Collections /Data Structures & Algorithms Course Content

❖ Pre requisite: Core Java knowledge

This Course is divided into 2 parts

DSA =

Complete Collections workshop + Time /Space complexity/ Algorithms/Sorting/Searching/Dynamic Programming/Pattern Matching/Matrix/Graph

❖ Complete Collections workshop - Course Content

- Need for Collection Framework.
- Collection hierarchy
- Collection vs Collections
- Internal Implementation of List
- Internal Implementation of Set
- Internal Implementation of Map
- How to create custom collection

- List
    - Array List
    - Vector
    - Linked List

  Copy on Write Array List
- Set
    - Hash Set
    - Linked Hash Set
    - Copy on write Array Set
- Map
    - Hash Map
    - Linked Hash Map
    - Concurrent hash Map
    - How to sort hashmap by values ?
    - How to sort hashmap by keys
    - Why to over ride equals and hash code method in hashmap ?

- What is iterator and how to use the iterator ?
- What is List Iterator and how to use it ?
- Difference between iterator and List iterator ?
- What is concurrent modification exception and how to resolve it?
- Concurrency vs Synchronization ?

- **Difference between Iterator and List Iterator ?**
- **What is concurrent modification exception and how to resolve it?**
- **Concurrency vs Synchronization ?**
- **Copy on write Array list , Copy on write array Set , Concurrent hash map**
- **How to create Custom collection (Custom Array List) ?**

- **Linked List**
  - Introduction
  - Insert (Head/Tail/Middle)
  - https://www.hackerrank.com/challenges/insert-a-node-at-the-head-of-a-linked-list/problem
  - https://www.hackerrank.com/challenges/insert-a-node-at-a-specific-position-in-a-linked-list/problem
    https://www.hackerrank.com/challenges/insert-a-node-at-the-tail-of-a-linked-list/problem
  - Delete (Head/Tail/Middle)
  - https://www.hackerrank.com/challenges/delete-a-node-from-a-linked-list/problem
  - Print:
  - https://www.hackerrank.com/challenges/print-the-elements-of-a-linked-list-in-reverse/problem
  - https://www.hackerrank.com/challenges/print-the-elements-of-a-linked-list/problem
  - https://www.hackerrank.com/challenges/get-the-value-of-the-node-at-a-specific-position-from-the-tail/problem
- **Stack:**
  - What is Stack ?
  - Basic Stack properties (Push, Pop, Peek)
  - https://www.hackerrank.com/challenges/java-stack/problem
  - Stack Implementation using Array
  - Stack Implementation using Linked List
  - Stack implementation using Queue
- **Queue:**
  - What is Queue ?
  - Basic Properties of Queue (Peek, poll)
  - What is D Queue, Blocking Queue, Priority Queue ?
  - What are the difference between Linked Blocking Queue verses Array Blocking Queue ?
  - Queue Implementation using Array
  - Queue Implementation using Linked List
  - Queue implementation using Stack
- **Trees**
  - Basic concepts
  - In order traversal: https://www.hackerrank.com/challenges/tree-inorder-traversal/problem
  - Post order traversal: https://www.hackerrank.com/challenges/tree-postorder-traversal
  - Preorder traversal: https://www.hackerrank.com/challenges/tree-preorder-traversal/problem
- **Tree Set**
- **Tree Map**

Time/Space Complexity/Algorithms Topics/ Sorting/ Searching/ Dynamic Programming/Matrix/Graph- Course Content

- **What is Time complexity ?**
- **What is space complexity ?**
- **Sorting**
  - **Bubble sort**
    https://www.hackerrank.com/contests/ashok-it-dsa/challenges/bubble-sort-implementation

- **Insertion sort**
  https://www.hackerrank.com/contests/ashok-it-dsa/challenges/insertion-sort-implementation
  https://www.hackerrank.com/challenges/insertionsort1/problem
  https://www.hackerrank.com/challenges/insertionsort2/problem
  https://www.hackerrank.com/challenges/insertion-sort/problem
- **Selection sort:**
  https://www.hackerrank.com/contests/ashok-it-dsa/challenges/selection-sort-implementation

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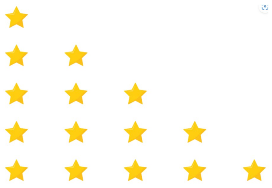
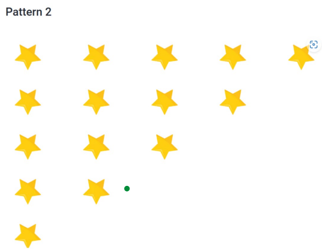
- **Two way Merging/Three way merging**
- **Merge sort & Merge sorted array:** https://leetcode.com/problems/merge-sorted-array/
- **Quick Sort**
- **What is Max Heap ?**
- **What is Min Heap ?**
- **What is Heap Sort?**
  - Convert the given array into Max Heap ?
  - Convert the given array into Min Heap ?
  - Adding an element to Max Heap or Min Heap ?

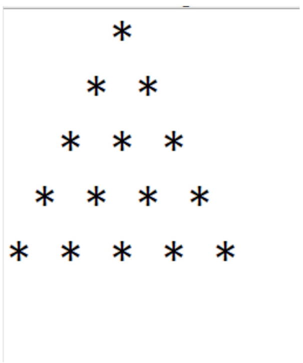
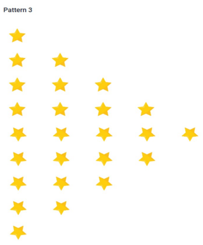
- **Graphs**
  - **Basic Concept and How to Construct the Graph in Java ?**
  - **BFS**
  - **DFS**
  - **Shortest Path from source to destination (Dijkstra's algorithm)**

- **Dynamic Programming**
  - **Fundamental OF DP**
  - **Fibonaci Series Problem**
  - **Recurrsion verses Dynamic Programming**
  - **Coin Change Problem**

- **Matrix:**
  - **Matrix Representation**
  - **Addition of 2 matrix**
  - **Multiplication of 2 matrix**
  - **Check whether the given matrix is symmetric or not ?**
  - **Printing the Matrix**
  - **Transpose of a Matrix**

- **Pattern Printing**
  https://www.hackerrank.com/challenges/staircase/problem?isFullScreen=true
  Triangle Pattern

- **Pattern Programs for the below patterns**
- 
- 

- 
- 

➢ Programmatic Questions

- ➢ Fundamentals of Array
- ➢ Min and Max element in the array
- ➢ Unique Elements of an array
- ➢ Use Recursion to reverse the array
- ➢ Duplicate elements of an array
- ➢ Search for the missing number
- ➢ Factorial of a number
- ➢ Nth Fibonacci number
- ➢ Prime or not:
- ➢ Basic Implementation
- ➢ https://www.hackerrank.com/challenges/simple-array-sum/problem
- ➢ Reverse of an Array: https://www.hackerrank.com/challenges/arrays-ds/problem?isFullScreen=true
- ➢ LCM of N numbers: https://www.hackerrank.com/contests/crescent-

contest/challenges/find-the-lcm

- Simple Array Sum: https://www.hackerrank.com/challenges/simple-array-sum/problem
- Sum of N numbers: https://www.hackerrank.com/contests/placement-prep-testing/challenges/sum-of-n-numbers
- What is the simplest way to identify the array is in sorted manner with less complexity ?
- Write a program to reverse the array without using extra memory ?
- Swap two numbers without using the third variable?
- Pair difference: www.interviewbit.com/problems/diffk/
- Linear & Binary Search: https://leetcode.com/problems/two-sum/
- Square Root: https://www.hackerrank.com/contests/ashok-it-dsa/challenges/square-root-10
- Compare two Linked list :
  - https://www.hackerrank.com/challenges/compare-two-linked-lists/problem
- Merge 2 sorted Linked List
  https://www.hackerrank.com/challenges/merge-two-sorted-linked-lists/problem
- Cyclic detection
  https://www.hackerrank.com/challenges/detect-whether-a-linked-list-contains-a-cycle/problem
- Open and close bracket problem using Stack:
  https://www.hackerrank.com/challenges/java-stack/problem
- Min and Max Element Present in a Binary Search Tree ?
- Print all leaves of a binary search tree?
- Height of A Tree: https://www.hackerrank.com/challenges/tree-height-of-a-binary-tree/problem
- Fill Depth: https://www.hackerrank.com/contests/ashok-it-dsa/challenges/find-depth
  Sum OF all the Elements Present in a Tree
- Level order traversal : https://www.hackerrank.com/challenges/30-binary-trees/problem
- Vertical order traversal : https://leetcode.com/problems/vertical-order-traversal-of-a-binary-tree/
- Distance Between 2 Nodes in BST : https://leetcode.com/problems/minimum-distance-between-bst-nodes/
- Left-View of A Tree : https://www.hackerrank.com/contests/ashok-it-dsa/challenges/left-view-of-tree-1
- Check Whether the given tree is BST or not ?123123
- Write a program to print the mirror image of a Tree ?
  https://www.codingninjas.com/studio/problems/second-largest-element-in-the-array_873375
  https://practice.geeksforgeeks.org/problems/merge-two-sorted-arrays-1587115620/1

- **Fee :**

  Only complete **Collection workshop : 3000 + Notes and video access up to 6 months**
  DSA:

  Only collections (Recordings to 4 months access): 3000
  Advance DSA LIVE classes :5000/-
  Collections class back up videos up yo 4 months and you can join live classes for ADSA: 8,000/-for Live classes -Notes+ only Collection video access up to 4 months
  Collections class back up videos live classes for ADSA: 10,000 /-for Live classes and complete course videos up to 1 Year access

Timing: 8 AM to 9 AM (Mon to Friday)

- ## Duration:

  30 to 35 days for Complete Collection framework
  DSA: 50 to 60 Days