



# Solving Sudoku

Sudoku puzzles involve a lot of mathematics. Of course, the puzzles are filled with numbers, but the solution process would be the same regardless of the symbols used. More interesting is the logic behind the solution process, which can provide extra satisfaction upon solving a puzzle (with a lot less erasing). In addition, the puzzles are examples of *Latin squares*—important in abstract algebra and in statistics, in experimental design.

Two Sudoku counting problems are: What is the fewest number of filled-in squares possible for a puzzle, and how many different puzzles are there? There are Sudoku puzzles with 17 numbers that have only one solution, but no one knows if there are puzzles with only 16 numbers that have a unique solution. As for the second question, there are more than five billion different puzzles. For counting purposes, puzzles that can be transformed by processes such as interchanging numbers or the top two rows are not considered different. This result depends on group theory and symmetry, crucial for much of modern physics and chemistry.

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

Puzzle by Arto Inkala

For More Information: "Sudoku Squares and Chromatic Polynomials," Agnes M. Herzberg and M. Ram Murty, *Notices of the American Mathematical Society*, June–July, 2007.



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