Topics

These are the main topics that should be done thoroughly.

Number theory

1. Euclidian and extended Euclidian algorithm
2. Modular arithmetic and modular inverse
3. Prime generation (sieve and segmented sieve)
4. Fermat’s theorem
5. Euler’s Totient function
6. Miller Rabin primality test
7. Chinese remainder theorem
8. Lucas theorem

Greedy algorithms

1. Activity-selection problem
2. Kruskal’s algorithm
3. Prim’s algorithm

Binary search

1. Topcoder binary search
2. Binary search
3. Ubiquitous binary search — get a grasp of discrete and continuous binary searches

Data structures

1. Linked lists
2. Binary-search tree
3. Binary-indexed tree or Fenwick tree
4. Segment Tree (RMQ, range sum, and lazy propagation)
5. Red-Black trees
6. Hashing
7. Extensive list of data structures

Graph algorithms

1. Breadth-first search (BFS)
2. Depth-first search (DFS)
3. Shortest path from source to all vertices (Dijkstra)
4. Shortest path from every vertex to every other vertex (Floyd Warshall)
5. Minimum spanning tree (Prim)
6. Minimum spanning tree (Kruskal)
7. Topological Sort
8. Johnson’s algorithm
9. Articulation points (or cut vertices) in a graph
10. Bridges in a graph
11. All graph algorithms

String algorithms

Learning library functions for string actually proves very helpful.

(C++: See this, this, String in Java.)

1. KMP algorithm
2. Rabin karp
3. Z's algorithm
4. Aho-Corasick string matching
5. Suffix arrays
6. Trie
7. Finite automata

Dynamic programming

1. Dynamic programming — GeeksforGeeks
2. Dynamic Programming — Codechef

Dynamic programming is quite important and can be infused and asked with various other topics. Some different types of DP concepts are:

Classic DP

1. Longest-common subsequence
2. Longest-increasing subsequence
3. Edit distance
4. Minimum partition
5. Ways to cover a distance
6. Longest path in matrix
7. Subset-sum problem
8. Optimal strategy for a game
9. 0–1 knapsack problem
10. Assembly-line scheduling
11. All DP algorithms

Computational geometry

1. Convex-hull algorithms
2. Geometric algorithms

“The ‘Science’ of Training in Competitive Programming”: In this blog,the author explains how to train for CP and what he did in order to be a good problem solver.