COMPETITIVE PROGRAMMING

00.24

00.60

01.14

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Detailed
Course Syllabus

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CP BASICS & NUMBER THEORY

Basics

- Starting with CP
- Solving First Competitive Programming Problem
- Ranges of input And Output
- C++ Tricks For Competitive Programming
- Using Typedef and Macros in C++
- IO Manipulation

Practice Problems

- Number Theory Basics
- Floating Point Default Print Format
- Floating point Manipulating Default Format
- Sum of N Natural Numbers
- Sum of Squares
- Factorial of A Number
- Trailing Zeros in Factorial
- Maximum Power Dividing Factorial
- Trailing Zeros in Factorial

Practice Problems

Practice Contest

Number Theory I

- Bit Masking
- Bitwise Operators in CPP (Part 1)
- Bitwise Operators in CPP (Part 2)
- Count set bits
- Check Kth bit is set or not
- Power of Two
- One Odd Occurring
- Two Odd Occurring
- Gray Codes
- Binary To Gray Code
- Gray to Binary
- Power Set using Bitwise

Practice Problems

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- LCM of Two Numbers
- Extended Euclidean Algorithm
- Bezout's Identity
- Linear Diophantine Equation (Check for Solution)
- Linear Diophantine Equation (Find any Solution)

Practice Problems

- Mathematical Principles

- Inclusion Exclusion Principle
- Inclusion Exclusion (Not Conditions)
- Pigeonhole Principle
- Derangements
- Counting Derangements
- Subarray Sum Divisible By Size

Practice Problems

- Number Theoretic Functions

- Euler Totient Function
- Euler Totient (Efficient Implement)
- Properties of Euler Totient Function
- Euler Totient for 1 To n

Practice Problems

- Binomial Coefficients

- Permutation
- Printing all Permutations
- Combinations
- nCr (Simple Method)
- nCr(Recursive Addition Formula)
- nCr Mod p for Large Prime

Practice Problems

Practice Contest

Number Theory III

- Catalan Numbers

- Catalan Number
- Catalan Number Implementation (Part 1)
- Catalan Number Implementation (Part 2)
- Count Ways To Reach Grid Top

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- Number of Binary Trees
- Counting Polygon Triangulation
- More Applications of Catalan

Practice Problems

- Modular Arithmetic

- Modular Arithmetic Introduction
- Modular Arithmetic in Competitive Programming
- Ranges of int Types
- Modular Arithmetic Properties
- Modulo Inverse
- Modulo Inverse Using Euler's Theorem
- Working of Euler's Theorem
- Modulo Inverse Using Fermet's Little Theorem
- Working Of Extended Euclidean Algorithm For Inverse
- Modulo Inverse of 1 to N
- Chinese Remainder Theorem (Introduction)
- CRT Efficient Implementation

Practice Problems

- Modular Exponentiation

- Computing Power
- Iterative Power
- Matrix Exponentiation Introduction
- Recursive Solution and Matrix Exponentiation Part 1
- Recursive Solution and Matrix Exponentiation Part 2

Practice Problems

- Combinatorial Game Theory

- Combinational Game Theory Introduction
- Impartial Game Examples
- Grundy Number (Background)
- Mex and Grundy Number
- Grundy number Implementation
- Composite Games
- Sprague Grundy Theorem
- The Game of Nim
- Working of Nim-Sum Formula
- Working of Grundy Number Theorem

Practice Problems

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RECURSION AND BACKTRACKING

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- **Queue**
  - Maximum subsequence sum with some constrained | queue
  - maximum in a window | queue
  - *Practice Problems*

- **Priority Queue**
  - Minimize the cost (priority queue)
  - Minimum number of stops | Priority queue
  - Maximum value of the equation | Priority queue
  - Skyline problem | Priority queue
  - Median of Running stream | priority queue
  - *Practice Problems*

  Practice Contest

TREES

- **Traversals in Tree**
  - Implementation of Inorder Traversal
  - Implementation of Preorder Traversal
  - Implementation of Postorder Traversal
  - Level Order Traversal
  - Level Order Traversal Line by Line (Part 1)
  - Level Order Traversal Line by Line (Part 2)
  - *Practice Problems*

- **Extra Concepts and Problem Solving**
  - LCA of Binary Tree (Part 1)
  - LCA of Binary Tree (Part 2)
  - Euler Tour of the tree
  - Euler Tour Problem
  - *Practice Problems*

  Practice Contest

GREEDY - CP

- **Greedy**
  - Greedy Vs DP
  - Greedy | Policemen and Thieves
  - Greedy| Fractional knapsack
  - Greedy | Xor Problem

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- Probability DP
  - Probability DP | Coins

  Practice Problems

- Digit DP
  - Digit D Occurring K times
  - First digit equal to the last digit

  Practice Problems

  Practice Contest

GRAPHS - CP

- BFS
  - Finding the level of each node in the graph
  - Snakes and Ladder
  - Multisource BFS

  Practice Problems

- DFS
  - Connected Components in Graph
  - Count the number of islands in the grid

  Practice Problems

- Topological Sort
  - Topological Sort | Introduction
  - Topological Sort | Algorithm and Code (Kahn's Algorithm)
  - Topological sorting | DFS

  Practice Problems

- Lowest Common Ancestor
  - LCA | Introduction
  - LCA | Checking parent using timer
  - LCA | Brute Force
  - LCA | Binary Lifting

  Practice Problems

- Bridges and Articulation Point
  - Bridges and Articulation Point | Introduction
  - Bridges and Articulation Point | Concept of Timer
  - Bridges | Algorithm and Code
  - Articulation Point | Algorithm and Code

  Practice Problems

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STRING ALGORITHMS - CP

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RANGE QUERY PROBLEMS - CP

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