

## Nematrian Website Pages covering Mathematical Recreations and Puzzles

[Nematrian website page: [MathsPuzzlesIntro](#), © Nematrian 2015]

Whilst the main aim of the Nematrian website is to provide accessible software and/or to promote other services that Nematrian offers, it also contains pages and [web service tools](#) on other loosely related topics, including some relating to mathematical 'recreations' and some [tests](#) to help children revise for mathematics exams.

Currently, the only web function that the Nematrian website contains in this respect is a tool for solving [Sudoku and Killer Sudoku](#) puzzles, see [MnSudokuSolve](#).

However, the aim is to expand this section of the website over time. Please [contact us](#) to let us know whether you think it is worthwhile us spending time developing solvers and puzzle creators for other somewhat similar types of puzzles including the following (the pages to which the links take you describe these games a little further):

- [Hashi](#)
- [Hitori](#)
- [Kakuro](#)
- [Mosaic](#)
- [Slitherlink](#)

### Sudoku

[\[SudokuIntro\]](#)

Are you a fan of *Sudoku*? In it, a 9 by 9 grid needs to be completed so that each row, each column and each of the 9 main 3 by 3 sub-grids contains just one of each of the numbers 1 to 9. At outset, the grid is partly filled in. Your task is to complete the rest of the grid.

Have you graduated to the *Killer Sudoku*? It has the same 9 by 9 grid, but (usually) none of the grid is filled in at outset. Instead, the grid contains a further mesh of smaller groups of cells. Within each such group, no number can be repeated and you are also told how much they add up to. So, if the group contains just 2 cells and totals 3 you know that one of its two cells must contain the number 1 and other must contain the number 2, but you don't immediately know which one is which.

Or do you prefer the larger scale *Samurai Sudoku* puzzles? These involve multiple overlapping 9 by 9 grids. There are other variants too.

### Solving Sudoku puzzles

There are several commercially available Sudoku solvers. Some are provided by stand-alone electronic devices or bespoke programs that you can buy, but most of these concentrate just on solving the 'basic' type of Sudoku puzzle described above. Sudoku enthusiasts have fewer options (other than, of course, their own brains!) if they want to access solvers for the more complicated variants, such as Killer Sudoku.

The Nematrian website provides interactive tools for solving several different types of Sudoku puzzle, including the mathematically more challenging Killer Sudoku puzzles. These all make use of the same

generic Nematrian Sudoku Solver web service that computer programs and spreadsheets can access directly via the web.

Happy solving!

#### Links to pages containing solvers for:

- [Killer Sudoku](#)
- [\(Standard\) Sudoku](#)

## Hashi

[\[HashiIntro\]](#)

Each circle with a number represents an island. Connect each island with up to two vertical or horizontal bridges so that the number of bridges per island equals the number inside each island and all islands are connected by a continuous path. Bridges cannot cross islands or other bridges. Source: [The Times \(2006\)](#).

## Hitori

[\[HitoriIntro\]](#)

Hitori is Japanese for single. No number can appear more than once in each column or row. Shade in duplicate numbers but remember shaded-in squares cannot touch one another either horizontally or vertically. Also, all the single numbers you don't black out must be connected. Source: [The Times \(2006\)](#).

## Kakuro

[\[Kakuro\]](#)

Kakuro, like Killer Sudoku, is similar to a crossword puzzle but using numbers. According to [Batsford \(2005\)](#), "Anyone who can add two numbers can solve these puzzles".

As with Sudoku, cells are combined into groups, the sum of the group is given, and only digits 1 to 9 (with no digit repeated) are allowed as entries within each cell.

It is arguably simpler than Killer Sudoku because the groups are arranged in vertical and horizontal lines on a grid formed akin to a crossword puzzle (in Killer Sudoku, each cell is in four separate groups, three of which contain 9 elements).

Kakuro can be solved using the generic Nematrian Sudoku Solver algorithm, either via the website's [Killer Sudoku](#) page, or by directly accessing the corresponding web service provided by the Nematrian website.

## Mosaic

[\[MosaicIntro\]](#)

Mosaic is based on squares in a pixellated grid. The grid contains numbers from 0 to 9. Most cells have eight neighbours, making a block of nine cells. Cells along an edge have five neighbours and those in the corner only three. The number in a cell indicates how many of it and its neighbours need to be filled in. The aim is to work out for each cell in the grid whether it is filled in or not, source: [The Times \(2006\)](#).

## **Slitherlink**

[\[SlitherlinkIntro\]](#)

Connect adjacent dots with vertical or horizontal line so that a single continuous loop is formed with no crossings or branches. Each number indicates how many lines surround it, while empty cells may be surrounded by any number of lines. Source: [The Times \(2006\)](#).

## Appendix Puzzle Solvers

### The Nematrian Killer Sudoku Solver

[\[KillerSudokuSolver\]](#)

Ever struggled to solve a Killer Sudoku puzzle? Help is at hand! Enter details of the 'groups' in the Killer Sudoku starting grid in the following table. The column titled  $n$  contains the number of cells in the group, the column titled  $T$  contains the total for the cells in the group. The remaining (max) 18 columns,  $(x1, y1), (x2, y2), \dots$ , contain grid references for each cell in the group. The groups (and the cells within any particular group) can be entered in any order. Then press the solve button and either the solution will be revealed, or an error message will be shown.

### The Nematrian Standard Sudoku Solver

[\[SudokuSolver\]](#)

The Nematrian Sudoku Solver utility can solve essentially any Sudoku-like puzzle, as long as the combinatorics involve choice of up to nine different cell values. This is because it finds solutions to problems involving an arbitrary number of overlapping groups of cells each of which can involve choice of up to nine different cell entries.

This means that it can also be used to solve standard Sudoku puzzles as well as more complicated variants such as Killer Sudoku. The 9 by 9 grid applicable to standard Sudoku puzzles in effect consist of 27 different groups of cells (the 9 rows, the 9 columns and the 9 principal 3 by 3 sub-grids) plus additional groups (each of which contains a single cell) identified by the opening known entries in the Sudoku grid.

See also [Killer Sudoku Solver](#).

### How about trying the Nematrian maths quiz for children?

[\[MathsQuiz\]](#)

Are you about 10 to 12 years old? Or do you have a child of this age about to sit a school maths exams. Then how about trying to answer the following questions **without using a calculator**.

If you fill in your answers in the boxes next to each question then you can check them by pressing the button marked *Press Button to Check Answers You Have Entered*. You can create new (randomly chosen) specimen questions (as often as you like) by pressing the button marked *Press Button to Create New Questions*.

N.B. Some of the questions assume that you are British in that they refer to pounds and pence. If there is sufficient interest from outside the UK then we will rewrite these questions to refer to, say dollars and cents or euros and cents depending on the country in which you are based.