

Sudoku Hints

Short Version Help for Your Healthy Addiction!

I know you've seen it in your paper, you may even have played it, but have you truly mastered the art of Sudoku? For me, Sudoku is not just a puzzle, it's an addiction. The purpose of this article is to give you some tips for mastering Sudoku.

A Sudoku puzzle is comprised of a 9 x 9 grid of cells broken down further into 9 squares. The squares are comprised of a three by three array of cells within the larger and are usually delineated by shading or darker borders. The goal of the puzzle is to place the digits 1 through 9 throughout the puzzle such that every row, column and square contains all the digits 1 through 9. The puzzle creator fills in a small number of the cells as clues to the final configuration. In general, the fewer cells provided, the more difficult the puzzle is to solve. Your job is to use those clues to fill in the rest.

Because of the requirement to contain the values 1-9 in each row, column, and square, each time a cell's value is determined it will impact those three dimensions. In other words, each time you establish the value of a cell you implicitly forbid that value anywhere else in that row, column and square. We will use this property to help determine the rest of the values.

The methodology described below I call the "punch out" method. In a nutshell what it does is to write every remaining possible value of each cell within that cell. These are determined by looking at the row, column and square of each cell to "punch out" the invalid values. In theory a completely empty puzzle would have each cell containing all values one through nine. Each clue provided by the puzzle creator and each cell that you complete, punch out potential values along each axis until only one possible value is left for a given cell.

Step 1 - Look around the cells for obvious solutions. Sometimes there are enough clues given for a value that you can solve some cells. Suppose there is a 7 in the second and third square but not in the first. There is a seven in row one and row three which means that the first square's seven must be in row two. Suppose also that there's only one opening in row two, the 7 must be in the open column. You can almost always find some values to fill in. I proceed through the puzzle from the top to the bottom looking at each of the values 1 through 9 individually, looking for clues such as this. If you don't find many or even any, don't worry as this first step merely simplifies subsequent steps but the answer will still fall out using this method.

Step 2 - Work through the puzzle filling in the possible values for each cell. There are many ways to accomplish this, I'll introduce two:

1. Cell-by-cell - for each cell look along its row, column and in its square for each value 1-9. If the value isn't already taken then it's a possible for the cell and you annotate it. Continue through all numbers and all cells.
2. For-each-number - Work each number cell by cell. Start with 1 and for each square that doesn't have a 1 in it, determine the cells within it that could contain a 1 and annotate a 1 in there. Continue for each value 2-9.

Once this is complete you will have all the possible values annotated for each "empty" cell. Please note that it is very important to be careful when filling in these values as any mistake here will result in an invalid solution.

Step 3 - Use clues within the puzzle to reduce the possibilities for each cell until you can fill in all the vacancies. Since there exists a relationship between cells along rows, columns and within squares, every time

you enter a new cell value you have to punch out that value as a possible along each axis from all other cells in the same row, column and square.

- A. Clue 1 - One Remaining Possible - This occurs when all the values but one for a cell are punched out by other cells in the same row, column or square. This is the most obvious solution and is ultimately the goal of the puzzle. The sole remaining possible is your solution for that cell.
- B. Clue 2 - Only Possible - a related solution technique is to review all numbers 1-9 in each row, column & square looking for a cell that is the only cell in that row, column or square containing that value as a possibility. Since each row, column and square must contain 1 occurrence of each value this cell must be it. Check each row, column and square looking for these situations.
- C. Clue 3 - Twins - when two cells in a row, column or square have exactly the same two remaining possibilities than you have twins. No matter which value is right for one the other value must be correct for the twin cell. This situation enables you to clear out additional possible values along the shared axis. If the twins are in the same square, then you can remove the twins from all other cells in the square. If the twins share a row or column, whether or not they share a square, then you can punch out both values as possibilities along that shared axis. This also applies to triplets though they occur far less often.
- D. Clue 4 - Pointers - A clue related to twins occurs when a pair of aligned cells in a square contain the only instances of a possible value for their square. While we don't know which will have the value and therefore can't solve their cells, we do know that one of them will have that value thereby covering that value for the shared row or column. When this occurs you can use the alignment as a pointer to remove that possible from all other cells along the pointed row or column. In short, they point to values that can be removed.
- E. Clue 5 - Reverse Pointers - A related situation occurs when only 1 square has a possible value for a given row or column allowing you to eliminate that value as a possible for the other cells within the square. Rather than allowing us to solve a cell this reduces the number of possibilities for 1 or more cells. I refer to this as a reverse pointer because they don't point out to a row or column but rather back into their square.

While filling in values and removing possibilities be on the look out for conflicts. Conflicts occur when two cells in a row, column or square are down to 1 possible and it's the same value or when a cell has no remaining possibilities. These situations indicate that you've made a mistake somewhere and you will likely have to restart.

The clues given above are sufficient to solve nearly all puzzles if you are very careful and systematic in following them. Once in a while I've been forced to guess in the very hardest puzzles. In these rare cases, I circle all values I select from that point on so that I can reset the puzzle if I find a conflict and have to guess another value.

Good luck and enjoy the challenge!

James Bray

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