

PREFACE

This is a book of unusual Sudoku, in the sense that the puzzles within have each been infused with a touch of simple math. It doesn't take more than the most basic arithmetic operations to create interesting situations and challenging puzzles, as we sprinkle in alternatives to the more typical clues. If you're reading this, then it's likely you've seen Sudoku before, but let's start at the beginning.

The rules of a typical Sudoku puzzle are fairly simple to explain. We are given a nine-by-nine grid divided into nine smaller three-by-three squares called "cages". The goal is to place the numbers one through nine into the cells so that every number appears exactly once in each row, column, and cage.

To restrict things further, we give away part of the solution. Specifically, we reveal the values of at least enough cells to ensure there is only one way to complete the puzzle from that point on, given our constraints.¹

The numbers one through nine serve only as symbols here. They can be replaced with the letters "A" through "I", any other nine numbers, the nine symbols for the planets and Pluto, the names of U.S. Supreme Court members, or any other nine distinguishable things. The particular symbols chosen do not matter. Some consider this a missed opportunity and want to use various properties of the numbers one through nine, either on their own or in relation to each other, to create clues for the puzzle. We can use those properties as clues in order to construct a puzzle with a unique solution, sometimes without any of the cells being revealed at all.

¹This also keeps all puzzles from being the same and ensures that there are not 6,670,903,752,021,072,936,960 solutions to every puzzle. Interestingly enough, that number wasn't known until 2005, twenty-six years after modern Sudoku puzzles appeared in Dell Magazines, and over a century after similar puzzles were first published in newspapers in France.

The types of Sudoku puzzles in this collection may feel different, but they all have one thing in common: the clues are based on maps that take in two numbers and give some sort of an output. Sometimes this output will also be a number, sometimes this output will be a different piece of information, but it will always be an outcome of an operation on the entries in adjacent cells.

Certain operations give too much information to allow us to construct interesting Sudoku, as the puzzle can be solved almost instantly with no thought. Other operations give so little information that it is impossible to construct a puzzle with only one solution without giving away as many cells as a standard Sudoku. Some operations give an amount of information between those extremes but aren't fun for certain other reasons. They might seem too unnatural, feel better done by a machine than a human, or perhaps everything gets revealed at the exact same time in one long chain instead of keeping one engaged throughout.

The operations used to construct the puzzles in this book have been selected from an extremely large collection to be enjoyable, uniquely solvable, and non-trivial. The finalists presented in the chapters here have rule sets that are simple to explain, but also have a sufficiently high upper bound on how much challenge they can provide. They were also chosen to be adequately distinct from each other. At the end of this book, we bring all these variants together for an experience that requires many different types of reasoning at once and may reveal new information about each rule set as we finally get to watch them interact with each other.

At some point you may encounter a puzzle which seems like it has multiple solutions. If this happens, pay very close attention to the instructions. In many cases they contain an "if and only if" statement. This means both that if certain conditions are met then a clue must appear, and also that if the conditions are not met then a clue cannot appear. Thus lack of a clue gives some information as well, and it is usually in these situations where people think there are more opportunities than there actually are.

Throughout the upcoming sections we make a conscious choice not to discuss any known strategies for a number of reasons. It ruins one of the more satisfying aspects of discovering a new puzzle: uncovering the techniques needed to succeed. These are not meant to be connect-the-dots style puzzles where the reader is always told exactly what to do next, but instead they are designed to encourage a more active form of learning. The enjoyment comes from figuring out ways to use the given information to move forward in the variety of unfamiliar situations presented by the rule sets here. We also aren't arrogant enough to assume that we've already thought of every possible approach. It's entirely possible that by encouraging readers to work with their own ideas, they might come up with something completely new.