# A Complete Guideline to Competitive Programming

## Basic and STL

1. Auto
2. Pair
3. Tuple
4. Struct
5. Pointers
6. String
7. Multidimensional array
8. Vector
9. List
10. Stack
11. Queue
12. Deque
13. Priority Queue
14. Set
15. Unordered set
16. Multiset
17. Map
18. Unordered map
19. Stringstream

## Number Theory

1. Primes and Sieve
2. Factorization
3. GCD and LCM
4. Divisibility
5. Number of divisors
6. Co-primes
7. Euler Totient Function
8. Trick with subarray gcd
9. Segmented Sieve
10. Extended Euclid, Linear Diophantine
11. Inclusion Exclusion
12. Interactive problem
13. Bigmod
14. Modular inverse
15. Fermat's little theorem

## Math

1. Basic Math
2. Matrix Exponential
3. Expected value
4. Probability

## Data Structure

1. Segment tree
2. Segment tree lazy
3. Binary index tree
4. Order statistics tree
5. Number of inversions
6. Sparse table
7. LCA and Binary lifting
8. Sqrt Decomposition
9. MO'S algorithm

## Graph Theory

1. Undirected or Directed graph
2. Adjacency matrix and lists
3. DFS and BFS
4. Directed array
5. Graph coloring
6. Connected components
7. Trees
8. DFS tree
9. Diameter of a tree
10. DSU (with or without rollback)
11. Dijkstra
12. Floyd warshall
13. DSU small to large technique
14. MST
15. SCC, Articulation Points and Bridges

## DP

1. Recursions
2. 0/1 knapsack
3. Longest common subsequence
4. LIS
5. DP with output tracking
6. Knapsack using bitsets
7. Kadane's Algorithm
8. SubString DP
9. Iterative DP and Memory Optimization
10. Queries on tree (Euler tour technique)
11. DP with tree
12. Bitmask DP
13. SOS DP
14. Digit DP

## Strings

1. KMP
2. Prefix Automation
3. Z Algorithm
4. String Hashing
5. GP Hash table
6. Trie
7. Aho carsick
8. Trie XOR max/min
9. Suffix Array

## Miscelleneous

1. Ternary Search
2. Co-ordinate compression
3. Pigeonhole Principle
4. Greedy
5. Activity selected problem
6. Tow pointer
7. Sliding window
8. All nearest smaller elements
9. Monotonous queue
10. Game theory
11. Grundy Numbers
12. Constructive algorithm
13. Difference array
14. Backtracking
15. Meet in the middle

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