Exact Cover Problems

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1 Regular Exact Cover problem

Use backtracking to solve the following exact cover problem, that is: is there a set of rows containing exactly one 1 in each column?

[1	0	0	1	0	0	1]
1	0	0	1	0	0	0
0	0	0	1	1	0	1
0 0 0	0	1	0	1	1	0
0	1	1	0	0	1	1
0	1	0	0	0	0	1]

Γ1	0	0 0 0 1 1	1	0	0	1
1	0	0	1	0	0	0
0	0	0	1	1	0	1
0	0	1	0	1	1	0
0	1	1	0	0	1	1
0	1	0	0	0	0	1

[1	0 0 0 0 1 1	0	1	0	0	1
1	0	0	1		0	0
0	0	0	1		0	1
0	0	1	0	1	1	0
0	1	1	0	0	1	1
0	1	0	0	0	0	1 0 1 0 1 1

0	0	1	0	0	1]
0	0	1	0	0	0
0	0	1	1		
0	1	0	1	1	0
1	1	0	0	1	1
1	0	0	0	0	1
	0 0 0 0 1	0 0 0 0 0 0 0 1 1 1 1 0	0 0 1 0 0 1 0 0 1 0 1 0 1 1 0 1 0 0	0 0 1 0 0 0 1 0 0 0 1 1 0 1 0 1 1 1 0 0 1 0 0	0 0 1 0 0 0 0 1 1 0 0 1 0 1 1 1 1 0 0 1

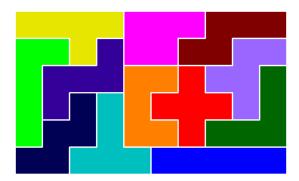
1	0	0	1	0	0 0 0 1 1 0	1
1	0	0	1	0	0	0
0	0	0	1	1	0	1
0	0	1	0	1	1	0
0	1	1	0	0	1	1
0	0 0 0 1	0	0	0	0	1

2 Pentomino

The Pentomino is a tiling problem involving

- 12 different tiles, each of them covering 5 cells
- a 6x10 grid

The following is one of the many solutions to the Pentomino problem:



Design the exact cover matrix for the Pentomino problem:

- what should it be represented by its columns?
- what should each row of the matrix represent?
- what is a solution to the problem?

3 A generalized exact cover problem: 8-Queens

Design the exact cover matrix for the 8-Queen problem.