



Discrete Mathematics and Its Applications, 8th ed.

Kenneth H. Rosen

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General Note from the Author on 8th Edition Changes:

Although the seventh edition has been an extremely effective text, many instructors have requested changes to make the book more useful to them. I have devoted a significant amount of time and energy to satisfy their requests and I have worked hard to find my own ways to improve the book and to keep it up-to-date.

The eighth edition includes changes based on input from more than 20 formal reviewers, feedback from students and instructors, and my insights. The result is a new edition that I expect will be a more effective teaching tool. Numerous changes in the eighth edition have been designed to help students learn the material. Additional explanations and examples have been added to clarify material where students have had difficulty. New exercises, both routine and challenging, have been added. Highly relevant applications, including many related to the Internet, to computer science, and to mathematical biology, have been added. The companion website has benefited from extensive development; it now provides extensive tools students can use to master key concepts and to explore the world of discrete mathematics. Furthermore, additional effective and comprehensive learning and assessment tools are available, complementing the textbook.

I hope that instructors will closely examine this new edition to discover how it might meet their needs. Although it is impractical to list all the changes in this edition, a brief list that highlights some key changes, listed by the benefits they provide, may be useful. This new edition of the book includes many enhancements, updates, additions, and edits, all designed to make the book a more effective teaching tool for a modern discrete math course.

Overall Changes

- Exposition has been improved throughout the book with a focus on providing more clarity to help students read and comprehend concepts.
- Many proofs have been enhanced by adding more details and explanations, and by reminding the reader of the proof methods used.
- New examples have been added, often to meet needs identified by reviewers or to illustrate new material. Many of these examples are found in the text, but others are available only on the companion website.
- Several hundred new exercises, both routine and challenging, have been address needs identified by instructors or cover new material, while others strengthen and broaden existing exercise sets.
- More second and third level heads have been used to break sections into smaller coherent parts and a new numbering scheme has been used to identify subsections of the book.
- The on-line resources for this book have been greatly expanded, providing extensive support for both instructors and students. These resources are described later in the front matter.

Topic Coverage Changes

- **Logic** Several logical puzzles have been introduced. A new example explains how to model n- queens problem as a satisfiability problem that both concise and accessible to students.
- **Set Theory** Multisets are now covered in the text. (Previously they were introduced in the exercises.)
- **Algorithms** The string matching problem, an important algorithm for many applications, including spell checking, key word searching, string matching, and computational biology, is now discussed. The brute-force algorithm for solving string matching problems is presented.
- **Number theory** The new edition includes the latest numerical and theoretic discoveries relating to primes and open conjectures about them. The extended Euclidean algorithm, a one-pass algorithm, is now discussed in the text. (Previously it was covered in the exercises.)
- **Cryptography** The concept of homomorphic encryption, and its importance to cloud computing, is now covered.
- **Mathematical induction** The template for proofs by mathematical induction has been expanded. It is now placed in the text before examples of proof by mathematical induction.
- **Counting methods** The coverage of the division rule for counting has been expanded.
- **Data mining** Association rules, one of the key concepts in data mining, are now discussed in the section on n-ary relations. Also, the Jaccard metric, which is used to find the distance between two sets and which is used in data mining is introduced in the exercises.
- **Graph theory applications** A new example illustrates how semantic networks, an important structure in artificial intelligence, can be modeled using graphs.
- **Abstract Algebra** Fundamental concepts of abstract algebra, including groups, rings, and field, and key applications are covered in a new chapter. This new chapter is available as a separate on-line resource, but it can be added to custom versions of the text.
- **Biographies** New biographies of Wiles, Bhaskaracharya, de la Vallée-Poussin, Hadamard, Zhang, and Gentry have been added. Existing biographies have been expanded and updated. This adds diversity by including more historically important Eastern mathematicians, major 19th and 20th century researchers, and currently active 21st century mathematicians and computer scientists.