

## Instruction booklet for the qualifying round of Logic Masters 2014

Welcome to the qualification round for the Logic Masters 2014!

We hope you enjoy the competition, regardless of whether you compete seriously or just for fun.

The contest will consist of 20 puzzles, some of them being extremely difficult. We believe most puzzlers will not be able to solve all of them in time. Solve those puzzles you can solve and skip the others; if you have time left, you can always come back to them.

The points for the puzzles have been assigned according to their difficulty. You may use these information to decide which puzzles to try first. However, keep in mind your estimation of a puzzle's difficulty may differ from ours.

The contest will start on Friday, May 9 at 12:00 pm and end on Monday, May 12 at 12:00 pm CEST. During that time, you can choose to start solving whenever you want. When you do, you will obtain the password for the encrypted contest file; after that, you have 150 minutes to solve the puzzles and send your answers via the contest page. Note that no results will be accepted on Monday after 12:00 pm anymore.

The 35 best solvers of German citizenship, together with the WPC team of 2013, will be invited to compete at the final round on June 21 in Stuttgart, to determine the German Puzzle Champion 2014 and the team competing at the World Puzzle Championship in London in August.

### Rules and rule changes:

- Wrong answers will yield a penalty of 5 points. During your solving time you can correct any mistakes, of course.
- Incorrect answer keys for an otherwise correct solution may be accepted as correct. However, in such a case only 80% of the puzzle's points will be given.
- You may enter your answer keys at any time, to avoid time trouble at the end of the contest.
- You are solely responsible for sending your answers in time.
- You must solve the qualification puzzles without outside help. Computer programs, Sudoku solvers or similar are not allowed.

If there are any last minute changes or clarifications, they will be announced in our forum at

<http://forum.logic-masters.de/showthread.php?tid=1231>

### Answer keys:

Please keep in mind the following guidelines when entering your answer keys:

- If not specified differently, enter your solution from top to bottom.
- For clarity's sake, you may use commas and spaces in your answer keys; they have no bearing on the correctness of your solutions.
- The solution form does not distinguish between capital and lower case letters.

The puzzles were created by the following authors:

Sebastian Matschke (4, 6, 7, 9, 12, 17, 19, 20), Martin Merker (3, 5, 8, 10, 13, 14, 18), Philipp Weiß (1, 2, 11, 15, 16)

## Instructions

The following instructions come directly from the contest file; only the diagrams have been removed. Instead of them, small examples are shown. These examples can not be found in the test file. You should read and understand the instructions and examples before the test.

### 1. Minesweeper

5 points

Place an unknown number of mines into the grid. The numbers indicate how many mines can be found in horizontally, vertically or diagonally adjacent cells. Each cell can contain at most one mine, and numbered cells must not contain a mine at all.

**Example:**

2		1	
3			2
		2	

2		1	
●	●		
3		●	2
●		2	●

**Answer key:** For each row, enter the total number of mines.

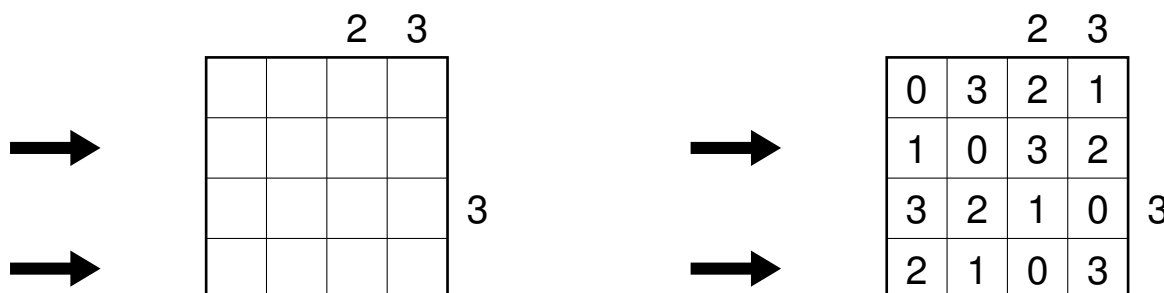
*For the example, the answer key would be: 0212*

### 2. Skyscrapers with parks

5 points

Place digits from 0 to 4 into the grid, so that each digit appears exactly once in each row and column; exactly one cell in each row and column remains empty. A 0 represents a park, the digits greater than 0 represent skyscrapers of different heights; the numbers outside the grid indicate how many skyscrapers can be seen in the respective row or column from the respective direction. Smaller skyscrapers are hidden behind higher ones.

**Example (with Scyscrapers from 1 to 3):**



**Answer key:** For each row marked by an arrow, enter the digits from left to right.

*For the example, the answer key would be: 1032, 2103*

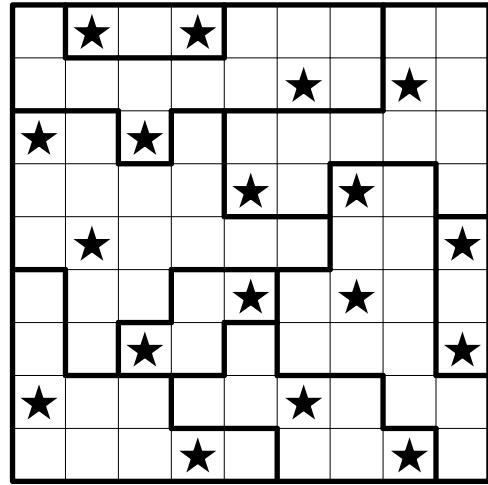
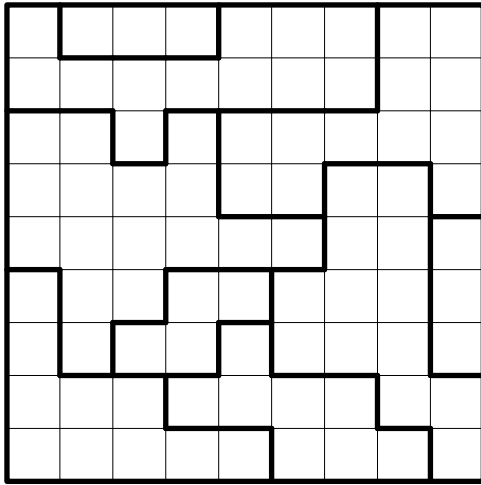


## 5. Star Battle

15 points

Place stars into the grid, so that each row, each column and each outlined region contains exactly two stars. The stars have the size of one cell and must not touch each other, not even diagonally.

**Example:**



**Answer key:** For each row, enter the number of cells between the two stars (not counting the cells containing the stars).

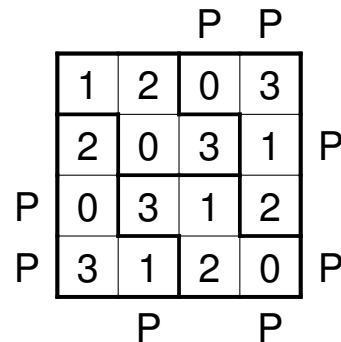
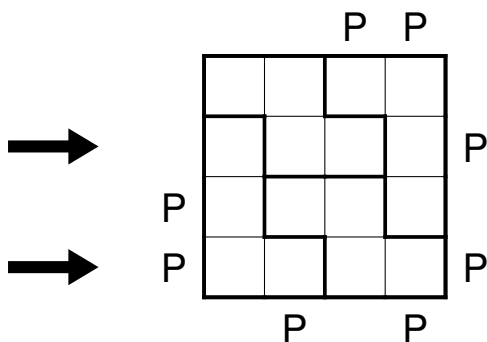
*For the example, the answer key would be: 111161543*

## 6. Outside Prime Sudoku

15 points

Place digits from 0 to 4 into the grid, so that each digit appears exactly once in each row, column and outlined region. The letter 'P' outside the grid indicates that the number form by the first two digits in the respective row or column is a prime number. The outer digit represents the tens, the inner digit the units. All 'P's are given, in other words, if there is no 'P', the respective two-digit number is not prime. (Prime numbers are positive integers with exactly two divisors: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, ...)

**Example (with digits from 0 to 3):**



**Answer key:** For each row marked by an arrow, enter the digits from left to right.

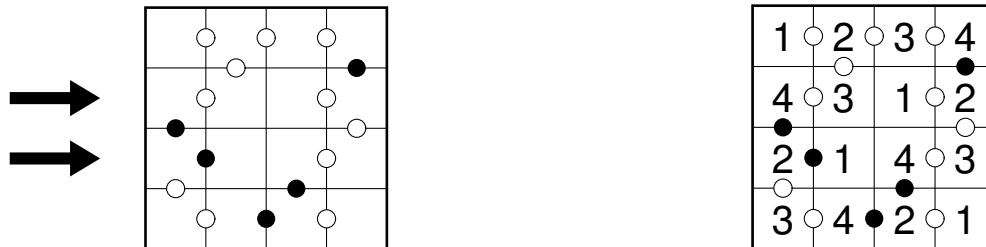
*For the example, the answer key would be: 2031, 3120*

## 7. Kropki

15 points

Place digits from 1 to 6 into the grid, so that each digit appears exactly once in each row and column. A white dot between two adjacent cells indicates that these cells hold consecutive numbers, and a black dot indicates that one number is exactly half of the other. If there is no dot between two adjacent cells, then neither property holds. A dot between the numbers 1 and 2 may be black or white, and not necessarily consistent throughout the puzzle.

**Example (with digits 1 to 4):**



**Answer key:** For each row marked by an arrow, enter the digits from left to right.

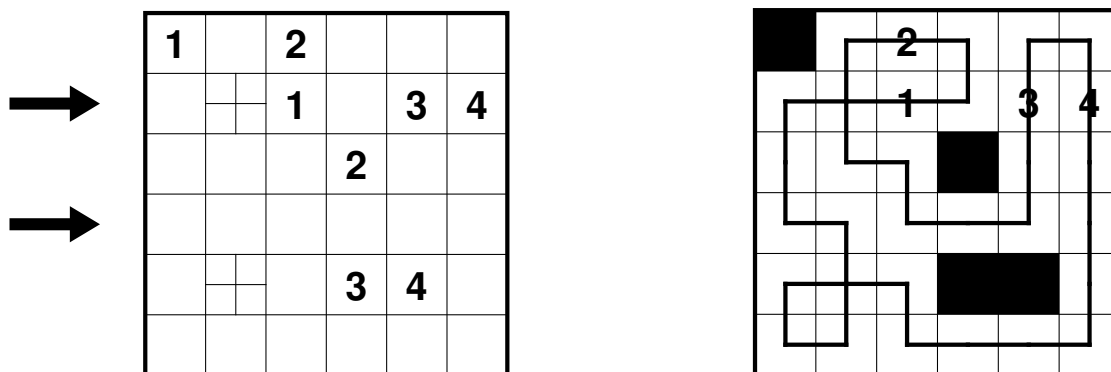
*For the example, the answer key would be: 4312, 2143*

## 8. Broken Railroads

15 points

For each number from 1 to 10, shade exactly one of the two copies. Draw a closed loop into the grid, that runs only horizontally and vertically and passes through each cell except the shaded cells. The loop must cross itself in the marked spots, and only there. The 'stations', indicated by digits, must be passed through in the order  $-1-2-3-4-5-6-7-8-9-10-1-$ , and the loop must not change direction in any station.

**Example (with numbers from 1 to 4):**



**Answer key:** For each row marked by an arrow, enter the length of horizontal sections of the loop in that row from left to right.

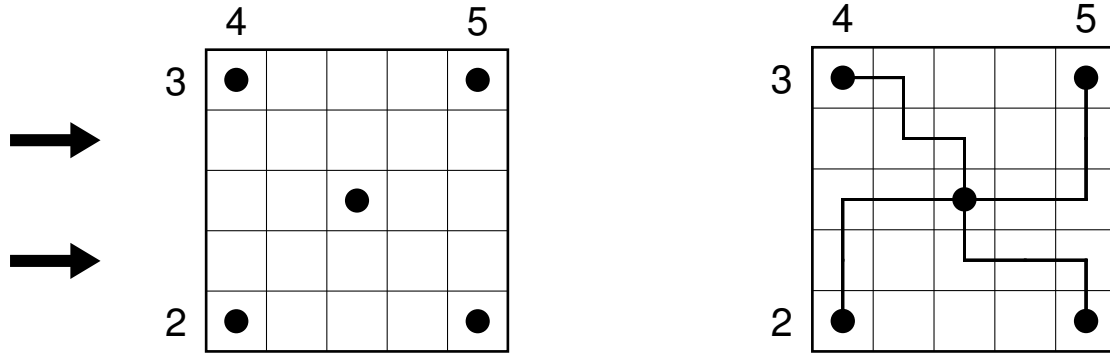
*For the example, the answer key would be: 3, 12*

## 9. 4 Snakes

20 points

Draw four snakes into the grid, each snake starting in the center and ending in a different corner. A snake must not touch itself, not even diagonally. Different snakes can use adjacent cells, however the starting point is the only cell they share. All snakes must have the same length (which is not given). Numbers outside the grid indicate the number of cells used by the snakes in the respective row or column.

**Example:**



**Answer key:** For each row marked by an arrow, enter the length of horizontal sections of the loop in that row from left to right.

*For the example, the answer key would be: 1, 2*

## 10. Hitori - Smashed Sums

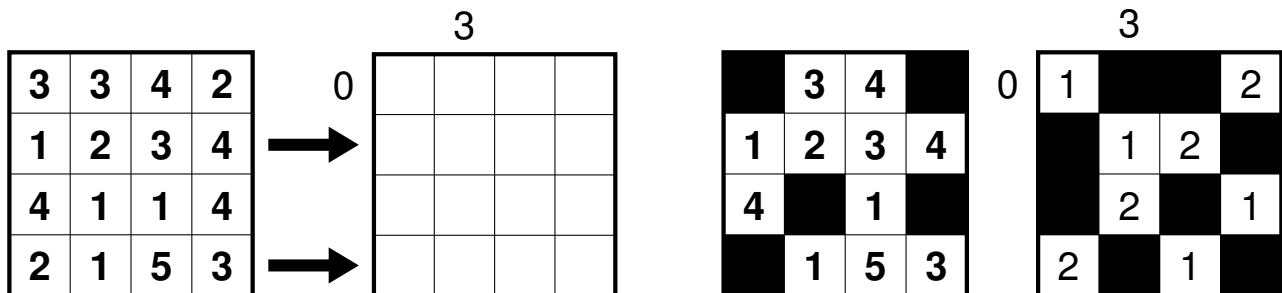
20 points

Hitori (left): Shade some cells, so that in the unshaded cells each digit appears at most once in each row or column. Shaded cells must not be horizontally or vertically adjacent, and all white cells are connected (the black cells must not divide the grid into two or more parts).

Smashed Sums (right): Shade some cells and place digits from 1 to 4 into the grid (1 to 2 in the example), so that each row and column contains each digit exactly once as well as two shaded cells. The numbers outside the grid indicate the sum of the digits between the two shaded cells in the respective row or column.

Furthermore, no cell can have the same content in both grids, neither the same (unshaded) digit nor being shaded in both grids.

**Example (Smashed Sums with numbers 1 to 2):**



**Answer key:** First, enter the total numbers of shaded cells for each row in the Hitori. Second, for each row in the smashed sums marked by an arrow, enter the digits from left to right.

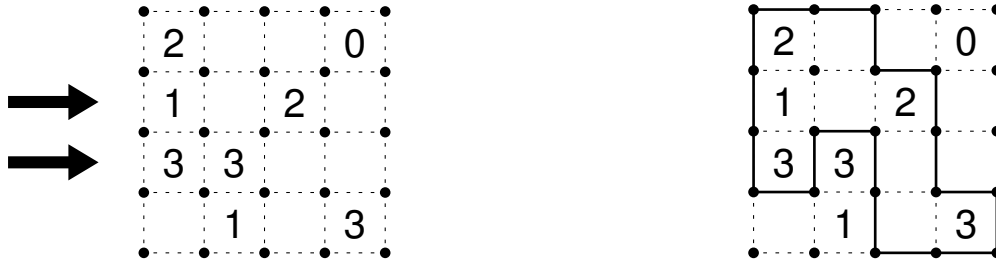
*For the example, the answer key would be: 2021, -12-, 2-1-*

## 11. Slither Link

25 points

Draw a single continuous loop by connecting neighboring dots along the dotted lines. The numbers indicate how many edges of a cell are used for the loop. The loop may not touch or cross itself, and it does not need to touch all of the dots.

**Example:**



**Answer key:** For each row marked by an arrow, for each sequence of connected cells inside the loop, enter the number of cells.

*For the example, the answer key would be: 3, 11*

## 12. Hex-Masyu

25 points

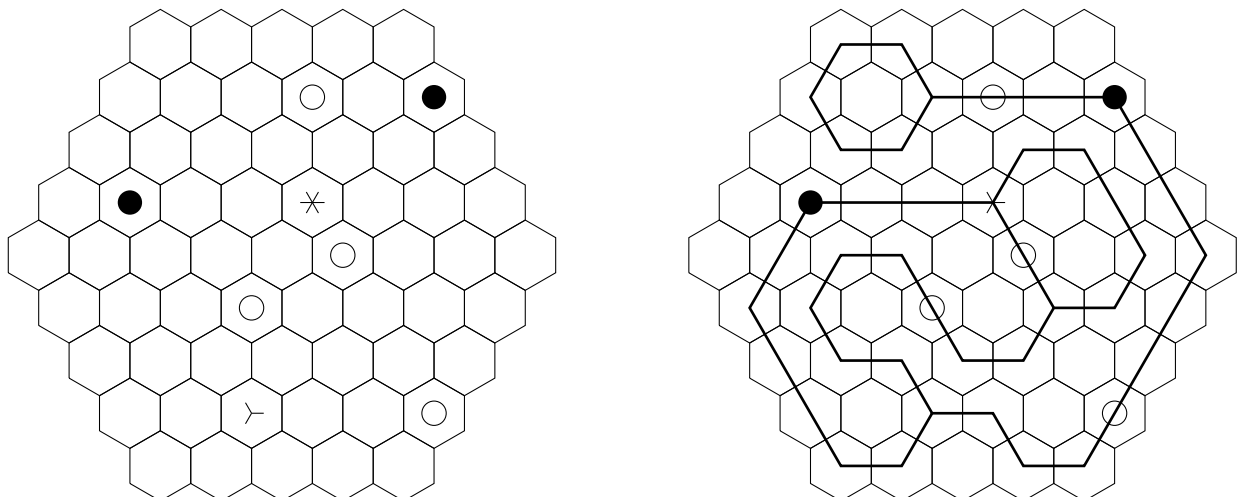
Draw a path system, connecting the centers of adjacent cells, passing through all cells with symbols. The path may pass straight through a cell or make a  $120^\circ$  angle, however  $60^\circ$  angles are not allowed. The path may branch out (any number of times); that means, from one cell lines are drawn to three adjacent cells, making three  $120^\circ$  angles (again,  $60^\circ$  angles are not allowed). All parts of the path must be connected, and there must not be any open ends.

The symbols have the following meaning:

- white circle: The path must pass straight through, and in the next cell in at least one direction it must make a turn or branch out.
- black circle: The path must make a  $120^\circ$  angle (not a branch), and it must go straight through the next cell in both directions.
- branching symbol (Y): The path must branch out, in the directions indicated by the symbol.
- asterisk: The path must branch out, in either of the two possibilities.

It is possible, that not all branching points are given.

**Example:**



**Answer key:** For each row, enter the number of empty cells.

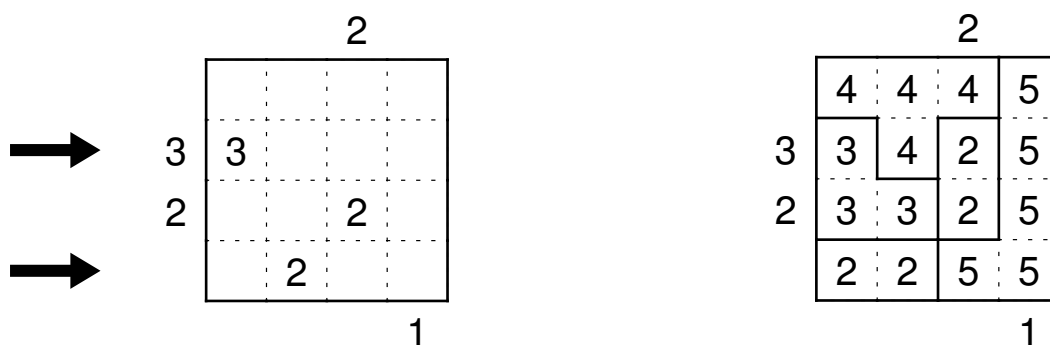
*For the example, the answer key would be: 312232121*

### 13. Skyscrapers Fillomino

25 points

Divide the grid into several regions and fill in a number into each square. Within each region, all numbers must be the same and be equal to the number of squares of that region. Regions of same size may touch each other only diagonally. Furthermore, consider each region as a skyscraper of the respective height. Numbers outside the grid indicate how many skyscrapers can be seen in the respective row or column from the respective direction. Smaller skyscrapers are hidden behind higher ones, or behind skyscrapers of the same height. It is possible for skyscrapers of the same height to appear in the same row or column.

**Example:**



**Answer key:** For each row marked by an arrow, enter the digits from left to right.

*For the example, the answer key would be: 3425, 2255*

### 14. Kuromasu

25 points

Shade some empty cells, so that no two shaded cells are horizontally or vertically adjacent and all white cells are connected (the black cells must not divide the grid into two or more parts). The numbers indicate how many cells are visible in all four directions, including the numbered cell itself.

**Example:**



**Answer key:** For each row, enter the number of shaded cells.

*For the example, the answer key would be: 11111*

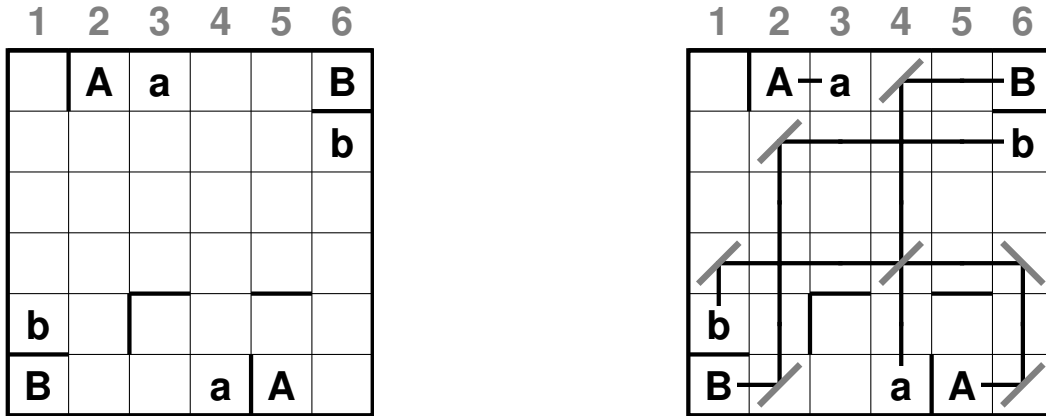


# 15. Mirrors

25 points

There are persons (capitel letters) and objects (lower case letters) in the grid. Each person is looking in one of four directions, (north, east, south, west) and can see an object with a corresponding letter. Each object is seen by exactly one person, and no person is seeing another person. Find out in which direction each person is looking, and place some diagonal mirrors in the grid; cells containing mirrors must not touch each other, not even diagonally (even if the mirrors wouldn't be touching). At a mirror, the line of sight is reflected in a 90° angle. Lines of sight can cross each other, and mirrors can be used from both sides. The bold lines are non-transparent walls.

Example:



**Answer key:** For each row, enter the position of all mirrors in that row.

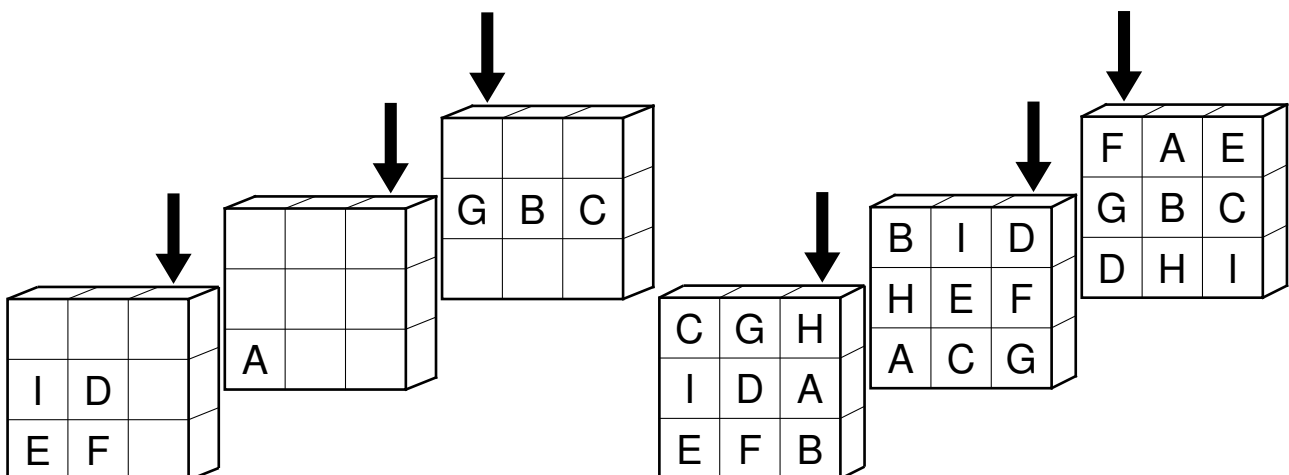
For the example, the answer key would be: 4, 2, , 146, , 26

# 16. 4x4x4-Sudoku

30 points

A cube consisting of 4x4x4 cells is given. The grids represent the four layers of this cube. Place letters from A to P into the cells, so that each of the 12 possible layers consisting of 16 cells contains each letter exactly once. This includes the 4 layers shown as well as another 8 layers using the third dimension; these 8 layers consist of the same row or column in each separate grid. (The example uses a cube of 3x3x3 cells with letters from A to I.)

Example (Letters A-I, 9 Layers made of 9 cells each):



**Answer key:** For each column marked by an arrow, enter the letters from top to bottom.

For the example, the answer key would be: HAB, DFG, FGD

## 17. Battleships

30 points

Place the given fleet into the grid, so that ships do not touch each other, not even diagonally. Ships can be placed horizontally or vertically. The numbers outside the grid indicate the number of ship segments in the respective row or column.

Example:

The example shows a 5x5 grid with row clues (2, 1, 4) and column clues (1, 2, 1, 4). A fleet of ships is shown: three 1x1 ships, three 1x2 ships, and two 2x1 ships. The solved grid is shown to the right, with wavy lines indicating empty cells.

**Answer key:** First, for each row the number of ship segments from top to bottom, second for each column the number of segments from left to right.

For the example, the answer key would be: 31303, 21214

## 18. Non-Consecutive Kakuro

45 points

Place digits from 1 to 9 into the white cells. The numbers in grey cells indicate the sum of digits in the corresponding "word" (continuous horizontal or vertical white cells). Within each word, no digit can repeat. Horizontally or vertically adjacent cells must not be consecutive.

Example:

The example shows a 6x6 grid with grey cells containing sums. Two rows are marked with arrows. The solved grid is shown to the right.

**Answer key:** For each row marked by an arrow, enter the digits from left to right. Ignore grey cells (empty cells and cells that contain the given sums).

For the example, the answer key would be: 13697, 2441

## 19. Capsules

50 points

Place digits from 1 to 5 into the grid, so that each outlined region contains each digit exactly once. Same digits must not touch each other, not even diagonally.

Example:

4				4
	4		3	
	2		1	
3				3
3		5		4

2	5	2	5	2
4	1	4	1	4
3	2	3	2	3
1	5	1	4	5
3	4	2	3	1
5	1	5	4	5
4	2	3	1	2
3	1	5	4	3
4	2	3	1	5
3	1	5	2	4

**Answer key:** For each row marked by an arrow, enter the digits from left to right.

For the example, the answer key would be: 25252, 31524

## 20. Crossword

50 points

Place the given words into the grid, horizontally from left to right or vertically from top to bottom. There can be no other words found in the grid, not even 2-letter words. All words must be interconnected.

From each word, exactly one letter is given, and that letter must not be used for another word.

Example:

	V		
			S
		E	

EINS  
DREI  
VIER

	V		
E	I	N	S
	E		
D	R	E	I

**Answer key:** For each row marked by an arrow, enter the letters from left to right. Ignore empty cells.

For the example, the answer key would be: EINS, E