# **SUMMER VACATION DSA PROBLEM SHEET**

### [The Code Skool](https://www.youtube.com/c/TheCodeSkool)

## Arrays (5 days)

* 1. Array Basics (2 days)
     1. Theory (0.5 days)
        1. [C++ Arrays (With Examples)](https://www.programiz.com/cpp-programming/arrays)
        2. [Java Array (With Examples)](https://www.programiz.com/java-programming/arrays)
        3. [Python Array (With Examples)](https://www.programiz.com/python-programming/array)
     2. Problems (1.5 days)
        1. [Wave Array | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/wave-array-1587115621/1)
        2. [Sort an array of 0s, 1s and 2s | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/sort-an-array-of-0s-1s-and-2s4231/1)
        3. [Subarray with given sum | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/subarray-with-given-sum-1587115621/1)
        4. [Kadane's Algorithm | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/kadanes-algorithm-1587115620/1)
        5. [Missing number in array | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/missing-number-in-array1416/1)
  2. Binary Search (2 days)
     1. Theory (0.5 days)
        1. <https://www.geeksforgeeks.org/binary-search/>
     2. Problems (1.5 days)
        1. [Search Insert Position - LeetCode](https://leetcode.com/problems/search-insert-position/)
        2. [Sqrt(x) - LeetCode](https://leetcode.com/problems/sqrtx/)
        3. [Find Smallest Letter Greater Than Target - LeetCode](https://leetcode.com/problems/find-smallest-letter-greater-than-target/)
        4. [Kth Smallest Element in a Sorted Matrix - LeetCode](https://leetcode.com/problems/kth-smallest-element-in-a-sorted-matrix/)
  3. Two Pointers (1 day)
     1. Theory (about 1 hr)
        1. <https://www.geeksforgeeks.org/two-pointers-technique/>
     2. Problems (1 day)
        1. [3 Sum | Interviewbit](https://www.interviewbit.com/problems/3-sum/)
        2. [Merge Two Sorted Lists II | Interviewbit](https://www.interviewbit.com/problems/merge-two-sorted-lists-ii/)
        3. [Remove Duplicates from Sorted Array | Interviewbit](https://www.interviewbit.com/problems/remove-duplicates-from-sorted-array/)

## Strings (2 days)

* 1. String Basics (2 days)
     1. [Integer To Roman | Interviewbit](https://www.interviewbit.com/problems/integer-to-roman/)
     2. [Reverse the String | Interviewbit](https://www.interviewbit.com/problems/reverse-the-string/)
     3. [Implement StrStr | Interviewbit](https://www.interviewbit.com/problems/implement-strstr/)
     4. [Vowel and Consonant Substrings! | Interviewbit](https://www.interviewbit.com/problems/vowel-and-consonant-substrings/)
     5. [Longest Common Prefix | Interviewbit](https://www.interviewbit.com/problems/longest-common-prefix/)
     6. [Longest Palindromic Substring | Interviewbit](https://www.interviewbit.com/problems/longest-palindromic-substring/)

## Linked Lists (4 days)

* 1. Theory (1 day)
     1. <https://www.programiz.com/dsa/linked-list>
  2. Problems (3 days)
     1. [Reverse a linked list - GeeksforGeeks](https://www.geeksforgeeks.org/reverse-a-linked-list/)
     2. ​​[Rotate a Linked List - GeeksforGeeks](https://www.geeksforgeeks.org/rotate-a-linked-list/)
     3. [Function to check if a singly linked list is palindrome - GeeksforGeeks](https://www.geeksforgeeks.org/function-to-check-if-a-singly-linked-list-is-palindrome/)
     4. [Nth node from end of linked list | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/nth-node-from-end-of-linked-list/1)
     5. [Detect Loop in linked list | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/detect-loop-in-linked-list/1)
     6. [Find the middle of a given linked list - GeeksforGeeks](https://www.geeksforgeeks.org/write-a-c-function-to-print-the-middle-of-the-linked-list/)
     7. [Delete N nodes after M nodes of a linked list - GeeksforGeeks](https://www.geeksforgeeks.org/delete-n-nodes-after-m-nodes-of-a-linked-list/)
     8. [Reverse a Linked List in groups of given size. | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/reverse-a-linked-list-in-groups-of-given-size/1)
     9. [Reverse alternate K nodes in a Singly Linked List - GeeksforGeeks](https://www.geeksforgeeks.org/reverse-alternate-k-nodes-in-a-singly-linked-list/)

## Stacks and Queues (5 days)

* 1. Theory (2 days)
     1. <https://www.programiz.com/dsa/stack>
     2. <https://www.geeksforgeeks.org/stack-in-cpp-stl/>
     3. <https://www.geeksforgeeks.org/stack-class-in-java/>
     4. <https://www.geeksforgeeks.org/stack-in-python/>
     5. <https://www.programiz.com/dsa/queue>
     6. <https://www.geeksforgeeks.org/queue-cpp-stl/>
     7. <https://www.geeksforgeeks.org/queue-interface-java/>
     8. <https://www.geeksforgeeks.org/queue-in-python/>
  2. Problems (3 days)
     1. [Balanced Parantheses! | Interviewbit](https://www.interviewbit.com/problems/balanced-parantheses/)
     2. [Redundant Braces | Interviewbit](https://www.interviewbit.com/problems/redundant-braces/)
     3. [Nearest Smaller Element | Interviewbit](https://www.interviewbit.com/problems/nearest-smaller-element/)
     4. [Largest Rectangle in Histogram | Interviewbit](https://www.interviewbit.com/problems/largest-rectangle-in-histogram/)
     5. [Min Stack | Interviewbit](https://www.interviewbit.com/problems/min-stack/)
     6. [First Unique Character in a String - LeetCode](https://leetcode.com/problems/first-unique-character-in-a-string/)
     7. [Implement Stack using Queues - LeetCode](https://leetcode.com/problems/implement-stack-using-queues/)
     8. [Time Needed to Buy Tickets - LeetCode](https://leetcode.com/problems/time-needed-to-buy-tickets/)
     9. [Implement Queue using Stacks - LeetCode](https://leetcode.com/problems/implement-queue-using-stacks/)

## Hashing (3 days)

* 1. Theory (1 day)
     1. <https://www.programiz.com/dsa/hash-table>
     2. <https://www.geeksforgeeks.org/unordered_map-in-cpp-stl/>
     3. <https://www.geeksforgeeks.org/java-util-hashmap-in-java-with-examples/>
     4. <https://www.geeksforgeeks.org/hash-map-in-python/>
  2. Problems (2 days)
     1. [Largest subarray of 0's and 1's | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/largest-subarray-of-0s-and-1s/1)
     2. [Find All Four Sum Numbers | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/find-all-four-sum-numbers1732/1)
     3. [Array Subset of another array | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/array-subset-of-another-array2317/1)
     4. [Sorting Elements of an Array by Frequency | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/sorting-elements-of-an-array-by-frequency-1587115621/1)
     5. [Union of Two Linked Lists | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/union-of-two-linked-list/1/)
     6. [Top K Frequent Elements in Array - | | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/top-k-frequent-elements-in-array/1)

## Tree-based Data Structures (7 days)

* 1. Binary Tree & BST (5 days)
     1. Theory (1 day)
        1. <https://www.geeksforgeeks.org/introduction-to-tree-data-structure/>
        2. <https://www.geeksforgeeks.org/binary-tree-set-1-introduction/?ref=lbp>
        3. <https://www.geeksforgeeks.org/binary-tree-set-2-properties/?ref=lbp>
        4. <https://www.geeksforgeeks.org/binary-tree-set-3-types-of-binary-tree/?ref=lbp>
     2. Problems (4 days)
        1. [Inorder Traversal | Interviewbit](https://www.interviewbit.com/problems/inorder-traversal/)
        2. [Preorder Traversal | Interviewbit](https://www.interviewbit.com/problems/preorder-traversal/)
        3. [Postorder Traversal | Interviewbit](https://www.interviewbit.com/problems/postorder-traversal/)
        4. [Max Depth of Binary Tree | Interviewbit](https://www.interviewbit.com/problems/max-depth-of-binary-tree/)
        5. [Right view of Binary tree | Interviewbit](https://www.interviewbit.com/problems/right-view-of-binary-tree/)
        6. [Sorted Array To Balanced BST | Interviewbit](https://www.interviewbit.com/problems/sorted-array-to-balanced-bst/)
        7. [Root to Leaf Paths With Sum | Interviewbit](https://www.interviewbit.com/problems/root-to-leaf-paths-with-sum/)
        8. [ZigZag Level Order Traversal BT | Interviewbit](https://www.interviewbit.com/problems/zigzag-level-order-traversal-bt/)
        9. [Symmetric Binary Tree | Interviewbit](https://www.interviewbit.com/problems/symmetric-binary-tree/)
        10. [Balanced Binary Tree | Interviewbit](https://www.interviewbit.com/problems/balanced-binary-tree/)
        11. [Valid BST from Preorder | Interviewbit](https://www.interviewbit.com/problems/valid-bst-from-preorder/)
        12. [Kth Smallest Element In Tree | Interviewbit](https://www.interviewbit.com/problems/kth-smallest-element-in-tree/)
  2. Heaps (1 day)
     1. Theory
        1. <https://www.geeksforgeeks.org/binary-heap/>
     2. Problems
        1. [K Largest Elements | Interviewbit](https://www.interviewbit.com/problems/k-largest-elements/)
        2. [Merge K Sorted Lists | Interviewbit](https://www.interviewbit.com/problems/merge-k-sorted-lists/)
  3. Trie (1 day)
     1. Theory
        1. <https://www.geeksforgeeks.org/advantages-trie-data-structure/?ref=lbp>
        2. <https://www.geeksforgeeks.org/trie-insert-and-search/?ref=lbp>
        3. <https://www.geeksforgeeks.org/trie-delete/?ref=lbp>
     2. Problems
        1. [Hotel Reviews | Interviewbit](https://www.interviewbit.com/problems/hotel-reviews/)
        2. [Shortest Unique Prefix | Interviewbit](https://www.interviewbit.com/problems/shortest-unique-prefix/)

## Dynamic Programming (8 Days)

* 1. Theory (3 days)
     1. <https://www.youtube.com/watch?v=OQ5jsbhAv_M&list=PLcDimPvbmfT8qAxD6JH_kmXiQwTNcoK78>
     2. <https://www.youtube.com/watch?v=ENyox7kNKeY&list=PLcDimPvbmfT8qAxD6JH_kmXiQwTNcoK78&index=2>
     3. <https://www.youtube.com/watch?v=ocZMDMZwhCY&list=PLcDimPvbmfT8qAxD6JH_kmXiQwTNcoK78&index=3>
     4. <https://www.geeksforgeeks.org/program-for-nth-fibonacci-number/>
     5. <https://www.geeksforgeeks.org/0-1-knapsack-problem-dp-10/>
     6. <https://www.geeksforgeeks.org/longest-increasing-subsequence-dp-3/>
     7. <https://www.geeksforgeeks.org/longest-common-subsequence-dp-4/>
     8. <https://www.geeksforgeeks.org/longest-common-substring-dp-29/>
  2. Problems (5 Days)
     1. [Nth Fibonacci Number | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/nth-fibonacci-number1335/1)
     2. [0 - 1 Knapsack Problem | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/0-1-knapsack-problem0945/1)
     3. [Coin Change | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/coin-change2448/1)
     4. [nCr | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/ncr1019/1)
     5. [Longest Increasing Subsequence | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/longest-increasing-subsequence-1587115620/1)
     6. [Longest Common Subsequence | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/longest-common-subsequence-1587115620/1)
     7. [Longest Common Substring | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/longest-common-substring1452/1)
     8. [Edit Distance | Interviewbit](https://www.interviewbit.com/problems/edit-distance/)
     9. [Ways to Decode | Interviewbit](https://www.interviewbit.com/problems/ways-to-decode/)
     10. [Longest valid Parentheses | Interviewbit](https://www.interviewbit.com/problems/longest-valid-parentheses/)
     11. [Dungeon Princess | Interviewbit](https://www.interviewbit.com/problems/dungeon-princess/)
     12. [Max Product Subarray | Interviewbit](https://www.interviewbit.com/problems/max-product-subarray/)
     13. [Max Sum Without Adjacent Elements | Interviewbit](https://www.interviewbit.com/problems/max-sum-without-adjacent-elements/)
     14. [Best Time to Buy and Sell Stocks I | Interviewbit](https://www.interviewbit.com/problems/best-time-to-buy-and-sell-stocks-i/)
     15. [Best Time to Buy and Sell Stocks II | Interviewbit](https://www.interviewbit.com/problems/best-time-to-buy-and-sell-stocks-ii/)

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## Graphs (8 Days)

* 1. Theory (3 days)
     1. <https://www.geeksforgeeks.org/graph-and-its-representations/>
     2. <https://www.geeksforgeeks.org/breadth-first-search-or-bfs-for-a-graph/>
     3. <https://www.geeksforgeeks.org/depth-first-search-or-dfs-for-a-graph/>
     4. <https://www.geeksforgeeks.org/dijkstras-shortest-path-algorithm-greedy-algo-7/>
     5. <https://www.geeksforgeeks.org/prims-minimum-spanning-tree-mst-greedy-algo-5/>
     6. <https://www.geeksforgeeks.org/kruskals-minimum-spanning-tree-algorithm-greedy-algo-2/>
     7. <https://www.geeksforgeeks.org/floyd-warshall-algorithm-dp-16/>
     8. <https://www.geeksforgeeks.org/union-find-algorithm-union-rank-find-optimized-path-compression/>
  2. Practice (5 days)
     1. [BFS of graph | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/bfs-traversal-of-graph/1)
     2. [DFS of Graph | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/depth-first-traversal-for-a-graph/1)
     3. [Find the number of islands | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/find-the-number-of-islands/1)
     4. [Implementing Dijkstra Algorithm | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/implementing-dijkstra-set-1-adjacency-matrix/1)
     5. [Detect cycle in a directed graph | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/detect-cycle-in-a-directed-graph/1)
     6. [Detect cycle in an undirected graph | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/detect-cycle-in-an-undirected-graph/1)
     7. [Topological sort | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/topological-sort/1)
     8. [Minimum Spanning Tree | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/minimum-spanning-tree/1)
     9. [Unit Area of largest region of 1's | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/length-of-largest-region-of-1s-1587115620/1/)
     10. [Floyd Warshall | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/implementing-floyd-warshall2042/1)
     11. [Shortest path from 1 to n | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/shortest-path-from-1-to-n0156/1)
     12. [Covid Spread | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/269f61832b146dd5e6d89b4ca18cbd2a2654ebbe/1)
     13. [Distance from the Source (Bellman-Ford Algorithm) | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/distance-from-the-source-bellman-ford-algorithm/1)
     14. [Biconnected Graph | Practice | GeeksforGeeks](https://practice.geeksforgeeks.org/problems/biconnected-graph2528/1)
     15. [Union-Find | Practice | GeeksForGeeks](https://practice.geeksforgeeks.org/problems/union-find/1)