter path from a given node to all vertices
- Floyd Warshall - The shorter path from every vertex to every other vertex

## DAY 54

- Valid path -- Leetcode 1391
- Is Graph Bipartite? -- Leetcode 785
- Smallest multiple with 0 & 1

## DAY 53

- Clone Graph - Leetcode 133
- Number of Islands -- Leetcode 200
- Course Schedule -- Leetcode 207

## DAY 56

- Knight on chess board
- Word ladder I
- Word ladder II

## DAY 55

- Commutable islands
- Detect cycle in Directed and Undirected Graph
- Black shapes

## DAY 57

- Smallest sequence with given primes
- Capture regions on board
- Word search board



# REVISION

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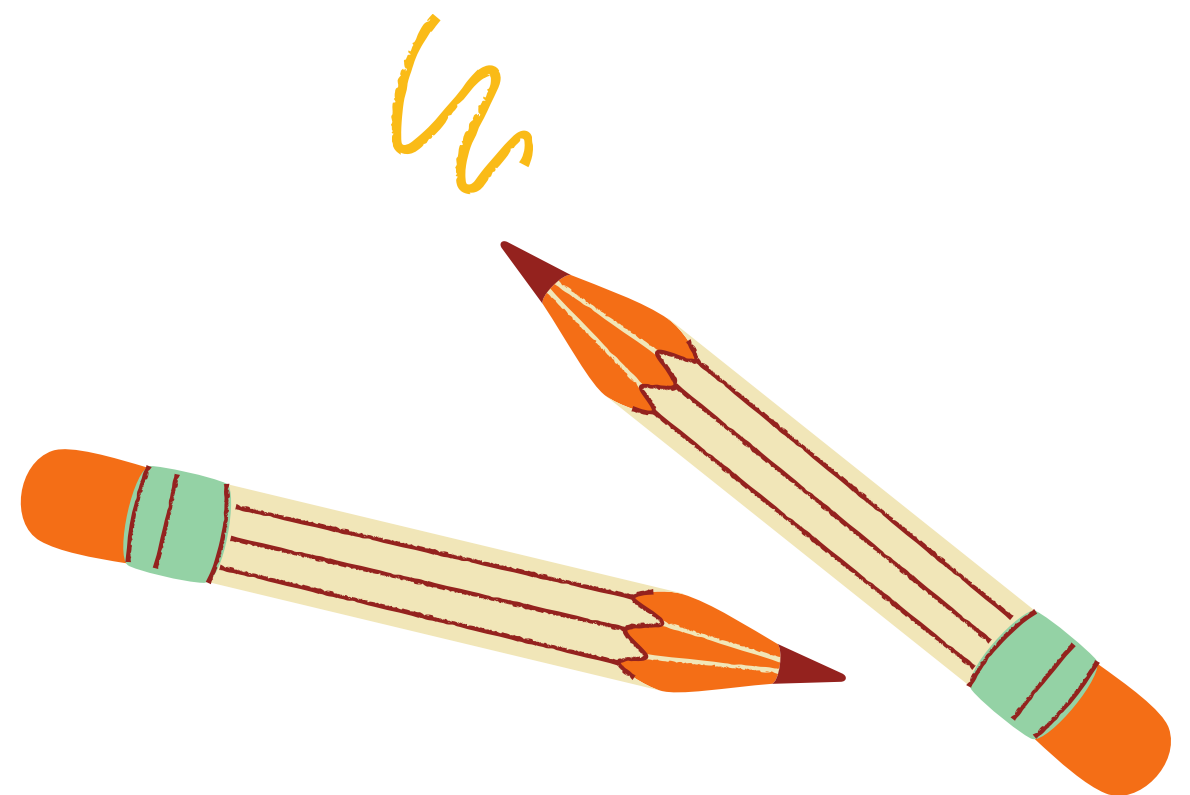
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03 DAYS



DAY 58

Revise Hashing  
and Practice



DAY 60

Revise Graphs  
and practice

DAY 59

Revise Trees  
and Tries



# GREEDY

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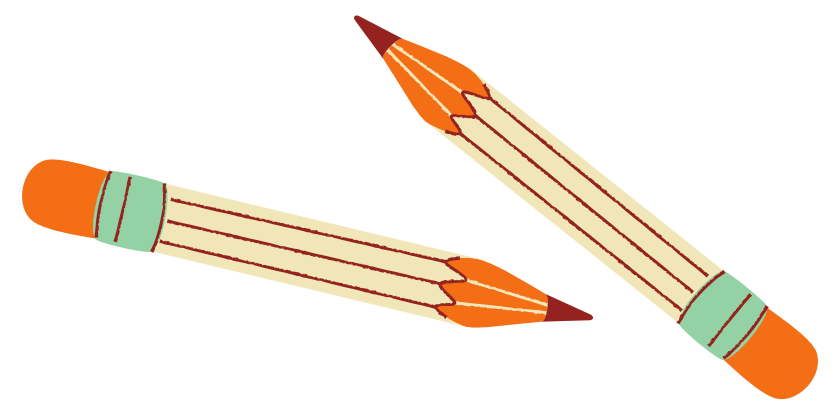
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02 DAYS



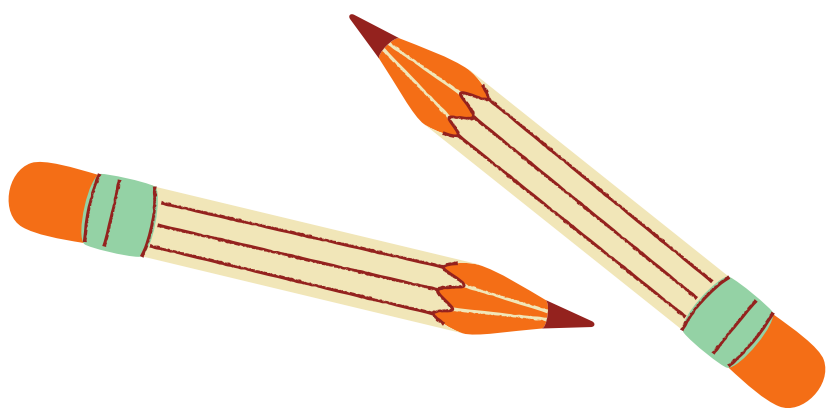
## DAY 61

- Fractional Knapsack problem
- N-Meetings in one room
- Job Sequencing Problem



## DAY 62

- Minimum Platforms
- Find Minimum Number



# DYNAMIC PROGRAMMING

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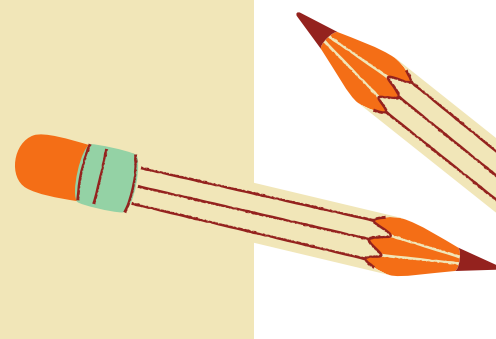
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10 DAYS



## DAY 63

- Understand what overlapping Subproblems mean?
- Understand memoization
- Fibonacci Number
- Catalan Number



## DAY 66

- Coin Change Leetcode 322
- Partition Equal Subset Sum Leetcode 416
- Minimum Cost to Cut a Stick Leetcode 1547

## DAY 64

- Maximum Product Subarray Leetcode 152
- Longest Increasing Subsequence Leetcode 300
- Longest Common Subsequence Leetcode 1143

## DAY 67

- Ways to decode
- Stairs
- Jump game

## DAY 68

- Min jumps
- Longest AP
- Evaluate expression to true

## DAY 65

- Ones and Zeroes Leetcode 474
- Edit Distance Leetcode 72
- Minimum Path Sum Leetcode 64

## DAY 69

- Best time to buy and sell stocks - 1
- Min sum path in matrix

## DAY 70

- Max rectangle in binary matrix
- Rod cutting
- Coin sum infinite

## DAY 71

- Best time to buy and sell stocks II
- Arrange II
- Best time to buy and sell stocks III

## DAY 72

- Equal avg partition
- Regex match
- Regex match II

## DAY 73

- Unique BST II
- Max sum path in BT
- Palindromic partitioning



# BACKTRACKING

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05 DAYS

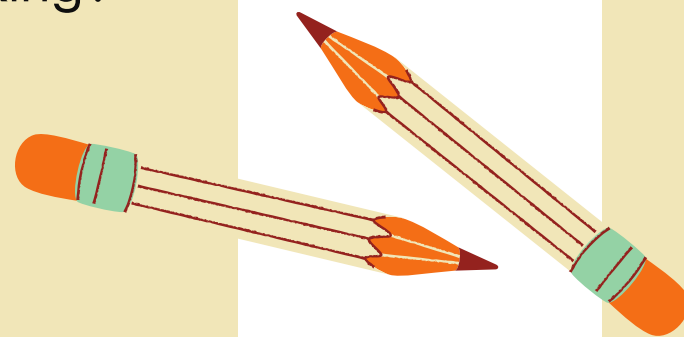


## DAY 74

- Understand why Backtracking?
  - when should we apply backtracking
  - how should we apply backtracking

Solve Following Questions

- Subset I
- Subset II



## DAY 76

- Palindrome Partitioning -- Leetcode 131
- Generate all parenthesis
- NQueens -- Leetcode 51

## DAY 75

- Combination sum -- Leetcode 39
- Combination sum II -- Leetcode 40

## DAY 77

- Sudoku Solver -- Leetcode 37
- Permutations -- Leetcode 46
- Kth permutation sequence Leetcode -- 60

## DAY 78

- Gray code
- M-Coloring Problem
- Rat in a Maze



# STRINGS

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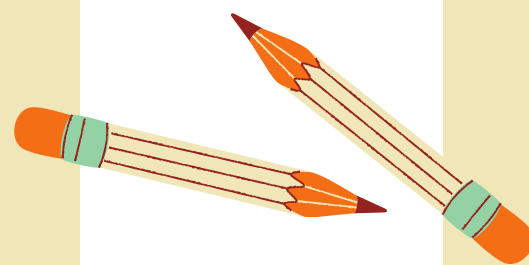
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04 DAYS



## DAY 79

- Reverse Words in a String  
Leetcode 151
- Longest Palindromic Substring  
Leetcode 5
- Roman to Integer Leetcode 13



## DAY 81

- Implement strStr() {Z Function}  
Leetcode 28
- KMP algo / LPS(pi) array -- Leetcode 28
- Minimum Characters required to make  
a String Palindromic -- Interview bit

## DAY 80

- String to Integer (atoi)  
Leetcode 8
- Longest Common Prefix  
Leetcode 14
- Rabin Carp

## DAY 82

- Valid Anagram -- Leetcode 242
- Count and Say -- Leetcode 38
- Compare Version Numbers -- Leetcode 165



## RANDOM QUESTIONS

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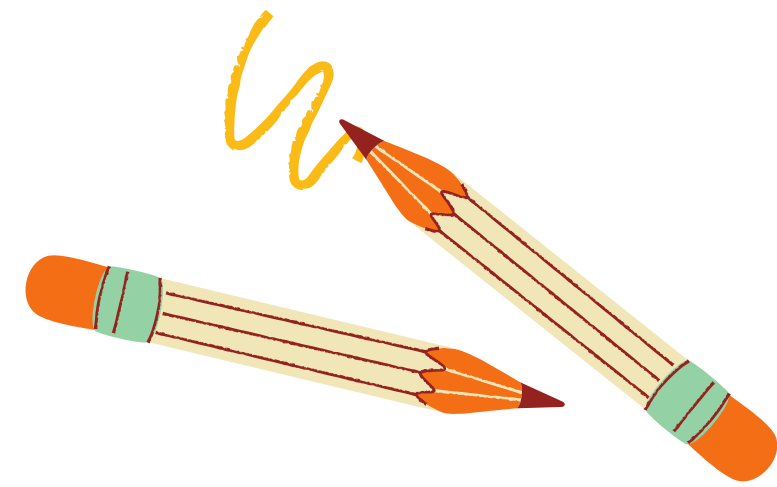
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08 DAYS



### DAY 83-85

Solve Random Array,  
Linked List, Stacks  
and Queue Questions



### DAY 86

Solve Random  
Recursion Hashing,  
Tree, and Graph  
Questions

### DAY 59

Solve Random DP,  
Backtracking, Strings,  
and other Questions

### DAY ...

Start Applying,  
you are Ready



**GOOD LUCK**

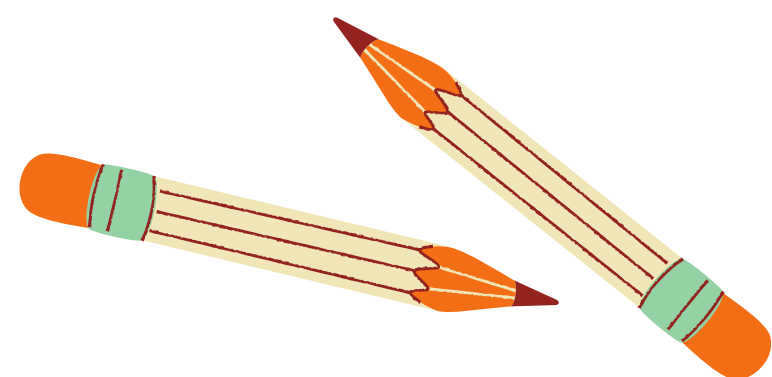
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All the best!



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WITH  
ASHISH