NEW, HUGE, AND CHALLENGING!

A One-Puzzle LMI Fun Contest by Ivan Koswara

The background

As per tradition since 2012, LMI will host another Puzzle Marathon this year. I was selected as an author, allowing me to choose any genre I'd like and create a big puzzle for the test. The keyword was "big"; I now learned that it's not synonymous with "extremely difficult". The resulting new, huge, and challenging puzzle was easily rejected from Puzzle Marathon 2016. However, it was deemed to be interesting enough that a one-puzzle fun contest was proposed for that, and here we are.

This test is a one-puzzle fun contest, in the same vein as X-Killer in November 2015. Similar to that, there is no pressure of the timer, although you can compete with others to solve it in the fastest time. Of course, this test is also unrated.

The puzzle

The puzzle is a new genre, called **Poset Futoshiki**, a variant of Futoshiki.

A grid and a diagram is given. Put an integer between 1-n, where n is the size of the grid, into each cell such that every number appears exactly once in each row/column. Additionally, <u>if *x* < *y* in the grid, then there is a path from *x* to *y* following the arrows (including the directions) in the diagram</u>.

An example, along with several practice puzzles, is provided on the next page.

The history

The name of the genre comes from the fact that the diagram represents a *partial order*. In the usual ordering of the integers, if *x* and *y* are distinct, then either *x* < *y* or *x* > *y*. In a partial order, there is a third option, where neither is true; *x* and *y* are then said to be *incomparable*. Two incomparable numbers cannot appear on both sides of an inequality (because then the inequality will be wrong). A set (of integers, in this case) that has a partial order is called a *partially ordered set*, or a *poset*.

The diagram is a *Hasse diagram*, representing a compact way of stating a partial order. In a Hasse diagram, every number is shown, along with some arrows between some numbers, such that *x* < *y* precisely when there is a path from *x* to *y* following the arrows. (There will be no cycles. There may be multiple paths between the same two numbers; it just needs at least one.)

The test

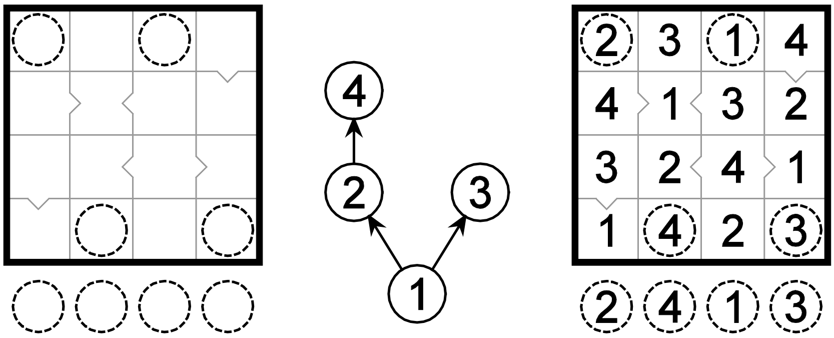
The test will be open from 4 March to 7 March. During this time, you may start the test and receive the password for the puzzle at any time, and you may continue solving until the end of the contest. Your time is counted from when you receive the password until when you submit your answer. Online solving is not provided, so it is recommended to print the puzzle. (It will be on one page.)

<u>To submit your answer, enter the contents of the marked cells from left to right. In case of double digits, enter only the last digit.</u> Instant Grading is enabled for the contest; you will immediately receive feedback on your answer, and if you're incorrect, you are allowed to fix your solution. Every incorrect answer adds 2 minutes to your solving time.

Example

Answer key for the example: 2413

Note that 1 < 4, because there is a path from 1 to 4 (namely 1 → 2 → 4). However, 2 < 3 is false, and so is 3 < 2, because the path 2 ← 1 → 3 doesn't follow the arrows.



Practice puzzles