## The Mathematics of Sudoku

### by Josh Cooper, USC Professor



A Sudoku board consists of a 9 by 9 grid of "cells", in which each column, row, and "block" (one of nine 3X3 subgrids that tile the board) has each of the numbers 1 through 9 exactly once. A Sudoku "puzzle" is a board partially filled in with "givens" (or "clues"), and a "fair" puzzle is one that can be completed in exactly one way. What is the fewest number of givens in any fair puzzle? It seems that the answer is 17, but our only proof of this is not truly rigorous – for interesting reasons. We take a closer look at the status of such computer-assisted proofs and talk about how to shore up our understanding of this question by situating it in a much larger topic: determining/critical sets of combinatorial objects. There is much known about this area, but even more we don't know.

Bio: Dr. Joshua Cooper is in his 19th year as Professor of Mathematics at USC. His research is mostly in discrete mathematics – especially spectral graph/hypergraph theory, but also combinatorial matrix theory, permutations, discrete geometry, and pseudo/quasi-randomness. He also dabbles in machine learning, information theory, and interdisciplinary collaborations with biologists. Dr. Cooper particularly enjoys working with students on research projects, including dozens of undergraduates over the years.

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LeConte 118

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