

| Milestone | Module | Topic | Sub Topic |
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| DSA Sem 1 | C --> CPP | Basics1 | |
| | | Basics2 | |
| | Intro to Algorithms, TC and SC | Intro to Algorithms and Optimizations | DS/Algo Intro with Dijktras |
| | | | Factors Count Optimisation |
| | | TC and SC Complexity 1 | Calculating Iterations |
| | | | Comparing 2 Algorithms |
| | | | How to Calculate Big O |
| | | TC and SC Complexity 2 | Asymptotic Analysis - Big O |
| | | | Issue in BigO |
| | | | Importance of Constraints |
| | | | Why TLE Occurs ? |
| | | Amortized Analysis | What is Amortized analysis? |
| | | | Types of Amortized Analysis |
| | | | Amortized Complexity Examples |
| | Array Basics | Simple Array 1 | Count no of elements with atleast 1 ele > itself |
| | | | Pair sum = k |
| | | | Vector Intro, Pass by value and passby reference |
| | | Simple Array 2 | Rotate arr[] by k times and optimisation |
| | | | Count no of distinct elements |
| | | | Arrays of Vectors or Vector of Vectors |
| | Array Optimization Techniques | CarryForward 1 | Leaders in Array |
| | | | Buy and Sell Stocks |
| | | | Ag Pairs |
| | | CarryForward 2 | Equilibrium Index |
| | | | Count GFG Pairs |
| | | | Count Triplets $i < j < k$ && $arr[i] < arr[j] < arr[k]$ |
| | | Precomputation : Pf Sums | Range Sum Queries |
| | | | 0-1 Prefix Sum |
| | | Subarrays 1 : Intro and Kadanes | Print all subarrays |
| | | | Print all subarray sums |
| | | | Print max subarray sum |
| | | Subarrays 2 : Contribution and Sliding Window | Sum of all subarray sums |
| | | | Max subarray sum of len = k |
| | | 2D Mat : 1 | Print row wise and column wise sum |
| | | | Identiy matrix |
| | | | Diagonal Printing |
| | | 2D Mat : 2 | Transpose |
| | | | Rotate 90 degrees |
| | | | Spiral Printing |
| | | 2D Mat : 3 | Matrix multiplication |
| | | | Make zero |

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| | Bit Manipulations | Bit Manipulation 1 | Introduction to Number System |
| | | | Binary to Decimal and Decimal to Binary |
| | | | Addition of Binary Numbers |
| | | | Bitwise Operations |
| | | | Negative Numbers |
| | | | Ranges |
| | | | Importance of Constraints |
| | | Bit Manipulation 2 | Bit Wise Properties |
| | | | Single Number |
| | | | Left Shift |
| | | | Right Shift |
| | | | Basic Problems a. Check bit b. Count Set Bits c. Toggle Bit d. Set Bit |
| | | Bit Manipulation 3 | Single Element 1 (Every element 2 times and one unique element) |
| | | | Single Element 2 (Every element 3 times and one unique element) |
| | | | Single Number 3 (Every element 2 times and 2 unique elements). |
| | | Bit Manipulation 4 | Min XOR Pair |
| | | | Max AND Pair |
| | | Bit Manipulation 5 | Subsets and Subsequences Intro |
| | | | Check if there exists a subset with sum = k |
| | | Bit Manipulation 6 | Fast exponentiation using powers |
| | | | Sum of xor of all pairs |
| | Maths | Maths 1 | % Modular Arithmetic |
| | | | Pairs with $(a+b)\%M = 0$ |
| | | Maths 2 : % Modular Arithmetic | For every number from 1 to N get frequency |
| | | | Prime or Not ? |
| | | | Prime from 1 to P using Seive |
| | | Maths 3 : Primes | Count of factors for all numbers from 1 to P |
| | | | Segemented Sieve [If needed] |
| | | Maths 4 : GCD | Calculate GCD |
| | | | Check if there exists a subsequence with GCD 1 |
| | | | Remove an elements so that we get max GCD |
| | HashMaps/HashSets | Hashing 1 : Intro | Intro to HashMap and HashSet, Functions |
| | | | Given queries, find frequency of an element |
| | | | First repeating element in arr[] |
| | | | No. of Distinct Elements, Teach multi set as well |
| | | | Iterate on HashMap |
| | | Hashing 2 : Subarray | Check if there exists a subarray with sum = 0 |
| | | | Length of longest subarray with sum = 0 |
| | | | Longest subarrays with equal 1's and 0's |
| | | Hashing 3 : Counting Pairs | Count of Pair Sum |

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| | | | Count of subarray with given sum. |
| | | Hashing 4 : Interview Questions 1 | Number of Distinct Character in every window of size K |
| | | | Longest Consecutive Sequence |
| | Recursion | Recurion 1 : Intro and Basic Problems | Basics of Stack |
| | | | Function/ Call Stack |
| | | | Recursion Basics + 3 Steps of Recursion |
| | | | Sum of N numbers |
| | | | Factorial of a number |
| | | | Print 1 to N |
| | | | Print N to 1 |
| | | | Print N to 1, 1 to N |
| | | Recursion 2 : More Problems | Sum of Digits of N |
| | | | Print 1 2 2 3 3 3 4 4 4 4 . . . |
| | | | Fibonacci |
| | | | Power Function. 1. $Pow(a,n) = Pow(a,n-1) * a$ 2. $Pow(a,n) = Pow(a,n/2) * Pow(a,n/2)$ |
| | | Recursion 3 : TC and SC | TC : Way1 : Based on no of function calls & SC |
| | | | TC : Way2 : Using recursive relation |
| | | Recursion 4 : Towers of Hanoi | Towers of Hanoi |
| | | | Print arr[] using recursion |
| | | | Passing arr[]/Vector in C++ |
| | Sorting | Sorting 1 | Bubble Sort |
| | | | Selection Sort |
| | | | Insertion Sort |
| | | | Merge 2 Sorted Arrays |
| | | | Merge 2 Sorted Subarrays in the same array |
| | | Sorting 2 | Merge Sort |
| | | | Invserion Count |
| | | Sorting 3 | Count Sort |
| | | | Problems on count sort |
| | | Sorting 4 | Overriding Comperator and its problem |
| | | | Largest Element |
| | | | Sorting elements based on factors |
| | Searching & 2 Pointers | Searching 1 : In sorted arr[] | Search for the element K in sorted array. |
| | | | Search for floor of ele k in sorted arr[] |
| | | | Search first & last K in sorted array with repeated elements. |
| | | | Search in 2D sorted matrix |
| | | Searching 2 : In arr[] | Search Peak Element. |
| | | | Single Element in a arr[] where every eleents repeats twice except 1 |
| | | Searching 3 : In Imaginary Search Space | Square root |
| | | | Painter's Partition Problem |
| | | Searching 4 : In Imaginary Search Spac | Agressive Cows |

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| | | | When to apply Binary Search |
| | | 2 Pointers 1 : Intro and Basic questions | Pair sum = k |
| | | | Pair difference = k |
| | | | Closest pair with sum = k |
| | | 2 Pointers 2 : Interview questions 1 | Minimize the triplet max - min diff |
| | | | Container with most water. |
| | | 2 Pointers 3 : Interview questions 2 | Max consecutive 1's with atmost k flips |
| | | | Search k in a row-wise sorted matrix |
| | | 2 Pointers 3 : Interview questions 3 | Increasing window problems |
| | | | Decreasing window problems |
| | | Meet in the Middle | Count no of quadplets with sum = k |
| | | | More question on this technique |
| | Strings | Basic Strings | First repeating character |
| | | | String concatenation TC |
| | | | More basic questions on strings |
| | | Strings Interview Questions | Length of longest palindromic substring |
| | | | Length of longest substring with all distinct characters |
| | Pattern Matching | String Pattern Matching 1 | Either RabinKarp or KMP |
| | | String Pattern Matching 2 | Problems on Pattern Matching 1 |
| | | String Pattern Matching 3 | Problems on Pattern Matching 2 |
| | Linked List | Linked List 1 | Class and Object Basics |
| | | | Create/ Search / Insert if time permits |
| | | Linked List 2 | Insert x at position p |
| | | | Insert x in a sorted list |
| | | | Delete x in linked list |
| | | | Delete all occurrences of x |
| | | Linked List 3 | Reverse Linked List |
| | | | Middle of a linked list |
| | | | Check if given linked list is palindrome or not |
| | | Linked List 4 | Check if given linked list has cycle. |
| | | | Find Intersection of 2 Linked Lists |
| | Advance Topics | Advanced Arrays 1 | Continuous Sum Query |
| | | | Rain water trapped |
| | | | Using PrefixMax and Suffix Max |
| | | Advanced Arrays 2 | Product array puzzle |
| | | | Using PrexProd and Suffix Prod |
| | | | Majotiy Elements |
| | | Advanced Arrays 3 | Min swaps requiried to bring all elements <=k together |
| | | | First missing +ve Integer |
| | | Advanced Arrays 4 | Overlapping Intervals |
| | | | Insert in overlapping Intervals |
| | | | Next Permutation |
| | | Advanced Arrays 5 | arr[i] - arr[j] + i-j maxixime |

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| | | | Wave array |
| | | Advanced Arrays 6 | Submatrix sum query |
| | | | Max submatrix sum in row sorted matrix |
| | | Advanced Sorting | Quick Sort |
| | | Advanced Hashing | No of distinct pairs |
| | | | No of right angles triangles |
| | | | No of rectangles parallel to x-axis and y axis [If timer permits] |
| | | Advanced TreeMap | TreeMap Introduction |
| | | | For every query get the nearest 1 |
| | | Advanced Searching 1 | Search in rotated sorted arr[] |
| | | | Get 1st missing +ve integer |
| | | Advanced Searching 2 | Kth index element in arr[] |
| | | | Median of 2 sorted arr[] |
| | | | Median of N sorted arr[] |
| | | Advanced Searching 3 | Median of 2 sorted array in log(N+M) approach |
| | | Advanced Strings | Check if 2 strings are anagrams of each other |
| | | | Length of smallest substring of B which contain all characters of A |
| | | | Count of Anagrams of A as substrings in B |
| | | Advanced LinkedList 1 | Doubly Linked List Introduction |
| | | | Insert a Node in DLL |
| | | | LRU Cache |
| | | Advanced LinkedList 2 | Reverse LinkedList in groups of size k |
| | | | Merge Two Sorted List. |
| | | | Merge Sort LinkedList |
| | | Advanced LinkedList 3 | Merge N Sorted Linked Lists |
| | | | Flatten Linked List |
| | | | Clone Linked List |
| | Stacks and Queues | Stacks 1 | Stack Intro and Implementation |
| | | | Balanced Parenthesis |
| | | | Double Character Trouble |
| | | Stacks 2 | Evaluate Postfix Expression |
| | | | Infix to Postfix Expression |
| | | Stacks 3 | Nearest Smaller & Greater Element on Left & Right. |
| | | | Largest Rectangle in a Histogram. |
| | | Queue 1 | Queue Introduction and implementation |
| | | | Reverse queue using stack |
| | | | Implement queue using stacks |
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