APRIL CONTEST 2018

by Riad Khanmagomedov

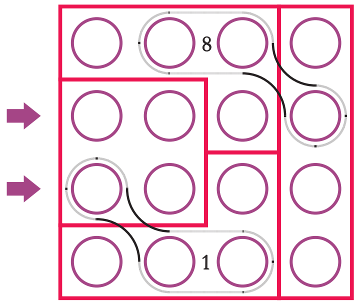
Submissions should be sent on the answer page at LMI not later than 24-00 (of Moscow time) April 11 2018

Thanks to Prasanna Seshadri, Rakesh Rai and Kota Morinishi for support

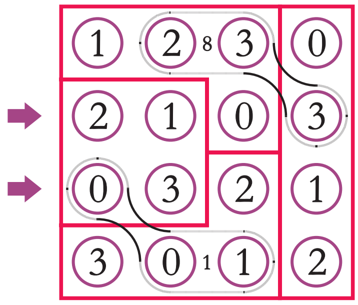
1. CIRCLER 6 pt

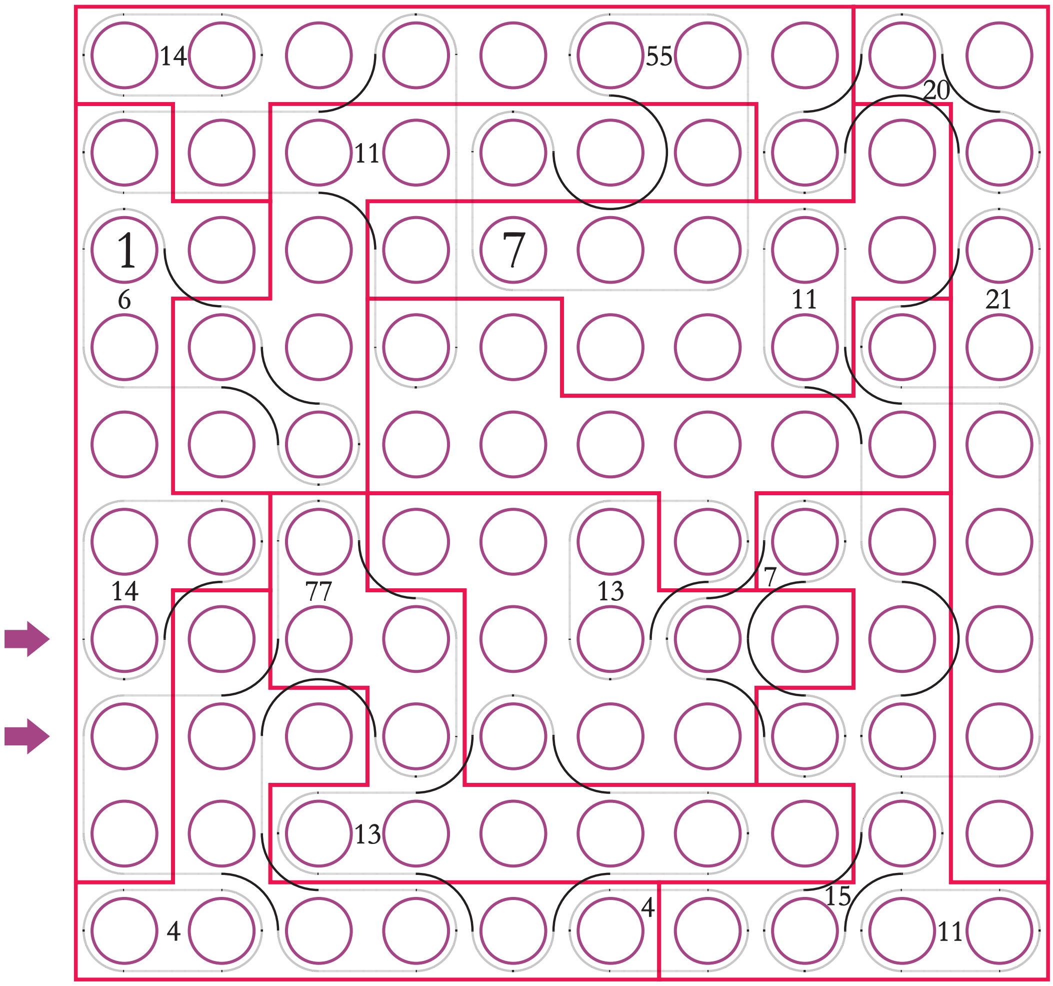
Fill the circles with digits from 0 to 9. Digits must be different in rows, columns and red outlined areas. Sum of digits in the black figured areas should be equal to the given numbers. Digits can repeat in black figured areas.

Example



Solution



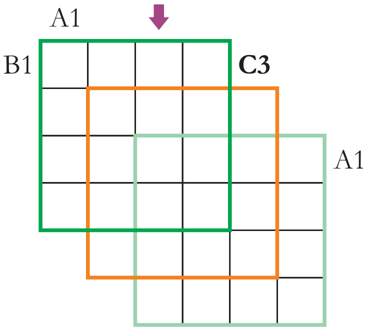


Answer format: Write the content of marked rows from left to right. For the example: 2103, 0321.

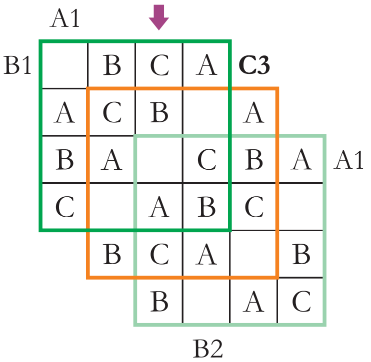
2. LATIN CASCADE **4 pt**

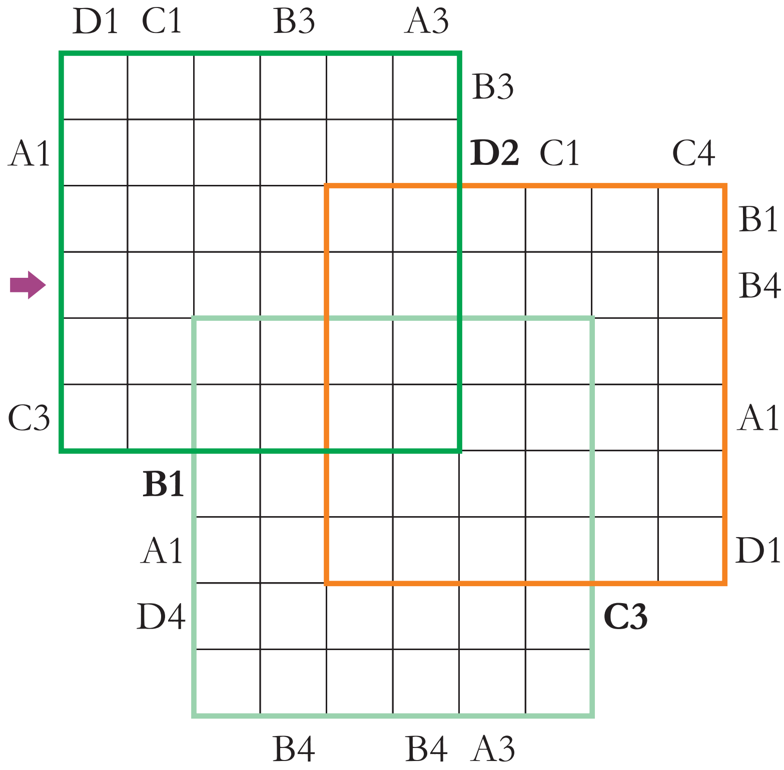
Fill each of the three 6 x 6 grids with letters A, B, C and D. In every grid, each letter appears exactly once in each row and column. Two cells remain empty in each row and column. Outside clues contain a letter and a number. For any grid, a letter X with index N means the letter X is the Nth letter when seen from that direction. Bold outside clues are located at intersections of two grids and it is part of solving to determine the grid to which these clues belong.

Example



Solution



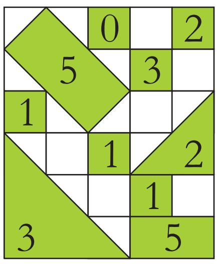


Answer format: Write the content of marked row from left to right. Use "-" for empty cells. For the example: CB-ACB.

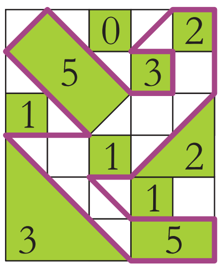
3. KEEP OFF THE GRASS! **4 pt**

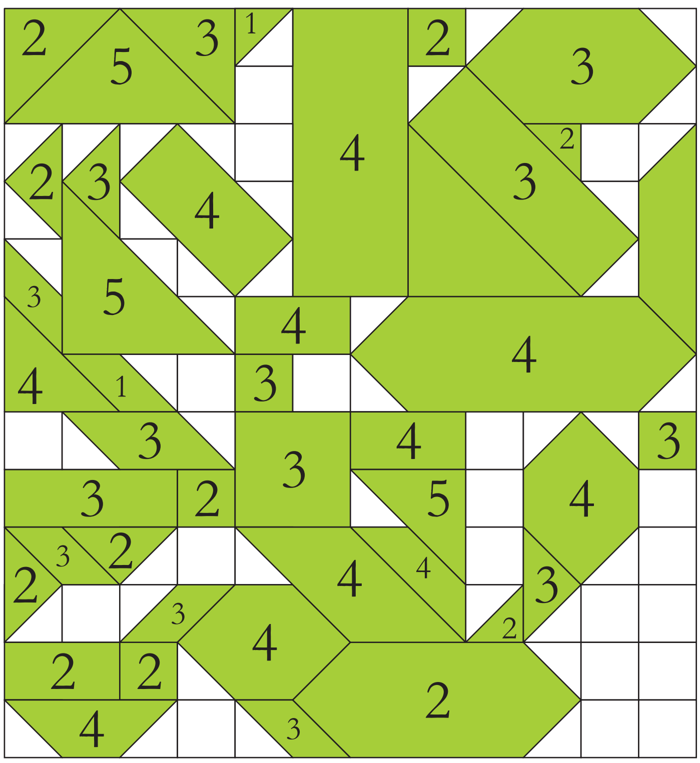
Draw a loop by connecting neighboring horizontal, vertical or diagonal (at 45° to the border) segments. The loop cannot touch or cross itself, and it cannot cross the green shapes (lawns/grass). The given number for a lawn indicates the number of unit segments (including diagonal segments) of the lawn which are part of the loop.

Example



Solution





Answer format: Write the number of diagonals unit segments of the loop. For the example: 12.

4. DRAW WITH NAMES **5 pt**

Blacken some cells in the grid. Numbers given at the top and left of the grid indicate the lengths of all black blocks in corresponding directions, in the correct order (top to bottom, or left to right). There should be at least one white cell between two black blocks. The letters given below the grid should appear in the corresponding columns in the same order. It should be possible to read some of the names from the list given at the right of the grid, reading row by row from top to bottom.

Example

➡				
4				
➡				
		J I C		R K

JACK
JIM
JIRI

Solution

	■	J	I	R
➡	■	I	J	■
4	■	■	■	■
➡	A	C	■	K
		J I C		R K

			3 3 1 1 2	1 1 1 1		4 1 3		1 2 2 5	4 4 3	7 3		1 9	1 2 1 1 2	1 1 4 4	
3 1 3 3															
5 1 1 1 1															
1 5 1 1 1															
1 4 1 1															
1 1 3 1 1 1															
3 1 6 1															
3 3 1 2															
1 3 6															
2 2 3 1															
2 2 1 3															
➡															
3 6 3															
➡															
	S E M	U N S	L L H E I		E S T		T I I T	A H M N A	U E A I	N H I A I	U R T I T M	E I K E R	S N M S M N I T		A I I N A A O

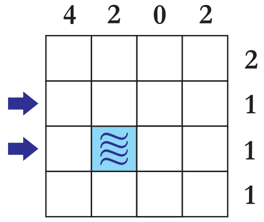
AARON
ALAN
AMIT
ANNA
ASHISH
ELENA
ELIN
HISASHI
IREN
KEN
LAURENT
MANUELA
MARTIN
MATUS
NICK
NIELS
NIKOLA
NOLA
ORION
RAINER
SHINICHI
SUMET
TAKUMA
TARMO
TARO
THOMAS
TIIT
TIM
TOMOAKI
ULLA

Answer format: Write the content of marked rows from left to right.
Use X for each black cell. For the example: XIJX, ACXK.

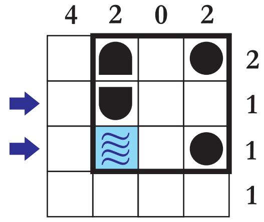
5. BORDERLESS BATTLESHIPS* **5 pt**

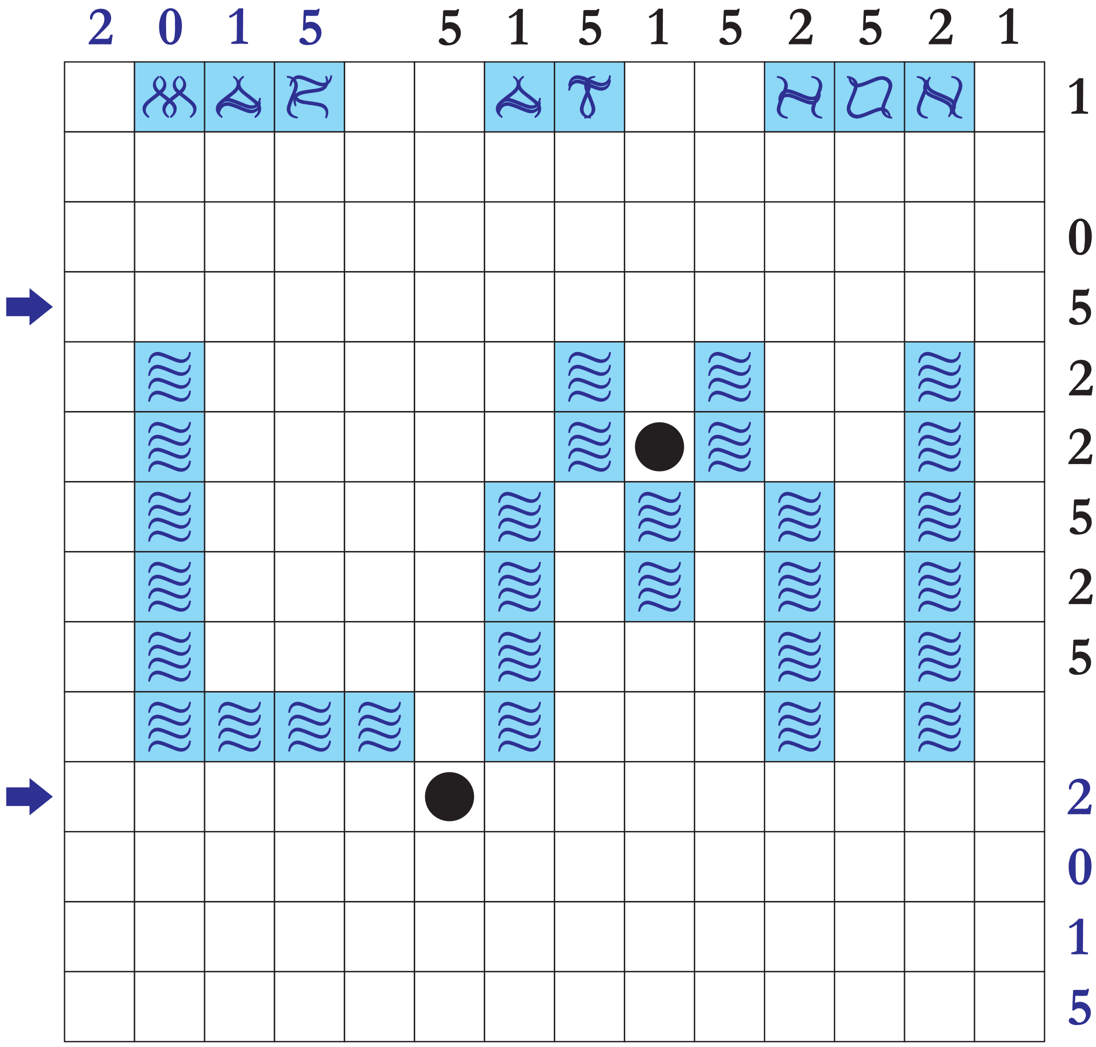
Outline an 11 x 11 area inside the given grid and place the battleships fleet in white cells inside this area. Ships cannot touch each other even diagonally. Digits outside the grid show how many cells are occupied by ships in corresponding directions. Blue cells indicate water and cannot contain ships. Some of the cells contain ship parts as indicated.

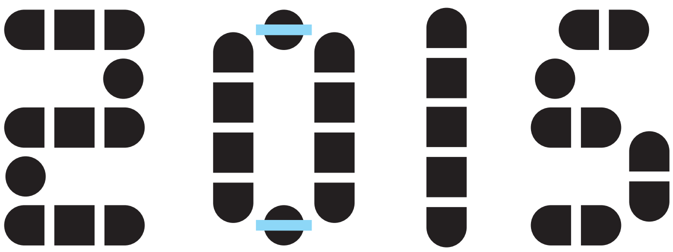
Example
(the 3 x 3 areas)



Solution







Answer format: Write the content of marked rows from left to right. Use the size of ship for each cell occupied by ships and "-" for other cells. For the example: -2--, ---1.

** The puzzle was composed for a Puzzle Marathon'2015 on LMI. Published for the first time.*

6. MAGIC SNAKE **9 pt**

Draw a snake – a set of continuous black cells with 1-cell width, and consisting of horizontal and vertical segments. The snake cannot touch or cross itself. The sum of digits in white cells (non-snake cells) should be the same for all rows and columns.

Example

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

Solution

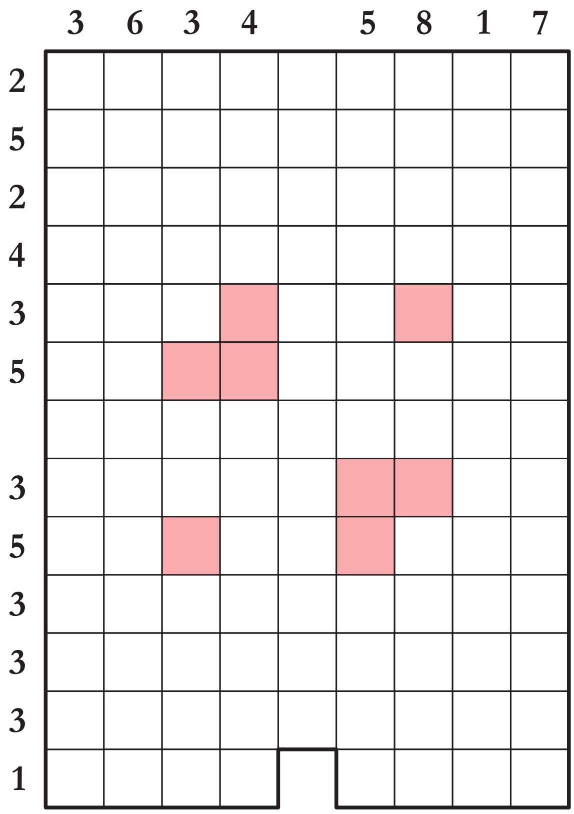
3	1	2	3	4
4	5	2	4	4
8	6	4	6	2
1	7	2	6	1
1	2	4	3	2

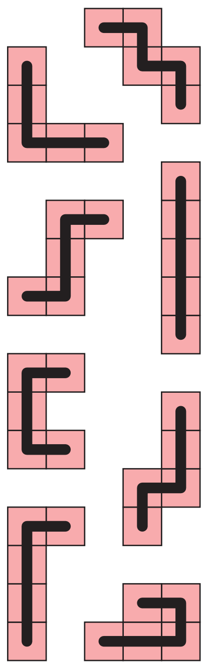
1	3	9	3	6	7	5	0	5	2	7
0	4	8	8	6	4	8	0	0	4	8
1	7	7	7	7	7	7	9	9	7	7
2	9	0	8	2	5	5	0	1	3	6
2	3	3	3	0	8	8	1	4	8	1
5	5	9	1	1	5	0	9	1	9	1
3	7	1	3	1	1	1	0	1	4	7
1	7	7	1	7	7	1	7	7	7	3
5	8	2	7	7	3	1	0	6	4	6
7	9	7	1	1	3	8	9	5	2	0
0	2	7	7	3	0	7	9	0	9	7

Answer format: Write the content of marked row from left to right and the column from top to bottom. Use "+" for each black cell and "-" for each white cell. For the example: ----+, ---++.

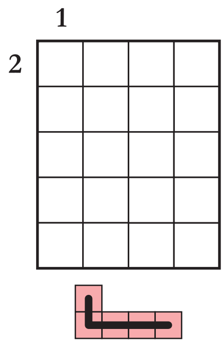
7. PENTOSTRIP **5 pt**

Place the 8 given pentominoes in the grid. Pentominoes can be rotated and reflected. They cannot touch each other, not even diagonally. Digits outside the grid show the number of cells occupied by pentominoes in the corresponding rows/columns. Some cells occupied by pentominoes are already given. Additionally, there should be a loop going through centres of all cells, and formed by horizontal and vertical segments. The loop cannot touch or cross itself. The loop path inside each pentomino is given.

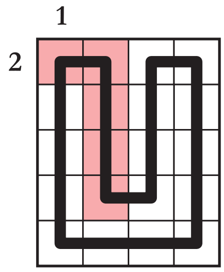




Example



Solution



Answer format: Write the number of all turns of the loop. For the example: 8.

8. CROSS MATH

14 pt

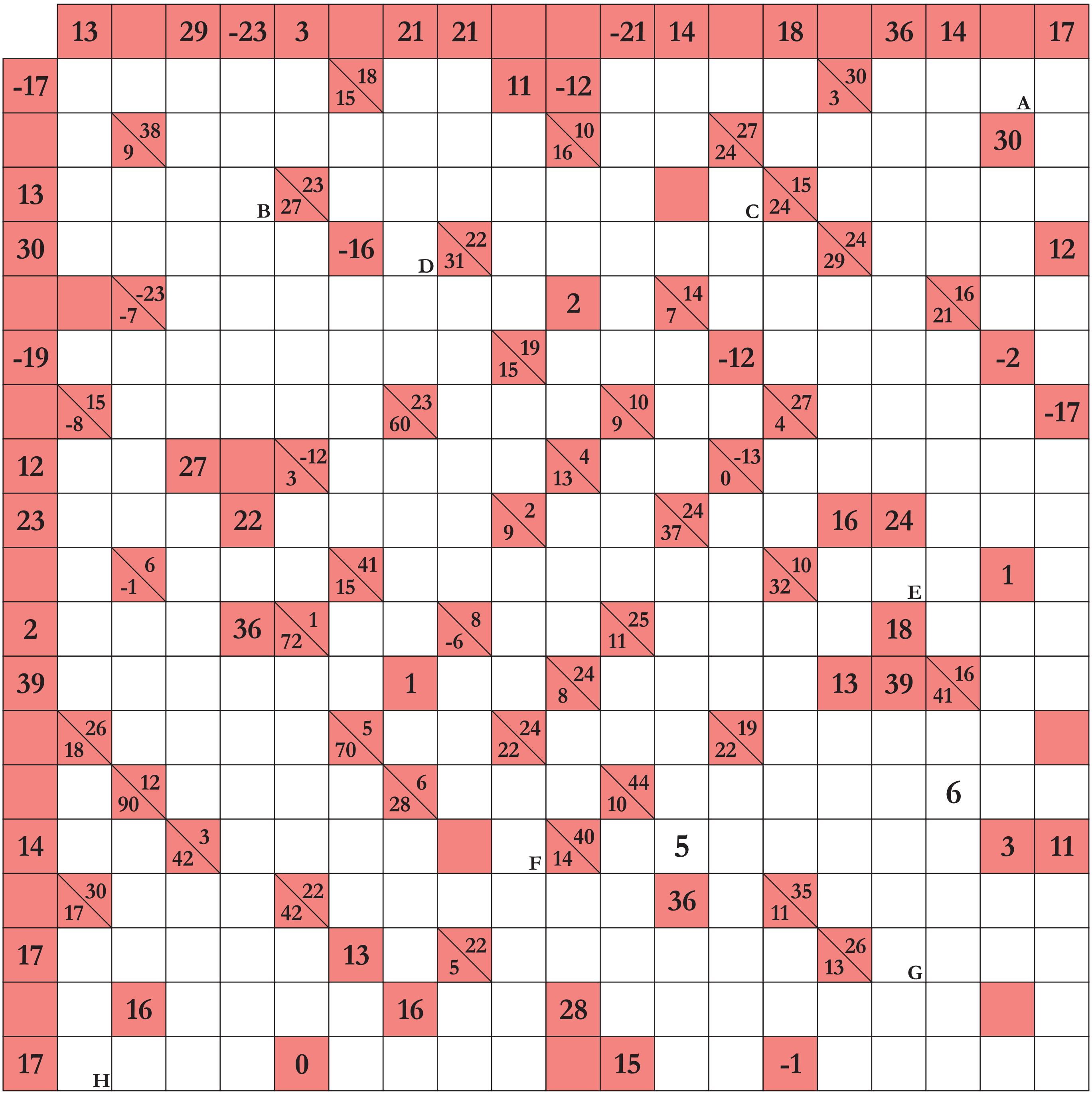
Fill the white cells with digits from 1 to 9. Digits cannot repeat in a white block (continuous white cells in a row or column). The numbers at the beginning of each white block can indicate one or more of the following: (a) the sum of all digits in the block, (b) the product of all digits in the block, (c) the difference between the maximum digit in the block and sum of all other digits, (d) the division of the maximum digit in the block by the product of all other digits.

Example

	19	1	29	
-1		A		84
70				
30	B			
	60			

Solution

	19	1	29	
-1	6	3	8	84
70	5	1	7	2
30	8	6	9	7
	60	2	5	6

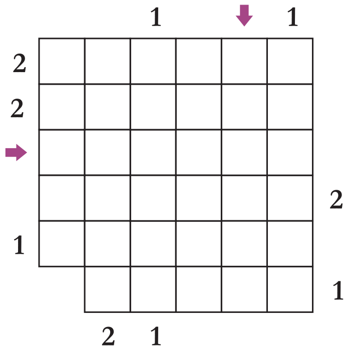


Answer format: Write the content of cells with A, B, C, D, E, F, G, H. For the example: 3, 8.

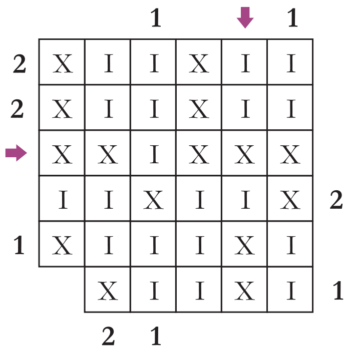
9. XII **5 pt**

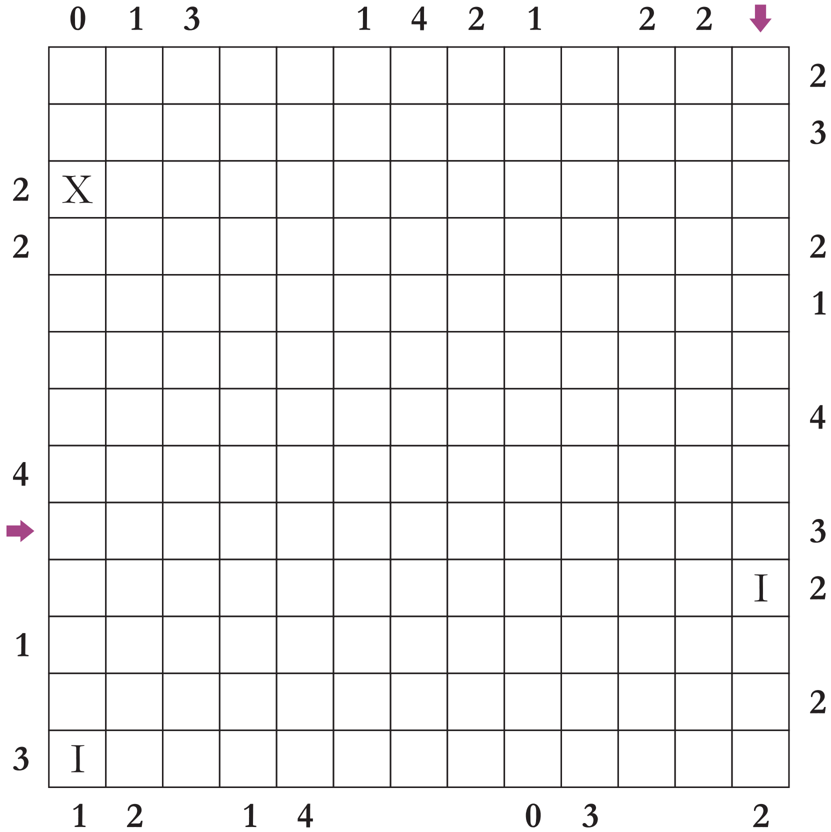
Place either an 'X' or an 'I' into each cell so that four consecutive 'X's or 'I's do not appear anywhere horizontally, vertically or diagonally. Given digits outside the grid the number of times three consecutive characters form the number 'XII' in the corresponding direction.

Example



Solution





Answer format: Write the content of marked row from left to right and the column from top to bottom. For the example: XXIXXX, IIXIXX.

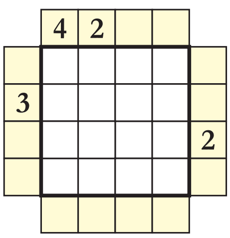
10. OPTI SKYSCRAPERS **14, 11, 8, 5, 2 pt for best solutions**

You are given four sets of digits from 1 to 5. Place some of these digits in the coloured cells so that the Skyscrapers puzzle has a unique solution.

Rules of Skyscrapers puzzle: Each white row and column contains skyscrapers of different heights from 1 to 7. Digits in the coloured cells indicate how many skyscrapers are visible from that direction.

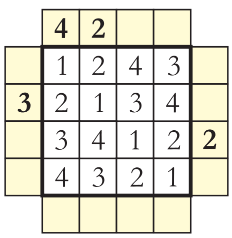
Minimize the value of the expression A + 2B +3C, where A – number of digits used twice in the coloured cells, B – number of digits used thrice in the coloured cells, C – number of digits used four times in the coloured cells. If two solutions have the same value of A + 2B + 3C, then the solution using minimum number of digits in coloured cells is considered better. If two solutions have the same value of A + 2B + 3C and use the same number of digits in coloured cells then the solution which has minimum sum of digits in coloured cells is considered better.

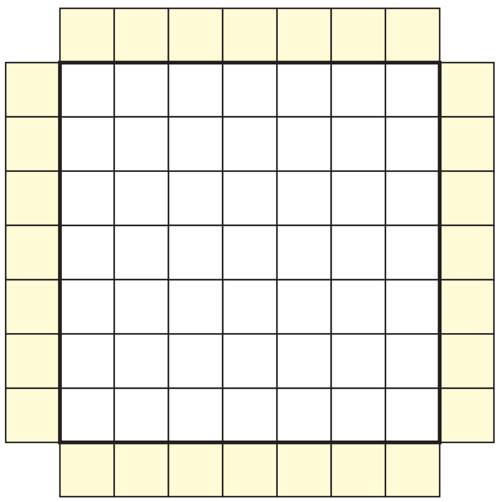
Example



A=1
B=0
C=0

Solution

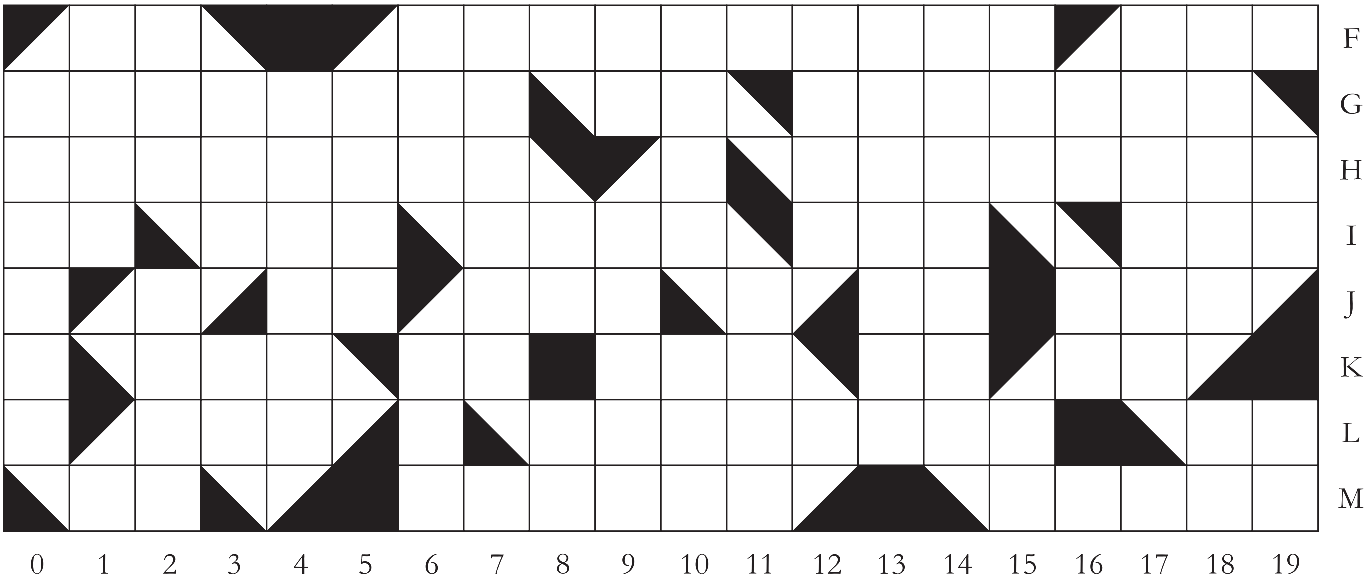




Answer format: Write the value A + 2B + 3C, the number of given digits, the content of the top and bottom colored row from left to right, then the content of the left and right colored column from top to bottom. Use "-" for each empty cell. For empty rows and columns, one "-" sign should be used. For the example: 1, 4, 42--, -, -3--, --2-.

11. ROLLBALL VARIATION **14, 11, 8, 5, 2 pt for best solutions**

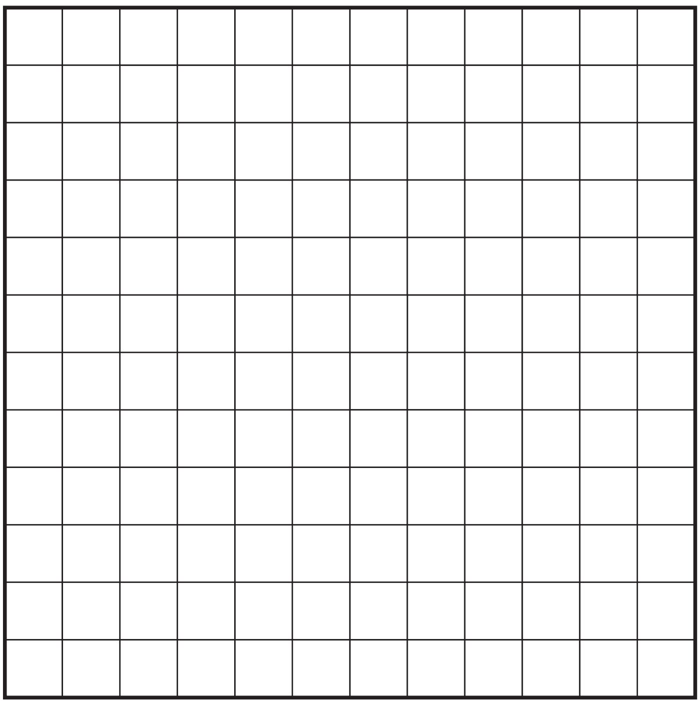
Place the ball in any fully white cell to start. Place some right angled triangles in any cells, except start cell. Push the ball going horizontally and vertically. It changes the direction after hitting the diagonal (hypotenuse) of half cells. The ball should not return back and it must go through the centres of all white half cells and all fully white cells. The ball can roll out of the grid or stay inside the grid – at the side of a fully black cell or at a cathetus (any of the sides that form the right angle) of a triangle. Minimize N, where N = number of right angled triangles added. If two solutions have the same N, then the solution with the longer route length is considered better.

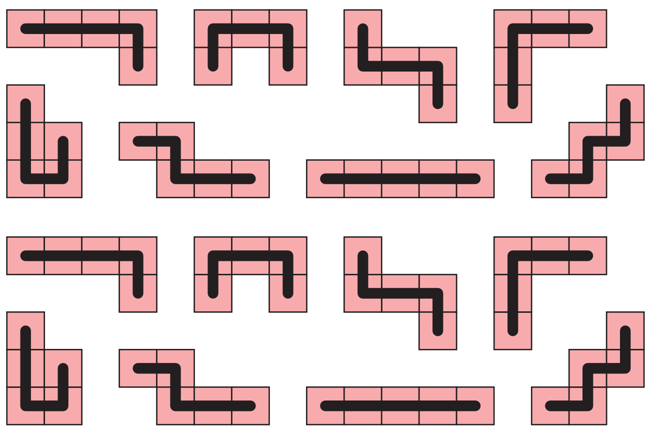


Answer format: Write your N, the length of balls route, the start cell coordinates and push direction (E, Z, W or N), then the type of each putting triangle (A, B, C, D) with the corresponding cell coordinates. For example: 11, 80.5, F2W, DM2, BJ2, CL4, BM3, AM4...

12. OPTI PENTOSTRIP **14, 12, 10, 8, 6, 4, 2 pt for best solutions**

You are given two sets of 8 pink pentominoes. Place the pentominoes and some black cells into the 12 x 12 grid. Pentominoes can be rotated and reflected. They cannot touch each other, not even diagonally. Additionally, there should be a unique loop going through centres of all white and pink cells, and formed by horizontal and vertical segments. The loop cannot touch or cross itself. The loop path inside each pentomino is given. Minimize the value of the expression K+2L where K = Number of pentominoes used twice, L = Number of black cells.





Answer format: Write the value K + 2L, then describe the content of the grid row by row from left to right and from top to bottom. Use X for cells occupied by pentominoes, Y for each black cell and "-" for other cells.