-**Basic Geometry/Euclidean Geometry/ordinate Geometry/[3-D** variants **of everything].**

1. **Computational Geometry.**
   Graham Scan algorithm for Convex Hull O(n * log(n)).
   a. Online construction of 3-D convex hull in O(n^2).
   b. Bentley Ottmann algorithm to list all intersection points of n line segments in O((n + I) * logn).
      - Suggested Reading -
        1. http://softsurfer.com/Archive/algorithm_0108/algorithm_0108.htm
   c. Rotating Calipers Technique.
      - Suggested Reading - http://cgm.cs.mcgill.ca/~orm/rotcal.html
      - Problems - Refer the article for a list of problems which can be solved using Rotating Calipers technique.
   d. Line Sweep/Plane Sweep algorithms -
      - Area/Perimeter of Union of Rectangles.
      - Closest pair of points.
      - Suggested Reading -
        1. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=lineSweep
      - Problems - Follow the tutorial for list of problems.
   e. Area of Union of Circles.
   f. Delaunay Triangulation of n points in O(n * logn).
   g. Voronoi Diagrams of n points in O(n * logn) using Fortune's algorithm.
   h. Point in a polygon problem -
      - O(n) solution without preprocessing.
      - O(logn) algorithm with O(n * logn) preprocessing for convex polygons.
   i. Problems on computational geometry -
      - BSHEEP, BULK, SEGVIS, CONDUIT, RUNAWAY, DIRVS, RAIN1, SHAMAN, TCUTTER, LITEPIPE, RHOMBS, FSHEEP, FLBRKLIN, CERC07P, BAC, ALTARS, CERC07C, NECKLACE, CH3D, RECTANGL, POLYSSQ, FOREST2, KPPOLY, RAIN2, SEGMENTS, ARCHPLG, BALLOON, CIRCLES, COMPASS, EOWAMRT, ICERINK on SPOJ.
      - CultureGrowth, PolygonCover on Topcoder.
   j. Suggested Reading -
      - Computational Geometry: Algorithms and applications. Mark De Burg.

To be Done till 6th may.

- **String Algorithm.**
  1. **KnuthMorrisPratt** algorithm.
     a. Problems - NHAY, PERIOD on SPOJ.
     b. Suggested Reading -
        i. Cormen chapter on Strings.
        ii. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=stringSearching
  2. Aho Corasick algorithm.

2. Problems - WPUZZLES on SPOJ.
   a. Suffix Arrays
      - O(n^2 * logn) Naive method of suffix array construction
      - O(n * logn^2) method of suffix array construction
      - O(n * log n) method of suffix array construction.
      - **O(n)** method of suffix array construction
      - O(n) LCA preprocess on Suffix Arrays to solve a variety of string problems.
   b. Suffix Trees
      - O(n) construction of Suffix trees using Ukkonon's algorithm.
      - O(n) construction of Suffix Trees if provided with Suffix Arrays using Farach's algorithm.
   c. Suffix Automata
      - O(n) Suffix Automaton construction.
   d. Dictionary Of Basic Factors
      - O(n * log n) method of DBF construction using Radix Sort.
   e. **Manacher's algorithm** to find length of palindromic substring of a string centered at a position for each position in the string. Runtime -> O(n).
   f. Searching and preprocessing Regular Expressions consisting of '?', '*'.
   g. Multi-dimensional pattern matching.
   h. Problems on Strings [can be solved with a variety of techniques] -
      - DISUBSTR, PLD, MSTRING, REPEATS, JEWELS, ARCHIVER, PROPKEY, LITELANG, EMOTICON, WORDS, AMCODES, UCODES, PT07H, MINSEQ, TOPALIN, BWHEELER, BEADS, SARRAY, LCS, LCS2, SUBST1, PHRASES, PRETILE on SPOJ
      - http://www.algorithmist.com/index.php/Category:String_algorithms

Till 11 may.

3. **Basic Graphs [beginner].**
   a. Representation of graphs as adjacency list, adjacency matrix, incidence matrix and edge list and uses of different representations in different scenarios.
   b. Breadth First Search.

        - problems -
            1. PPATH, ONEZERO, WATER on SPOJ

c. Depth First Search.
d. Strongly Connected Components.
    - problems -
        1. TOUR and BOTTOM on SPOJ.
e. Biconnected Components, Finding articulation points and bridges].
    - problems -
        1. RELINETS, PT07A on SPOJ.
f. Dijkstra algorithm -
    - problems -
        1. SHPATH on SPOJ.
g. Floyd Warshall algorithm -
    - problems -
        1. COURIER on SPOJ.
h. Minimum Spanning Tree
    - problems -
        1. BLINNET on SPOJ.
i. Flood-fill algorithm
j. Topological sort
k. Bellman-Ford algorithm.
l. Euler Tour/Path.
    - problems - WORDS1 on SPOJ.
m. Suggested reading for most of the topics in Graph algorithms -
    - http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=graphsDataStrucs1.
    - Also refer to the tutorial for problems concerning these techniques.
    - Cormen chapter 22 to 24.

Till 13 may.(before coming iitk it should be done :))

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4. **Flow networks/ matching etc etc. [Intermediate/Advanced].**
    a. Maximum flow using Ford Fulkerson Method.
        - Suggested Reading -
            1. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=maxFlow
        - problems - TAXI, POTHOLE, IM, QUEST4, MUDDY, EN, CABLETV, STEAD, NETADMIN, COCONUTS, OPTM on SPOJ.
    b. Maximum flow using Dinic's Algorithm.
        - Problems - PROFIT on spoj.
    c. Minimum Cost Maximum Flow.
        - Successive Shortest path algorithm.
        - Cycle Cancelling algorithm.
        - Suggested Reading -
            1. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=minimumCostFlow1
    d. Maximum weighted Bipartite Matching (Kuhn Munkras algorithm/Hungarian Method)
        - problems - GREED, SCITIES, TOURS on SPOJ | http://www.topcoder.com/stat?c=problem_statement&pm=8143
    e. Stoer Wagner min-cut algorithm.
    f. Hopcroft Karp bipartite matching algorithm.
            1. problems - ANGELS on SPOJ.
    g. Maximum matching in general graph (blossom shrinking)
    h. Gomory-Hu Trees.aa
        - i) Problems - MCQUERY on Spoj.
    i. Chinese Postman Problem.
        - problems - http://acm.uva.es/archive/nuevoportal/data/problem.php?p=4039
        - Suggested Reading - http://eie507.eie.polyu.edu.hk/ss-submission/B7a/
    j. Suggested Reading for the full category ->
        - Network flow - Algorithms and Applications by Ahuja
        - Cormen book chapter 25.

Till 20 th may.

5. **Dynamic Programming.**
    a. Suggested Reading - Dynamic Programming(DP) as a tabulation method
        - Cormen chapter on DP
    b. Standard problems (you should really feel comfortable with these types)
        - http://www.topcoder.com/stat?c=problem_statement&pm=8570&rd=12012&rm=269199&cr=7581406
        - http://www.topcoder.com/stat?c=problem_statement&pm=10765&rd=14183
    c. State space reduction
        - http://www.topcoder.com/stat?c=problem_statement&pm=10902
        - http://www.topcoder.com/stat?c=problem_statement&pm=3001
        - http://www.topcoder.com/stat?c=problem_statement&pm=8605&rd=12012&rm=269199&cr=7581406
    d. Solving in the reverse - easier characterizations looking from the end
        - http://www.spoj.pl/problems/MUSKET
        - http://www.topcoder.com/stat?c=problem_statement&pm=5908
    e. Counting/optimizing arrangements satisfying some specified properties

- http://www.topcoder.com/stat?c=problem_statement&pm=8306
- http://www.topcoder.com/stat?c=problem_statement&pm=784
- 9Strategies and expected values
- http://www.topcoder.com/stat?c=problem_statement&pm=10765&rd=14183
- http://www.topcoder.com/stat?c=problem_statement&pm=10806
- http://www.topcoder.com/stat?c=problem_statement&pm=7828
- http://www.topcoder.com/stat?c=problem_statement&pm=7316

f. DP on probability spaces
- http://www.topcoder.com/stat?c=problem_statement&pm=7422
- http://www.topcoder.com/stat?c=problem_statement&pm=2959
- http://www.topcoder.com/stat?c=problem_statement&pm=10335

g. DP on trees
- http://www.topcoder.com/stat?c=problem_statement&pm=10800
- http://www.topcoder.com/stat?c=problem_statement&pm=10737
- http://www.topcoder.com/stat?c=problem_solution&rm=266678&rd=10958&pm=8266&cr=7581406

h. DP with data structures
- http://www.spoj.pl/problems/INCSEQ/
- http://www.spoj.pl/problems/INCDSEQ/
- http://www.spoj.pl/problems/LIS2/
- http://www.topcoder.com/stat?c=problem_statement&pm=1986

i. Symmetric characterization of DP state
- http://www.topcoder.com/stat?c=problem_statement&pm=8610

j. A good collection of problems
- http://codeforces.com/blog/entry/325
- http://problemclassifier.appspot.com/index.jsp?search=dp&usr=

Till 28 th may.

6. **Greedy.**
   a. Suggested Reading -
      - Chapter on Greedy algorithms in Cormen.
      - http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=greedyAlg
   b. problems - refer to the topcoder tutorial.
7. **Number Theory.**
   a. Modulus arithmetic - basic postulates [Including modular linear equations,Continued fraction and Pell's equation]
      - Suggested Reading -
        1. Chapter 1 from Number Theory for Computing by SY Yan [Recommended]
        2. 31.1, 31.3 and 31.4 from Cormen
        3. www.topcoder.com/tc?module=Static&d1=tutorials&d2=primeNumbers
      - Problems
        1. http://projecteuler.net/index.php?section=problems&id=64
        2. http://projecteuler.net/index.php?section=problems&id=65
        3. http://projecteuler.net/index.php?section=problems&id=66
        4. http://www.topcoder.com/stat?c=problem_statement&pm=6408&rd=9826
        5. http://www.topcoder.com/stat?c=problem_statement&pm=2342
   b. Fermat's theorem, Euler's Totient theorem (totient function, order , primitive roots)
      - Suggested Reading
        1. 1.6, 2.2 from Number Theory by SY Yan
        2. 31.6 , 31.7 from Cormen
      - Problems
        1. http://projecteuler.net/index.php?section=problems&id=70
        2. http://www.spoj.pl/problems/NDIVPHI/
   c. Chinese remainder theorem
      - Suggested Reading
        1. 31.5 from Cormen
        2. 1.6 from Number Theory by SY Yan
      - Problems
        1. Project Euler 271
        2. http://www.topcoder.com/stat?c=problem_statement&pm=10551&rd=13903
   d. Primality tests -
      - Deterministic O(sqrt(n)) approach
      - Probabilistic primality tests - Fermat primality test, Miller-Rabin Primality test
        1. Suggested Reading -
           a. *http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=primalityTesting*
           b. Cormen 31.8
           c. 2.2 from Number Theory by SY Yan
        2. Problems -
           a. PON, PRIC, SOLSTRAS on SPOJ
           b. http://www.topcoder.com/stat?c=problem_statement&pm=4515
   e. Prime generation techniques - Sieve of Eratosthenes
      - Suggested Problems - PRIME1 on SPOJ
   f. GCD using euclidean method
      - Suggested Reading
        1. 31.2 Cormen
      - Problems -

1. GCD on SPOJ
2. http://uva.onlinejudge.org/external/114/11424.html

g. Logarithmic Exponentiation
   - Suggested Reading -
     1. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=primalityTesting

h. Integer Factorization
   - Naive O(sqrt(n)) method
   - Pollard Rho factorization
   - Suggested Reading
     1. 2.3 from Number Theory SY Yan
     2. 31.9 Cormen
   - Problems -
     1. http://www.topcoder.com/stat?c=problem_statement&pm=2986&rd=5862
     2. http://www.spoj.pl/problems/DIVSUM2/
     3. http://www.topcoder.com/stat?c=problem_statement&pm=4481&rd=6538

i. Stirling numbers

j. Wilson theorem
   - nCr % p in O(p) preprocess and O(log n) query

k. Lucas Theorem

l. Suggested Reading for Number Theory -
   - Number theory for computing by Song Y Yan [Simple book describing concepts in details]
   - Concepts are also superficially covered in Chapter 31 of Introduction to Algorithms by Cormen
   - http://www.codechef.com/wiki/tutorial-number-theory
   - http://www.algorithmist.com/index.php/Category:Number_Theory

m. Problems on Number Theory -
   - http://www.algorithmist.com/index.php/Category:Number_Theory
   - http://problemclassifier.appspot.com/index.jsp?search=number&usr=

Till 6th june.

8. **Math (Probability, Counting, Game Theory, Group Theory, Generating functions, Permutation Cycles, Linear Algebra)**

   a. **Probability.**

   Syllabus
   - Basic probability and Conditional probability
     1. Suggested problems
        a. http://www.spoj.pl/problems/CT16E/
        b. http://www.spoj.pl/problems/CHICAGO/
   - Random variables, probability generating functions
   - Mathematical expectation + Linearity of expectation
     1. Suggested problems
        a. http://www.spoj.pl/problems/FAVDICE/
        b. http://www.topcoder.com/stat?c=problem_statement&pm=10744
   - Special discrete and continuous probability distributions
     1. Bernoulli, Binomial, Poisson, normal distribution
     2. Suggested Problem
        a. http://acm.sgu.ru/problem.php?contest=0&problem=498
   - Suggested Readings
     1. Cormen appendix C (very basic)
     2. Topcoder probabilty tutorial
        http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=probabilities
     3. http://en.wikipedia.org/wiki/Random_variable
     4. http://en.wikipedia.org/wiki/Expected_value
     5. William Feller, An introduction to probability theory and its applications

   b. **Counting**

   Syllabus
   - Basic principles - Pigeon hole principle, addition, multiplication rules
     1. Suggested problems
        a. http://acm.timus.ru/problem.aspx?space=1&num=1690
        b. http://www.topcoder.com/stat?c=problem_statement&pm=10805
     3. Suggested readings
        a. http://en.wikipedia.org/wiki/Combinatorial_principles
        b. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=combinatorics
        c. http://www.maa.org/editorial/knot/pigeonhole.html
   - Inclusion-exclusion
     1. Suggested readings
        a. http://en.wikipedia.org/wiki/Inclusion-exclusion_principle
     2. Suggested problems
        a. http://www.topcoder.com/stat?c=problem_statement&pm=4463&rd=6536
        b. http://www.topcoder.com/stat?c=problem_statement&pm=10238
   - Special numbers
     1. Suggested reading - Stirling, eulerian, harmonic, bernoulli, fibonacci numbers
        a. http://en.wikipedia.org/wiki/Stirling_number

        b. http://en.wikipedia.org/wiki/Eulerian_numbers
        c. http://en.wikipedia.org/wiki/Harmonic_series_(mathematics)
        d. http://en.wikipedia.org/wiki/Bernoulli_number
        e. http://en.wikipedia.org/wiki/Fibonnaci_numbers
        f. Concrete mathematics by Knuth
    2. Suggested problems
        a. http://www.topcoder.com/stat?c=problem_statement&pm=1643
        b. http://www.topcoder.com/stat?c=problem_statement&pm=8202&rd=11125
        c. http://www.topcoder.com/stat?c=problem_statement&pm=8725
        d. http://www.topcoder.com/stat?c=problem_statement&pm=2292&rd=10709
- Advanced counting techniques - Polya counting, burnside lemma
    1. Suggested reading
        a. http://en.wikipedia.org/wiki/Burnside's_lemma
        b. http://petr-mitrichev.blogspot.com/2008/11/burnsides-lemma.html
    2. Suggested Problems
        a. http://www.topcoder.com/stat?c=problem_statement&pm=9975
        b. http://www.spoj.pl/problems/TRANSP/

c. Game theory

Syllabus

- Basic principles and Nim game
    1. Sprague grundy theorem, grundy numbers
    2. Suggested readings
        a. http://en.wikipedia.org/wiki/Sprague%E2%80%93Grundy_theorem
        b. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=algorithmGames
        c. http://www.ams.org/samplings/feature-column/fcarc-games1
        d. http://www.codechef.com/wiki/tutorial-game-theory
    3. Suggested problems
        a. http://www.topcoder.com/stat?c=problem_statement&pm=3491&rd=6517
        b. http://www.topcoder.com/stat?c=problem_statement&pm=3491&rd=6517
- Hackenbush
    1. Suggested readings
        a. http://en.wikipedia.org/wiki/Hackenbush
        b. http://www.ams.org/samplings/feature-column/fcarc-partizan1
    2. Suggested problems
        a. http://www.cs.caltech.edu/ipsc/problems/g.html
        b. http://www.spoj.pl/problems/PT07A/

d. Linear Algebra

Syllabus

- Matrix Operations
    1. Addition and subtraction of matrices
        a. Suggested Reading
            i. Cormen 28.1
    2. Multiplication (Strassen's algorithm), logarithmic exponentiation
        a. Suggested reading
            i. Cormen 28.2
            ii. Linear Algebra by Kenneth Hoffman Section 1.6
        b. Problems
            i. http://uva.onlinejudge.org/external/111/11149.html
    3. Matrix transformations [Transpose, Rotation of Matrix, Representing Linear transformations using matrix]
        a. Suggested Reading
            i. Linear Algebra By Kenneth Hoffman Section 3.1,3.2,3.4,3.7
        b. Problems
            i. http://www.topcoder.com/stat?c=problem_statement&pm=6877
            ii. JPIX on Spoj
    4. Determinant , Rank and Inverse of Matrix [Gaussian Elimination , Gauss Jordan Elimination]
        a. Suggested Reading
            i. 28.4 Cormen
            ii. Linear Algebra by Kenneth Chapter 1
        b. Problems
            i. http://www.topcoder.com/stat?c=problem_statement&pm=8174
            ii. http://www.topcoder.com/stat?c=problem_statement&pm=6407&rd=9986
            iii. http://www.topcoder.com/stat?c=problem_statement&pm=8587
            iv. HIGH on Spoj

5. Solving system of linear equations
    a. Suggested Reading
        i. 28.3 Cormen
        ii. Linear Algebra by Kenneth Chapter 1
    b. Problems -
        i. http://www.topcoder.com/stat?c=problem_statement&pm=3942&rd=6520
6. Using matrix exponentiation to solve recurrences
    a. Suggested Reading
        i. http://www.topcoder.com/tc?module=Static&d1=features&d2=010408
    b. Problems
        i. REC, RABBIT1 , PLHOP on spoj
        ii. http://www.topcoder.com/stat?c=problem_statement&pm=6386 , http://www.topcoder.com/stat?c=problem_statement&pm=7262, http://www.topcoder.com/stat?c=problem_statement&pm=6877
7. Eigenvalues and Eigen-vectors
    a. Problems
        i. http://www.topcoder.com/stat?c=problem_statement&pm=2423&rd=4780

- Polynomials
    1. Roots of a polynomial [Prime factorization of a polynomial, Integer roots of a polynomial, All real roots of a polynomial]
        a. Problems
            i. http://www.topcoder.com/stat?c=problem_statement&pm=8273&rd=10798
            ii. POLYEQ , ROOTCIPH on Spoj
    2. Lagrange Interpolation
        a. Problems
            i. http://www.topcoder.com/stat?c=problem_statement&pm=10239
            ii. http://www.topcoder.com/stat?c=problem_statement&pm=8725

e. Permutation cycles
- Suggested Reading
    1. Art of Computer Programming by Knuth Vol. 3
- Problems
    1. ShuffleMethod, Permutation and WordGame on topcoder.

f. Group Theory
- Burnside Lemma, Polya's theorem
    1. Suggested Reading
        a. Hernstein's topics in algebra
        b. http://petr-mitrichev.blogspot.com/2008/11/burnsides-lemma.html
    2. Problems
        a. TRANSP on spoj
        b. http://www.topcoder.com/stat?c=problem_statement&pm=9975

b. Generating functions
- Suggested Reading
    1. Herbert Wilf's generating functionology/
    2. Robert Sedgewick and Flajoulet's Combinatorial analysis

9. **Data Structures.**

i. Basic

a. Arrays/Stacks/Queues :
- Problems
    1. https://www.spoj.pl/problems/STPAR/
    2. https://www.spoj.pl/problems/SHOP/
    3. https://www.spoj.pl/problems/WATER/
- Reading:
    1. CLRS: section 10.1
    2. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=dataStructures

b. Singly/Doubly Linked List :
- Problems
    1. https://www.spoj.pl/problems/POSTERS/
- Reading: CLRS: section 10.2, Mark Allen Weiess Chapter 3

c. Hash Tables :
- Problems
    1. https://www.spoj.pl/problems/HASHIT/
    2. https://www.spoj.pl/problems/CUCKOO/
- Reading: CLRS: Chapter 11, Mark Allen Weiess Chapter 5

d. Circular linked list / queue
- Problems
    1. https://www.spoj.pl/problems/CTRICK/

e. Binary/nary Trees
- Reading
  1. CLRS: section 10.4
  2. CLRS: Chapter 12
  3. Mark Allen Weiess Chapter 4
  4. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=binarySearchRedBlack

f. Heaps
- Problems
  1. https://www.spoj.pl/problems/PRO/
  2. https://www.spoj.pl/problems/EXPEDI/
- Reading : Mark Allen Weiess Chapter 6

ii. Advanced

a. Trie (Keyword tre
- Problems
  1. https://www.spoj.pl/problems/MORSE/
  2. https://www.spoj.pl/problems/EMOTICON/
- Reading

b. Interval trees / Segment Trees
- Problems
  1. https://www.spoj.pl/problems/ORDERS/
  2. https://www.spoj.pl/problems/FREQUENT/
- Reading

c. Fenwick(Binary Indexed) trees
- Problems
  1. https://www.spoj.pl/problems/MATSUM/
- Reading: http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=binaryIndexedTrees

d. Disjoint data structures
- Problems
  1. https://www.spoj.pl/problems/BLINNET/
  2. https://www.spoj.pl/problems/CHAIN/
- Reading:
  1. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=disjointDataStructure
  2. Mark Allen Weiess Chapter 8

e. Range minimum Query(RMQ)
- Problems
  1. https://www.spoj.pl/problems/GSS1/
- Reading
  http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=lowestCommonAncestor

f. Customized interval/segment trees (Augmented DS)
- Problems
  1. https://www.spoj.pl/problems/GSS3/
  2. https://www.spoj.pl/problems/RRSCHED/
- Reading: CLRS: Chapter 14 (augmented DS)

g. AVL Trees
- Problems
  1. https://www.spoj.pl/problems/ORDERS/
- Reading

iii. Miscellaneous (Not to be covered)

a. Splay Trees
b. B/B+ Trees
c. k-d Trees
d. Red-black Trees
e. Skip List
f. Binomial/Fibonacci heaps

iv. Exercises

1. **https://www.spoj.pl/problems/LAZYPROG/ (Hint: Heaps)t**
2. **https://www.spoj.pl/problems/HELPR2D2/ (Hint: Interval Trees)**
3. **https://www.spoj.pl/problems/SAM/ (Hint: Heaps)**
4. **https://www.spoj.pl/problems/PRHYME/ (Hint: Trie)**
5. **https://www.spoj.pl/problems/HEAPULM/ (Hint: Interval Trees)**
6. **https://www.spoj.pl/problems/CORNET/ (Hint: Disjoint)**
7. **https://www.spoj.pl/problems/EXPAND/**
8. **https://www.spoj.pl/problems/WPUZZLES/**
9. **https://www.spoj.pl/problems/LIS2/**

10. **Search Techniques/Bruteforce writing techniques/Randomized algorithms.**

a. Backtracking - [Beginner].
- problems ->
  1. N queens problems
  2. Knight’s Tour
  3. Sudoku Problem
  4. Tiling Problem.

5. 15 puzzle.

b. Dancing Links and Algorithm X given by Knuth - [Advanced]
   - problems - PRLGAME, SUDOKU, NQUEEN on SPOJ
   - Suggested reading -
     1. http://www-cs-faculty.stanford.edu/~uno/papers/dancing-color.ps.gz
c. Binary Search - [Beginner].
   - problems - AGGRCOW on SPOJ. Refer the tutorial for more problems.
   - finding all real roots of a polynomial using binary search. [intermediate].
   - Suggested Reading -
     1. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=binarySearch
d. Ternary Search - [Intermediate].
   - problems -
     1. http://www.spoj.pl/problems/KPPOLY/
     2. http://www.codechef.com/DEC09/problems/K1/
     3. http://www.topcoder.com/stat?c=problem_statement&pm=4705&rd=7993
     4. http://www.topcoder.com/stat?c=problem_statement&pm=7741&rd=10671
     5. http://www.topcoder.com/stat?c=problem_statement&pm=6464&rd=9994
     6. http://www.topcoder.com/stat?c=problem_statement&pm=3501&rd=6529
     7. http://www.topcoder.com/stat?c=problem_statement&pm=4567&rd=6539
e. Meet in the middle [Intermediate].
   - problems -
     1. http://www.spoj.pl/problems/MAXISET/
     2. Hill Climbing [Advanced].
f. Regular Iteration to reach a fixed point [Advanced].
   - Newton-Raphson method to find root of a mathematical function.
   - Iterations to solve linear non homogeneous system of equations.

General programming issues in contests ->

g. Arithmetic Precision - [Beginner].
   - Suggested Reading -
     1. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=integersReals
h. Representing sets with bitmasks and manipulating bitmasks - [Beginner].
   - Suggested Reading -
     1. http://www.topcoder.com/tc?module=Static&d1=tutorials&d2=bitManipulation
   - problems - refer to the tutorial link in Suggested reading section.