**Basic**

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**1: Pattern printing problems**

**2: Analysis of time complexity**

**3: Linear Search problems**

**4: Circular array using simple array**

**5: Palidrom, Perfect number**

**6: Simple Hashing problems**

**7: Prefix Sum Problems 1D/2D**

**8: Sliding window technich (1/5)**

**Intermewdiate**

**----------**

**1: Binary Search problesm (2/5)**

**2: Find GCD of 2 numbers in LogN (Euclined and Extended euclined algo)**

**3: Prime in Sqrt(n) complexity**

**4: Seive of Eratosthenes**

**5: Segmented Seive**

**6: Finding the prime factorization of a number in logn per query**

**7: Euler Totient function**

**8: Fermet Little theorem**

**Number Theory**

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**1: Finding x^n in LogN**

**2: Modular Arithmetic**

**3: Module Inverse of a number**

**4: Chines remainder theorem**

**5: Factorial Modulo Mod**

**6: Finding nCr & nPr in queries**

**7: Inclusion Exclusion principle**

**Some Advanced**

**----------**

**1: Learn about basic sorting Algorithms (Bubbel, Selectiom, Insertion)**

**2: Constructive and having swap terms in it**

**3: Bit Manupulation problems(Left shift,Right shift, Set bit, MSB LSB etc) (Hackerearth as good tuts)**

**4: Power set of a given array or string using BIT**

**5: Number of subarray with XOR as ZERO (Not alogirithm, but a nust do problem)**

**6: Greedy Algoriths Tag**

**7: Kadan's Algorithms and problem related to them**

**8: Job sequesnce and activity selection problem**

**Recursion**

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**1: Recurssion probelms like finding factorial**

**2: Implement Binary search using recursion**

**3: Implement modular exponent**

**4: Solve recursion problem like finding subset with given sum and other problesm**

**Advanced**

**---------**

**1: Learn Merge Sort & Quick sort algorithms**

**2: Do backtracking problems like Sudoku and N-Queen problem (Help in DP path problems)**

**3: Meet in the middle algo and probs**

**4: Devide & Conquer problesm on Codeforces**

**5: Find next greater / Next samller element using stack**

**6: problesm related to paranthesis**

**7: Largest ractangular area in Histogram**

**8: Probleam related to Heap (Priority Queue)**

**Practice Hard on above problesm**

**More Advanced Don't GiveUP (1-4 hr in a problem)**

**----------**

**1: Hashing on strings, know wh ncollision happens (cpalgorithm site)**

**2: Rabin karp algo**

**3: Prefix function**

**4: KMP Algo**

**5: Z-Function**

**6: Manacher's Algo (Solve bunch of problem in above topic)**

**Trees**

**----------**

**1: Tree / Graph representation**

**2: DFS/BFS traversel in tree /graph**

**3: Diameter of a tree/Height/**

**4: Euler TOur fo tree**

**5: Finding LCA using Euler Tour / Binary Lifting**

**6: DIstance b/w two nodes**

**7: Subtree Problems (Solve prob on abos tree prob)**

**Graph**

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**1: Connected Components**

**2: Topilogical sort**

**3: Cyclic detection in graph**

**4: Bipartite check in graph**

**5: SCC using Kosaraju's alog**

**6: Dijkarta's Algo**

**7: Belmenford Algo**

**8: Floyd warshall algo (Solver more problems on above topic - Hackerearht/Codeforce)**

**9: Bridge in Grapgh**

**10: Articulation point in graph**

**11: Minimum spanning tree & kruskal algo**

**12: Prim's Alog**

**13: 0/1 BFS in linear time (cpalgo)**

**14: Finding bridgesin graph (Solve prob)**

**Dynamic Programming**

**----------**

**1: Start with Recusion & Memoization with strong knowledge**

**2: Knapsack prob solve**

**3: Solve AtCoder Educational contest on DP 26/26 solve**

**4: Solve problem from SPOJ then Codeforces**

**5: Understand how we write recurrence for Digit DP(CF blog)**

**6: Read DP with bitmasks and solve on hackerearth**

**7: DP in trees (Rajit jain video)**

**8: SOS DP**

**9: Practice More**

**More**

**------**

**1: Disjoint Set(Using all optimizations)**

**2: Offline Quesries using Disjoint Set**

**3: Kruskal's Alog**

**4: Sparse Table (Not Imp)**

**5: Fenwick Tree (Read Update Trick also)**

**6: Binary Lifting on fenwick tree (More Solve prob)**

**And More**

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**1: Matrix Exponentiation**

**2: Sqrt Decomposition**

**3: Update and query operations**

**4: Mo's Algo (Codeforce blog)**

**5: Mo's Algo on Trees**

**6: Segment Tree (Most Imp topic - Range queries and point updates)**

**7: Lazy propogation in segment tress**

**This help you tille E- level on Codeforces as least**

**At Last**

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**1: Sprague-Grundy Theorem**

**2: Flows and related prob**

**3: Heavy light decomposition**

**4: Convex Hull Alog**

**5: FFT/NTT**