What are the "must known" algorithms for online programming contests?

36

Hello all,
I've been practicing at Codechef for a while and now I'm gradually moving toward medium/hard problems. However many algorithms at these levels are very difficult to predict, and I was always stuck because I'm not aware of them. So I open this topic, my hope is to have a wish-list of most used algorithm for online programming contest that I can look up for reference. Here is my short-list up to now:

17

1. Segment tree/Interval Tree
2. Binary Indexed Tree
3. Fast Modulo Multiplication (Exponential Squaring)
4. Suffix Array/Suffix Tree
5. KMP string searching
6. Manacher's Algorithm
7. Union Find/Disjoint Set
8. Trie
9. Prime Miller Rabin
10. Matrix Recurrence + Fast Modulo Multiplication for counting
11. Stable Marriage Problem
12. Extended Euclid's algorithm
13. Ternary Search
14. Fast Fourier Transform for fast polynomial multiplication
15. Djikstra's algorithm, Bellman-ford algorithm, Floyd-Warshall Algorithm
16. Prim's Algorithm, Kruskal's Algorithm
17. RMQ, LCA
18. Flow related algorithms, assignment problem, Hungarian algorithm
19. Bipartite matching algorithms
20. Heavy-light decomposition
21. Sweep line algorithm
22. Z algorithm
23. Convex Hull
24. Suffix Arrays
25. LCP
26. Heuristic Algorithms
27. Gaussian Elimination
28. Numerical Integration/Differentiation
29. Line Clipping
30. Advanced Maths Ad-Hoc problems
31. Aho-Corasick string matching algorithm;
32. Calculate nCr % M Lucas's Theorem
33. Heavy Light decomposition in trees
34. Inverse Modulo operations
35. Pollard Rho Integer Factorization
36. Catalan Numbers

Add some more...

algorithm

This question is marked "community wiki".

edited **9 hours ago**
n2n_
554●1●8●13

asked **24 Jul, 13:02**

tyrant
821●10●16●22
accept rate: 25%

7 It will be great if we can build on this to give links of useful resources against each algorithm and also mention problems which require these algorithms to be solved.

admin ◆◆ (24 Jul, 19:48)

1 @admin nice thought...it will be very very helpful :)

donofgaya (24 Jul, 20:16)

Tags:

algorithm **×77**

Asked: **24 Jul, 13:02**

Seen: **1,205 times**

Last updated: **6 hours ago**

Related questions

Fitting Lines into a Grid Matrix (Fitting Problem)

algorithms

Insomnia 2013

Algorithmic

how to solve np problems??

Performance of C++ code

Sorting algorithm

Please Help me in my project

Paying up:explaination

Number of Instructions that can be acceptable in 1 second

2 @admin: Great suggestion. Will do when I have time ;)

tyrant (24 Jul, 22:25)

3 Should we make this as a community wiki and people can keep adding and editing it there? The down side is that the votes that you have gathers will be lost. Or we can create another community wiki with the contents of this thread and the community can edit it there. What say?

admin ◆◆ (25 Jul, 13:54)

6 @admin: Please do, I don't mind those votes as long as it will help the community ;).

tyrant (26 Jul, 22:42)

showing 5 of 8 show all add new comment

8 Answers: oldest newest most voted

9

- Euclid's GCD Algorithm
- Extended Euclid's algorithm
- Binary Search, Ternary Search
- Sieve of Eratosthenes for finding primes
- Fast Fourier Transformation for fast polynomial multiplication
- Graph algorithms - BFS, DFS, finding connected components
- Djikstra's algorithm, Bellman-ford algorithm, Floyd-Warshall Algorithm
- Prim's Algorithm, Kruskal's Algorithm
- RMQ, LCA
- Flow related algorithms, assignment problem, Hungarian algorithm
- Bipartite matching algorithms
- Heavy-light decomposition
- Sweep line algorithm
- Z algorithm

link | award points edited **24 Jul, 13:42** answered **24 Jul, 13:39**

n2n_
554●1●8●13
accept rate: 15%

add new comment

8

- Kruskal's or Prim's algorithm
- Dijkstra's algorithm
- Convex Hull

Edit: It would be a nice idea to group these algorithms. For example, KMP algortihm, Aho-Corasick algorithm, Rabin-Karp algorithm all fall under the category of String Match, and hence should be put under the category of string match algorithms; and so on for other algorithms as well.

Grouping would help newbies like me to explore a particular group and learn all the algorithms in that.

link | award points edited **24 Jul, 15:25** answered **24 Jul, 13:45**

bugkiller
4.0k●8●30●59
accept rate: 6%

add new comment

8

Hello,

I can add a few more topics:

- Suffix Arrays;
- LCP;
- Heuristic Algorithms;
- Gaussian Elimination;
- Numerical Integration/Differentiation;
- Line Clipping;
- Advanced Maths Ad-Hoc problems;
- Aho-Corasick string matching algorithm;
- Knuth-Morris-Pratt algorithm;

Sadly, this list is endless and the hardest part is to understand which of these topics need to be applied to solve a given problem. As a bonus, you can have variations of these standard topics which may require mixing some of these concepts.

I will edit the above post with all these suggestions, except some of the suggestions given by @n2n_, since putting on the same bag, FFT and Sieve of Eratosthenes for finding primes, seems a bit overkill to me, as the second one is a **basic** algorithm and not needed to advanced problems I would say :)

Best regards,

Bruno

link | award points answered **24 Jul, 14:23**

kuruma
6.5k●28●72●115
accept rate: 4%

add new comment

6 A very useful link ,list in-dept analysis of basic to advanced algorithm ,many which are listed above ,very helpful read http://e-maxx.ru/algo/ though in russian but google translator might help. :)

link | award points

answered **27 Jul, 03:48**
johri21
91●1●3
accept rate: 0%

add new comment

6 Hello @all and especially @admin,

Is the idea of linking all of the above topics to some resource with a tutorial and suggested problems still up?

Because if it is, I can try to write about the topic 3. Fast Modulo Multiplication (Exponential Squaring), as it is a topic I master relatively well, and, when I'm finished with my tutorial I can provide the link here :D

What do you think?

Best regards,

Bruno

link | award points

answered **2 days ago**
kuruma
6.5k●28●72●115
accept rate: 4%

1 Great job!

tyrant (10 hours ago)

We still have much more to do :D And me, personally, I have way much more to learn :p

kuruma (6 hours ago)

add new comment

3 http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html i've found it very useful

link | award points

answered **yesterday**
akrai48
90●1●7
accept rate: 0%

add new comment

2 This website can also of great help in learning basic algorithms: http://www.learnalgorithms.in/

link | award points

answered **11 hours ago**
coding_addict
31●3
accept rate: 0%

add new comment

1 I'd suggest further adding

- Heavy Light decomposition in trees
- Inverse Modulo operations
- Lucas theorem method for nCr
- Pollard Rho Integer Factorization
- Catalan Numbers

Some useful resources : come on code on

Some cool problems : Nikhil Garg's blog on quora

link | award points

edited **11 hours ago**

answered **11 hours ago**
code_master01
395●2●5●11
accept rate: 0%

add new comment

Your answer

[hide preview] community wiki

Post Your Answer