Beginner

Operators & Complexity Analysis:

1. Binary Number System
2. Logical and Bitwise Operators and their application in CP
3. Introduction to Time & Memory Complexity Analysis

Introduction to Competitive Programming:

1. How Online Judges & online Contest work
2. Explanation of different verdicts
3. How to solve a problem
4. Introduction to team contests, what is ICPC

Array and Strings:

1. Array
2. Linked List
3. Subarray, Substring, Subsequence, Palindrome, Longest Palindromic Substring, Anagram
4. Relevant Problem Solving

Function:

1. Intro to Function
2. Recursive Function.

Data Structures and C++ STL:

1. Basic Data structure (Stack/ Queue/ Vector/Binary Tree)
2. Binary Search Tree
3. Various STL features

Searching Techniques:

1. Binary Search and its application
2. Relevant problem solving on Binary search
3. Intuition behind Interpolation Search

Various Sorting Algorithms:

1. Insertion sort, Counting Sort, Bubble Sort
2. Merge sort and Quick sort
3. Problem solving

Number Theory:

1. Primality Testing
2. Various type of sieve techniques (prime generation, divisor finding/ counting etc.)
3. Relevant problem solving

Modular Arithmetic:

1. Identities in modular arithmetic
2. Modular exponentiation (big mod) and it's application
3. Inverse modulo (Fermat's Little theorem) and relevant problem solving

Greedy Techniques:

1. Intro to Greedy technique
2. Problem solving

Dynamic Programing:

1. Intro to DP
2. Classical problem solving

Range Query Techniques:

1. Basic Range Query technique
2. Relevant problem solving

Combinatorics in CP:

1. Various application of combinatorics in CP
2. Relevant problem Solving

Intermediate

Basic Data Structure & Complexity:

1. Intro to Basic Data Structure (Stack/Queue/Vector/Priority Queue/Set/Map)
2. Time & Memory Complexity Analysis

STL:

1. In depth analysis of STL in C++ with application
2. Relevant problem solving

Searching Techniques:

Binary (Bisection), Ternary Search:

1. In depth discussion
2. Application with problem solving

Recursion:

1. Concept of Recursion
2. Divide & Conquer
3. Backtracking

String Algorithm:

1. KMP basic + Problem Solving
2. Hashing

Number Theory:

1. Primality testing, Various Sieve Techniques
2. Modular Arithmetic, Modular Inverse, Iterative & Recursive Big-mod
3. Totient Function, Mobius Function
4. Number Theory problem solving

Dynamic Programing:

Classical DP:

1. Intro to DP
2. Complexity analysis of DP
3. Coin Change, 0/1 knapsack
4. String DP (LCS, Edit Distance)
5. Longest Increasing Subsequence (LIS)
6. Relevant problem solving

Graph Theory:

1. Intro to Graphs
2. BFS/DFS/Dijkstra & relevant problem solving
3. Graph bicoloring
4. Relevant problem solving

Combinatorics:

1. nCr, nPr theory, coding and problem
2. relevant problem solving

Disjoint Set Union:

1. intro
2. Minimum Spanning Tree (Kruskal)
3. Problem solving

Segment Tree:

1. Intro to Segment Tree
2. Problem solving
3. Lazy Propagation

Advanced

Graph:

1. Floyd Warshall, Bellman Ford, problem solving
2. Topological Sorting + Strongly Connected Component
3. Graph Problems

String:

1. Trie + Hashing basics
2. Z algorithm + KMP basic + problem solving
3. String problems

Math:

1. Intro to Probability/Expected Value
2. Number theory problem
3. Combinatorics problem
4. Matrix Exponentiation

Dynamic Programming:

1. Basic DP problems + Iterative DP
2. More DP problems + DP with DS (Segment tree)
3. Bitmask DP
4. Digit DP

Game Theory:

1. Game Theory Basics (up to nim game)
2. Grundy Numbers

Geometry:

1. Point in Polygon
2. Ternary Search
3. Precision Issue handling
4. Problem solving

Miscellaneous:

1. Meet in the middle basics
2. Binary Search problem

Greedy:

1. Greedy problem
2. Exchange Arguments
3. Modify Past Decision

Expert

Data Structure:

1. Heavy Light Trick + Persistent Data Structure (Segment Tree)
2. Heavy Light Decomposition
3. Mo's Algorithms & advanced square root techniques
4. Centroid Decomposition
5. DSU on tree

Graph:

1. Articulation Point, Biconnected Component, Bridges, Bridge Tree
2. Bipartite Matching (BPM) and Covering problems
3. Max Flow and Min Cost Max Flow (MCMF)

String:

1. Suffix array problem
2. Aho Corasick

Math:

1. Probability and Expected Value
2. Gaussian Elimination basic and problem
3. Principle of Inclusion Exclusion and advanced Number Theory problems
4. FFT basics

Dynamic Programming:

1. Sibling DP
2. DP Optimization Tricks (Convex Hull Trick / CHT)
3. DP Optimization Tricks (Divide and Conquer, Knuth's Optimization)

Greedy Theory:

1. Advanced Greedy Problems
2. Solving problems

Game Theory:

1. Grundy Numbers and problem
2. Hackenbush and Advanced game theory problems

Geometry:

1. Vector Geometry Theory
2. Vector Geometry Coding and problem
3. Convex Hull, 3D Geometry Basics, Other Geometry Techniques

Problem Solving using Randomized Techniques