

Competitive Programming Common Algorithms

Graph Algorithms

- Breadth First Search
- Depth First Search
- Dijkstra's
- Floyd-Warshall
- Bellman-Ford
- Minimum Spanning Tree
 - Prim
 - Kruskal
- Heavy Light Decomposition
- Strongly Connected Components
 - Kosaraju's Algorithm
 - Tarjan's SCC Algorithm
- Euler Tour
- Topological Sort

Flow Algorithms

- Maximum Flow
- Minimum Cost Flow
- Maximum Bipartite Matching
- Hungarian Algorithm

Dynamic Programming

Number Theory

- Greatest Common Divisor
- Least Common Multiple
- Extended Euclidean
- Modular Arithmetic(addition, subtraction, multiplication)
- Modular Multiplicative Inverse("division") – Existence and Computation
- Euler Totient Function
- Sieve of Eratosthenes and Sieve of Atkins
- Prime Factorization(with and without pre-process)
- Probabilistic Primality Checks
- Fast Modulo Multiplication(Exponential Squaring)
- Solving System of linear modular congruences - Chinese Remainder Theorem
- Solving Linear Recurrences by Fast Exponentiation of Matrices
- Primitive root modulo N
- Discrete logarithm

- Discrete square root
- Multiplicative function and Mobius Inversion Formula
- Farey Sequence and applications.
- Logarithmic Exponentiation
- Fermat's Theorem
- Pigeonhole Principle
- Subsets and Permutations

Geometry

- Subroutines(2D/3D)
 - Dot Products/ Cross Products.
 - Rotation
 - Reflection
- Intersection between
 - X and Y, where $X, Y \in \{\text{Circle, Polygon, Segment, Line}\}$.
- Closest distance between
 - X and Y, where $X, Y \in \{\text{Circle, Polygon, Segment, Line}\}$.
- 2D/3D Convex Hulls.
- Graham-Scan for Convex Hull.

String Algorithms

- Knuth-Morris-Pratt
- Boyre Moore
- Z-Function
- Aho-Corasik

String Data Structure

- Suffix Arrays
- Tries

Advanced Data Structures

- Segment Tree
- Binary Indexed Tree
- Treap
- Skip Lists
- Interval Tree

Combinatorial Games

- Nim Game
- Grundy Numbers

Others

- Backtracking and Pruning
- Meet in the Middle Algorithm
- Heuristic Algorithms
- Manacher's Algorithm
- Union Find/ Disjoint Set
- Prime Miller Rabin
- Matrix Recurrence + Fast Modulo Multiplication for Counting
- Stable Marriage Problem
- Ternary Search
- Fast Fourier Transform for Fast Polynomial Multiplication
- Range Minimum Query
- Lowest Common Ancestor

- Sweep Line Algorithm
- Longest Common Prefix
- Gaussian Elimination
- Numerical Integration/ Differentiation
- Line Clipping
- Advanced Maths Ad-Hoc Problems
- Lucas Algorithm ($nCr \% M$)
- Inverse Modulo Operations
- Pollard Rho Integer Factorization
- Catalan Numbers