

Topic	Approach / Concept	Signature Problems	Time Complexity Range	Status
Arrays & Hashing	Prefix Sum / Difference Array	Range sum queries, range update	$O(n)$ preprocessing + $O(1)$ query	
Arrays & Hashing	Sliding Window (fixed/variable)	Max sum subarray, smallest subarray with sum $\geq K$	$O(n)$	
Arrays & Hashing	Two Pointers (opposite/same dir)	Two sum sorted, remove duplicates, trapping rainwater	$O(n)$	
Arrays & Hashing	Kadane's Algorithm	Maximum subarray sum (normal & circular)	$O(n)$	
Arrays & Hashing	Binary Search on Answer	Minimize max distance, capacity to ship packages	$O(n \log R)$	
Arrays & Hashing	Partitioning / Quickselect	K-th largest element	$O(n)$ avg, $O(n^2)$ worst	
Arrays & Hashing	Hash Map / Set Usage	Subarray sum = K, anagrams detection	$O(n)$	
Arrays & Hashing	Prefix XOR	Count subarrays with XOR = K	$O(n)$	
Strings	Two Pointers	Palindrome check, reverse vowels	$O(n)$	
Strings	KMP / Z / Rabin-Karp	String pattern matching	$O(n+m)$	
Strings	Manacher's Algorithm	Longest palindromic substring	$O(n)$	
Strings	Sliding Window + Freq Count	Find all anagrams, min window substring	$O(n)$	
Strings	Trie	Autocomplete, word break	$O(L)$ per word	
Strings	Rolling Hash	Detect duplicate substring	$O(n)$	
Strings	Suffix Array / Automaton	Lexicographic substring problems	$O(n \log n)$	
Strings	DP on Strings	Edit distance, LCS, regex match	$O(n^2)$	
Linked Lists	Fast & Slow Pointers	Detect cycle, middle of list	$O(n)$	
Linked Lists	Reverse In-Place	Reverse linked list, reverse between m & n	$O(n)$	
Linked Lists	Merge Techniques	Merge two sorted lists, k-way merge	$O(n \log k)$	
Linked Lists	Linked List to Tree	Sorted list to BST	$O(n)$	
Linked Lists	Pointer Manipulation	Remove N-th node from end	$O(n)$	
Stacks & Queues	Monotonic Stack / Queue	Next greater element, histogram area	$O(n)$	
Stacks & Queues	Stack for State Tracking	Valid parentheses, min stack	$O(n)$	
Stacks & Queues	Queue for BFS	Level order traversal	$O(n)$	
Stacks & Queues	Two Stacks $\rightarrow$ Queue	Implement queue using stacks	$O(1)$ amortized	
Trees	DFS / BFS Traversals	Inorder, preorder, postorder, zigzag	$O(n)$	
Trees	Recursive Divide & Conquer	Balanced BST construction	$O(n)$	
Trees	BST Operations	Validate BST, insert, delete	$O(h)$	
Trees	Lowest Common Ancestor	LCA with recursion or parent map	$O(h)$	
Trees	Diameter / Height Calc	Tree diameter in one DFS	$O(n)$	
Trees	Morris Traversal	$O(1)$ space inorder traversal	$O(n)$	
Trees	Serialization / Deserialization	Serialize tree to array/string	$O(n)$	
Trees	Segment Tree / Fenwick Tree	Range sum/min/max queries	$O(\log n)$	
Graphs	DFS / BFS	Connected components, path existence	$O(V+E)$	
Graphs	Topological Sort	Course schedule	$O(V+E)$	
Graphs	Cycle Detection	Union-Find / DFS coloring	$O(V+E)$	

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Graphs	Shortest Path	Dijkstra, Bellman-Ford	$O(E \log V)$	
Graphs	MST	Kruskal, Prim	$O(E \log V)$	
Graphs	Union-Find	Connected components	$O(\alpha(n))$	
Graphs	Tarjan's Algorithm	Bridges, SCC	$O(V+E)$	
Graphs	Bipartite Check	BFS/DFS coloring	$O(V+E)$	
Heaps & PQ	Heap Basics	K-th largest, heapify	$O(n)$ build	
Heaps & PQ	Two Heaps	Median finder	$O(\log n)$	
Heaps & PQ	Top-K Problems	Top K frequent elements	$O(n \log k)$	
Dynamic Programming	1D DP	Climbing stairs, house robber	$O(n)$	
Dynamic Programming	2D DP	Grid paths, min path sum	$O(n^2)$	
Dynamic Programming	Knapsack Variants	0/1, unbounded, subset sum	$O(nW)$	
Dynamic Programming	State Compression	Bitmask TSP	$O(2^n * n)$	
Dynamic Programming	Subsequences DP	LIS, LCS, count subsequences	$O(n^2)$	
Dynamic Programming	Interval DP	Matrix chain multiplication	$O(n^3)$	
Dynamic Programming	Tree DP	Max independent set	$O(n)$	
Dynamic Programming	Digit DP	Count numbers with constraints	$O(\text{digits} * \text{tight} * \text{mask})$	
Bit Manipulation	Masking & Shifting	Power of two check	$O(1)$	
Bit Manipulation	XOR Props	Single number, missing number	$O(n)$	
Bit Manipulation	Bit DP	TSP, subset enumeration	$O(2^n * n)$	
Bit Manipulation	Brian Kernighan's	Count set bits	$O(\# \text{bits set})$	
Math & Geometry	Modular Arithmetic	Mod exp, mod inverse	$O(\log n)$	
Math & Geometry	Number Theory	GCD, LCM, sieve	$O(n \log \log n)$	
Math & Geometry	Geometry	Convex hull, sweep line	$O(n \log n)$	
Math & Geometry	Probability / Combinatorics	$nCr$ , Pascal's triangle	$O(n^2)$	
Patterns	Meet in the Middle	Subset sum	$O(2^{n/2})$	
Patterns	Greedy + Sorting	Interval scheduling	$O(n \log n)$	
Patterns	Backtracking	N-queens, permutations	$O(n!)$	
Patterns	Search Space Reduction	Pruning, constraint propagation	Depends	
Patterns	Simulation	Game of life, LRU cache	$O(n*m)$	