

Basic Sudoku

Menu

When you first open Basic Sudoku you are greeted by the menu. Hopefully it's fairly straightforward! It looks something like this:

Basic sudoku

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press 'l' to load a sudoku file
press 'g' to generate a puzzle
press 'c' to create a puzzle
press 'd' to start the editor
press 's' to step through a solution
press 'r' to rate a sudoku
press 'f' to save a sudoku file
press 'p' to save a file to print
press 'v' for variants of a puzzle
press 'x' for redundant clues
press 'e' to end
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You can get to the menu by pressing escape when you are in the editor, when you are stepping through the solution to a puzzle or when you have rated a puzzle.

File handling

Basic Sudoku reads sudoku files as a string of 81 numbers in a .txt file. here's an example:
000000000051870000026530000067000000094000580000000130000095620000024790000000000

It will also read this string as a sudoku file:
.....5187.....2653.....67.....94...58.....13.....9562.....2479.....
Here the zeros have been replaced by dots.

The first nine digits are the first row of the puzzle, the second nine digits are the second row and so on.

Basic sudoku can handle text files with up to 30000 sudoku puzzles in them. After you open the file the program will tell you how many puzzles it thinks are in the file and prompt you to enter the number of the file you're interested in. If you want to handle files with more than 30000 sudoku puzzles in them then Basic Sudoku is not for you! If the program can't read the file as a sudoku puzzle it will prompt you to open another file.

Once you've opened a file the program returns you to the menu. Then you can choose to open that puzzle with the editor, to step through the solution to that puzzle, to rate the puzzle, to create another sudoku with clues distributed in the same pattern as that sudoku or to save the puzzle as a file that prints nicely in Open Office or WordPad (MS Word messes the file up a bit).

You can also save puzzles that you've created with Basic Sudoku. If you choose to save a puzzle into a file that already exists, then it will be added to the end of the file. So you can save a collection of puzzles in one file.

If you accidentally close Basic Sudoku before saving a puzzle that you've been working on, then the program automatically saves the puzzle into a file called recovery.txt. NB this file is written over each time you run the program.

Generating and rating a puzzle

If you press 'g' from the menu then Basic Sudoku will generate a random sudoku puzzle. First you will be prompted to choose the difficulty of the puzzle. You will see this message:

press 1 for an easy puzzle
press 2 for a moderate puzzle
press 3 for a hard puzzle
press 4 for a lucky dip

If you press 1 you will get a puzzle that can be solved with hidden and naked singles. If you press 2 or 3 you are guaranteed a harder puzzle but you may have to wait a while for Basic Sudoku to generate it. Sometimes it is very quick but it can take a minute or more! if you press 4 you will get a puzzle very quickly and it's most likely to be an easy puzzle, but it may be a harder one. About 70% of randomly generated puzzles can be solved by singles.

Puzzles are rated with 1 to 5 stars by Basic Sudoku. Any puzzle generated by Basic Sudoku is automatically rated by the program. However if you load a puzzle from a file or you copy a puzzle into the editor, then from the menu if you press 'r' Basic Sudoku will rate that puzzle. Apart from the 1-5 star ratings there are two other possible ratings. The first is 'invalid'. This means there is no way of completing the puzzle. The second is 'not solved'. This could mean that there is more than one solution to the puzzle, but it may also mean that the puzzle requires techniques that are beyond Basic Sudoku! I guess it's possible that there are puzzles that are 'invalid' but require techniques that are beyond Basic Sudoku to prove that they're 'invalid'!

Creating a puzzle

If you press 'c' from the menu then you can search for a puzzle with clues distributed in a given pattern. There are two ways to input the pattern. One is to load a sudoku file first and then start the search. The other is to input the pattern manually. When you press 'c' you will see these options:

choose symmetry:

press:

0 for no symmetry
1 for full symmetry
2 for quarter turn symmetry
3 for symmetry in both diagonals
4 for horizontal and vertical symmetry
5 for vertical symmetry
6 for half turn symmetry
7 for major diagonal symmetry
8 for minor diagonal symmetry
9 for horizontal symmetry

or press s to use the current pattern

If you press s then Basic Sudoku will use the current sudoku puzzle as the template for the pattern.

Otherwise after choosing a symmetry you will see three sudoku grids, one large grid on the left and two smaller grids on the right. Each will have one cell highlighted. This is the cursor. You can move it to the right by pressing 'k', to the left by pressing 'j', up by pressing 'i' and down by pressing 'm'. If you press '1' then the cell highlighted by the cursor and cells symmetric to it will be filled with a '1'. If you fill cells by mistake, you can press '0' to clear them. Once you are happy with your template, you press 's' to start the search.

The program uses an iterative method to search for puzzles. On the first pass the program fills the cells randomly within the rules of sudoku. This is the seed for the process. After this on each pass the program tries to optimise its choice for each cell. There is a random element to this process, so given the same seed the outcome could be different on different trials. The process halts in one of three ways. It might find a valid sudoku, in which case it automatically rates the puzzle. It might make 10 passes without finding a valid puzzle, or it might make a pass without changing a clue. In either of the latter cases you are given the option of continuing the search with the same grid. As there is a random element to the search, sometimes this approach is fruitful! if you choose not to continue with the same grid, you are given the option of searching for a puzzle with the same pattern.

Basic Sudoku does not know if there is a valid sudoku for any given pattern. It's fairly stupid in that respect. It will happily search for a sudoku in an empty grid, although in that case it will give up very quickly! If the program does not find a puzzle after several searches, that does not mean there is no puzzle for that pattern. It's reliant on the seed puzzle, which is random, as well as a search, which has a random element to it. The advantage of this approach is that if you run the same pattern on several occasions, you may get several different solutions. However sometimes you will get no solution!

The puzzle editor

When you open the puzzle editor you see three sudoku grids. On the left is a large sudoku grid. On the right are two smaller grids. The uppermost one shows the puzzle and the lower one shows the solution that Basic Sudoku can find. When you first open the editor it applies all it's techniques. So if it can solve the puzzle the lower right hand grid, and the left hand grid, will show the solution.

In each of the grids one of the cells is highlighted. This is the cursor. You can move it to the right by pressing 'k', to the left by pressing 'j', up by pressing 'i' and down by pressing 'm'. When it covers one of the givens of the puzzle, it will show all the alternative candidates for that cell. You can press '0' to clear the cell or alternatively you can press the number of one of the alternative candidates to see what effect that has on the puzzle.

Another way to analyse a puzzle is to see what techniques you need to solve it. Basic Sudoku applies locked candidates types 1 and 2, hidden and naked sets of 2, 3 and 4 candidates and basic fish on 2, 3 and 4 lines (i.e. x-wings, swordfish and jellyfish). You can press 'a' to turn all these techniques on or off. If you press 'b' it turns locked candidates type 1 on or off, 'g' turns locked candidates type 2 on or off, 'p' turns naked pairs on or off, 'w' turns hidden pairs on or off, 'x' turns x-wings on or off, 't' turns naked triples on or off, 'r' turns hidden triples on or off, 's' turns swordfish on or off, 'q' turns naked quads on or off, 'u' turns hidden quads on or off and 'v' turns jellyfish on or off.

If you have several techniques turned off and the puzzle is not solved, then some techniques will be highlighted in green. This means that those techniques will cause some eliminations.

If a puzzle has no solution you will hear a beep and see a message in red which says 'fatal'!

You can press 'l' to load a puzzle into the puzzle editor, or press 'f' to save a puzzle to a file from the editor. If you press return you will get an empty grid if you want to enter a new puzzle into the editor.

At any time you can press escape to return to the menu or 'e' to end the program.

Stepping through the solution for a puzzle

If you press 's' from the menu you can step through the solution of a puzzle. When you do this you will see three grids. One large grid on the left and two smaller grids on the right. The large grid shows the candidates for each cell after straightforward eliminations in each cell, row, column and 3x3 box. The uppermost right hand grid shows the puzzle and the lower grid shows the current solution.

When you first open the puzzle, some of the techniques will be highlighted in green. This shows that these techniques will cause eliminations. However at the start all the techniques are turned off. Most puzzles usually have some hidden and naked singles that can be deduced from the start. If you press the space bar then any hidden singles will appear in the lower right hand grid in red and any naked singles will appear in green. You can continue to press the space bar and this process will be repeated for as long as Basic Sudoku can infer hidden and naked singles from the current position in the puzzle. For easy puzzles this process will lead to a solution of the puzzle.

For harder puzzles at some point pressing the space bar will have no effect. At this point you need to turn on one of the techniques that is highlighted in green. You can press 'a' to turn all these techniques on or off. If you press 'b' it turns locked candidates type 1 on or off, 'g' turns locked candidates type 2 on or off, 'p' turns naked pairs on or off, 'w' turns hidden pairs on or off, 'x' turns x-wings on or off, 't' turns naked triples on or off, 'r' turns hidden triples on or off, 's' turns swordfish on or off, 'q' turns naked quads on or off, 'u' turns hidden quads on or off and 'v' turns jellyfish on or off.

When you turn a technique on some of the candidates in the left hand grid will be highlighted in light blue. These are the candidates that will cause eliminations due to that technique. You can press '#' to see the candidates that will be eliminated by these candidates. The eliminated candidates will be highlighted in red. If you press '#' again you will see the candidates highlighted in light blue again. The eliminations will not happen until you press space. So you might want to see what effect other techniques have before continuing. Once you press space the eliminations are carried out and then all the techniques are turned off again.

You can continue stepping through the solution to a puzzle until either it's solved, Basic Sudoku discovers that there's no solution or Basic Sudoku can make no more progress. If a puzzle has no solution you will hear a beep and see a message in red which says 'fatal'!

At any time you can press escape to return to the menu or 'e' to end the program.

Saving a file to print

If you press 'p' from the menu you can save a file in a format which prints nicely in WordPad or Open Office. The file is saved as a .rtf file. The output looks like this:

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

MS Word misses the top of the grid and also adds a cursor at the bottom!

Variants of a puzzle

If you press 'v' from the menu Basic Sudoku will search for variants of a puzzle. These are puzzles which differ from the current puzzle by one clue. Basic Sudoku will save these puzzles in a file called variants.txt. NB this file will be overwritten each time you press 'v' from the menu.

Redundant clues

If you press 'x' from the menu Basic Sudoku will search for redundant clues in a puzzle. First you will be asked to choose a symmetry. Once you have chosen a symmetry the program starts the search trying to remove clues according to that symmetry. Once it has finished, the redundant clues are highlighted in red. For example if you choose no symmetry the program will highlight all the redundant clues. This means you can remove each clue individually, but not necessarily more than one at the same time. If you have chosen a half turn, horizontal or vertical symmetry or diagonal symmetry the program will highlight pairs of clues (or in some cases individual clues) which can be removed.