

# Array

Rearrange the array with alternate high and low elements

Sort binary array in linear time

Sort an array containing 0's, 1's and 2's (Dutch national flag problem)

Find pair with given sum in the array

Shuffle a given array of elements (Fisher–Yates shuffle)

Find equilibrium index of an array

Find majority element in an array (Boyer–Moore majority vote algorithm)

Move all zeros present in the array to the end

Inplace merge two sorted arrays

Merge two arrays by satisfying given constraints

Find sub-array with 0 sum

Find maximum length sub-array having given sum

Find maximum length sub-array having equal number of 0's and 1's

Find index of 0 to be replaced to get maximum length sequence of continuous ones

Find maximum product of two integers in an array

Replace each element of array with product of every other element without using division operator

Find a duplicate element in a limited range array

Find largest sub-array formed by consecutive integers

Find Longest Bitonic Subarray in an array

Find maximum difference between two elements in the array by satisfying given constraints

Maximum subarray problem (Kadane's algorithm)

Maximum Sum Circular Subarray

Find all distinct combinations of given length

Find all distinct combinations of given length with repetition allowed

Find max sequence of continuous 1's that can be formed by replacing at-most k zeroes by ones

Find minimum sum subarray of given size k

Find subarray having given sum in given array of integers

Find the length of smallest subarray whose sum of elements is greater than the given number

Find largest number possible from set of given numbers

Find the smallest window in array sorting which will make the entire array sorted

Find maximum sum path involving elements of given arrays

Maximum profit earned by buying and selling shares any number of times

Trapping Rain Water within given set of bars

Longest Increasing Subsequence

Find maximum product subarray in a given array

Find maximum sum of subsequence with no adjacent elements

Decode the array constructed from another array

Find Triplet with given sum in an array

Find min number of platforms needed in the station so to avoid any delay in arrival of any train

Merging Overlapping Intervals

Activity Selection Problem

Job Sequencing Problem with Deadlines

Introduction to Priority Queues using Binary Heaps

Min Heap and Max Heap Implementation in C++

Heap Sort (Out-of-place and In-place implementation in C++ and C)

Check if given array represents min heap or not

Convert Max Heap to Min Heap in linear time

Find K'th largest element in an array

Sort a K-Sorted Array

Merge M sorted lists of variable length

Find K'th smallest element in an array

Find smallest range with at-least one element from each of the given lists

Merge M sorted lists each containing N elements

Insertion sort | Iterative & Recursive

Selection sort | Iterative & Recursive

Bubble sort | Iterative & Recursive

Merge Sort

Quicksort

Iterative Implementation of Quicksort

Quicksort using Dutch National Flag Algorithm

Quick Sort using Hoare's Partitioning scheme

Hybrid QuickSort

External merge sort

Sort an array using one swap

Custom Sort | Sort elements by their frequency and Index

Custom Sort | Sort elements of the array by order of elements defined by the second array

Inversion Count of an array

Segregate positive and negative integers in linear time

Binary Search

Ternary Search vs Binary search

Interpolation search

Exponential search

Find number of rotations in a circularly sorted array

Search an element in a circular sorted array

Find first or last occurrence of a given number in a sorted array

Count occurrences of a number in a sorted array with duplicates

Find smallest missing element from a sorted array  
Find Floor and Ceil of a number in a sorted array  
Search in a nearly sorted array in  $O(\log n)$  time  
Find number of 1's in a sorted binary array  
Find the peak element in an array  
Maximum Sum Subarray using Divide & Conquer  
Find Minimum and Maximum element in an array using minimum comparisons  
Matrix Chain Multiplication  
0-1 Knapsack problem  
Maximize value of the expression  
Partition problem  
Subset sum problem  
Minimum Sum Partition problem  
Rod Cutting  
Coin change-making problem (unlimited supply of coins)  
Coin Change Problem – Find total number of ways to get the denomination of coins  
Longest alternating subsequence  
Combinations of words formed by replacing given numbers with corresponding alphabets  
Decode the given sequence to construct minimum number without repeated digits  
All combinations of elements satisfying given constraints

## Backtracking

Print all possible solutions to N Queens problem  
Print all Possible Knight's Tours in a chessboard  
Magnet Puzzle  
Find Shortest Path in Maze  
Find Longest Possible Route in a Matrix  
Find path from source to destination in a matrix that satisfies given constraints  
Find total number of unique paths in a maze from source to destination  
Print All Hamiltonian Path present in a graph  
Print all k-colorable configurations of the graph (Vertex coloring of graph)  
Find all Permutations of a given string  
Find all binary strings that can be formed from given wildcard pattern  
All combinations of elements satisfying given constraints

# Binary

Bit Hacks – Part 1 (Basic)

Bit Hacks – Part 2 (Playing with k'th bit)

Bit Hacks – Part 3 (Playing with rightmost set bit of a number)

Bit Hacks – Part 4 (Playing with letters of English alphabet)

Bit Hacks – Part 5 (Find absolute value of an integer without branching)

Bit Hacks – Part 6 (Random Problems)

Brian Kernighan's Algorithm to count set bits in an integer

Compute parity of a number using lookup table

Count set bits using lookup table

Find the minimum or maximum of two integers without using branching

Multiply 16-bit integers using 8-bit multiplier

Round up to the next highest power of 2

Round up to the previous power of 2

Swap individual bits at given position in an integer

Reverse Bits of a given Integer

Check if given number is power of 4 or not

Generate binary numbers between 1 to N

Efficiently implement power function | Recursive and Iterative

Find square of a number without using multiplication and division operator | 3 methods

Generate power set of a given set

Huffman Coding

# Binary Tree

Check if two given binary trees are identical or not | Iterative & Recursive

Calculate height of a binary tree | Iterative & Recursive

Delete given Binary Tree | Iterative & Recursive

Inorder Tree Traversal | Iterative & Recursive

Preorder Tree Traversal | Iterative & Recursive

Postorder Tree Traversal | Iterative & Recursive

Level Order Traversal of Binary Tree

Spiral Order Traversal of Binary Tree

Reverse Level Order Traversal of Binary Tree

Print all nodes of a given binary tree in specific order

Print left view of binary tree  
Print Bottom View of Binary Tree  
Print Top View of Binary Tree  
Find next node in same level for given node in a binary tree  
Check if given binary tree is complete binary tree or not  
Determine if given two nodes are cousins of each other  
Print cousins of given node in a binary tree  
In-place convert given binary tree to its sum tree  
Check if given binary tree is a sum tree or not  
Combinations of words formed by replacing given numbers with corresponding alphabets  
Determine if given binary tree is a subtree of another binary tree or not  
Find diameter of a binary tree  
Check if given binary Tree has symmetric structure or not  
Convert binary tree to its mirror  
Determine if binary tree can be converted to another by doing any no. of swaps of left & right child  
Find Lowest Common Ancestor (LCA) of two nodes in a binary tree  
Print all paths from root to leaf nodes in given binary tree  
Find ancestors of given node in a Binary Tree  
Find the distance between given pairs of nodes in a binary tree  
Find Vertical Sum in a given Binary Tree  
Print nodes in vertical order of a given Binary Tree (Vertical Traversal)  
Find the diagonal sum of given binary tree  
Print Diagonal Traversal of Binary Tree  
Print corner nodes of every level in binary tree  
In-place convert convert given Binary Tree to Doubly Linked List  
Sink nodes containing zero to the bottom of the binary tree  
Convert given binary tree to full tree by removing half nodes  
Truncate given binary tree to remove nodes which lie on a path having sum less than K  
Find maximum sum root-to-leaf path in a binary tree  
Check if given binary tree is height balanced or not  
Convert normal binary tree to Left-child right-sibling binary tree

Determine if given Binary Tree is a BST or not  
Convert a Binary Tree to BST by maintaining its original structure

# Binary Search Tree (BST)

Insertion in BST

Search given key in BST

Deletion from BST

Construct balanced BST from given keys

Determine if given Binary Tree is a BST or not

Check if given keys represents same BSTs or not without building the BST

Find inorder predecessor for given key in a BST

Find Lowest Common Ancestor (LCA) of two nodes in a Binary Search Tree

Find K'th smallest and K'th largest element in BST

Floor and Ceil in a Binary Search Tree

Find optimal cost to construct binary search tree

Convert a Binary Tree to BST by maintaining its original structure

# Divide & Conquer

Binary Search

Ternary Search vs Binary search

Exponential search

Interpolation search

Find number of rotations in a circularly sorted array

Search an element in a circular sorted array

Find first or last occurrence of a given number in a sorted array

Count occurrences of a number in a sorted array with duplicates

Find smallest missing element from a sorted array

Find Floor and Ceil of a number in a sorted array

Search in a nearly sorted array in  $O(\log n)$  time

Find number of 1's in a sorted binary array

Find the peak element in an array

Maximum Sum Subarray using Divide & Conquer

Find Minimum and Maximum element in an array using minimum comparisons

Efficiently implement power function | Recursive and Iterative

Merge Sort

Merge Sort for Singly Linked List

Inversion Count of an array

Quicksort  
Iterative Implementation of Quicksort  
Quicksort using Dutch National Flag Algorithm  
Quick Sort using Hoare's Partitioning scheme  
Hybrid QuickSort

## Dynamic Programming

Introduction to Dynamic Programming  
Longest Common Subsequence | Introduction & LCS Length  
Longest Common Subsequence | Space optimized version  
Longest Common Subsequence | Finding all LCS  
Longest Common Subsequence of K-sequences  
Longest Common Substring problem  
Longest Palindromic Subsequence using Dynamic Programming  
Longest Repeated Subsequence problem  
Implement Diff Utility  
Shortest Common Supersequence | Introduction & SCS Length  
Shortest Common Supersequence | Finding all SCS  
Shortest Common Supersequence | Using LCS  
Longest Increasing Subsequence using Dynamic Programming  
Longest Bitonic Subsequence  
Increasing Subsequence with Maximum Sum  
The Levenshtein distance (Edit distance) problem  
Find size of largest square sub-matrix of 1's present in given binary matrix  
Matrix Chain Multiplication  
Find the minimum cost to reach last cell of the matrix from its first cell  
Find longest sequence formed by adjacent numbers in the matrix  
Count number of paths in a matrix with given cost to reach destination cell  
0-1 Knapsack problem  
Maximize value of the expression  
Partition problem  
Subset sum problem  
Minimum Sum Partition problem  
Find all N-digit binary strings without any consecutive 1's  
Rod Cutting  
Maximum Product Rod Cutting  
Coin change-making problem (unlimited supply of coins)

Coin Change Problem – Find total number of ways to get the denomination of coins  
Longest alternating subsequence  
Count number of times a pattern appears in given string as a subsequence  
Collect maximum points in a matrix by satisfying given constraints  
Count total possible combinations of N-digit numbers in a mobile keypad  
Find optimal cost to construct binary search tree  
Word Break Problem  
Wildcard Pattern Matching

Find probability that a person is alive after taking N steps on the island  
Calculate sum of all elements in a sub-matrix in constant time  
Find maximum sum K x K sub-matrix in a given M x N matrix  
Find maximum sum submatrix present in a given matrix  
Find maximum sum of subsequence with no adjacent elements  
Maximum subarray problem (Kadane's algorithm)  
Single-Source Shortest Paths – Bellman Ford Algorithm  
All-Pairs Shortest Paths – Floyd Warshall Algorithm

## Graphs

Terminology and Representations of Graphs  
Graph Implementation using STL  
Graph Implementation in C++ without using STL  
Breadth First Search (BFS) | Iterative & Recursive Implementation  
Depth First Search (DFS) | Iterative & Recursive Implementation  
Arrival and Departure Time of Vertices in DFS  
Types of edges involved in DFS and relation between them  
Bipartite Graph  
Minimum number of throws required to win Snake and Ladder game  
Topological Sorting in a DAG  
Transitive Closure of a Graph  
Check if an undirected graph contains cycle or not  
Total number of paths in given digraph from given source to destination having exactly m edges  
Determine if an undirected graph is a Tree (Acyclic Connected Graph)  
2-Edge Connectivity in the graph  
2-Vertex Connectivity in the graph  
Check if given digraph is a DAG (Directed Acyclic Graph) or not  
Disjoint-Set Data Structure (Union-Find Algorithm)

Chess Knight Problem – Find Shortest path from source to destination  
Check if given Graph is Strongly Connected or not  
Check if given Graph is Strongly Connected or not using one DFS Traversal  
Union-Find Algorithm for Cycle Detection in undirected graph  
Kruskal's Algorithm for finding Minimum Spanning Tree  
Single-Source Shortest Paths – Dijkstra's Algorithm  
Single-Source Shortest Paths – Bellman Ford Algorithm  
All-Pairs Shortest Paths – Floyd Warshall Algorithm

Print all k-colorable configurations of the graph (Vertex coloring of graph)  
Print All Hamiltonian Path present in a graph  
Greedy coloring of graph

## Heaps

Introduction to Priority Queues using Binary Heaps  
Min Heap and Max Heap Implementation in C++  
Heap Sort (Out-of-place and In-place implementation in C++ and C)  
Check if given array represents min heap or not  
Convert Max Heap to Min Heap in linear time  
Find K'th largest element in an array  
Sort a K-Sorted Array  
Merge M sorted lists of variable length  
Find K'th smallest element in an array  
Find smallest range with at-least one element from each of the given lists  
Merge M sorted lists each containing N elements

External merge sort  
Huffman Coding  
Find first k maximum occurring words in given set of strings  
Find first k non-repeating characters in a string in single traversal

## Linked Lists

Introduction to Linked Lists  
Linked List Implementation | Part 1

Linked List Implementation | Part 2

Static Linked List in C

Clone given Linked List

Delete Linked List

Pop operation in linked list

Insert given node into the correct sorted position in the given sorted linked list

Given a linked list, change it to be in sorted order

Split the nodes of the given linked list into front and back halves

Remove duplicates from a sorted linked list

Move front node of the given list to the front of the another list

Rearrange the given list such that every even node will be moved to end of the list in reverse order

Split given linked list into two lists where each list containing alternating elements from it

Construct a linked list by merging alternate nodes of two given lists

Merge given sorted linked lists into one

Merge Sort for Singly Linked List

Intersection of two given sorted linked lists

Reverse linked list | Part 1 (Iterative Solution)

Reverse linked list | Part 2 (Recursive Solution)

Reverse every group of k nodes in given linked list

Find K'th node from the end in a linked list

Merge alternate nodes of two linked lists into the first list

Merge two sorted linked lists from their end

Delete every N nodes in a linked list after skipping M nodes

Rearrange linked list in specific manner in linear time

Check if linked list is palindrome or not

Move last node to front in a given Linked List

Rearrange the linked list in specific manner

Detect Cycle in a linked list (Floyd's Cycle Detection Algorithm)

Sort linked list containing 0's, 1's and 2's

## Matrix

Print Matrix in Spiral Order

Create Spiral Matrix from given array

Shift all matrix elements by 1 in Spiral Order

Find Shortest path from source to destination in a matrix that satisfies given constraints

Change all elements of row i and column j in a matrix to 0 if cell (i, j) has value 0

Print diagonal elements of the matrix having positive slope

Find all paths from first cell to last cell of a matrix  
Replace all occurrences of 0 that are not surrounded by 1 in a binary matrix  
In-place rotate the matrix by 90 degrees in clock-wise direction  
Count negative elements present in sorted matrix in linear time  
Report all occurrences of an element in row wise and column wise sorted matrix in linear time  
Calculate sum of all elements in a sub-matrix in constant time  
Find maximum sum  $K \times K$  sub-matrix in a given  $M \times N$  matrix  
Find maximum sum submatrix present in a given matrix  
Find probability that a person is alive after taking  $N$  steps on the island  
Count the number of islands  
Flood fill Algorithm  
Find shortest safe route in a field with sensors present  
Find all occurrences of given string in a character matrix  
Lee algorithm | Shortest path in a Maze

Travelling Salesman Problem using Branch and Bound  
Collect maximum points in a matrix by satisfying given constraints  
Count number of paths in a matrix with given cost to reach destination cell  
Find longest sequence formed by adjacent numbers in the matrix  
Find the minimum cost to reach last cell of the matrix from its first cell  
Matrix Chain Multiplication  
Find size of largest square sub-matrix of 1's present in given binary matrix  
Chess Knight Problem – Find Shortest path from source to destination  
Find Duplicate rows in a binary matrix  
Print all possible solutions to  $N$  Queens problem  
Print all Possible Knight's Tours in a chessboard  
Find Shortest Path in Maze  
Find Longest Possible Route in a Matrix

## Queue

Chess Knight Problem – Find Shortest path from source to destination  
Lee algorithm | Shortest path in a Maze  
Find shortest safe route in a field with sensors present  
Flood fill Algorithm  
Count the number of islands  
Find Shortest path from source to destination in a matrix that satisfies given constraints  
Generate binary numbers between 1 to  $N$

Calculate height of a binary tree | Iterative & Recursive  
Delete given Binary Tree | Iterative & Recursive  
Level Order Traversal of Binary Tree  
Spiral Order Traversal of Binary Tree  
Reverse Level Order Traversal of Binary Tree  
Print all nodes of a given binary tree in specific order  
Print left view of binary tree  
Find next node in same level for given node in a binary tree  
Check if given binary tree is complete binary tree or not  
Print Diagonal Traversal of Binary Tree  
Print corner nodes of every level in binary tree  
Breadth First Search (BFS) | Iterative & Recursive Implementation  
Minimum number of throws required to win Snake and Ladder game  
Check if an undirected graph contains cycle or not

## Sorting

Insertion sort | Iterative & Recursive  
Selection sort | Iterative & Recursive  
Bubble sort | Iterative & Recursive  
Merge Sort  
Quicksort  
Iterative Implementation of Quicksort  
Hybrid QuickSort  
Quicksort using Dutch National Flag Algorithm  
Quick Sort using Hoare's Partitioning scheme  
External merge sort  
Custom Sort | Sort elements by their frequency and Index  
Custom Sort | Sort elements of the array by order of elements defined by the second array  
Inversion Count of an array  
Segregate positive and negative integers in linear time  
Sort linked list containing 0's, 1's and 2's

Find the smallest window in array sorting which will make the entire array sorted  
Find largest number possible from set of given numbers  
Move all zeros present in the array to the end  
Sort linked list containing 0's, 1's and 2's

Sort binary array in linear time  
Merge Sort for Singly Linked List  
Group anagrams together from given list of words  
Activity Selection Problem  
Lexicographic sorting of given set of keys  
Heap Sort (Out-of-place and In-place implementation in C++ and C)  
Merge M sorted lists of variable length  
Merge M sorted lists each containing N elements  
Find all palindromic permutations of a string  
Find all lexicographically next permutations of a string sorted in ascending order  
Merge two sorted linked lists from their end  
Sort an array containing 0's, 1's and 2's (Dutch national flag problem)  
Find pair with given sum in the array  
Inplace merge two sorted arrays  
Merge two arrays by satisfying given constraints  
Find maximum product of two integers in an array  
Find all distinct combinations of given length  
Find all distinct combinations of given length with repetition allowed  
Merging Overlapping Intervals  
Sort an array using one swap

## Stack

Check if given expression is balanced expression or not  
Find duplicate parenthesis in an expression  
Evaluate given postfix expression  
Decode the given sequence to construct minimum number without repeated digits

Inorder Tree Traversal | Iterative & Recursive  
Preorder Tree Traversal | Iterative & Recursive  
Postorder Tree Traversal | Iterative & Recursive  
Find ancestors of given node in a Binary Tree  
Check if two given binary trees are identical or not | Iterative & Recursive  
Reverse given text without reversing the individual words  
Find all binary strings that can be formed from given wildcard pattern  
Iterative Implementation of Quicksort  
Depth First Search (DFS) | Iterative & Recursive Implementation

# String

Check if given set of moves is circular or not

Check if given string is a rotated palindrome or not

Longest Palindromic Substring (Non-DP Space Optimized Solution)

Check if repeated subsequence is present in the string or not

Check if strings can be derived from each other by circularly rotating them

Convert given number into corresponding excel column name

Determine if two strings are anagram or not

Find all binary strings that can be formed from given wildcard pattern

Find all interleavings of given strings

Isomorphic Strings

Find all possible palindromic substrings in a string

Find all possible combinations of words formed from mobile keypad

Find all possible combinations by replacing given digits with characters of the corresponding list

Find all words from given list that follows same order of characters as given pattern

Find first k non-repeating characters in a string in single traversal

Group anagrams together from given list of words

Introduction to Pattern Matching

Inplace remove all occurrences of 'AB' and 'C' from the string

Longest even length palindromic sum substring

Print string in zig-zag form in k rows

Reverse given text without reversing the individual words

Run Length Encoding (RLE) data compression algorithm

Validate an IP address

Find the longest substring of given string containing k distinct characters

Find all palindromic permutations of a string

Find all substrings of a string that are permutation of a given string

Find the longest substring of given string containing all distinct characters

Find all Permutations of a given string

Find all lexicographically next permutations of a string sorted in ascending order

Find Lexicographically minimal string rotation

Find all strings of given length containing balanced parentheses

Find all N-digit binary numbers with k-bits set where k ranges from 1 to N

Generate binary numbers between 1 to N

Find all combinations of non-overlapping substrings of a string

Check if given sentence is syntactically correct or not

Calculate rank of given string among all its lexicographically sorted permutations  
Length of longest continuous sequence with same sum in given binary arrays

Combinations of words formed by replacing given numbers with corresponding alphabets

Word Break Problem

Wildcard Pattern Matching

Count number of times a pattern appears in given string as a subsequence

The Levenshtein distance (Edit distance) problem

Longest Common Subsequence | Introduction & LCS Length

Longest Common Subsequence | Space optimized version

Longest Common Subsequence | Finding all LCS

Longest Common Subsequence of K-sequences

Longest Repeated Subsequence problem

Longest Palindromic Subsequence using Dynamic Programming

Longest Common Substring problem

Implement Diff Utility

Shortest Common Supersequence | Introduction & SCS Length

Shortest Common Supersequence | Finding all SCS

Shortest Common Supersequence | Using LCS

## Trie

Trie Implementation | Insert, Search and Delete

Memory efficient Trie Implementation using Map | Insert, Search and Delete

Longest Common Prefix in given set of strings (using Trie)

Lexicographic sorting of given set of keys

Find maximum occurring word in given set of strings

Find first k maximum occurring words in given set of strings

Find Duplicate rows in a binary matrix

## Greedy

Activity Selection Problem

Huffman Coding

Shortest Superstring Problem

Job Sequencing Problem with Deadlines

Greedy coloring of graph

Kruskal's Algorithm for finding Minimum Spanning Tree

Single-Source Shortest Paths – Dijkstra's Algorithm

## Puzzles

Clock angle problem – Find ? between hour and minute hand

Add two numbers without using addition operator | 4 methods

Generate power set of a given set

Implement power function without using multiplication and division operators

Print all numbers between 1 to N without using semicolon

Swap two numbers without using third variable | 5 methods

Determine the if condition to print specific output

Find maximum, minimum of three numbers without using conditional statement and ternary operator | 4 methods

Find numbers represented as sum of two cubes for two different pairs

Print "Hello World" with empty main() function | 3 methods

Tower of Hanoi Problem

Print all numbers between 1 to N without using any loop | 4 methods

Print a semicolon without using semicolon anywhere in the program

Multiply two numbers without using multiplication operator or loops

Find square of a number without using multiplication and division operator | 3 methods

Magnet Puzzle

**Thank you all for your valuable time and being with us.**