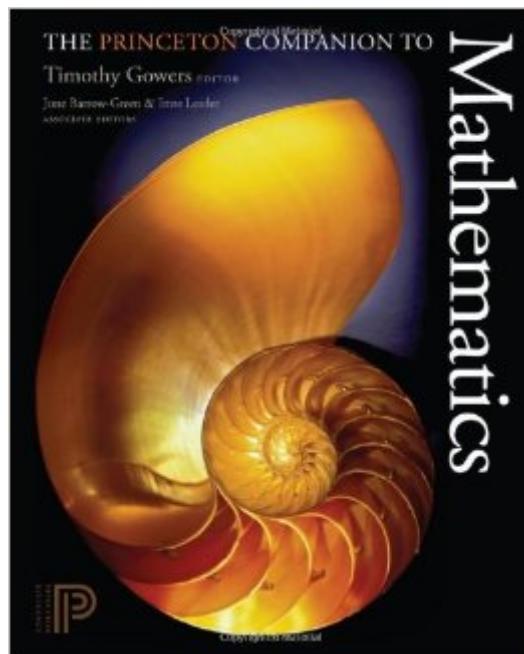


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# The Princeton Companion To Mathematics



## Synopsis

This is a one-of-a-kind reference for anyone with a serious interest in mathematics. Edited by Timothy Gowers, a recipient of the Fields Medal, it presents nearly two hundred entries, written especially for this book by some of the world's leading mathematicians, that introduce basic mathematical tools and vocabulary; trace the development of modern mathematics; explain essential terms and concepts; examine core ideas in major areas of mathematics; describe the achievements of scores of famous mathematicians; explore the impact of mathematics on other disciplines such as biology, finance, and music--and much, much more. Unparalleled in its depth of coverage, *The Princeton Companion to Mathematics* surveys the most active and exciting branches of pure mathematics, providing the context and broad perspective that are vital at a time of increasing specialization in the field. Packed with information and presented in an accessible style, this is an indispensable resource for undergraduate and graduate students in mathematics as well as for researchers and scholars seeking to understand areas outside their specialties. Features nearly 200 entries, organized thematically and written by an international team of distinguished contributors. Presents major ideas and branches of pure mathematics in a clear, accessible style. Defines and explains important mathematical concepts, methods, theorems, and open problems. Introduces the language of mathematics and the goals of mathematical research. Covers number theory, algebra, analysis, geometry, logic, probability, and more. Traces the history and development of modern mathematics. Profiles more than ninety-five mathematicians who influenced those working today. Explores the influence of mathematics on other disciplines. Includes bibliographies, cross-references, and a comprehensive index. Contributors include: Graham Allan, Noga Alon, George Andrews, Tom Archibald, Sir Michael Atiyah, David Aubin, Joan Bagaria, Keith Ball, June Barrow-Green, Alan Beardon, David D. Ben-Zvi, Vitaly Bergelson, Nicholas Bingham, Béla Bollobás, Henk Bos, Bodil Branner, Martin R. Bridson, John P. Burgess, Kevin Buzzard, Peter J. Cameron, Jean-Luc Chabert, Eugenia Cheng, Clifford C. Cocks, Alain Connes, Leo Corry, Wolfgang Coy, Tony Crilly, Serafina Cuomo, Mihalis Dafermos, Partha Dasgupta, Ingrid Daubechies, Joseph W. Dauben, John W. Dawson Jr., Francois de Gandt, Persi Diaconis, Jordan S. Ellenberg, Lawrence C. Evans, Florence Fasanelli, Anita Burdman Feferman, Solomon Feferman, Charles Fefferman, Della Fenster, José Ferreirós, David Fisher, Terry Gannon, A. Gardiner, Charles C. Gillispie, Oded Goldreich, Catherine Goldstein, Fernando Q. Gouvêa, Timothy Gowers, Andrew Granville, Ivor Grattan-Guinness, Jeremy Gray, Ben Green, Ian Grojnowski, Niccolò Guicciardini, Michael Harris, Ulf Hashagen, Nigel Higson, Andrew Hodges, F. E. A. Johnson, Mark Joshi, Kiran S. Kedlaya, Frank Kelly, Sergiu Klainerman, Jon Kleinberg, Israel

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## **Customer Reviews**

The Princeton Companion to Mathematics is such an extraordinary book that I am still amazed that the chief editor, Timothy Gowers, managed to pull it off. The renowned mathematician Doron Zeilberger announced that if he could take only one book with him to a desert island, it would be the Princeton Companion to Mathematics. Why such high praise? Simply put, the PCM gives a single-volume overview of all of pure mathematics, with a clarity and coherence that cannot be found anywhere else. To be sure, there do exist several good books on the history of mathematics that give a good overview of elementary mathematics and introduce the reader to some of the great

mathematicians of the past. There also exist excellent "popular science" books by writers such as Martin Gardner and Ian Stewart, that explain selected topics in advanced mathematics to the lay reader in an engaging and clear manner. And there are also encyclopedias (including Wikipedia) that delineate the main branches of mathematics and give succinct definitions of all the main concepts. But only the PCM does all of these things at once, in only a thousand pages. The PCM is all things to all people. If your mathematical background is limited, you can still learn a great deal from the more elementary sections of the book, as well as from the biographical sketches of nearly a hundred famous mathematicians of the past. At the other end of the scale, even professional mathematicians will learn something from the articles on branches of mathematics other than their own specialty. Gowers made a systematic effort to find contributors who are not only world experts in their subject, but who write extremely well. He also forced the contributors to write in as accessible and elementary a manner as possible.

Got my copy a week ago. What an exceptional book! Any of the random samples I read so far provides a informative, yet pleasant read. Gowers (Rouse Ball Professor of Mathematics in Cambridge) did a fantastic job in editing the many articles into a coherent and surprisingly accessible overview of modern mathematics. From inception to publication of this book took Gowers and his associate editors some 6 years. The amount of editorial attention given to this publication clearly shows and translated into a book that is - unlike any other math book I know of - easy to read and of high quality. This book provides lots of material that is of interest to non-mathematicians. As is mentioned in one of the other reviews here, this heavy volume does not contain a separate chapter on mathematical physics, yet as a physicist I found lots of material directly relevant to physics. There is a very interesting chapter on the general theory of relativity, and lots of material on quantum mechanics. Also fundamental concepts highly relevant in physics such as spherical harmonics, dynamical systems, deterministic chaotic behavior, phase transitions, Lie groups, etc. are covered in inviting shorter sections. Each of the subjects is introduced in such a way that the reader first gains an intuitive understanding of the concept, that subsequently gets deepened via a more rigorous approach. If only there was a similar 'companion' to modern physics! (The book of Oxford's Emeritus Rouse Ball professor Roger Penrose, *The Road to Reality: A Complete Guide to the Laws of the Universe* comes close, but falls short of being truly PCM's equivalent in physics).

Take Gowers's delightful little book, "Mathematics: a very short introduction", make it about twenty times as long, bring in a host of excellent contributors to write specialized articles, put the whole

thing together very nicely, and you have the present book. This book is not an encyclopedia, but it does offer a sweeping panorama of mathematics, written at an accessible level. It includes introductory articles on what mathematics is and basic concepts, more advanced (but still accessible) articles introducing various key concepts and areas of mathematics, articles on history of mathematics and biographies of mathematicians, descriptions of key theorems and problems, essays on the applications of mathematics, and more. There is something in here for everyone with an interest in mathematics. As a professional mathematician, I am familiar with most of the introductory material, but I still like seeing it so nicely expressed and might use it as a teaching resource. Among the more advanced articles, there is lots of material which I feel like I "should" know, but actually don't. The editors did an amazing job of finding really top-level people to write the specialized articles, who are both renowned experts in their areas and excellent expositors. The quality of the writing is infinitely superior to most articles in wikipedia or other online math encylopedias. As I said, this not a comprehensive reference. The articles are introductory and designed for "bedtime reading". (Although if you read this book in bed you will probably have to sit up and put it on your lap because it is as big as a phone book.) Anyway, I was very pleasantly surprised when I received this book.

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