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Data Structures & Algorithms Course Content

Introduction:

1. Why to Learn DSA?
2. Why companies are giving importance to DSA?
3. What are the pre-requisite to attend this batch?
4. Fundamental of DSA

Pattern Printing

5. <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/pattern-1-13-1>
6. <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/pattern-2-8-3>
7. <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/pattern-3-3-3>
8. <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/pattern-4-3-2>
9. <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/pattern-5-3-4>
10. <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/pattern-6-6>
11. <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/pattern-7-8>
12. <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/pattern-9-8>

Hollow rectangle pattern

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/hollow-rectangle-pattern>

Inverted pyramid pattern

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/inverted-pyramid-pattern>

Rectangle pattern: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/rectangle-pattern>

Print pyramid pattern

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/print-pyramid-pattern>

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Palindrome pyramid pattern

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/palindrome-pyramid-pattern>

Diamond Pattern

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/number-diamond-pattern-1>

Clock Pattern: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/clock-pattern>

Down Facing Triangle:

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/down-facing-triangle>

Binary Pattern: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/binary-pattern-3>

PNC Pattern: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/diamond-pnc-pattern>

Alphabet Pattern: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/alphabet-pattern-3-1>

Fundamentals of Array

Min and Max element in the array

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/min-and-max-element-in-the-array>

Unique Elements of an array

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/unique-elements-of-an-array>

Use Recursion to reverse the array

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/use-recursion-to-reverse-the-array>

Duplicate elements of an array

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/duplicate-elements-of-an-array>

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Search for the missing number

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/search-for-the-missing-number>

Min-Max Sum: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/mini-max-sum>

Fundamental of Matrix

Matrix Addition: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/matrix-addition-8>

Row wise sum of matrix

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/row-wise-sum-of-matrix>

Column wise Sum of Matrix

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/column-wise-sum-of-matrix>

Transpose of a Matrix: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/transpose-of-a-matrix-7>

Sparse Matrix: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/check-whether-matrix-is-sparse-matrix-or-not>

Print Diagonal: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/print-diagonals-of-a-matrix>

Rotation of a Matrix: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/rotation-of-a-matrix>

Fundamental of Mathematics

Sum of a digit: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/sum-of-a-digit>

Valid Triangle:

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/check-for-a-valid-triangle>



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Compute a power b

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/calculate-a-power-b>

Factorial of a number

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/find-factorial-for-small-input-range>

Nth Fibonacci number

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/find-the-nth-fibonacci-number>

Find the multiple of 3 and 5

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/find-number-of-multiple-of-5-and-3>

Sum of first N Natural Number

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/sum-of-first-n-natural-number-1>

Find the sum of squares

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/square-sum-5>

Find the sum of cubes

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/find-the-sum-of-cubes>

Check Armstrong number

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/check-armstrong-number>

Check-Narcissistic numbers

<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/check-narcissistic-numbers>

Prime or not: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/prime-or-not-1-5>

Harshad numbers : <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/harshad-numbers>

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Basic Implementation

1. <https://www.hackerrank.com/challenges/simple-array-sum/problem>
2. <https://www.hackerrank.com/challenges/diagonal-difference/problem>
3. <https://www.hackerrank.com/challenges/plus-minus/problem>
4. <https://codeforces.com/problemset/problem/4/A>
5. <https://codeforces.com/problemset/problem/112/A>
6. <https://codeforces.com/problemset/problem/266/A>

Time & Space Complexity

- Asymptotic Notations

Bit Manipulation

- Basic of bit manipulation
- Conversion from binary to decimal and vice-versa:
<https://www.hackerrank.com/contests/ashok-it-dsa/challenges/binary-representations>
- Check whether particular bit is set or not : <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/check-whether-the-particular-bit-is-set-or-not>
- Numbers of 1 bit: <https://leetcode.com/problems/number-of-1-bits/>
- Power of 2: <https://leetcode.com/problems/power-of-two/>
- Reverse bit: <https://leetcode.com/problems/reverse-bits/>
- Subset: <https://leetcode.com/problems/subsets/>
- Single number: <https://leetcode.com/problems/single-number/>
- <https://leetcode.com/problems/single-number-ii/>
- <https://leetcode.com/problems/single-number-iii/>

Miscellaneous Question

- Recursion
- Basic concept
- Sum, Fact, Fib, AP Sum.
- Mathematical analysis of time complexity.

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- Master theorem
- Tower Of Hanoi
- Recursion to Generate Sum Set
- Balanced Bracket
- Magic Square
- Miscellaneous String Problem

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>

Counting Sort

<https://www.hackerrank.com/challenges/countingsort1/problem>

<https://www.hackerrank.com/challenges/countingsort2/problem>

Closest Number : <https://www.hackerrank.com/challenges/closest-numbers/problem>

Find the median: <https://www.hackerrank.com/challenges/find-the-median/problem>

Merge sort/ Quick sort & Merge sorted array: <https://leetcode.com/problems/merge-sorted-array/>



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Pair difference: www.interviewbit.com/problems/diffk/

Triplet sum: <https://leetcode.com/problems/3sum/>

Linear & Binary Search: <https://leetcode.com/problems/two-sum/>

Finding floor: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/finding-the-floor-1>

Square Root: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/square-root-10>

Cube Root: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/cube-root-1-1>

Find First and Last Position of Element in Sorted Array

<https://leetcode.com/problems/find-first-and-last-position-of-element-in-sorted-array/>

AGGRCOW - Aggressive cows: <https://www.spoj.com/problems/AGGRCOW/>

- Job Scheduling
- Median of an Array
- Hashing
- Why hashing?
- Hashing Techniques
- Collision Resolutions

LinkedList

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>

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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>

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>

Merge point of 2 Linked List

<https://www.hackerrank.com/challenges/find-the-merge-point-of-two-joined-linked-lists/problem>

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>
- Height of A Tree: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/height-of-tree-1>

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- Fill Depth: <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/find-depth>
- Sum OF all the Elements Present in a Tree
- Max Element Present in a Tree
- Level order traversal : <https://www.hackerrank.com/challenges/tree-level-order-traversal/problem>
- Vertical order traversal : <https://leetcode.com/problems/vertical-order-traversal-of-a-binary-tree/>
- Diameter of a tree : <https://leetcode.com/problems/diameter-of-binary-tree/>
- Distance Between 2 Nodes in BST : <https://leetcode.com/problems/minimum-distance-between-bst-nodes/>
- Binary Tree Paths : <https://leetcode.com/problems/binary-tree-paths/>
- Left-View of A Tree : <https://www.hackerrank.com/contests/ashok-it-dsa/challenges/left-view-of-tree-1>
- Find the Maximum Sum Path
- Nodes at K distance
- Right-View Of A Tree
- Top-View Of A tree
- Ceil Of Given Element
- Convert a given binary tree into doubly linked list

Heap

- Print the sorted Matrix Which is only row-wise sorted
- Miscellaneous questions

TRIE

- Matrix Problems
- Given an array find the max sub array XOR
- Median of a Sub Array

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Dynamic Programming

- Fundamental OF DP
- Ladder-Problem
- Filling a floor
- Number of Combination of 0 and 1 such that they don't have consecutive one.
- 6 sided dice, no of ways to get a sum K
- 6 sided dice, to get a sum K(in minimum turn)
- Painting House
- Max subsequence sum such that chosen element must not be adjacent
- Miscellaneous Problem
- Knapsack
- Coin Change Problem
- Matrix Problem

Graphs

- Basic Concept
- BFS
- DFS
- Number of Connected Components
- Given a graph, check whether its tree or not
- Find the longest path in a graph
- No of Island
- Shortest Path from source to destination
- Krushkal's algorithm
- Topological Sort
- Bi-Partite Graph
- Segment tree
- SQRT Decomposition

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