UVA PROBLEM LIST

- **Guideline for programming contestants' [version 1.0] Created by SGIPC :**

কোন একটা প্রব্লেম সল্ভ করতে হয়তো কারো ১ দিন লেগে গেল।কিন্তু একটা ছোট থিওরি জানলে হয়তো তার এটা করতে কয়েক মিনিট লাগত।তাই আগে আমাদের কিছু জিনিস জানতে হবে,সে অনুযায়ী প্র্যাক্টিস করতে হবে। এই সিলেবাসে বা গাইডলাইনে ক্যাটাগরি অনুযায়ী প্রব্লেম এবং অনেক reading material দেয়া আছে।

Ad hoc:
10055, 10071, 11172, 10783, 11877, 11479, 100, 11984, 11936, 11854, 11799, 11727, 11150, 10110, 11875, 10970, 10812, 10079, 10696, 11461, 11388, 11231,
10195, 10302, 10591, 10879, 10346, 11934, 11839, 382, 11777, 11715, 11000, 10693, 10347, 10323, 575, 11185, 11247, 11462, 10035, 11764, 10699, 10929, 11526,
10530, 10327, 10784, 10300, 10161, 673, 591, 913, 694, 579, 10365..

Topic: Data Structures. Reading material: http://sites.google.com/site/smilitude/stl
http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=standardTemplateLibrary
Total Selected Problems: 30
*Source: all problems are taken from: www.uva.onlinejudge.org
Reading material:
http://www.cplusplus.com/reference/algorithm/
http://www.cplusplus.com/reference/stl/set/set/
http://www.cplusplus.com/reference/stl/map/
http://www.cplusplus.com/reference/stl/multiset/
http://www.cplusplus.com/reference/stl/multimap/
http://www.cplusplus.com/reference/string/string/
http://www.cplusplus.com/reference/string/getline/
Pre-requirements: basic string problems,
Ad-hoc problems with sorting,
Ad-hoc problems with counting
Basic Data Structures:
482, 541, 591, 10038, 10260, 10703, 11933
C++ STL algorithm (Java Collections):
146, 11321, 11824
Sorting-related problems:
299, 10327, 11462
C++ STL stack (Java Stack):
120
C++ STL queue (Java Queue):
10935
C++ STL priority_queue (Java Priority Queue):
10954, 11995
C++ STL map/set (Java TreeMap/TreeSet):
417, 484, 501, 642, 755, 10226, 10282, 10295, 10374,10815, 11062, 11136
Graph Data Structures Problems:
11991

String: Reading material: Learn these functions: strtok(),strstr(),substr(),c_str(),[c_str is used to convert a string object to c like string]isalpha(),isdigit(),isupper(),islower() 1. UVA-11734(Big Number Of Teams will solve This)
2. uva-621(Secret Research)
3. UVA-11743(Credit Check)
4. uva-488(Triangle Wave)
5. uva-490(Rotating Sentence)
6. uva-11830(Contract Revision)
7. UVA-10340(All in All)
8. UVA-11687(DIGITS)
9. UVA-11716(Digital Fortress)
10. uva-482(Permutation Array)
11. uva-10361(Autometic Poetry)
12. UVA-263(Number Chains)
13. UVA-11362(Phone List)
14. UVA-10293(Word Length and Frequency)
15. UVA-644(Immediate Decodability)

16. UVA-156(Ananagrams)
17. UVA-401(Palindromes)
18. UVA-537(Artificial Intelligence)
19. UVA-12015(Google is feeling Lucky)
20. UVA-10226(Hardwood Species)
21. UVA-11048(Automatic correction of misspellings)
22. UVA-409(Excuses,Excuses)
23. UVA-455(Periodic Strings)
24. UVA-10298(Power Strings)
25. UVA-422(Word-Search Wonder)
26. UVA-10010(Where's Waldorf)
27. UVA-496(Simply Subsets)
28. UVA-11452(Dancing the Cheeky-Cheeky)
29. ACM-ICPC 2010 Dhaka site (Prb-B).
30. UVA-10146 (Dictionary)
31. UVA-11548(Blackboard Bonanza)

MATH:
Category 1: Mathematical Simulation
 Reading Materials:- Nothing special to know, Simply Brute force approach :)   100 - The 3n + 1 problem
       616 - Coconuts, Revisited
       10346 - Peter's Smokes
       11150 - Cola
       11689 - Soda Surpler
       11877 - The Coco-Cola Store
       11934 - Magic Formula
       11968 - In The Airport
       11970 - Lucky Numbers
       12032 - The Monkey and the Oiled Bamboo
Category 2: Finding Pattern or Formula
       Problems:
       913 - Joana and the Odd Numbers
       10161 - Ant on a Chessboard
       10170 - The Hotel with Infinite Rooms
       10427 - Naughty Sleepy Boys
       10499 - The Land of Justice
       10509 - R U Kidding Mr. Feynman?
       10693 - Traffic Volume
       10696 - f91   10970 - Big Chocolate
       10994 - Simple Addition
       11202 - The least possible effort
       11231 - Black and white painting
       11296 - Counting Solutions to an Integral Equation
       10940 - Throwing cards away II
Category 3: Logarithm, Exponentiation, Power
 Reading Materials:
 - Review your logarithm, Exponentiation, Power knowledge
 Problems:
113 - Power of Cryptography
11636 - Hello World!
 11666 - Logarithms
 11847 - Cut the Silver Bar
701 - The Archeologists' Dilemma
107 - The Cat in the Hat

Category 4: **Binomial Coefficients**
Reading Materials:
-Concrete Mathematics by Knuth chapter 5
 326 - Extrapolation Using a Difference Table
 369 - Combinations
 485 - Pascal's Triangle of Death
 530 - Binomial Showdown
 10105 - Polynomial Coefficients
 10219 - Find the ways !

Category 5: Prime Numbers Reading Materials:
-Concrete Mathematics by Knuth sec 4.2, 4.3, 4.4, 4.5
-Sieve algorithm http://en.wikipedia.org/wiki/Sieve_of_Eratosthenes
-Competitive Programming by Halim (edition 1) 5.3.1
-http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=primeNumbers
-http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=math_for_topcoders
http://www.comp.nus.edu.sg/%7Estevenha/myteaching/competitive_programming/ch5.zip here you will find implementation of sieve and
some other prime number related algorithms
 406 - Prime Cuts
 543 - Goldbach's Conjecture
 686 - Goldbach's Conjecture (II)
 897 - Anagrammatic Primes
 914 - Jumping Champion
 1210 - Sum of Consecutive Prime Numbers
 10140 - Prime Distance
 10168 - Summation of Four Primes
 10200 - Prime Time
 10235 - Simply Emirp
 10394 - Twin Primes
 10852 - Less Prime
 10924 - Prime Words
 10948 - The primary problem

Category 6: GCD and/or LCM Reading Materials:
 -Competitive Programming by Halim (edition 1) 5.3.2
 -Concrete Mathematics by Knuth sec 4.1
 -http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=math_for_topcoders
 332 - Rational Numbers from Repeating Fractions
 408 - Uniform Generator
 412 - Pi
 10193 - All You Need Is Love
 10407 - Simple division
 10892 - LCM Cardinality
 11388 - GCD LCM
 11417 - GCD
 11827 - Maximum GCD

Category 7: Finding Prime Factors
 583 - Prime Factors 10392 - Factoring Large Numbers
 11466 - Largest Prime Divisor
 160 - Factors and Factorials
 993 - Product of digits
 10061 – How many zero's and how many digits?
 10139 - Factovisors
 10484 - Divisibility of Factors
 10780 - Again Prime? No Time
 10791 - Minimum Sum LCM
 11889 - Benefit
 12090 - Counting Zeroes

Category 8: Modulo Arithmetic Reading Materials:
 - Competitive Programming by Halim (edition 1) 5.3.5
 - http://en.wikipedia.org/wiki/Modular_arithmetic
 - Concrete Mathematics by Knuth sec 3.4,4.6
Problems:
 374 - Big Mod
 10127 - Ones
 10174 - Couple-Bachelor-Spinster Numbers
 10176 - Ocean Deep ! - Make it shallow !!
 10212 - The Last Non-zero Digit
 10489 - Boxes of Chocolates
Category 9: Phi funtion Reading Materials:
 - Concrete Mathematics by Knuth sec 3.4,4.6
 - Competitive Programming by Halim (edition 1) 4.9

Problems:
 10179 - Irreducible Basic Fractions
 10299 - Relatives
 10820 - Send a Table
 11064 - Number Theory
Category 10: Extended Euclid Reading materials:
- Competitive Programming by Halim (edition 1) 5.3.4
Problems:
10633 - Rare Easy Problem
10673 - Play with Floor and Ceil **Category 11: Inverse Modulus**
 Reading materials: http://www.cs.brown.edu/courses/cs007/modmult/node2.html Problems: lightOj 1067-Combinations
http://www.lightoj.com/volume_showproblem.php?problem=1067

Category 11: Catalan Numbers Reading materials:
 -http://en.wikipedia.org/wiki/Catalan_number
 -Enumerative Combinatorics by Richard P. Stanley Volume 2 (catalan number exercises)
 Problems:
 991 - Safe Salutations
 10007 - Count the Trees
 10223 - How many nodes?
 10303 - How Many Trees?
Category 12: Combinatorics Reading Materials:
- http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=combinatorics
- http://www.mathsisfun.com/combinatorics/combinations-permutations.html
- Competitive Programming by Halim (edition 1) 5.5.1
- Daniel A. Marcus - Combinatorics (A Problem Oriented Approach)
- Enumerative_Combinatorics by Richard P. Stanley vol 1 and 2
10079 - Pizza Cutting
 10359 - Tiling
 10733 - The Colored Cubes
 10784 - Diagonal
 10790 - How Many Points of Intersection?
 10843 - Anne's game
 11115 - Uncle Jack
 11204 - Musical instruments
 11310 - Delivery Debacle
 11401 - Triangle Counting
 11480 - Jimmy's Balls
 11554 - Hapless Hedonism
 11597 - Spanning Subtree
Category 13: Big Integer Reading materials:
For c/c++: http://lightoj.com/article_show.php?article=1004
For java: Competitive Programming by Halim (edition 1) sec 5.4
          424 - Integer Inquiry
          465 - Overflow
          713 - Adding Reversed Numbers
          10013 - Super long sums
          10083 - Division
          10106 - Product
          10523 - Very Easy !!!
          10925 - Krakovia
Category 14: Fibinacci Numbers Reading Materials:
          -Concrete Mathematics by Knuth sec 6.6
          -Google for 'Fobonacci Numbers'
          495 - Fibonacci Freeze
          763 - Fibinary Numbers
          900 - Brick Wall Patterns
          10334 - Ray Through Glasses
          10450 - World Cup Noise
          10579 - Fibonacci Numbers
          10862 - Connect the Cable Wires
          11161 - Help My Brother (II)
Category 15: Factorial Reading Materials:

- GENERATING FACTORIALS USING STRING https://www.google.com/search?sourceid=chrome&ie=UTF-8&q=GENERATING+FACTORIALS+USING+STRING

Then go to the second link

324 - Factorial Frequencies

 623 - 500!

 10220 - I Love Big Numbers! 10323-Factorial! You must be kidding

Category 16: Permutation related Reading materials:

-http://www.bearcave.com/random_hacks/permute.html

-http://marknelson.us/2002/03/01/next-permutation/

-http://www.cut-the-knot.org/do_you_know/AllPerm.shtml

-http://newton.ex.ac.uk/teaching/jmr/recursion.html

-Practical Algorithms in C by Flamig chapter 4 sec : permutation generators

Problems:

12335 - Lexicographic Order

-More problems will be added soon :)

Category 17: Probability(Will be covered in Dynamic programming part)

Category 18: Special Numbers Reading Materials:

-Concrete Mathematics by Knuth chapter 6

10844 - Bloques

1118 - Binary Stirling Numbers 12034

Top coder SRM 391 Div 1 500 point problem

Category 19: Cycle-Finding Reading Materials:

-Competitive Programming by Halim sec 5.5.2

Problems:

202 - Repeating Decimals

350 - Pseudo-Random Numbers

944 - Happy Numbers

10591 - Happy Number

11053 - Flavius Josephus Reloaded

11634 - Generate random numbers

Bitmask: Reading material:

http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=bitManipulation

Problems:

         12368 - Candles

          10576 - Y2K Accounting Bug

Greedy

Problems:

1.410 - Station Balance

2.10670 - Work Reduction

3.10340 - All in All

4.11054 - Wine trading in Gergovia

Binary Search: Reading material:

Competitive programming edition 1, chapter 7,divide and conquer revisited

Problems:

1. 679 - Dropping Balls

2.10341 - Solve It

3.10474 - Where is the Marble?

4. 11057 - Exact Sum

5. 11646 - Athletics Track

6. 10668 - Expanding Rods 7. 10611The Playboy Chimp

Resursion: Reading material: -নিটনের "সবার জন্য সি" এর "ফাংশান" অধ্যায় থেকে "রিকার্শান"

-http://zobayer.blogspot.com/2009/12/cse-102-attacking-recursion.html

-http://zobayer.blogspot.com/2009/12/cse-102-practice-recursions.html

Some well known algorithms:

         i)N-queen problem:computer algorithms by sahni,chapter backtracing

         ii)Sum-of subset:computer algorithms by sahni,chapter backtracing

         iii)Toewrs-of-Hanoi : computer algorithms by sahni,chapter 1

Problems

         1.uva 574 Sum It Up

         2.uva 750 - 8 Queens Chess Problem

         3.uva 10017 The Never Ending Towers of Hanoi

         4.uva 10285 Longest Run on a Snowboard

5.uva 487 - Boggle Blitz
6.uva 10344 - 23 out of 5

GRAPH: Reading material
To learn basics of grph theory :
Tutorial in Bangla : http://www.shafaetsplanet.com/planetcoding/?p=143
http://primes.utm.edu/cgi-bin/caldwell/tutor/graph/intro
Introduction to Algorithm-Corman P 531-549 At first read this:
http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=graphsDataStrucs1
Implementation of some graph algorithms is here :
http://www.comp.nus.edu.sg/%7Estevenha/myteaching/competitive_programming/ch4.zip
BFS
Tutorial in bangla : http://www.shafaetsplanet.com/planetcoding/?p=604
BFS coding : http://www.shafaetsplanet.com/planetcoding/?p=639
Reading material: http://sites.google.com/site/smilitude/shortestpath
http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=graphsDataStrucs2
http://sites.google.com/site/smilitude/shortestpath_problems
      336 - A Node Too Far(Easy)
567 Risk
 439 Knight Moves(2D graph use stracture or pair(STL))
      417 - Word Index
      532 - Dungeon Master
      10067 - Playing with Wheels 321 The new villa
      10150 - Doublets
      10610 - Gopher and Hawks
      11513 - 9 Puzzle
      11792 - Krochanska is Here!
      11377 - Airport Setup
      571 - Jugs

DFS/FloodFill Reading Material: Introduction to Algorithm-Corman P 540-549
Competitive Programming-Halim P 61
Tutorial in Bangla : http://www.shafaetsplanet.com/planetcoding/?p=973
      469 - Wetlands of Florida
      352 - The Seasonal War
      10336 - Rank the Languages
      11518 - Dominos 2
      11470 - Square Sums
      11244 - Counting Stars
      11561 - Getting Gold
      1247 - Interstar Transport
Topological Sort Reading Material:
 http://sites.google.com/site/smilitude/topsortIntroduction to Algorithm-Corman P 549-552
Competitive Programming-Halim P 66
Tutorial in Bangla : http://www.shafaetsplanet.com/planetcoding/?p=848
SPOJ PFDEP - Project Files Dependencies
UVA 124 - Following Orders
UVA 452 - Project Scheduling
UVA 10305 - Ordering Tasks
UVA 10917 - A Walk Through the Forest
UVA 109 26 - How Many Dependencies
UVA 11060 - Beverages
UVA 11174 - Stand in a line
UVA11686 - Pick up sticks
Bipartite Graph Check
      10004 - Bicoloring
      11080 - Place the Guards

SIMPLE DFS WITH COLOR
Finding Articulation Points/Bridges
Reaidng material: Competitive Programming-Halim P 62
      315 - Network
      610 - Street Directions
      796 - Critical Links

10199 - Tourist Guide

Finding Strongly Connected Components
Reading material: http://en.wikipedia.org/wiki/Tarjan's_strongly_connected_components_algorithm
11504 - Dominos
11770 - Lighting Away
1229 - Sub-dictionary

Dijkstra
Reading Material: Introduction to Algorithm-Corman P 595-599
341 - Non-Stop Travel
10986 - Sending email
929 - Number Maze
10801 - Lift Hopping
11492 - Babel
10603 - Fill

Bellman Ford's Reading Material: Introduction to Algorithm-Corman P 588
558 - Wormholes
10557 - XYZZY
11280 - Flying to Fredericton

Floyd Warshall
Reading Material: Introduction to Algorithm-Corman P 629
341 - Non-Stop Travel
186 - Trip Routing
423 - MPI Maelstrom
1198 - The Geodetic Set Problem
1247 - Interstar Transport

Variant
Reading material: Competitive Programming-Halim P 80
534 - Frogger
544 - Heavy Cargo
869 - Airline Comparison

MST
Reading Material: Introduction to Algorithm-Corman P 567
10034 - Freckles
908 - Re-connecting Computer Sites
1208 - Oreon

Maximum Flow/Min Cut
Reading Material: Competitive Programming-Halim P 81
http://en.wikipedia.org/wiki/Maximum_flow_problem
http://en.wikipedia.org/wiki/Edmonds–Karp_algorithm
820 - Internet Bandwidth
10594 - Data Flow
10480 - Sabotage

Dynamic Programming(DP)
Reading material:
1)http://sites.google.com/site/smilitude/%E0%A6%A1%E0%A6%BE%E0%A6%87%E0%A6%A8%E0%A6%BE%E0%A6%AE%E0%A6%BF%E0%A6%95%E0%A6%AA%E0%A7%8D%E0%A6%B0%E0%A7%87%E0%A6%BE%E0%A6%97%E0%A7%8D%E0%A6%B0%E0%A6%BE%E0%A6%AE%E0%A6%BF%E0%A6%82%E0%A6%8F%E0%A6%B0%E0%A6%B8%E0%A7%82%E0%A6%9A%E0%A6%A8%E0%A6%BE
2)http://community.topcoder.com/tc?module=Static&d1=features&d2=040104
3)http://sites.google.com/site/smilitude/recursion_and_dp

Now solve some classical DP:
1) LCS (longest common subsequence)
Reading material: you have already learned this from here http://community.topcoder.com/tc?module=Static&d1=features&d2=040104
Introduction to algorithms by Coreman chapter 15(dynamic programming) page 350 second edition
Problems from uva:
7.10066 - The Twin Towers
8.10192 - Vacation
9.10405 - Longest Common Subsequence
2) Coin change:
Reading material:https://sites.google.com/site/programinggconcept/algorithm
Problems from uva:
10.147 - Dollars

11.357 - Let Me Count the Ways

12.674 - Coin Change

3) Knapsack:

Reading material: you have seen it earlier: http://community.topcoder.com/tc?module=Static&d1=features&d2=040104

https://sites.google.com/site/programinggconcept/0-1-knapsack

Problems from uva:

13.10130 - SuperSale

14.624 - CD

4) Maximum sum:

Reading material: Competitive programming

--by halim, chap 3 p 47, 1st edition

Problems from uva:

15.108 - Maximum Sum

16.836 - Largest Submatrix

17.10074 - Take the Land

18.10667 - Largest Block

19.507 - Jill Rides Again

20.10684 - The jackpot

5) Matrix chain multiplication:

Reading material: Introduction to algorithms by Coreman chapter 15(dynamic programming) page 331 second edition

Problems from uva:

21.348 - Optimal Array Multiplication Sequence

6) LIS (longest increasing subsequence)/LDS(longest decreasing subsequence)

Reading material: http://www.algorithmist.com/index.php/Longest_Increasing_Subsequence

http://www.algorithmist.com/index.php/Longest_Increasing_Subsequence.cpp

Problems from uva:

22.111 - History Grading

23.481 - What Goes Up?

24.10534 - Wavio Sequence

25.11790 - Murcia's Skyline

26.10131 - Is Bigger Smarter

7) Edit Distance:

Reading material: http://www.csse.monash.edu.au/~lloyd/tildeAlgDS/Dynamic/Edit/

Problems from uva:

27.164 - String Computer

28.526 - String Distance and Edit Process

NON-CLASSICAL:

29. uva 10003 - Cutting Sticks

30. Topcoder AvoidRoads TCO '03 Semifinals 4 Div I

http://community.topcoder.com/stat?c=problem_statement&pm=1889&rd=4709

31. UVa 825

32. UVa 11067

33. TCCC '03 Round 4 Div I http://community.topcoder.com/stat?c=problem_statement&pm=1592&rd=4482

34. ShortPalindromes SRM 165 Round 1 - Division II, Level Three

35. uva 10739 - String to Palindrome

36. uva 11151 - Longest Palindrome

Problems from TOPCODER:

37. Primesums TCO 2008 qualification round 1

38. LostParentheses SRM 348 d 1 l 1

39. entencedecomposition srm 411

40.fairworkload srm 169

41.Thepriceisright srm 159

42.CheapestTabComplete TCCC 06 online round 2

43.FIELDDiagrams srm 401 div 2 level 2

DP + bitmask:

Problems from uva:

44.10911 - Forming Quiz Teams

45.10364 - Square

46.10651 - Pebble Solitaire

47.10908 - Largest Square

Probability Reading Materials:

-http://www.mathsisfun.com/data/probability-false-negatives-positives.html
-http://www.mathsisfun.com/data/probability-shared-birthday.html
-http://www.mathsisfun.com/data/probability-events-conditional.html
-http://www.mathsisfun.com/activity/dice-experiment-2.html
-http://www.mathsisfun.com/data/index.html
-http://www.dartmouth.edu/~chance/teaching_aids/books_articles/probability_book/amsbook.mac.pdf
-Probability and statistics by walpole
-Concrete Mathematics by Knuth chapter 8
-First course in probability by ross
-Introduction to probability models by ross
 Topcoder: The DiceGame srm 381 div 2 level 2
Topcoder: RandomSort SRM 402 div2,level 3
uva 12369 – Cards
10056 - What is the Probability?
 10238 - Throw the Dice
 10328 - Coin Toss
 10491 - Cows and Cars
 10759 - Dice Throwing
 11181 – Probability | Given
 11500 - Vampires
 11628 - Another lottery
 12024 - Hats

Game theory :(using DP)
Topics: Game of Nim and Grundy number
Reading material:
http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=algorithmGames
http://sps.nus.edu.sg/~limchuwe/cgt/

        Chomp TCO 08 online round 1
        10578 - The Game of 31
        http://www.lightoj.com/volume_showproblem.php?problem=1199
        http://www.lightoj.com/volume_showproblem.php?problem=1315
        http://www.lightoj.com/volume_showproblem.php?problem=1247
        http://www.lightoj.com/volume_showproblem.php?problem=1253
যা কিছু বাকি রয়ে গেছেঃ Computational Geometry http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=alg_index
উপরের লিঙ্কে আরো বেশ কিছু এলগরিদম আছে, যা আমাদের এই গাইডলাইনে অন্তর্ভুক্ত হয় নি, সেগুলাও দেখতে হবে। বুয়েটের একটা সিলেবাস পাওয়া যায়
এখানে http://www.acmsolver.org/?p=1037 এথানকার কোন কিছু আমাদের সিলেবাসে না থাকলে সেটাও দেখতে হবে। http://uhunt.felix-halim.net/
এখানে আরো বেশ কিছু ক্যাটাগরি আছে। এখান থেকেও দেখতে হবে। Credits: Junaed,Rakib,Adnan,Mahbub,Sobuj,Opu Special thanks: Shiyam,
Shafaet(DU) and all the members of SGIPC

●

○