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Book Review of The Tower of Hanoi: Myths and Maths (Birkhäuser)

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As the title of the book suggests, the central topic of "The Tower of Hanoi – Myths and Maths" by Hinz, Klavžar, Milutinović, and Petr is the famous puzzle of the same name. The classic Tower of Hanoi puzzle along with a number of its variations and related puzzles are examined in a rigorous mathematical framework.

Chapter 0 of the book gives a detailed historical account of the Tower of Hanoi puzzle and its variants as well as an introduction to some of the mathematical results concerning them. The later chapters of the book tend to be dedicated to a particular puzzle or variant and a number of theorems and proofs concerning it.

Despite its somewhat playful title, this book is not for a casual reader. It really should be thought of as a mathematical textbook. It is probably best suited for a graduate student or someone with a strong background in mathematics; particularly combinatorics. Throughout the book, the authors assume the reader has some familiarity with, for example, recurrence relations, graph theory, and group theory. In examining the Tower puzzle and its variants, the authors present many theorems and proofs. Despite the simplicity of these puzzles, many of the results in the book are difficult.

I think the book would be ideal for a topics course for graduate students and advanced undergraduates. The book includes a nice selection of exercises of varying levels of difficulty (hints and complete solutions for most problems appear at the end). In addition, the text contains a number of interesting conjectures and open problems (Chapter 9 has a nice list). This book would also serve as a good base for thesis or dissertation topics for different levels of students of mathematics.

One particularly unique and appealing part of the book is its dedication to telling the history of the Tower of Hanoi puzzle and related puzzles. Along the way they dispel several persistent myths in the history of mathematics. Most textbooks either have no historical perspective or include just a few footnotes. I believe that the approach taken by the authors should serve as a model for other textbooks. Even traditional topics such as algebra or analysis would be better served with some historical context.

Overall the book is well-written and the authors make good decisions about how to present the material. There are a few issues a reader should be aware of. Chapter 0 contains a lot of interesting material, but at times it is too vague or informal. It can be

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easy to get lost early on. To be fair, the authors admit to this and caution the reader. Chapter 1 concerns the Chinese Rings puzzle. I found it difficult to understand the exact rules of this puzzle without looking it up elsewhere. That was a bit unfortunate for a self-contained book, but not dire.

Once we reach Chapter 2 the book really begins to shine. The Tower of Hanoi puzzle is explained in detail and some early algorithms are developed and theorems are proved. Later chapters continue this trend and introduce variations of the Tower puzzle and prove results.

The highlight of the book is Chapter 4 which shows the connection between the Tower puzzle and Sierpiśki triangle – the famous fractal. It turns out that if we build a graph of all of the possible states of a Tower of Hanoi with n discs, then this graph can essentially be represented as a step in the process of building the Sierpiński triangle. This connection is detailed rigorously in the chapter and is truly remarkable. The fact that these two popularly-known mathematical objects are so closely connected is startling.

The combination of the historical background and essentially graduate-level mathematics makes this book unique and a treat to read. As such, I would recommended it to anyone with interest in mathematical puzzles and some background in upper-division mathematics.