

# Pre-Placements Checklist

## Data Structures:

### 1. Array

#### a. Kadane's Algorithm

<https://www.geeksforgeeks.org/largest-sum-contiguous-subarray/>

#### b. N/2, N/3 greatest Number

<https://leetcode.com/problems/majority-element/>

<https://leetcode.com/problems/majority-element-ii/>

<https://www.geeksforgeeks.org/given-an-array-of-of-size-n-finds-all-the-elements-that-appear-more-than-nk-times/>

#### c. Merge overlapping intervals

<https://leetcode.com/problems/merge-intervals/>

#### d. Rotate matrix

<https://leetcode.com/problems/rotate-image/>

#### e. Buy / Sell stocks - I, II, III:

<https://leetcode.com/problems/best-time-to-buy-and-sell-stock/>

### 2. String

#### a. Pattern matching algorithms (KMP + Rabin Karp)

<https://www.geeksforgeeks.org/kmp-algorithm-for-pattern-searching/>

<https://www.geeksforgeeks.org/rabin-karp-algorithm-for-pattern-searching/>

#### b. Using StringBuilder class -> Add, Multiply Strings

<https://www.geeksforgeeks.org/stringbuilder-class-in-java-with-examples/>

<https://www.geeksforgeeks.org/stringbuilder-append-method-in-java-with-examples/>

- c. String compression algorithm

<https://leetcode.com/problems/string-compression/>

### 3. LinkedList

- a. Implementation of LinkedList

<https://www.geeksforgeeks.org/implementing-a-linked-list-in-java-using-class/>

<https://leetcode.com/problems/design-linked-list/>

- b. Detect cycle in a LinkedList - Floyd Algo

<https://leetcode.com/problems/linked-list-cycle/>

- c. Reverse a linked list + reverse in groups

<https://leetcode.com/problems/reverse-linked-list/>

<https://leetcode.com/problems/reverse-nodes-in-k-group/>

### 4. Stack

- a. Implementation of Stack

<https://www.geeksforgeeks.org/stack-data-structure-introduction-program/>

<https://www.geeksforgeeks.org/stack-class-in-java/>

- b. Balance parenthesis

<https://leetcode.com/problems/valid-parentheses/>

- c. Trapping rain water

<https://leetcode.com/problems/trapping-rain-water/>

- d. Implement min stack

<https://leetcode.com/problems/min-stack/>

## 5. Queue

### a. Implementation of Queue + Deque

<https://www.geeksforgeeks.org/queue-set-1introduction-and-array-implementation/>

<https://www.geeksforgeeks.org/queue-interface-java/>

<https://www.geeksforgeeks.org/implementation-deque-using-circular-array/>

<https://www.geeksforgeeks.org/deque-interface-java-example/>

### b. Sliding window maximum

<https://leetcode.com/problems/sliding-window-maximum/>

### c. Implement BFS

<https://www.geeksforgeeks.org/breadth-first-search-or-bfs-for-a-graph/>

### d. Implement Level order in Binary tree

<https://leetcode.com/problems/binary-tree-level-order-traversal/>

## 6. PriorityQueue or Heap

### a. Implementation of Heap Data structure

<https://www.geeksforgeeks.org/heap-data-structure/>

### b. Connect n ropes with min cost:

<https://www.geeksforgeeks.org/connect-n-ropes-minimum-cost/>

### c. Median of running stream:

<https://www.geeksforgeeks.org/median-of-stream-of-running-integers-using-stl/>

### d. LRU and LFU cache

<https://leetcode.com/problems/lru-cache/>

<https://leetcode.com/problems/lfu-cache/>

## 7. Set & Map

- a. Internal working of HashMap

<https://www.geeksforgeeks.org/internal-working-of-hashmap-java/>

- b. 4-sum

<https://leetcode.com/problems/4sum/>

- c. Longest substring without repeat:

<https://www.interviewbit.com/problems/longest-substring-without-repeat/>

## 8. Binary Tree

- a. Implementation: insert, delete, traverse:

<https://youtu.be/QhIM-G7FAow>

- b. Print top view, left view, right view, bottom view, level order, zig-zag traversal of Binary tree

<https://www.geeksforgeeks.org/print-nodes-top-view-binary-tree/>

<https://www.geeksforgeeks.org/print-left-view-binary-tree/>

<https://leetcode.com/problems/binary-tree-right-side-view/>

<https://www.geeksforgeeks.org/bottom-view-binary-tree/>

<https://www.geeksforgeeks.org/level-order-tree-traversal/>

<https://leetcode.com/problems/binary-tree-zigzag-level-order-traversal/>

- c. Invert a binary tree:

<https://leetcode.com/problems/invert-binary-tree/>

- d. Lowest common ancestor

<https://leetcode.com/problems/lowest-common-ancestor-of-a-binary-tree/>

## 9. Binary Search Tree

- a. Implementation

<https://www.geeksforgeeks.org/binary-search-tree-set-1-search-and-insertion/>

- b. Check if a tree is BST or not  
<https://www.geeksforgeeks.org/a-program-to-check-if-a-binary-tree-is-bst-or-not/>
- c. AVL tree and rotation  
<https://www.geeksforgeeks.org/avl-tree-set-1-insertion/>  
<https://www.geeksforgeeks.org/avl-tree-set-2-deletion/>

## 10. Graph

- a. Implementation, BFS, and DFS traversals  
<https://www.geeksforgeeks.org/graph-and-its-representations/>  
<https://www.geeksforgeeks.org/breadth-first-search-or-bfs-for-a-graph/>  
<https://www.geeksforgeeks.org/depth-first-search-or-dfs-for-a-graph/>
- b. Topological sorting  
<https://www.geeksforgeeks.org/topological-sorting/>
- c. Bellman ford Algorithm  
<https://www.geeksforgeeks.org/bellman-ford-algorithm-dp-23/>
- d. Dijkstra's Algorithm  
<https://www.geeksforgeeks.org/dijkstras-shortest-path-algorithm-greedy-algo-7/>
- e. Prim's Algorithm  
<https://www.geeksforgeeks.org/prims-minimum-spanning-tree-mst-greedy-algo-5/>
- f. Kruskal's Algorithm  
<https://www.geeksforgeeks.org/kruskals-minimum-spanning-tree-algorithm-greedy-algo-2/>
- g. Unique Islands Problem:  
<https://www.geeksforgeeks.org/find-the-number-of-distinct-islands-in-a-2d-matrix/>

11. Trie
    - a. Implementation  
<https://www.geeksforgeeks.org/trie-insert-and-search/>
  12. Segment Trees : More important in CP
    - a. Implementation  
<https://www.hackerearth.com/practice/data-structures/advanced-data-structures/segment-trees/tutorial/>
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## Algorithms:

1. Two pointers Algorithm
  - a. 3-Sum  
<https://leetcode.com/problems/3sum/>
  - b. Container with most water  
<https://leetcode.com/problems/container-with-most-water/>
  - c. Sort the array containing only 0, 1 and 2  
<https://www.geeksforgeeks.org/sort-an-array-of-0s-1s-and-2s/>
2. Math
  - a. Fast Power: <https://www.youtube.com/watch?v=dyrRM8dTEus>
  - b. Euclid GCD:  
<https://www.geeksforgeeks.org/euclidean-algorithms-basic-and-extended/>
  - c. Sieve of Eratosthenes:  
<https://www.geeksforgeeks.org/sieve-of-eratosthenes/>
3. Recursion + Backtracking
  - a. Sudoku solver  
<https://leetcode.com/problems/sudoku-solver/>
  - b. N-Queens Problem  
<https://leetcode.com/problems/n-queens/>

- c. Permutation and Combinations (Bruteforce)  
<https://www.geeksforgeeks.org/permutation-and-combination/>
- 4. Bits Manipulation + Mathematics
  - a. Find one non-repeating number, find two  
<https://www.geeksforgeeks.org/non-repeating-element/>  
<https://www.geeksforgeeks.org/find-two-non-repeating-elements-in-an-array-of-repeating-elements/>
  - b. Count 1 bits in a number  
<https://leetcode.com/problems/number-of-1-bits/>
- 5. Divide & Conquer
  - a. Merge Sort  
<https://www.geeksforgeeks.org/merge-sort/>
  - b. Median of two sorted arrays  
<https://leetcode.com/problems/median-of-two-sorted-arrays/>
- 6. Binary Searching
  - a. Find upper and lower bounds using Binary search  
<https://www.geeksforgeeks.org/find-first-and-last-positions-of-an-element-in-a-sorted-array/>
  - b. Allocate books:  
<https://www.interviewbit.com/problems/allocate-books/>
- 7. Greedy Programming
  - a. Candy distribution:  
<https://www.interviewbit.com/problems/distribute-candy/>
  - b. Gas station: <https://www.interviewbit.com/problems/gas-station/>
  - c. Fractional Knapsack  
<https://www.geeksforgeeks.org/fractional-knapsack-problem/>
- 8. Dynamic Programming
  - a. 0/1 Knapsack: <https://www.youtube.com/watch?v=y6kpGJBI7t0>
  - b. Longest increasing subsequence  
<https://leetcode.com/problems/longest-increasing-subsequence/>

- c. Matrix chain multiplication

<https://www.geeksforgeeks.org/matrix-chain-multiplication-dp-8/>

- d. Coin change problem

<https://leetcode.com/problems/coin-change/>

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## Operating System:

1. Basics of Threads
  2. Process scheduling algorithms
  3. Critical section Problem
  4. Deadlock
  5. Memory management
    - a. Paging
    - b. Segmentation
  6. Page replacement algorithms
  7. Disk scheduling algorithms
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## DBMS:

1. Types of Keys: Candidate, Super, Foreign keys
2. Normal Forms
3. Joins
4. SQL queries
5. ACID properties
6. Indexing: B trees, B+ trees concepts



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## System design:

1. Low-level design
  - a. Class, ER diagrams
  - b. OOPS concepts
  - c. Design Elevator system, Parking Lot, MakeMyTrip System
2. High-level design
  - a. Scaling
  - b. Distributed systems
  - c. Microservice and Monolithic architecture
  - d. Load balancing
  - e. Message queue
  - f. Design Whatsapp, Tinder, and Uber system