Compiled By Sreenivasan AC

BINARY SEARCH

Binary Search Example
Search an element in a sorted and pivoted array
Check for Majority element in a Sorted array
Floor and Ceiling in a sorted array
Find the Minimum length Unsorted Subarray, sorting which makes the array sorted
Count the number of occurrences of x in a sorted array
Find a Fixed Point (where a[i] equals i) in a given array
Find the maximum element in an array which is first increasing and then decreasing
Merge two sorted arrays of size N and M
Median of two sorted arrays
Longest Increasing Subsequence in O(NlogN)
Find the minimum element/(or search for an element) in a sorted and rotated array
Given an array of infinite size containing 0/1 only and in sorted order, find position of first 1

DIVIDE AND CONQUER

Introduction
Calculate pow(X,N) in O(logN)
Find the N-th Fibonacci Numberin O(logN)
Closest Pair of Points - O(NlogN)
Closest Pair of Points - O(nlogn) Implementation
Maximum Subarray Sum in O(NlogN)

BIT MANIPULATIONS

Check if a given number is a power of 2
Reverse bits of a number
Count set bits in an integer
Count numer of set its to be flipped to convert A to B
Rotate bits of an integer
Compute the absolute value (abs) without branching
Turn off the rightmost set bit
Add two numbers without using arithmetic operators
Position of the right most set bit
Swap every consecutive odd and even positioned bit in a number
Find the position of the only set bit
Perform nibble wise swap in a byte of data

SORTING
Stability
Lower bound for comparison based sorting algorithms
External Sorting

DYNAMIC PROGRAMMING

Overlapping Subproblems Property
Optimal Substructure Property
0-1 Knapsack Problem
Min Cost Path
Minimum number of jumps to reach end
Maximum size square sub matrix with all 1s
Matrix Chain Multiplication
Coin Change
Longest Common Substring
Longest Increasing Subsequence
Maximum Sum Increasing Subsequence
Box Stacking Problem
Rod Cutting
Minimum insertions to form a palindrome
Longest Palindromic Substring
Longest Palindromic Subsequence
Palindrome Partitioning
Dice Throw
Maximum sum rectangle in a 2D matrix
Largest Independent Set Problem
Egg Dropping Puzzle
Optimal BST
Find if a string is interleaved of two other strings
Optimimum Strategy to maximise coins to collect from either ends

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LINKED LIST

Nth node from the end of a Linked list
Reverse a Linked List
Recursive function to print reverse of a Linked List
Check if a singly linked list is a Palindrome
Delete Linked list
Detect loop in a Linked List
Detect and remove loop in a Linked List
Middle of a Linked list
Find the intersection point of two Linked Lists
Intersection of two Sorted Linked Lists
Union and Intersection of two Linked Lists
Delete Alternate Nodes of a Linked List

Rotate a Linked List by K nodes
Reverse a Linked List in groups of given size K
Reverse alternate K nodes in a Singly Linked List

Merge two sorted linked lists
Sort a linked list of 0s, 1s and 2s
Segregate even and odd nodes in a Linked List
Move vowels to end of Linked List maintaining the order
Alternating split of a given Singly Linked List
Find a triplet from three linked lists with sum equal to a given number

Add two numbers represented by linked lists
Product of two numbers given in Linked List
Pairwise swap elements of a given linked list
Swap Kth node from beginning with Kth node from end in a Linked List
Delete N nodes after M nodes of a linked list

Swap odd and even nodes in a Linked List
Merge a linked list into another linked list at alternate positions
Merge Sort for Linked Lists
Flattening a Linked List
Copy a linked list with next and arbit pointer

Memory Efficient DLL using XOR
Memory Efficient DLL

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TREES

Size of a Tree
Height of a Tree
Diameter of a Binary Tree
Maximum width of a binary tree
Check if Two Trees are Identical
Tree Traversal

Populate Inorder Successor for all nodes
Level Order Traversal
Connect nodes at same level
Level Order Traversal in Spiral Form
Reverse Level Order Traversal
Vertical Sum in a given Binary Tree
Difference between sums of odd level and even level nodes of a Binary Tree
Check if all leaves are in same level or not
Delete a tree
Zig-Zag Traversal of Tree
Boundary Traversal of binary tree
Count leaf nodes in a binary tree
Lowest Common Ancestor in a BINARY Tree
Print nodes at distance K from root
Print Left View of a Binary Tree
In a binary tree, if parent is 0, then left child is 0 and right child is 1. if parent is 1, then left c
kth node value which is present at Nth level
Convert the given Binary tree to its Double tree

Find the node with minimum value in a BST
Add all greater values to every node in a given BST
Inorder Successor in BST
Lowest Common Ancestor in a BST
Check if two trees are Isomorphic

Check if a given binary tree is SumTree or not
Check if given Binary Tree is BST or not
Check if Binary Tree is Balanced or not
Check if given BT is Complete Binary Tree or not
Check if given Binary Tree can be Folded or not
Convert Tree to its Mirror Tree
Convert a given tree to its Sum Tree
Check for children sum property
Convert a BT to a tree that holds children sum property

Convert a BST to a Binary Tree such that sum of all greater keys is added to every key
Find k-th smallest element in BST
Find pair of numbers in a BST adding upto K

Two nodes of a BST are swapped, correct the BST
Print BST keys in the given range
Remove BST keys outside the given range
Remove all nodes in a BST which lie on a path having sum less than k

Print all root-to-leaf Paths
Root to leaf path sum equal to a given number
Find the maximum sum leaf to root path in a Binary Tree
Print Ancestors of a given node
Print ancestors of a given binary tree node without recursion

BST to DLL
Sorted DLL to Balanced BST
Sorted Array to Balanced BST
Sorted Linked List to Balanced BST
Merge Two Balanced Binary Search Trees

Serialisation - storing a BT in a file
Construct Tree from given Inorder and Preorder traversals
Construct Special Binary Tree from given Inorder traversal
Construct a special tree from given preorder traversal
Construct Full Binary Tree from given preorder and postorder traversals
Construct Tree from Ancestor Matrix
Construct Ancestor Matrix from Tree

Find the largest BST subtree in a given Binary Tree if entire subtree has to be taken
Find the largest BST subtree in a given Binary Tree if part of subtree can also be taken
Find the maximum weight node in a tree if each node is the sum of the weights all the node

Morris Inorder Traversal - Threaded binary Trees
Ternary Search Tree

TRIE

STACKS & QUEUES

Implement two stacks in one array
Implement Stack using Queues
Implement Queue using Two Stacks
Implement stack with push(), pop(), getMin() [each in O(1) time]
Design a stack with operations on middle element
Check for balanced parentheses in an expression
Expression Evaluation with operator priority and multiple braces
Implement LRU Cache
The Stock Span Problem
Print the First Greater Element on the right side for each element
Largest Rectangular Area in a Histogram
Implement three stacks in one array
Find maximum element in every window of size K in an array

STRINGS

Print reverse of a string using recursion
Print all permutations of a string
Given a string find its first non-repeating character
Reverse words in a given string
Print all the duplicates in the input string
Move all even-index positioned chars to end of string maintaining even-odd order

Find Lexicographic rank of a string
Run Length Encoding
Implement atoi function
Print the first unique character in a string
Write strcmp function and returns -1 if s1 < s2, 0 if s1 = s2, else returns 1
Remove from string s1, all the characters that are present in string s2.
Check whether two strings are anagram of each other

Length of the longest substring without repeating characters
Find the smallest window in a string containing all characters of another string

Recursively remove all adjacent duplicates
Evaluate a regular expression a*b?c with aaaabcc
String Matching - KMP Algorithm

ARRAYS

Find Union and Intersection of two sorted arrays
Find the Number Occurring Odd Number of Times
Find missing number from array of N-1 numbers in the range 1 to N

Find the two non-repeating elements in an array of repeating elements
Find the two numbers with odd occurrences in an unsorted array
Find the next smallest palindrome
find the next higher permutation of the given number as an array of digits. If such a numbe
doesn't exist, return -1.

Find pair of numbers with given sum X
Find a,b,c such that a^2+b^2=c^2
Find a triplet that sum to a given value
Find four elements that sum to a given value
Find two repeating elements in a given array
Find the 3 elements such that a[i] < a[j] < a[k] and i < j < k
Find the least positive number missing in an unsorted array.
Find the row with maximum number of 1s in a 2D row-wise sorted matrix
Find Maximum difference between two elements such that the larger element appears afte
the smaller element in array
Find two numbers such that their difference is minimum
Find two elements whose sum is closest to zero
Find the first subarray which has a zero sum in an array
Find duplicates in O(n) time
Find points in an array where left-sum==right-sum
Search a number in a row wise and column wise sorted 2D matrix
Print matrix spirally
Measure amount of water in j'th glass of i'th row of glasses arranged like a pyramid
Construct Product Array without division operator: each element = product of elements in
arr[] except arr[i]
Shuffle a given array
Sort elements by frequency

Segregate Even and Odd numbers
Segregate 0s and 1s
Sort an array of 0s, 1s and 2s
Move all zeroes to end of array
Rearrange positive and negative numbers alternatively
Given an array [a1b2c3d4] convert to [abcd1234]
Maximum and minimum of an array using minimum number of comparisons

Given binary 2D Matrix, for all cells as 1, set corresponding row and column as 1
Turn an image by 90 degrees
Inplace M x N size matrix transpose
Intersection of n sets
Print Matrix Diagonally

Rotate an array by d elements
Largest Sum Contiguous Subarray
Maximum Product Subarray
Maximum Length Bitonic Subarray
Find continous subarray with given sum
Largest subarray with equal number of 0s and 1s
Maximum subsequence sum such that no two elements are adjacent
Find the majority element (with frequency > N/2)
Find the maximum repeating number

Count the number of Inversions in an array
Find kth smallest element
Stock Buy Sell to Maximize Profit
Print the elements greater than all the elements to its right
calculate the area of water collected by rain holded by bar graph/histogram

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Graphs
Graph representations
Depth First Traversal for a Graph
Breadth First Traversal for a Graph
Detect Cycle in a Directed Graph
Find if there is a path between two vertices in a directed graph
Find number of connected components in an undirected graph
Bellman Ford Algorithm
Floyd Warshall Algorithm
Kruskal's MST
Dijiktra's Shortest Path Algorithm
Union Find
Union Find by rank
Topological Sorting for DAG
Detect cycle in an undirected graph

Strongly Connected Components
Shortest Path in Directed Acyclic Graph
Maximum Bipartite Matching

Check if Bipartite Graph
Stable Marriage Problem
Longest Path in a Directed Acyclic Graph
Find maximum number of edge disjoint paths between two vertices
Graph Coloring
Travelling Salesman Problem

COMPUTATIONAL GEOMETRY
Check whether a given point lies inside a triangle or not
check if two given line segments intersect
check if a given point lies inside or outside a polygon
Convex Hull | Set 1 (Jarvis's Algorithm or Wrapping
Given n line segments, find if any two segments intersect

MATHS
Binomial Coefficient nCr
Pascal's Triangle in nth row
Select a random number from stream, with O(1) space

MISCELLANEOUS
Little and Big Endian
Memory Leak
Greedy Algorithms | Set 1 (Activity Selection Problem)
Print all subsets
Make a fair coin from a biased coin
Find the first circular tour that visits all petrol pumps

HEAP
Sort a nearly sorted (or K sorted) array

Find the k most frequent words from a file / running stream of numbers
Sort numbers stored on different machines
Huffman Coding
Program to print last 10 lines of a file
Merge k sorted arrays
Find a median in running stream of numbers.

C++

OOPS concepts like:
Inheritance, Encapsulation, Abstraction, Polymorphism
virtual function, friend function
function overloading, overriding
constuctor, templates
exception handling
storage classes,type qualifiers, modifiers,
macros,inline
memory allocation
reference, pointers

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