

# 1. Arrays & Strings

Term	Definition
<b>Subarray</b>	A contiguous portion of an array
<b>Subsequence</b>	A sequence derived by deleting elements without changing their order
<b>Monotonic</b>	Elements are entirely non-decreasing or non-increasing
<b>Circular Array</b>	Array where the end connects to the beginning
<b>Partition</b>	Dividing array into parts based on specific criteria
<b>Kadane's Algorithm</b>	Technique to find maximum sum subarray
<b>Two Pointers</b>	Using two index pointers to solve array problems
<b>Sliding Window</b>	Technique of maintaining a window that slides through an array
<b>Prefix Sum</b>	Array where each element is sum of all previous elements
<b>Suffix Sum</b>	Array where each element is sum of all elements after it
<b>Rotation</b>	Shifting array elements by a certain offset
<b>In-place</b>	Algorithm that transforms input without creating another data structure
<b>Anagram</b>	A word created by rearranging the letters of another word or phrase, using all the original letters exactly once
<b>Substring</b>	A contiguous block of a string (like subarray but for strings).
<b>Palindrome</b>	Strings that read the same forward and backward.
<b>Lexicographic Order</b>	Dictionary ordering of strings

## 2. Trees

Term	Definition
Binary Tree	Tree where each node has at most two children
BST (Binary Search Tree)	Binary tree where left child < parent < right child
Complete Binary Tree	Every level filled except possibly last, which is filled left to right
Perfect Binary Tree	All internal nodes have exactly two children and all leaf nodes are at same level
Balanced Tree	Height difference between left and right subtrees is limited (often $\leq 1$ )
Self-Balancing Tree	Automatically maintains balance after insertions/deletions (e.g. AVL, Red-Black)
Traversal	Methods to visit all nodes (preorder, inorder, postorder, level-order)
Lowest Common Ancestor (LCA)	Deepest node that is an ancestor of two given nodes
Serialization/Deserialization	Converting a tree to/from a string representation
Diameter	Longest path between any two nodes in a tree
Level Order	Processing tree nodes level by level
Segment Tree	Data structure for range queries
BFS	Traversing the tree level by level
Height	Longest path from node to a leaf
Depth	Distance from root to a node
Heap	Complete binary tree where each parent node is $\leq$ (min-heap) or $\geq$ (max-heap) its children.
DFS	Traversing the tree in a depth-first manner

# 3. Graphs

Term	Definition
Directed / Undirected	Edges with/without direction
Weighted/Unweighted	Edges with/without values – known as weights
Connected Component	Subset of vertices where any two vertices are connected by a path
Strongly Connected Component (SCC)	In a directed graph, subset where every vertex is reachable from every other
Bipartite Graph	Can be divided into two sets with no edges within each set
DAG (Directed Acyclic Graph)	Directed graph with no cycles
Topological Sort	Linear ordering of vertices where for every edge $(u,v)$ , $u$ comes before $v$ . Works with DAGs
Adjacency List	Graph representation where vertices store a list of their neighbouring vertices
BFS/DFS	Traversal strategies. Short for Breadth-First Search and Depth-First Search
MST (Minimum Spanning Tree)	Tree connecting all vertices with minimum total edge weight. Prim's and Kruskal's
Bellman-Ford/Dijkstra /Floyd-Warshall	Shortest path algorithms
Union-Find	Data structure for disjoint sets operations
Cycle Detection	Algorithms to find cycles in graphs
A* Algorithm	Best-first search algorithm for path finding

# 4. Heaps

Term	Definition
Min Heap / Max Heap	Tree-based data structure where parent is smaller/larger than children
Heap Sort	Sorting algorithm using a heap
Priority Queue	Abstract data type providing efficient access to the minimum/maximum element
Heapify	Process of creating a heap from an array
K-Way Merge	Merging k sorted arrays/lists (often using heaps)
Build Heap	The process of running heapify() on the entire heap to create a valid heap
Two Heaps	A technique / pattern used to find the median of a data stream using a max and a min heap

# 5. Backtracking

Term	Definition
Subsets	Set A is a subset to Set B if all of its elements are found in Set B
Combinations	Number of ways of selection and arrangement of items where <b>order does not matter</b>
Permutations	Number of ways of selection and arrangement of items where <b>order matters</b>
Pruning	Used to eliminate branches early on that can never lead to valid solutions
Constraint	A condition that must be satisfied to reach a valid solution.
Base Case	Determines when a valid solution has been found
Unique Combination	Two combinations are unique if the frequency of chosen numbers is not the same

# 6. Dynamic Programming

Term	Definition
Memoization	Cache technique to avoid redundant calculations
Tabulation	Bottom-up approach using arrays to store subproblem results
State	Snapshot of the progress you've made in solving the larger problem
Overlapping Subproblems	When the same subproblems are solved multiple times
1 Dimensional	The result for the current state only depends on one previous state or a linear history, e.g. Fib
2 Dimensional	The problem depends on two varying factors, often two strings, two sequences, or two indices
Longest Common Subsequence (LCS)	Finding the longest subsequence common to two sequences
LIS (Longest Increasing Subsequence)	Finding the longest subsequence where elements are in ascending order
0 / 1 Knapsack	Pick the items such that profit can be maximized. Each item can be picked at most <b>once</b>
Unbounded Knapsack	Same as 0 / 1 Knapsack but each item can be picked <b>unlimited</b> times

# 7. Miscellaneous

Term	Definition
Amortized Analysis	Analyzing average performance over a sequence of operations
Randomized Algorithm	Algorithm that uses random numbers to decide next step
Skip List	Probabilistic data structure for efficient search
Execution Time	The raw time taken in seconds to execute an algorithm
Stable Sorting Algorithm	A sorting algorithm that maintains the relative order of elements after sorting
Unstable Sorting Algorithm	A sorting algorithm that does not maintain the relative order of elements after sorting