

# Dancing Links

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	4	6	7	8	9	1	2
6	7	2	1	9	5	3	4	8
1	9	8	3	4	2	5	6	7
8	5	9	7	6	1	4	2	3
4	2	6	8	5	3	7	9	1
7	1	3	9	2	4	8	5	6
9	6	1	5	3	7	2	8	4
2	8	7	4	1	9	6	3	5
3	4	5	2	8	6	1	7	9

$$\begin{pmatrix} 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{pmatrix}$$

A 7x7 matrix is displayed, enclosed in large parentheses. The matrix contains binary values (0 and 1). The second and seventh columns are highlighted with a gray background. The fifth row is highlighted with a yellow background. The intersection of the highlighted row and column (row 5, column 2) is highlighted with a darker brown color.

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



A 6x7 matrix is displayed with large black numbers. The matrix is enclosed in large black parentheses on the left and right sides. The second, fourth, and seventh columns are highlighted with vertical gray bars. The fifth column is highlighted with a vertical green bar. The fifth row is highlighted with a horizontal yellow bar. The intersection of the yellow row and green column is a darker green color.

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

A 7x7 matrix of binary digits (0s and 1s) is displayed, enclosed in large black curly braces on the left and right sides. The matrix is color-coded: the first, third, fifth, and seventh rows are blue; the second, fourth, and sixth rows are white. The first, second, and seventh columns are gray; the third, fourth, and sixth columns are blue. The fifth column is highlighted in green, and the fifth row is highlighted in yellow. The digits are as follows:

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

A 6x7 matrix is shown with a black outline. The first and fifth rows are highlighted in yellow. The second, third, and seventh columns are highlighted in gray. The matrix contains the following values:

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

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

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

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

A 6x7 matrix of binary digits (0s and 1s) is displayed, enclosed in large black parentheses. The matrix is as follows:

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

The matrix features several highlighted elements:

- Row 1 is highlighted in yellow.
- Row 4 is highlighted in yellow.
- Row 5 is highlighted in yellow.
- Column 1 is highlighted in yellow.
- Column 3 is highlighted in yellow.
- Column 4 is highlighted in yellow.

The background of the matrix cells is shaded in a checkerboard pattern of light gray and white.

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



A 7x7 matrix is displayed, enclosed in large black parentheses. The matrix contains binary values (0 and 1). Three rows are highlighted with a light orange background: the first row, the fourth row, and the fifth row. The other rows are in black text.

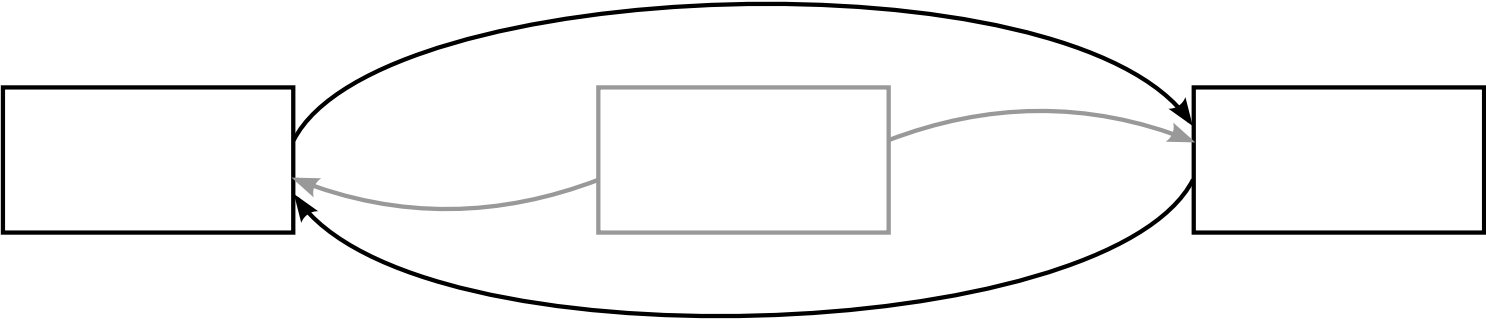
0	0	1	0	1	1	0
1	0	0	1	0	0	1
0	1	1	0	0	1	0
1	0	0	1	0	0	0
0	1	0	0	0	0	1
0	0	0	1	1	0	1

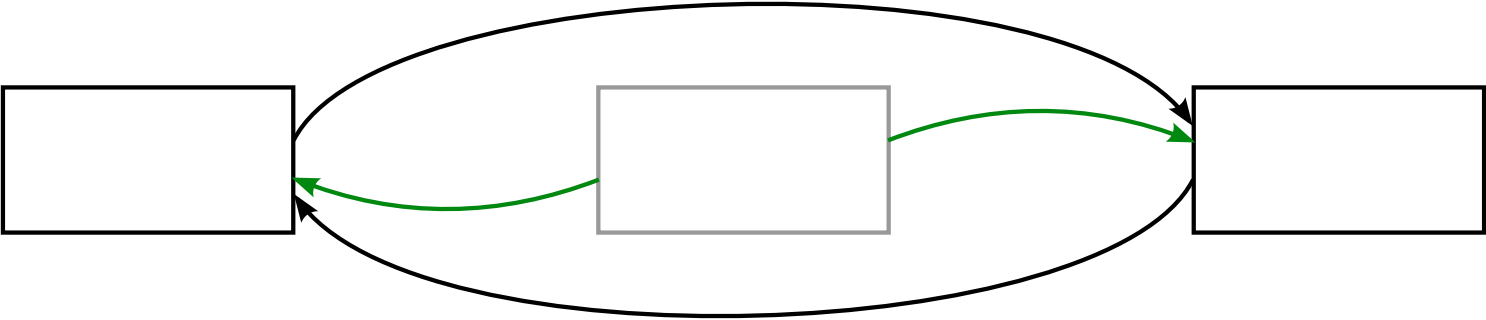
backtracking

**2 rows**

NP-complete

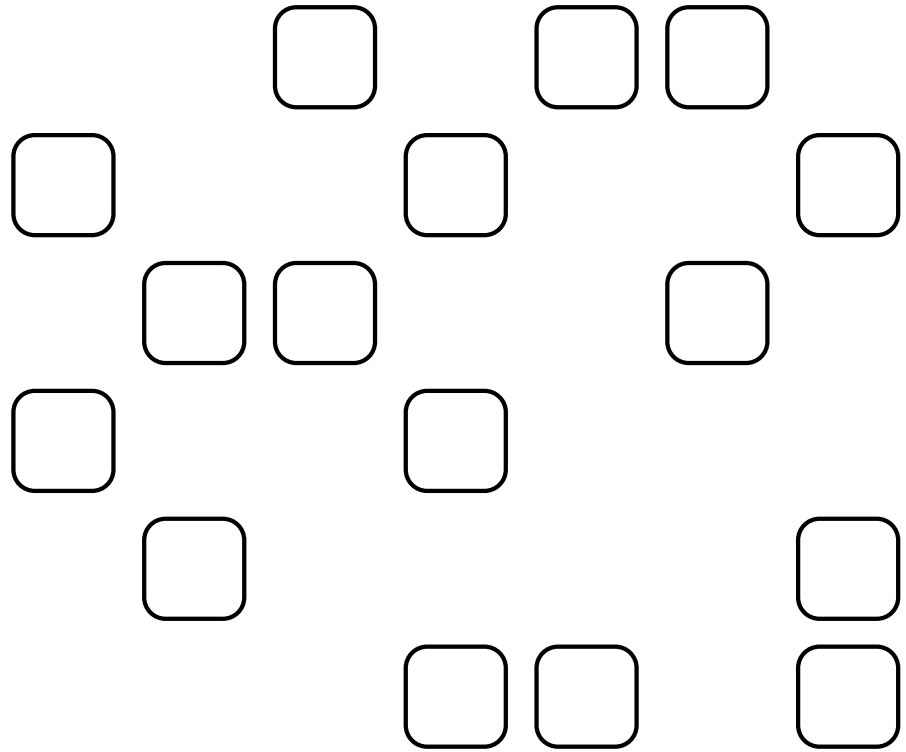


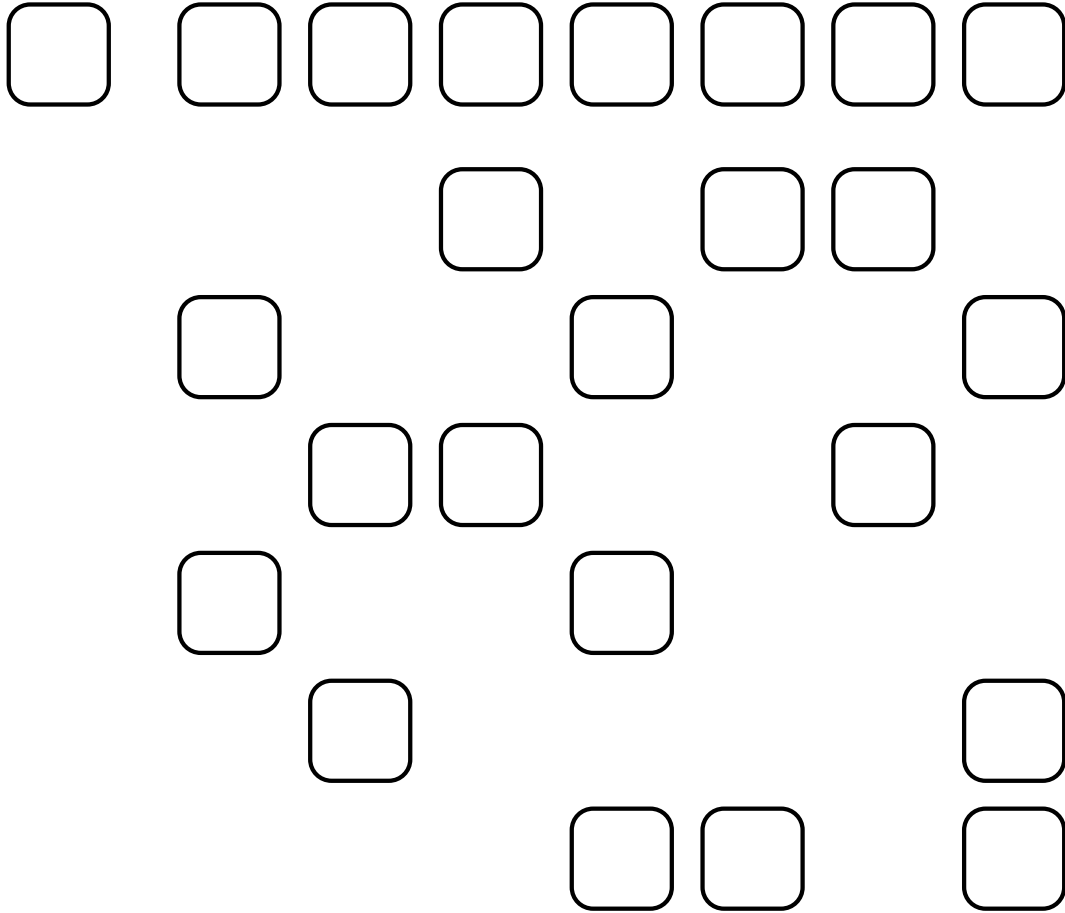


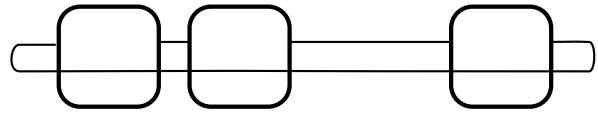
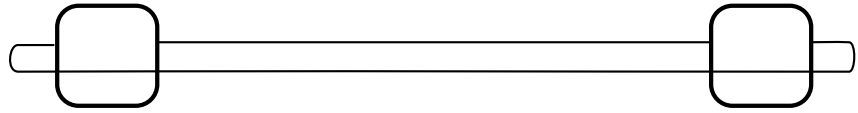
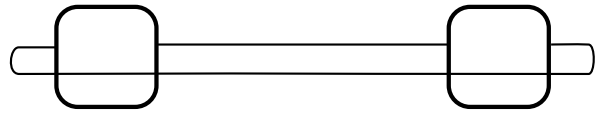
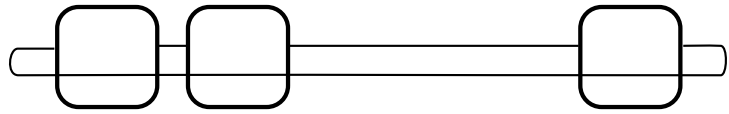
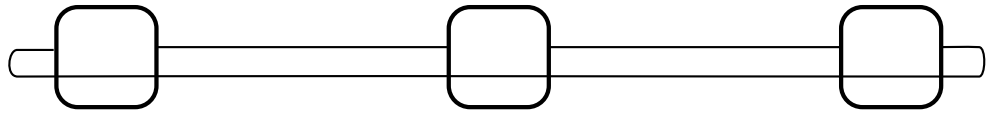
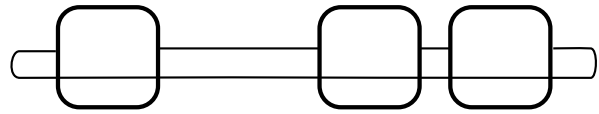
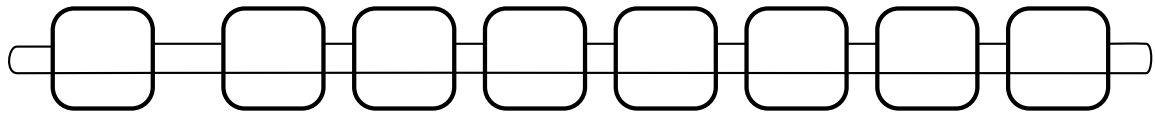


$$\begin{pmatrix} 0 & 0 & \boxed{1} & 0 & \boxed{1} & \boxed{1} & 0 \\ \boxed{1} & 0 & 0 & \boxed{1} & 0 & 0 & \boxed{1} \\ 0 & \boxed{1} & \boxed{1} & 0 & 0 & \boxed{1} & 0 \\ \boxed{1} & 0 & 0 & \boxed{1} & 0 & 0 & 0 \\ 0 & \boxed{1} & 0 & 0 & 0 & 0 & \boxed{1} \\ 0 & 0 & 0 & \boxed{1} & \boxed{1} & 0 & \boxed{1} \end{pmatrix}$$



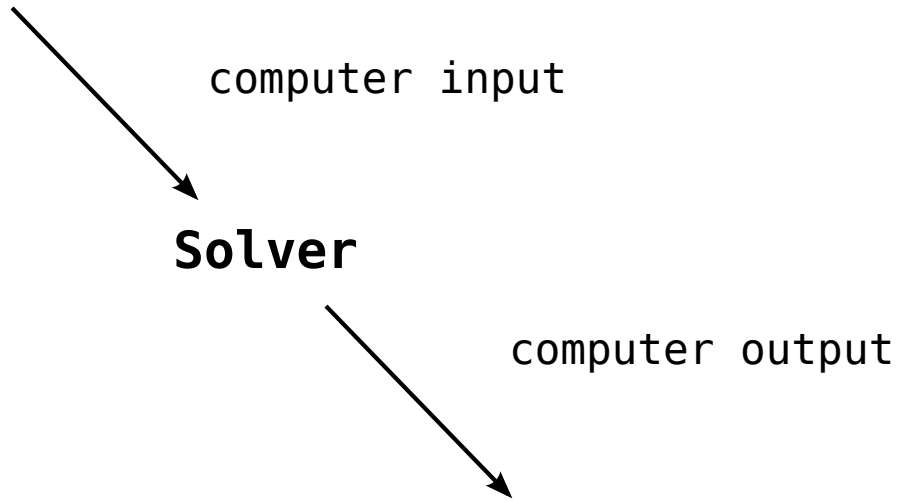


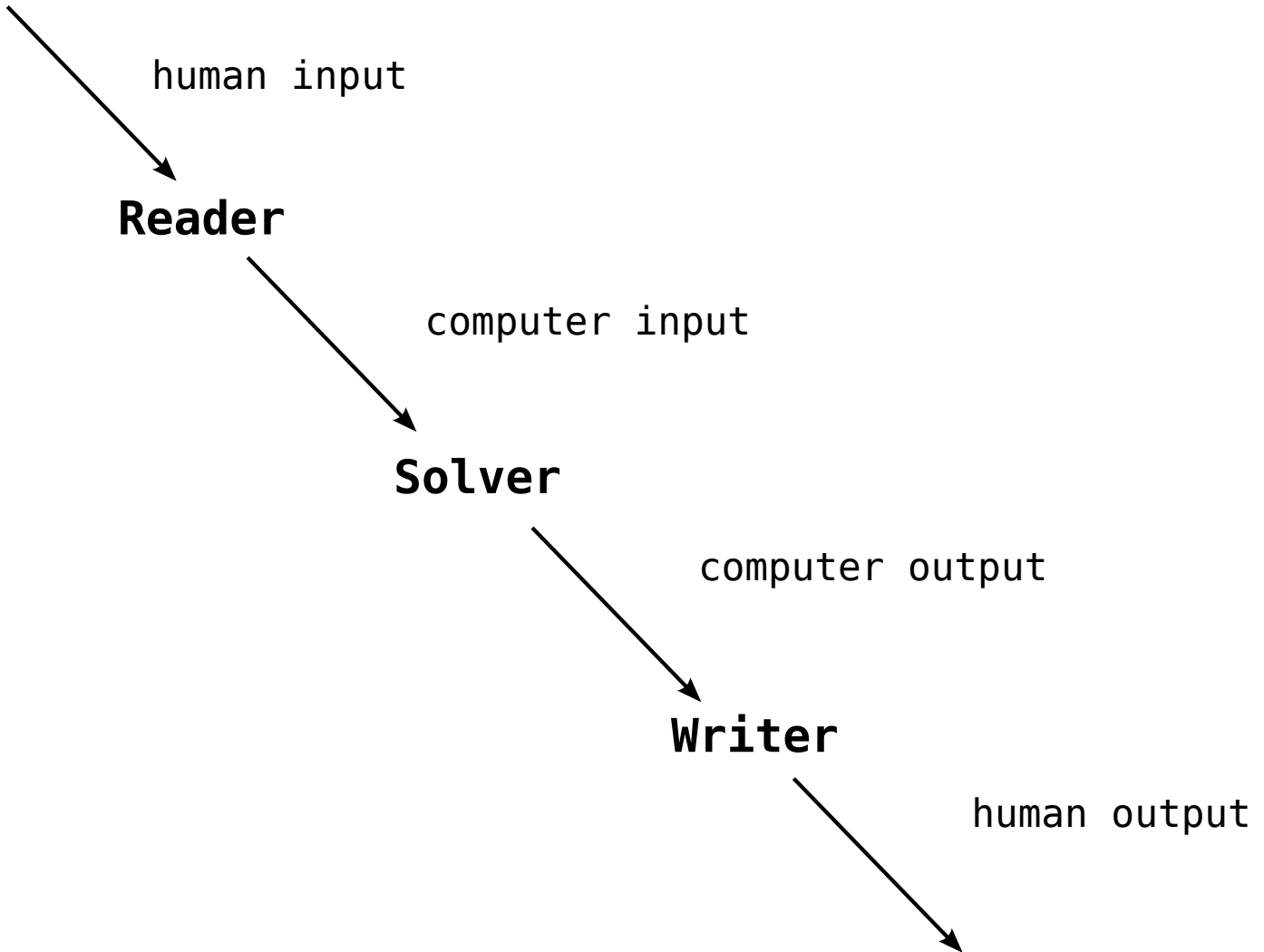






no memory allocations!





the cake is a lie



exact cover is like tiling

column  $\leftrightarrow$  location

row  $\leftrightarrow$  tile

pentominoes

8-queens

# C implementation

thank you