



Mathematics 1001: Absolutely Everything That Matters in Mathematics in 1001 Bite-Sized Explanations

By Dr. Richard Elwes

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A comprehensive study of math principles in one volume for the general reader.

This practical reference provides clear and concise explanations of the most fascinating fundamental mathematical concepts. Distilled into 1001 mini-essays arranged thematically, this unique book moves steadily from the basics through to the most advanced areas of math, making it the ideal guide for both the beginner and the math wiz.

The book covers all of the fundamental mathematical disciplines:

- Geometry
- Numbers
- Analysis
- Logic
- Algebra
- Probability and statistics
- Applied mathematics
- Discrete mathematics
- Games and recreational mathematics
- Philosophy and metamathematics

Expert mathematician Richard Elwes explains difficult concepts in the simplest language with a minimum of jargon. Along the way he reveals such mathematical magic as how to count to 1023 using just 10 fingers and how to make an unbreakable code.

Enlightening and entertaining, **Mathematics 1001** makes the language of math come alive.

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Editorial Review

Review

[Review of hardcover edition:] Designed with the general reader and students in mind, this volume provides clear and concise explanations of mathematical concepts. It uses the simplest, jargon-free language possible to clarify such concepts as probability and statistics, discrete mathematics, logic, and analysis. Covering 1001 mathematical topics, the work covers such subjects as geometry, algebra, numbers, applied mathematics, and calculus. This is a fun resource that can make most any student find something interesting in mathematics. It is a concise, general work that can be used for browsing or for looking up specific topics in both high school and public libraries. (Melinda F. Matthews *American Reference Books Annual 2010* 2011-03-01)

[Review of hardcover edition:] Often, when one hears a scientific or mathematical reference, it usually requires a concise explanation using regular terminology. Elwes (mathematics researcher, Univ. of Leeds, England) gives us a shortcut to some of mathematics' most significant topics, doing for his subject what Paul Parsons did for science in Science 101: Absolutely Everything That Matters About Science in 1001 Bite-Sized Explanations. As in that book, concise essays about a variety of mathematical fields--numbers, algebra, geometry, logic--are arranged here by broad topics along with more specific subjects. The accessible text is written without troublesome jargon and terminology. Many of the essays contain illustrations of plots, graphs, and figures. The index makes it easy to find an essay if one is not particularly familiar with the hierarchy of mathematics. One can rarely call a mathematics book fun, but that's exactly what Elwes's book is. Appropriate for school, public, and academic collections. (Margaret Dominy *Library Journal*)

[Review of hardcover edition:] Absolutely fascinating.... Dr. Elwes is brilliant at giving the reader the broad perspective, with enough details to fascinate, rather than confuse. Many of the topics cover the foundations of an area of mathematics, and others cover unsolved problems, and everything in between.... I highly recommend this book for any student considering math as their future field of study, as well as anyone who ever enjoyed studying math. For that matter, this book would also be good for anyone who finds math at all intriguing. (Sonder Books 2011 Stand-outs 2012-03-03)

For those who want easy to understand, short descriptions... As he points out in the Introduction, Dr. Parson's objective "...was to combine the breadth of a reference book -- for example, a dictionary of science -- with the accessibility and sense of fun that you get from a piece of popular science writing." ... Whether you use the book as a reference guide or you read it cover to cover you will find the information interesting and clearly defined. Science 1001 is a useful book for older children as well as students in high school, university -- and beyond. (Glenn Perrett *Simcoe.com, DurhamRegion.com, MuskokaRegion.com*, P 2014-11-24)

About the Author

Dr. Richard Elwes is a writer, lecturer and researcher in mathematics. He contributes to *New Scientist* and *Plus Magazine* and has published numerous scholarly research papers.

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INTRODUCTION

THE FIRST MATHEMATICIAN KNOWN BY NAME is Ahmes, an Egyptian scribe who around 1650 BC copied out and studied a list of complex mathematical problems he called the 'ancient writings'. Today, Ahmes' text is known as the *Rhind papyrus*. From this, and older stone tablets, we know that the scholars of ancient Egypt and Babylon had sophisticated numerical notation and a taste for challenging problems in algebra, geometry and number theory.

The study of mathematics, then, is as ancient as civilization; but it also represents the modernity of today's world. In the millennia since Ahmes' work, we have seen scientific and technological progress of which he could not have dreamt. Central to this advance has been the march of mathematics, which has contributed the basic language used in all scientific contexts. Probably mathematics' most fundamental contribution has been in the sphere of physics. Galileo's revolutionary insight in the early 17th century that the universe might yield to a purely mathematical description set the direction towards the world-changing theories of quantum mechanics and relativity.

This reliance on mathematics is not confined to the physical sciences. The social sciences depend on techniques of probability and statistics to validate their theories, as indeed do the worlds of business and government. More recently, with the emergence of information technology, mathematics became entangled in another love-affair, with computer science. This too has had a profound impact on our world.

As its influence has broadened, the subject of mathematics itself has grown at a startling rate. One of history's greatest mathematicians, Henri Poincaré, was described by Eric Temple Bell as 'the last universalist', the final person to have complete mastery of every mathematical discipline that existed during his lifetime. He died in 1912. Today, no-one can claim to have mastered the whole of topology, let alone geometry or logic, and these are just a fraction of the whole of mathematics.

Poincaré lived through a turbulent period in the history of mathematics. Old ideas had been blown away, and new seeds planted which flourished during the 20th century. The result is that the mathematical world we know today is rich and complex in ways that even the greatest visionaries of the past could not have imagined. My aim in this book is to give an overview of this world and how it came to be. I might have tried to sketch a low-resolution map of the entire mathematical landscape, but this would be neither useful nor entertaining. Instead, I have presented 1001 short 'postcards' from interesting landmarks around the mathematical world that nonetheless give a feel for the bigger picture of mathematics.

In the scheme of things, 1001 is a very small number (see the frivolous theorem of arithmetic). My challenge has been to select the real highlights: the truly great theorems, the outstanding open problems and the central ideas. I have also sought to represent the surprises and quirks that make the subject truly fascinating.

This book is organized thematically, on three levels. It is divided into ten chapters, each covering a broad subject, beginning with 'Numbers'. Each chapter is subdivided into sections, which are more narrowly focused on a single topic, such as 'Prime numbers'. Each section comprises a series of individual entries, such as the one on the Riemann hypothesis.

How you should read *Mathematics 1001* depends on what you want from it. If you are interested in prime numbers you can read through that section. If you want a quick explanation of the Riemann hypothesis, you can jump straight there; but, because 'a quick explanation of the Riemann hypothesis' is an impossibility, you will then need to rewind a little, to take in the preceding few entries where the necessary prerequisites are laid out. Alternatively you can dip in and out, perhaps finding a new story by following the bold cross-references to different entries in the book.

Who is this book aimed at? The answer is anyone with a curiosity about mathematics, from the novice to the informed student or enthusiast. Whatever the reader's current knowledge I'm sure that there will be material here to enlighten and engage. Some parts of the book undoubtedly cover highly complex subjects. That is the nature of the subject; shying away from it would defeat the purpose. However, the book is structured so that the relevant basic concepts precede the complex ones, giving a foundation for understanding. My job in writing has been to discuss all ideas, from the basic to the most abstract, in as direct and focused a way as possible. I have done my best, and have certainly relished the challenge. Now I can only hope that you will enjoy it too.

Richard Okura Elwes

Users Review

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Mary Gonzalez:

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