Complete DSA with Python – Beginner to Advanced

■ Prerequisites

1. Variables, Data Types (int, float, string, bool)
2. Conditionals (if, elif, else)
3. Loops (for, while)
4. Functions (def, return values)
5. Basic List, Tuple, Dictionary usage

■ Tools Needed

1. Code Editor: VS Code / PyCharm / Jupyter Notebook
2. Online Judge: LeetCode, HackerRank, or CodeStudio
3. Environment: Python 3.10+ installed locally or Google Colab
4. Version Control (optional): Git + GitHub

■ Full DSA Syllabus & Roadmap (Python)

Week 1: Python Refresher + Logic Building

1. Recap: Loops, Functions, Lists, Strings
2. Tasks: Palindrome, Vowel Count, Factorial
3. Mini Project: Calculator CLI App

Week 2: Arrays / Lists

1. Operations: insert, delete, traverse
2. Problems: Reverse array, Move zeros, Duplicate elements
3. Mini Project: Student Marks Analyzer

Week 3: Strings

1. Manipulations, ASCII tricks
2. Problems: Anagram, Longest Prefix, Frequency count
3. Mini Project: Password Strength Checker

Week 4: Recursion + Backtracking

1. Concepts: Base Case, Recursive Case
2. Problems: Fibonacci, Tower of Hanoi, Subset Sum
3. Mini Project: Maze Solver

Week 5: Searching & Sorting

1. Linear/Binary Search, Bubble/Insertion/Merge/Quick Sort
2. Problems: Kth smallest, Rotated Binary Search
3. Mini Project: Sorting CLI App

Week 6: Hashing / Dictionaries

1. Hash Maps and their uses
2. Problems: Two Sum, Frequencies, First Non-Repeating
3. Mini Project: Word Frequency Counter

Week 7: Stacks and Queues

1. Implement using list/deque
2. Problems: Balanced Parentheses, Next Greater Element
3. Mini Project: Undo-Redo System

Week 8: Linked Lists

1. Singly, Doubly, Circular - Insert/Delete/Reverse
2. Problems: Reverse, Loop Detection, Merge Sorted
3. Mini Project: To-do List App

Week 9: Trees

1. Binary Tree, BST, Traversals
2. Problems: Height, Leaf Nodes, Check BST
3. Mini Project: Expression Tree Evaluator

Week 10: Heaps & Priority Queue

1. Heapq Module, Min/Max Heaps
2. Problems: K Largest, Heap Sort
3. Mini Project: Job Scheduler

Week 11: Graphs (Basic)

1. Adjacency list/matrix, BFS, DFS
2. Problems: Shortest Path, Islands, Topological Sort
3. Mini Project: Friend Network Finder

Week 12: Dynamic Programming

1. Memoization vs Tabulation
2. Problems: Coin Change, LIS, Knapsack
3. Mini Project: Optimal Game Solver