LTEUVA PROBLEM LIST

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

কোন একটা প্রব্লমে সল্ভ করতে হয়তো কারো ১ দনি লগে গলো।কন্তিু একটা ছোট্ট থওিরি জানলে হয়তো তার এটা করতে কয়কে মনিটি লাগত।তাই আগে আমাদরে কছিু জনিসি জানতে হব,সে অনুযায়ী প্রযাক্টসি করতে হব। এই সলিবোসে বা গাইডলাইনে ক্যাটাগরি অনুযায়ী প্রব্লমে এবং অনকে reading material দয়ো আছ।

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 (TLE)
6. 10668 - Expanding Rods
7. 10611 - The Playboy Chimp
Resursion: Reading material: -নটিনরে "সবার জন্য সি" এর "ফাংশান" অধ্যায় থকেে "রকিার্শান"

-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 graph 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, সেগুলোও দেখতে হবে। বুয়েটের একটা সিলেবাস পাওয়া যায় এখানে
http://www.acmsolver.org/?p=1037 এখানকার কোন কিছু আমাদের সিলেবাসে না থাকলে সেটাও দেখতে হবে। http://uhunt.felix-halim.net/ এখানে আরো বেশ কিছু ক্যাটাগরি আছে। এখান থেকেও দেখতে হবে।