# Problem Solving & DSA Training Program

## Days 4-14 Agenda (Remaining 11 Days)

### Day 4: 17/07/2025 - Advanced Recursion & Introduction to Dynamic Programming

**Morning Session:**

- Recursion optimization techniques (memoization)
- Solve Coin Change problem using memoization
- Fibonacci with and without memoization
- Tower of Hanoi problem

**Afternoon Session:**

- Introduction to Dynamic Programming concepts
- DP vs Recursion vs Memoization
- Climbing Stairs problem
- House Robber problem
- Practice problems on HackerRank/LeetCode

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### Day 5: 18/07/2025 - Dynamic Programming Fundamentals

**Morning Session:**

- 1D DP problems:
  - Longest Increasing Subsequence
  - Maximum Subarray Sum (Kadane's revisited with DP)
  - Jump Game problem
  - Decode Ways

**Afternoon Session:**

- 2D DP introduction:
  - Grid path problems
  - Minimum Path Sum
  - Unique Paths
  - Edit Distance (introduction)

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### Day 6: 19/07/2025 - Advanced Dynamic Programming

**Morning Session:**

- Classic DP problems:

- Longest Common Subsequence
- 0/1 Knapsack problem
- Edit Distance (detailed implementation)
- Palindrome problems

**Afternoon Session:**

- DP optimization techniques
- Space optimization in DP
- Practice session with medium-level DP problems
- Mini contest on DP problems

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## Day 7: 20/07/2025 - Stacks and Queues

**Morning Session:**

- Stack implementation and applications:
  - Valid Parentheses
  - Next Greater Element
  - Largest Rectangle in Histogram
  - Evaluate Reverse Polish Notation

**Afternoon Session:**

- Queue implementation and applications:
  - Circular Queue implementation
  - Stack using Queue and Queue using Stack
  - Sliding Window Maximum
  - First non-repeating character in stream

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## Day 8: 21/07/2025 - Linked Lists

**Morning Session:**

- Linked List fundamentals:
  - Singly Linked List implementation
  - Reverse Linked List
  - Merge Two Sorted Lists
  - Remove Nth Node from End

**Afternoon Session:**

- Advanced Linked List problems:

Advanced Linked List problems:

- Detect Cycle in Linked List (Floyd's algorithm)
- Find Intersection of Two Linked Lists
- Add Two Numbers (represented as linked lists)
- Copy List with Random Pointer

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## Day 9: 22/07/2025 - Trees - Fundamentals

**Morning Session:**

- Binary Tree basics:
  - Tree traversals (Inorder, Preorder, Postorder)
  - Level Order Traversal
  - Maximum Depth of Binary Tree
  - Symmetric Tree

**Afternoon Session:**

- Binary Search Tree:
  - BST implementation
  - Search, Insert, Delete in BST
  - Validate BST
  - Lowest Common Ancestor in BST
  - Convert Sorted Array to BST

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## Day 10: 23/07/2025 - Advanced Trees

**Morning Session:**

- Tree algorithms:
  - Diameter of Binary Tree
  - Path Sum problems
  - Binary Tree Maximum Path Sum
  - Serialize and Deserialize Binary Tree

**Afternoon Session:**

- Heap/Priority Queue:
  - Min Heap and Max Heap implementation
  - Kth Largest Element
  - Merge k Sorted Lists
  - Top K Frequent Elements

## Day 11: 24/07/2025 - Graphs - Introduction

**Morning Session:**

- Graph representations:
  - Adjacency Matrix vs Adjacency List
  - Graph implementation in Python
  - Depth First Search (DFS)
  - Number of Islands

**Afternoon Session:**

- Breadth First Search (BFS):
  - BFS implementation
  - Shortest Path in Unweighted Graph
  - Rotting Oranges
  - Word Ladder

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## Day 12: 25/07/2025 - Advanced Graph Algorithms

**Morning Session:**

- Graph algorithms:
  - Topological Sort
  - Detect Cycle in Directed Graph
  - Course Schedule problem
  - Clone Graph

**Afternoon Session:**

- Shortest Path algorithms:
  - Dijkstra's Algorithm
  - Network Delay Time
  - Cheapest Flights Within K Stops
  - Introduction to Union-Find

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## Day 13: 26/07/2025 - Specialized Topics & Optimization

**Morning Session:**

- Bit Manipulation:
  - Basic bitwise operations
  - Single Number problem

- Counting Bits
- Power of Two

**Afternoon Session:**

- Two Pointers & Sliding Window (advanced):
  - 3Sum problem
  - Container With Most Water
  - Longest Substring Without Repeating Characters
  - Minimum Window Substring

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### Day 14: 27/07/2025 - Integration & Final Assessment

**Morning Session:**

- Trie (Prefix Tree):
  - Trie implementation
  - Word Search II
  - Implement Trie (Prefix Tree)

**Afternoon Session:**

- **Final Contest/Assessment:**
  - Mixed problems from all topics covered
  - Time-bound problem solving
  - Code review and optimization discussion
  - Course wrap-up and next steps

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## Daily Structure (Each Day)

### Morning Session (3 hours)

- **Theory & Concept Introduction** (45 minutes)
- **Live Coding & Implementation** (90 minutes)
- **Problem Solving Practice** (45 minutes)

### Afternoon Session (3 hours)

- **Advanced Problems** (90 minutes)
- **Hands-on Practice** (60 minutes)
- **Contest/Assessment** (30 minutes)

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## Assessment Strategy

### Assessment Strategy

#### Daily Assessments:

- **Mini Contests** (Days 4, 6, 8, 10, 12) - 20 minutes each
- **Coding Challenges** - At least 2 problems per day
- **Peer Code Reviews** - 15 minutes daily

#### Major Assessments:

- **Mid-term Contest** (Day 9) - 1 hour
- **Final Contest** (Day 14) - 2 hours

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## Problem Sets by Day

### Day 4 Problems:

- Coin Change (with memoization)
- Fibonacci (optimized)
- Climbing Stairs
- House Robber

### Day 5 Problems:

- Longest Increasing Subsequence
- Maximum Product Subarray
- Jump Game
- Unique Paths

### Day 6 Problems:

- Longest Common Subsequence
- 0/1 Knapsack
- Edit Distance
- Palindromic Substrings

### Day 7 Problems:

- Valid Parentheses
- Next Greater Element
- Largest Rectangle in Histogram
- Sliding Window Maximum

### Day 8 Problems:

- Reverse Linked List

- Merge Two Sorted Lists
- Linked List Cycle
- Remove Nth Node from End

### Day 9 Problems:

- Binary Tree Inorder Traversal
- Maximum Depth of Binary Tree
- Symmetric Tree
- Validate BST

### Day 10 Problems:

- Diameter of Binary Tree
- Path Sum II
- Kth Largest Element
- Merge k Sorted Lists

### Day 11 Problems:

- Number of Islands
- Clone Graph
- Word Ladder
- Rotting Oranges

### Day 12 Problems:

- Course Schedule
- Network Delay Time
- Cheapest Flights Within K Stops
- Find if Path Exists in Graph

### Day 13 Problems:

- Single Number
- 3Sum
- Container With Most Water
- Longest Substring Without Repeating Characters

### Day 14 Problems:

- Mixed problems from all topics
- Time-bound contest problems

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## Resources & Tools

### Online Platforms:

- LeetCode for daily practice
- HackerRank for contests
- GeeksforGeeks for theory

### Python Libraries:

- `collections` (deque, defaultdict, Counter)
- `heapq` for priority queues
- `bisect` for binary search

### Development Environment:

- Python 3.8+
- VS Code or PyCharm
- Jupyter Notebooks for visualization

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## Expected Outcomes

By Day 14, participants will have:

- Solved 100+ coding problems
- Mastered major data structures and algorithms
- Developed problem-solving intuition
- Prepared for technical interviews
- Built a strong foundation for competitive programming