TUPC/PUPC 線上題庫

TUPC/PUPC 歷屆試題

2016
https://csie.asia.edu.tw/uploads/archive_file_multiple/file/621db5f6063ca2e3cd15de1a/ncTu_2016.pdf

2017
https://csie.asia.edu.tw/uploads/archive_file_multiple/file/621db5f6063ca2e3cd15de19/ncTu_2017.pdf

2018
https://csie.asia.edu.tw/uploads/archive_file_multiple/file/621db5f6063ca2e3cd15de18/ncTu_2018.pdf

2019
https://csie.asia.edu.tw/uploads/archive_file_multiple/file/621db5f6063ca2e3cd15de1d/ncTu_2019.pdf

2020
https://csie.asia.edu.tw/uploads/archive_file_multiple/file/621db5f6063ca2e3cd15de1c/ncTu_2020.pdf

2021
https://csie.asia.edu.tw/uploads/archive_file_multiple/file/621db5f6063ca2e3cd15de1b/ncPu_2021.pdf

2022
https://csie.asia.edu.tw/uploads/archive_file_multiple/file/62c4ed99063ca258a4fb4d91/PUPC2022%E7%AB%B6%E8%B3%BD%E9%A1%8C%E7%9B%AE.pdf

2023 (詳解 by 謝育平老師)
https://www.youtube.com/watch?v=yR2qCzy17kA

ICPC/NCPC 線上題庫

請至 ITSA 教育部智慧創新跨域人才培育聯盟計畫聯合登入平臺
(https://portal.itsa.org.tw/index) 註冊帳號並登入，成功登入後會看到以下入口畫面

選擇程式自學平台 → 線上題庫，便可看到各樣題庫

針對 ICPC 題庫，可點選 "各競賽試題" 進入，即可看見 "ICPC 臺灣區 題目專區"，勾選 "同意加入題庫成員"

ICPC 臺灣區 題目專區

返回上一頁

2023年

2022年

2021年

2020年

2019年

2017年

2016年

2015年

2014年

2013年

2009年

使用者 ⊟
👥 題庫參與者

活動 ⊟
📄 程式練習
👥 討論區

系統管理 ⊟
🔧 成績
🖼 簡介

主題大綱

👥 公佈欄

1 📄 [Problem PA] Counterfeit Money　🔲

2 📄 [Problem PB] Recurring Decimal to Fractions　🔲

3 📄 [Problem PC] Where the Lantern Lights are Dimming　🔲

4 📄 [Problem PD] Quarantine Policy　🔲

5 📄 [Problem PE] Slabstones Rearrangement　🔲

6 📄 [Problem PF] Baker's Dilemma　🔲

7 📄 [Problem PG] A Packing Problem　🔲

8 📄 [Problem PH] Bank Deposit Challenge　🔲

9 📄 [Problem PI] The Pentagon Conjecture　🔲

10 📄 [Problem PJ] Lead Time Estimation　🔲

其他題庫與資源

CSES Problem Set (https://cses.fi/problemset/; 感謝張碩齊同學提供)

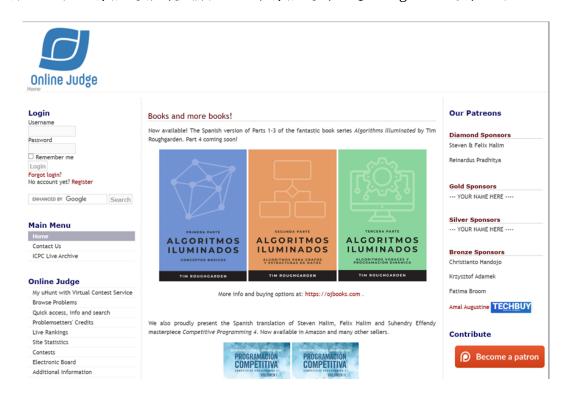Problem Set (https://cses.fi/problemset/)

AP325－從 APCS 實作題檢測三級到五級 (https://jmj.cmgsh.tp.edu.tw/files/AP325_v1.3.pdf; by 吳邦一教授)

競賽導論及常用函式 (https://hackmd.io/@MingdaoCP/ryG67cnQK?print-pdf#/)
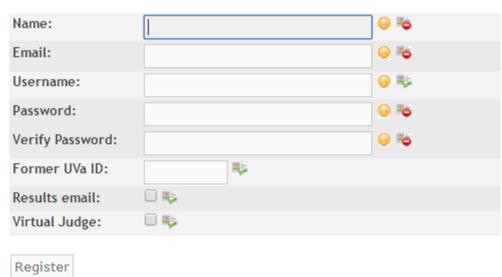
UVa Online Judge (請見次頁說明; 感謝陳洧鑫同學協助)

UVa Online Judge 使用說明

1. UVa Online Judge 網址: https://onlinejudge.org/
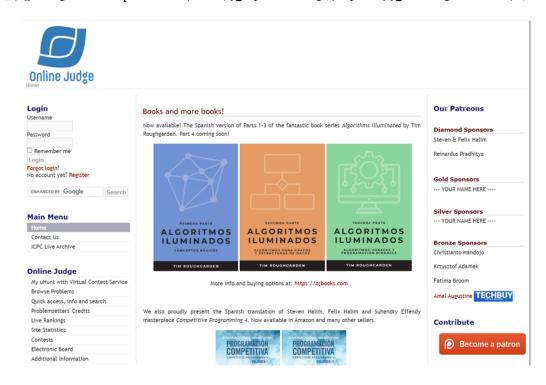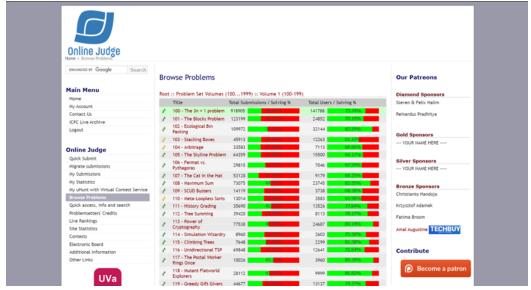
2. 介面如下:已有帳號者則直接登入,未有帳號則點選"Register"進行註冊。

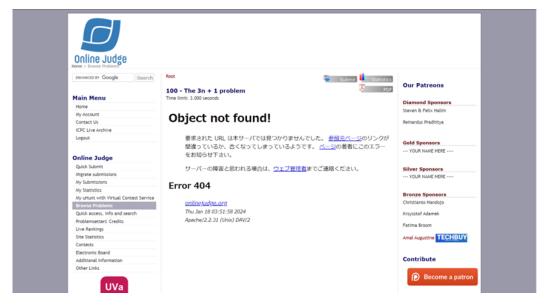3. 接下來填寫相關資訊,Result email 勾選:如有排名更動會 email 通知,若不勾選則不會有排名通知。Virtual Judge 可勾選或不勾選。

4. 接著點選 Browse problem 即可瀏覽題目，並選擇題目閱覽及點選 submit 作答。

5. 部分題目有中文翻譯可參考: http://web.kshs.kh.edu.tw/academy/luckycat/index.htm

6. 以下提供部分題目類型分類及難度:

New Comer

- ★ 100 The 3n+1 problem
- ★ 10189 Minesweeper
- ★ 10137 The Trip
- ★ 706 LCD Display
- ★ 10267 Graphical Editor
- ★★ 10033 Interpreter
- ★ 10196 Check The Check
- ★ 10142 Australian Voting

Data Structure

- ★ 10038 Jolly Jumpers
- ★★ 10315 Poker Hands
- ★★ 10050 Hartals
- ★★ 843 Crypt Kicker
- ★ 10205 Stack 'em Up
- ★★ 10044 Erdos Numbers
- ★ 10258 Contest Scoreboard
- ★★★ 10149 Yahtzee

String

- ★ 10082 WERTYU
- ★★ 10010 Where's Waldorf?
- ★ 10252 Common Permutation
- ★★ 850 Crypt Kicker II
- ★ 10188 Automated Judge Script
- ★★ 10132 File Fragmentation
- ★★★ 10150 Doublets
- ★★ 848 Fmt

Sorting

- ★ 10041 Vito's Family
- ★★ 120 Stacks of Flapjacks
- ★★★ 10037 Bridge
- ★ 10191 Longest Nap
- ★★ 10026 Shoemaker's Problem
- ★★ 10138 CDVII
- ★★ 10152 ShellSort
- ★ 10194 Football (aka Soccer)

Arithmetic and Algerba

- ★ 10035 Primary Arithmetic
- ★ 10018 Reverse and Add
- ★ 701 The Archeologists' Dilemma
- ★★ 10127 Ones
- ★★★ 847 A Multiplication Game
- ★ 10105 Polynomial Coefficients
- ★ 10077 The Stern-Brocot Number System
- ★★★★ 10202 Pairsumonious Numbers

Combinations

- ★ 10183 How Many Fibs?
- ★★ 10213 How Many Pieces of Land ?
- ★★ 10198 Counting
- ★★ 10157 Expressions
- ★★ 10247 Complete Tree Labeling
- ★★ 10254 The Priest Mathematician
- ★★ 10049 Self-describing Sequence
- ★★ 846 Steps

Number Theory

★ 10110 Light, More Light
★★ 10006 Carmichael Numbers
★ 10104 Euclid Problem
★★ 10139 Factovisors
★★ 10168 Summation of Four Primes
★ 10042 Smith Numbers
★ 10090 Marbles
★★ 10089 Repackaging

其他 (僅列出分類、題號與題目)

Flood Fill
----

352 - The Seasonal War
469 - Wetlands of Florida
572 - Oil Deposits
657 - The die is cast
705 - Slash Mazes
776 - Monkeys in a Regular Forest
782 - Contour Painting
784 - Maze Exploration
785 - Grid Colouring
830 - Shark
852 - Deciding victory in Go
10279 - Mine Sweeper
10336 - Rank the Languages
10592 - Freedom Fighter
10946 - You want what filled?

Max Flow / Max Bipartite Matching:
----

259 - Software Allocation
563 - Crimewave
663 - Sorting Slides
670 - The Dog Task
753 - a plug for unix
820 - Internet Bandwidth
10080 - Gopher II
10092 - The Problem with the Problem Setter
10122 - Mysterious Mountain
10249 - the grand dinner (Max Flow too slow for TLE)
10330 - Power Transmission

10380 - Shogi Tournament
10511 - Councilling
10746 - Crime Wave - The Sequel
10779 - Collectors Problem
10804 - Gopher Strategy

Games:
----

847 - Multiplication Game
10368 - Euclids Game
10404 - Bachet's Game
10578 - The Game of 31

Dynamic Programming:
----

108 - Maximum Sum
111 - History Grading
116 - Unidirectional TSP
147 - Dollars
164 - String Computer
231 - Testing the CATCHER
348 - Optimal Array Multiplication Sequence
357 - Let Me Count The Ways
442 - Matrix Chain Multiplication
481 - What Goes Up
497 - Strategic Defense Initiative
507 - Jill Rides Again
526 - String Distance and Edit Process
531 - Compromise
562 - Dividing Coins
674 - Coin Change
711 - Dividing Up
836 - Largest Submatrix
10003 - Cutting Sticks
10032 - Tug Of War
10051 - Tower of Cubes
10066 - The Twin Towers
10069 - Unidirectional TSP
10081 - Tight Words
10100 - Longest Match
10130 - SuperSale
10131 - Is Bigger Smarter?
10154 - Weights and Measures
10192 - Vacation
10201 - Advantures in Moving Part IV
10259 - Hippity Hopscotch

10261 - Ferry Loading
10280 - Old Wine into New Bottles
10304 - Optimal Binary Search Tree
10379 - Pit Stop Strategy
10400 - Game Show Math
10405 - Longest Common Subsequence
10465 - Homer Simpson
10482 - The Candyman Can
10529 - Dumb Bones
10549 - Russian Dolls
10558 - A Brief Gerrymander
10559 - Blocks
10593 - Kites
10599 - Robots (II)
10604 - Chemical Reaction
10617 - Again Palindrome
10635 - Prince and Princess
10645 - Menu
10664 - Luggage
10690 - Expression Again
10721 - Bar Codes
10723 - Cyborg Genes
10739 - String to Palindrome
10755 - Garbage Heap
10759 - Dice Throwing
10817 - Headmaster's Headache
10819 - Trouble of 13-Dots
10827 - Maximum Sum on a Torus
10860 - Many a Little Makes a Mickel
10874 - Segments
10898 - Combo Deal
10912 - Simple Minded Hashing
10913 - Walking on a Grid

Graphs:
----

117 - The Postal Worker Rings Once
125 - Numbering Paths
280 - vertex
709 - Formatting Text (the shortest path)
793 - Network Connections
10239 - The Book-shelver's Problem (the shortest path)
10265 - Toroidal Chess Queens' Problem (tree rounds ???)
10266 - Surveying (connected components)
10054 - euler problem
10178 - count the faces
10608 - Friends
10731 – Test

```
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Connectivity:
-----------------------------------

459 - Graph Connectivity
10147 - Highways
10397 - Connect the Campus


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Big Integer:
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324 - Factorial Frequencies
424 - Integer Inquiry
495 - Fibonacci Freeze
623 - 500!
713 - Adding Reversed Numbers
10013 - Super long sums
10018 - Reverse and Add
10035 - Primary Arithmetic
10106 - Product
10220 - I Love Big Numbers !
10515 - Powers Et Al.


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Counting:
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357 - Let Me Count The Ways
369 - Combinations
10219 - Find the ways !
10338 - Mischievous Children


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Josephus:
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151 - Power Crisis
440 - Eeny Meeny Moo


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Math:
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106 - Fermat vs. Pythagoras
113 - Power of Cryptography
579 - ClockHands
834 - Continued Fractions
847 - A Multiplication Game
```

10071 - Back to High School Physics
10079 - Pizza Cutting
10161 - Ant on a Chessboard
10302 - Summation of Polynomials
10408 - Farey sequences

Matrix:
----

108 - Maximum Sum
348 - Optimal Array Multiplication Sequence
541 - Error Correction
836 - Largest Submatrix
10189 - Minesweeper

Number Conversion:
----

344 - Identifying Concurrent Events
446 - Kibbles `n" Bits `n" Bits `n" Bits
575 - Skew Binary
10469 - To Carry or not to Carry

Number Theory:
----

136 - Ugly Numbers
138 - Street Numbers
160 - Factors and Factorials
256 - Quirksome Squares
294 - Divisors
350 - Pseudo-Random Numbers
382 - Perfection
406 - Prime Cuts
408 - Uniform Generator
543 - Goldbach's Conjecture
686 - Goldbach's Conjecture (II)
10200 - Prime Time

Simulation:

10346 - Peter's Smoke
10409 - Die Game

Sorting & Searching:
----

299 - Train Swapping
331 - Mapping the Swaps
499 - What's The Frequency, Kenneth?
10008 - What's Cryptanalysis?
10107 - What is the Median?
10295 - Hay Points
10327 - Flip Sort

String:
----

272 - TEX Quotes
401 - Palindromes
444 - Encoder and Decoder
458 - The Decoder
483 - Word Scramble
490 - Rotating Sentences
492 - Pig-Latin
494 - Kindergarten Counting Game
576 - Haiku Review
739 - Lost in Space
10082 - WERTYU
10222 - Decode the Mad man
10260 - Soundex
10293 - Word Length and Frequency
10340 - Peter's Smoke
10361 - Peter's Smoke
10424 - Love Calculator
10508 - Word Morphing

Tree:
----

536 - Tree Recovery
10223 - How many nodes ?
10410 - Tree Reconstruction

Variable Range:

10055 - Hashmat the Brave Warrior

Greedy:

10020 - Minimal Coverage
10382 - Watering Grass
10440 - Ferry Loading (II)
10563 - Least Squares
10665 – Diatribe

Graph Theory:

- Topological Sorting:

   00200 Rare Order   Find the correct ordering of an alphabet
   10305 Ordering Tasks   Provide some ordering of tasks

- Trees

   00112 Tree Summing   Navigate through a LISP encoded binary tree
   00115 Climbing Trees   Figure out the relationships between people
   00122   Trees on the level   Produce level-order traversals of binary trees
   00615 Is It A Tree?   Determine whether or not the graph is a tree
   10308 Roads in the North Find the longest distance (diameter) of a tree.

- Eulerian Graphs

  00117 The Postal Worker... Minimize a cost tour for a postman
               (Simplified Chinese Postman problem)

- Cycles

   00125 Numbering Paths   Count number of paths in a directed graph
   00626 Ecosystem   Find/Print all cycles of size 3

- Polygon Intersection

   00137 Polygons   Find the XOR of two polygon areas

- Maximum Flow

   00563 Crimewave   Solve the escape problem

- Minimum Spanning Trees

   10307 Killing Aliens in Bor..   Find least cost way to assimilate all

----
Dynamic Programming:

- Memotization

    00101 The 3n + 1 Problem   Find the size of the longest sequence
    00371 Ackermann Functions   Find the size of the longest sequence
    00547 DDF   Output the longest Decimal-Digit Factor

- Longest Asc/Desc Subsequence

    00103 Stacking Boxes   Find the longest desc. subsequence in n-dims.
    00111 History Grading   Find marks for a chronologic ordering question

- Longest Common Subsequence

    00531 Compromise   Find the LCS for two texts

- 1D Minimize/Maximize

    00222 Budget Travel   Minimize the cost of a road trip

- 2D Minimize/Maximize

    00104 Arbitrage   Find a successful arbitrage sequence
    00108 Maximum Sum   Find the sub-rectangle with largest sum
    00116 Unidirectional TSP   Find the minimal path through a 2D field
    00585 Triangles   Find the largest triangle in a trianglular field
    00590 Always on the run   Find the minimum cost for flying city to city
    00526 String Distance & Transform...   Find the string distance and path
    10285 Longest Run on a Snowboard   Find the longest snowboarding path in a 2D field
    10306 E-coins   Find minimum number of 2D coins to get certain sum

- Change Making

    00147 Dollars   Count # of ways to make change

Modelling/Simulation:

- Object State Modelling

    00102 The Blocks Problem   Manipulation of blocks with robot arm

- Planar World Modelling

    00114 Simulation Wizardry   Simulate a idealized pinball machine

```
    00118 Mutant Flatworld Explorers   Simulate robots moving on a plane
    00407 Gears on a Board             Simulate gears on a plane
    00411 Centipede Collisions         Simulate centipedes on a plane
    00824 Coast Tracker                Simulate coastal robots on a plane
```

- Geometric Structure Modelling

```
    00201 Squares                      Count the number of squares in a grid
    00209 Triangular Vertices          Model triangular coordinates
```

- Record Keeping / Bookkeeping

```
    00119 Greedy Gift Givers           Keep track of everyone's net gain/loss
    00123 Searching Quickly            Keep track of keywords in titles of books
    00139 Telephone Tangles            Keep track of telephone bill
    00145 Gondwanaland Telecom         Keep track of telephone bill
    00405 Message Routing              Keep track of where routing goes
    00603 Parking Lot                  Keep track of cars in a parking lot
    00645 File Mapping                 Print out a file directory
```

- Josephus Rings

```
    00130 Roman Roulette               Find the survivor
    00133 The Dole Queue               Find the order of selected people
    00144 Student Grants               Find the order of students getting grants
    00151 Power Crisis                 Find the step such that a certain region survives
```

- Card Games

```
    00127 "Accordian" Patience         Simulate Accordian Patience (Solitaire)
    00131 The Psychic Poker Player     Determine the best Poker hand
    00451 Poker Solitaire              Evaluate some Poker hands
    00462 Bridge Hand Evaluator        Evaluate some Bridge hands and suggest a move
    00635 Clock Solitaire              Count winning Clock solitaire games
```

- Board Games

```
    00141 The Spot Game                Figure out who wins the Spot game
    00633 A Chess Knight               Figure out how many moves for a dynamic knight
    00647 Chutes and Ladders           Figure out who wins a game of Chutes and Ladders
    10284     Chessboard in FEN        Figure out number of unattacked squares
```

- Parsing:

```
    00134 Loglan-A logical Language    Check to see if sentences are in the grammar
    00171 Car Trialling                Check to see if sentence is valid instruction
    00620 Cellular Structure           Identify the type of organism.
    00622 Grammar Evaluation           Evaluate/Parse a [+,*,(,)] math expression
```

- Calendar/Time Modelling

    00150 Double Time   Convert between two calendars
    00419 Matching Meetings   Find suitable meeting times for department

- Sports Games

    00584 Bowling   Calculate a bowling game score

- Data Type Modelling

    00540 Team Queue   Implement a efficient TeamQueue (buddy system)

- Print/Font Formatting

    00403 Postscript   Implement "fonts" with formatting
    00416 LED Test   Determine if there is a valid LED countdown
    00426 Fifth Bank of Swamp County Output the bank record sorted in 3 columns
    00433 Bank (Not Quite O.C.R)   Check LED version of bank number

- Text Manipulation

    00373 Romulan Spelling   Fix some spelling mistakes
    00444 Encoder and Decoder   Encode/Decode according to certain rules
    00464 Sentence/Phrase Generator Generate phrases according to grammar rules
    00625 Compression   Compress some source code
    00628 Passwords   Rule replacement
    00641 Do the Untwist   Untwist an encrypted string

- Assembler Modelling

    00448 OOPS!   Convert hexcode to assembly code

Arithmetic:

- Fractions

    00202 Repeating Decimals   Figure out length of repeat period of fraction
    00834 Continued Fractions   Convert fraction to a continued fraction

- Pythagorean Triples

    00106 Fermat vs. Pythagoras   Generating/Counting Pythagorean triples

- Additive/Multiplicative Series

    00107 The Cat in the Hat   Calculate the number of cats in the hat
    00138 Street Numbers   Find special house numbers
    10302 Summation of Polynomials   Find the sum of the first N cubes

- Exponentiation/Logarithms

    00113 Power of Cryptography   Find integer roots of large numbers
    00545 Heads   Find 2^{-n} = x.xxxE-y for large n

- Polynomials

    00126 The Errant Physicist   Multiply polynomials of x and y
    00586 Instant Complexity   Calculate the complexity of a program

- Long Division/Multiplication

    00128 Software CRC   Calculate the CRC value for a string of text(divide)
    00550 Multiplcation by Rotation Find shortest factor with rotamult-property
    00465 Overflow   Determine whether numbers overflow an int

- Combinatorics:

    00135 No Rectangles   Find a suitable block design
    00146 ID Codes   Find the next permutation
    00153 Permalex   Convert between indices and words sorted in lex. order
    00580 Critical Mass   Count number of binary strings with 3 consecuive 1's
    00527 The partition of a cake   Count the number of partitions made by cake cutting
    10294 Arif in Dhaka   Count the number of necklace/bracelets of size N with T colors
    10303 How Many Trees?   Count the number of binary trees (Catalan numbers)

- Primes/Factorization

    00136 Ugly Numbers   Find the 1500th ugly number factors(2,3,5)
    00583 Prime Factors   List the prime factorization of a number efficiently
    10311 Goldbach and Euler   Determine if a number is sum of 2 primes

- Probability

    00542 France '98   Figure out the probability that a team will win
    10288 Coupons   Figure out probability that you will win

- Number Bases

    00619 Numerical Speaking   Convert between words and numeric index

- Partitioning

- Convex Hulls

    00109 SCUD Busters   Determine regions with power after a war
    00132 Bumpy Objects   Find a stable position for shapes

- Circles

    00121 Pipe Fitters   Calculate the most pipes that can fit
    00149 Forests   Determine viewable trees in an infinite forest
    10301 Rings and Glue   Determine number of intersecting circles

- Points in Polygons

    00143 Orchard Trees   Determine numbers of points in triangles
    00634   Polygon   Determine if a point is in a polygon

- Distance

    00152 Tree's a Crowd   Generate a histogram of tree distances
    10310 Dog and Gopher   Find out if the golpher can get to hole

- Art Gallery Problem

    00588 Video Surveillance   Determine if a camera can see all walls

- Spheres/Globes

    00535 Globetrotter   Find distance between two points on earth

- Polar/Azimuth Coordinates

    00404 Radar Scopes   Figure out warnings for planes using radar

- Area of polygons

    00428 Swamp County Roofs   Calculate area of trapezoidal roof tiles

- Pure Geometry

    10283 The Kissing Circles   Determine areas associated with circles in circles
    10286 Trouble with a Pentagon   Find the length of largest square in a pentagon
    10287 Gifts in a Hexagon Box   Fit circles inside a regular hexagonal box

- Center of gravity

    10291 Cut the Legs   Cut a table so that it balances

- Line intersection

00834 Water Falls   Figure out where water will land

Searching:

- Constraint Satisfaction

    00124 Following Orders   Find all consistent orderings
    00129 Krypton Factor   Find special "hard" sequences

- Brute Force Searching (no pruning)

    00140 Bandwidth   Check all 8! sequences
    00418 Molecules   Find the largest molecule that can be made
    00565 Pizza Anyone?   Satisfy all topping requests if possible
    00616 Coconuts, Revisited   Find the maximum number of people on island.
    00629 Test   Find all "non different" sets
    00638 Finding Rectangles   Find all rectangles in alphabetical order

- Search with pruning

    00624 CD   Find set of songs which fit best on tape
    10309 Turn the Light Off   Find min. # of pushes to turn off lights

- Anagrams

    00148 Anagram Checker   Find possible anagram sentences from dictionary
    00630 Anagrams(II)   Find possible anagrams for words
    00642 Word Amalgamation Find possible anagrams for words

- Word Searches

    00581 Word Search Wonder   Find words in a grid
    00409 Excuses, Excuses!   Find key "excuses" in a sentences
    00425 Enigmatic Encryption   Find the password from a text
    00604 The Boggle Game   Find matching words in 2 Boggle boards

- Greedy Algorithms

    00410 Balance Station   Minimize Imbalance for a centrifuge