



# **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. Pattern-1 13 | DSA IT-World Question | Contests | HackerRank
- 6. Pattern-2 8 | DSA IT-World Question | Contests | HackerRank
- 7. Pattern-3 3 | DSA IT-World Question | Contests | HackerRank
- 8. Pattern-4 3 | DSA IT-World Question | Contests | HackerRank
- 9. Pattern-5 3 | DSA IT-World Question | Contests | HackerRank
- 10. Pattern-6 | DSA IT-World Question | Contests | HackerRank
- 11. Pattern-7 | DSA IT-World Question | Contests | HackerRank
- 12. Pattern-8 | DSA IT-World Question | Contests | HackerRank
- 13. Print half diamond pattern 1 | DSA IT-World Question | Contests | HackerRank

#### Hollow rectangle pattern

Hollow rectangle pattern | DSA IT-World Question | Contests | HackerRank

### Inverted pyramid pattern

Inverted pyramid pattern | DSA IT-World Question | Contests | HackerRank

### Rectangle pattern

Rectangle pattern | DSA IT-World Question | Contests | HackerRank

### Print pyramid pattern

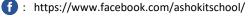
Palindrome pyramid pattern | DSA IT-World Question | Contests | HackerRank

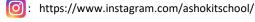
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#### **Diamond Pattern**

Number Diamond Pattern 1 | DSA IT-World Question | Contests | HackerRank

**Down Facing Triangle:** 

Number Diamond Pattern 1 | DSA IT-World Question | Contests | HackerRank

**Binary Pattern:** 

Binary pattern 3 | DSA IT-World Question | Contests | HackerRank

Alphabet Pattern:

Down Facing Triangle | DSA IT-World Question | Contests | HackerRank

# **Fundamentals of Array**

**Simple Array Sum** 

Simple Array Sum | DSA IT-World Question | Contests | HackerRank

Mini-Max Sum

Mini-Max Sum | DSA IT-World Question | Contests | HackerRank

Min and Max element in the array

Min and Max element in the array | DSA IT-World Question | Contests | HackerRank

**Unique Elements of an array** 

Unique Elements of an array | DSA IT-World Question | Contests | HackerRank

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** 

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Duplicate elements of an array | DSA IT-World Question | Contests | HackerRank

### Search for the missing number

Search for the missing number | DSA IT-World Question | Contests | HackerRank

### **\Fundamental of Matrix**

#### **Matrix Addition:**

Matrix Addition 8 | DSA IT-World Question | Contests | HackerRank

Row wise sum of matrix

Row wise sum of matrix | DSA IT-World Question | Contests | HackerRank

**Column wise Sum of Matrix** 

Column wise Sum of Matrix | DSA IT-World Question | Contests | HackerRank

Transpose of a Matrix:

Transpose of a Matrix | DSA IT-World Question | Contests | HackerRank

**Sparse Matrix:** 

Check whether matrix is sparse matrix or not | DSA IT-World Question | Contests | HackerRank

**Print Diagonal:** 

Print Diagonals of a Matrix | DSA IT-World Question | Contests | HackerRank

**Rotation of a Matrix:** 

Rotation Of a Matrix | DSA IT-World Question | Contests | HackerRank





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# **Fundamental of Mathematics**

Sum of a digit:

Sum of a digit | DSA IT-World Question | Contests | HackerRank

Valid Triangle:

Check for a valid triangle | DSA IT-World Question | Contests | HackerRank

Compute a power b

Calculate a power b | DSA IT-World Question | Contests | HackerRank

Factorial of a number

Find factorial for small input range | DSA IT-World Question | Contests | HackerRank

Nth Fibonacci number

Find the Nth fibonacci number | DSA IT-World Question | Contests | HackerRank

Find the multiple of 3 and 5

Find number of multiple of 5 and 3 | DSA IT-World Question | Contests | HackerRank

**Sum of first N Natural Number** 

Sum of first N Natural Number 1 | DSA IT-World Question | Contests | HackerRank

Find the sum of squares

square-sum | DSA IT-World Question | Contests | HackerRank

Find the sum of cubes

Find the sum of cubes | DSA IT-World Question | Contests | HackerRank

**Check Armstrong number** 

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Check Armstrong number | DSA IT-World Question | Contests | HackerRank

#### **Check-Narcissistic numbers**

Check-Narcissistic numbers | DSA IT-World Question | Contests | HackerRank

#### Prime or not

Prime or not 1 | DSA IT-World Question | Contests | HackerRank

#### Harshad numbers:

Harshad numbers | DSA IT-World Question | Contests | HackerRank

# **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. <a href="https://codeforces.com/problemset/problem/266/A">https://codeforces.com/problemset/problem/266/A</a>

# **Time & Space Complexity**

Asymptotic Notations

### **Bit Manipulation**

# **Miscellaneous Question**

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

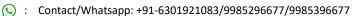
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- **Tower Of Hanoi**
- **Recursion to Generate Sum Set**
- **Balanced Bracket**
- **Magic Square**
- **Miscellaneous String Problem**

# Sorting

#### **Bubble sort**

<u>Bubble Sort implementation | DSA IT-World Question | Contests | HackerRank</u>

#### **Insertion sort**

Insertion sort implementation | DSA IT-World Question | Contests | HackerRank

https://www.hackerrank.com/challenges/insertionsort1/problem

https://www.hackerrank.com/challenges/insertionsort2/problem

https://www.hackerrank.com/challenges/insertion-sort/problem

#### **Selection sort:**

Selection Sort Implementation | DSA IT-World Question | Contests | HackerRank

### **Counting Sort**

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

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

Merge sort/ Quick sort & Merge sorted array:

https://leetcode.com/problems/merge-sorted-array/

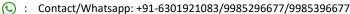
### Pair difference:

#### www.interviewbit.com/problems/diffk/

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

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

Finding floor: Finding The Floor 1 | DSA IT-World Question | Contests | HackerRank

Square Root: Square Root 10 | DSA IT-World Question | Contests | HackerRank

Cube Root: Cube Root 1 | DSA IT-World Question | Contests | HackerRank

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/

- 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

Delete (Head/Tail/Middle)

https://www.hackerrank.com/challenges/delete-a-node-from-a-linked-list/problem

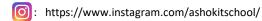
#### **Print:**

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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-thetail/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

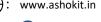
Merge point of 2 Linked List

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

#### **Trees**

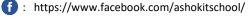
- **Basic concepts**
- In order traversal: https://www.hackerrank.com/challenges/tree-inorder-traversal/problem
- Post order traversal: https://www.hackerrank.com/challenges/tree-postorder-traversal
- Preorder traversal: https://www.hackerrank.com/challenges/tree-preordertraversal/problem
- Height of A Tree: https://www.hackerrank.com/contests/ashok-it-dsa/challenges/height-oftree-1
- 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-ordertraversal/problem

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- Vertical order traversal : <a href="https://leetcode.com/problems/vertical-order-traversal-of-a-binary-tree/">https://leetcode.com/problems/vertical-order-traversal-of-a-binary-tree/</a>
- Diameter of a tree: https://leetcode.com/problems/diameter-of-binary-tree/
- Distance Between 2 Nodes in BST: <a href="https://leetcode.com/problems/minimum-distance-between-bst-nodes/">https://leetcode.com/problems/minimum-distance-between-bst-nodes/</a>
- Binary Tree Paths: <a href="https://leetcode.com/problems/binary-tree-paths/">https://leetcode.com/problems/binary-tree-paths/</a>
- Left-View of A Tree: <a href="https://www.hackerrank.com/contests/ashok-it-dsa/challenges/left-view-of-tree-1">https://www.hackerrank.com/contests/ashok-it-dsa/challenges/left-view-of-tree-1</a>
- Nodes at K distance
- Right-View Of A Tree
- Top-View Of A tree
- Ceil Of Given Element

# **Dynamic Programming**

# **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

