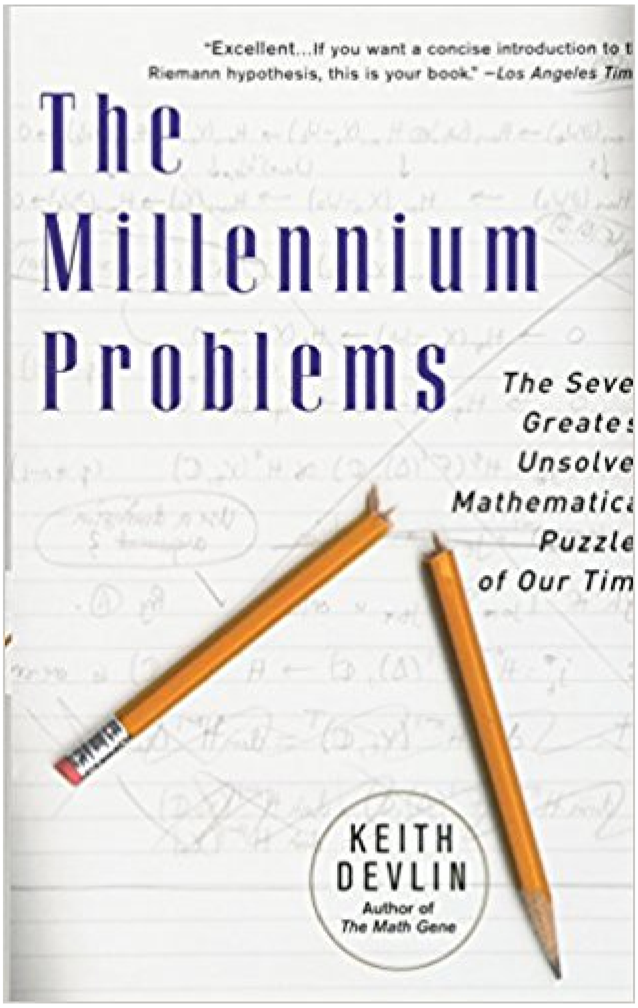
The Millennium Problems: The Seven Greatest Unsolved Mathematical Puzzles Of Our Time



Synopsis

In 2000, the Clay Foundation announced a historic competition: whoever could solve any of seven extraordinarily difficult mathematical problems, and have the solution acknowledged as correct by the experts, would receive 1 million in prize money. There was some precedent for doing this: In 1900 the mathematician David Hilbert proposed twenty-three problems that set much of the agenda for mathematics in the twentieth century. The Millennium Problems--chosen by a committee of the leading mathematicians in the world--are likely to acquire similar stature, and their solution (or lack of it) is likely to play a strong role in determining the course of mathematics in the twenty-first century. Keith Devlin, renowned expositor of mathematics and one of the authors of the Clay Institute's official description of the problems, here provides the definitive account for the mathematically interested reader.

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Customer Reviews

The noble idea that advanced mathematics can be made comprehensible to laypeople is tested in this sometimes engaging but ultimately unsatisfying effort. Mathematician and NPR commentator Devlin (The Math Gene) bravely asserts that only "a good high-school knowledge of mathematics" is needed to understand these seven unsolved problems (each with a million-dollar price on its head from the Clay Mathematics Institute), but in truth a Ph.D. would find these thickets of equations daunting. Devlin does a good job with introductory material; his treatment of topology, elementary calculus and simple theorems about prime numbers, for example, are lucid and often fun. But when he works his way up to the eponymous problems he confronts the fact that they are too abstract, too encrusted with jargon, and just too hard. He finally throws in the towel on the Birch and Sinnerton-Dyer Conjecture ("Don't feel bad if you find yourself getting lost... the level of abstraction is simply too great for the nonexpert"), while the chapter on the Hodge Conjecture is so baffling that the second page finds him morosely conceding that "the wise strategy might be to give up." Nor does Devlin make a compelling case for the real-world importance of many of these problems, rarely going beyond vague assurances that solving them "would almost certainly involve new ideas that will... have other uses." Sadly, this quixotic book ends up proving that high-level mathematics is beyond the reach of all but the experts.

Adult/High School-In May, 2000, the Clay Mathematics Institute posted a million-dollar prize to anyone able to solve any of what it considered the seven most important mathematical problems of the 21st century. They were chosen not for theoretical beauty alone, but because many of them deal with concepts in fields like physics, computer science, and engineering, and exist because practitioners in those fields are already using theoretical or practical design solutions that have not been mathematically proven. Devlin, "The Math Guy" from NPR's Weekend Edition, does a good job explaining the background of the problems and why theoretical mathematics as a discipline should matter to a general audience. Each problem has a chapter of its own and is given a treatment that, where applicable, extends back to the ancient Greeks. A passing knowledge of mathematics is important for taking in Devlin's work but a major in the subject is not, and this book should satisfy anyone looking for a layman's guide to modern theoretical mathematics. Or hoping to win a million dollars.Sheryl Fowler, Chantilly Regional Library, VA

As time passes math tends to get further and further out of the reach of most people (in fact as one gathers from the book that mathematicians themselves lose track of their colleagues techniques and progress to a non-trivial degree). This book is an attempt to shrink some of that distance and is an entertaining summary of the spirit of the current (though one problem has been solved) most noted problems in math- to a large degree, the modern day equivalent of Hilbert's list from a century ago.It is always tough for authors to strike a balance between describing the problem and its history versus going describing the various paths that a solution might be found on. This book minimizes the solution potentials and their descriptions, for good reason, as the problems are modern day math and would require specific graduate training to even attempt parts of the solution (exept maybe the P NP problem) and instead focuses on more of the historical side of things and how the questions were motivated and became prominent.To me its always nice for a working mathematician to spend the time to try to describe the spirit of a problem. This book does a great job where it can, as the problems are spelled out very nicely- towards the end of the book, the goal of heuristically describing the problem becomes close to impossible (one learns the author needed weeks to understand the problem himself). I recommend this to all who want to try to an elevated view of current problems and what mathematicians are working on (and solving).

The goal of Keith Devlin's "The Millennium Problems: The Seven Greatest Unsolved Mathematical Puzzles of Our Time" is "to provide the background to each problem, to describe how it arose, [to] explain what makes it particularly difficult, and [to] give you some sense of why mathematicians regard it as important." "In May 2000 ... the Clay Mathematical Institute (CMI) announced that seven $1 million prizes were being offered for the solutions to each of [the] seven unsolved problems of mathematics..." Devlin's book is a "general introductions to ... the official book on the problems..." "... readers ... wishes to ... solve one of the Clay Problems should read the definitive description ... in the CMI book." "The official CMI book consists primarily of detailed and accurate descriptions of the seven problems..." Keith Devlin was asked "to provide short introductory accounts of the problems to make the book more accessible to mathematicians...journalists...readers..." "To read my [Keith Devlin's] book, all you need...is...high school knowledge of mathematics...You will also need sufficient interest in the topic." The book has eight chapters. Chapter zero is the general introduction to the problems. Chapter one is about the Riemann Hypothesis. Riemann suggests that for Riemann's Zeta function to be zero, the roots have the form Ãƒâ Ã Â + bi for some real number b. Chapter two is about Yang-Mills Theory and the Mass Gap Hypothesis. The Yang-Mills equations describe all of the forces of nature (electromagnetic force, the weak nuclear force, and the strong nuclear force) other than gravity. The hypothesis provides "an explanation of why electrons have mass." The problem asks for "missing mathematical development of the theory, starting from axioms." The third chapter is about computer (The P Versus NP Problem). "Computer scientists divide computational tasks into two main categories: Tasks of type P can be tackled effectively on a computer; tasks of type E could take millions of years to complete. Unfortunately, most of the big computational tasks that arise in industry and commerce fall into a third category, NP, which seems to be intermediate between P and E. But is it? Could NP be just a disguised version of P? ... no one has been able to prove whether or not NP and P are the same." Chapter four is about the Navier-Stokes Equations. The equations describe "the motion of fluids and gases--such as water around the hull of a boat or air over an aircraft wing." They are partial differential equations (PDE). "To date, no one has clue how to find a formula that solves these particular equations." Chapter five is about the Poincare Conjecture. "If you stretch a rubber band around the surface of an apple, you can shrink it down to a point by moving it slowly, without tearing it and without allowing it to leave the surface...if you imagine that the same rubber band has somehow been stretched in the appropriate direction around a doughnut, then there is no way of shrinking it to a point without breaking either the rubber band or the doughnut...when you ask the same shrinking band idea distinguishes between four-dimensional analogues of apples and doughnuts...no one has been able to provide an answer." Chapter six is about the Birch and Swinnerton-Dyer Conjecture. The conjecture suggests that "there are infinitely many rational points on E [the elliptic curve] if and only if L(E,1)=0." Birch and Swinnerton-Dyer "creates" an counting device L(E,1) for rational points. Chapter seven is about the Hodge Conjecture. "The basic idea was to ask to what extent you can approximate the shape of a given object by gluing together simple geometric building blocks of increasing dimension ... The Hodge conjecture asserts that for one important class of objects (called projective algebraic varieties), the piece called Hodge cycles are, nevertheless, combinations of geometric pieces (called algebraic cycles)."

As always, when I order math books at , I do that for 3 or 4 items together. When I receive them, it is often difficult to chose with which one to start. Since I had already read a lot about the millennium problems, I waited with this one, because I knew already at least something of the topics inside. However, when I finally started reading this book, I discovered that all the various problems had been written in not only a thorough way, but also in a pleasant, easily readable way. For instance, I had read a number of books about the Riemann Hypothesis already, but Keith Devlin even managed to explain some items in a new way. Also his description of the P versus NP problem was a pleasure to read. So, in fact of the 3 books I had ordered, this one appeared to be the best. And, in addition, I'm sure within a couple of weeks I will read it again. Just for fun.

Riemann and the Greatest Unsolved Problem in Mathematics Mathematical Problems from Combustion Theory (Applied Mathematical Sciences) (v. 83) The New York Times Monday Through Friday Easy to Tough Crossword Puzzles: 50 Puzzles from the Pages of The New York Times (New York Times Crossword Puzzles) Bible Brain Teasers for Adults (4 Book Set includes:Bible Crossword Puzzles;Bible Games;Bible Quizzes & Puzzles;Bible Word Search Puzzles) Pirates of the Digital Millennium: How the Intellectual Property Wars Damage Our Personal Freedoms, Our Jobs, and the World Economy Unsolved! Mysterious Places (TIME FOR KIDSÃ Â® Nonfiction Readers) 100 Math Brainteasers (Grade 7, 8, 9, 10). Arithmetic, Algebra and Geometry Brain Teasers, Puzzles, Games and Problems with Solutions: Math olympiad contest problems for elementary and middle schools How trace element selenium affects men's health: Discover how selenium can affect: prostate problems, eczema problems, asthma breathing, and 9 other health problems Inheritance: How Our Genes Change Our Lives--and Our Lives Change Our Genes The Mind-Gut Connection: How the Hidden Conversation Within Our Bodies Impacts Our Mood, Our Choices, and Our Overall Health The Gardner Heist: The True Story of the World's Largest Unsolved Art Theft Alabama Unsolved Mysteries Lost Girls: An Unsolved American Mystery Roanoke: The Lost Colony--An Unsolved Mystery from History Unsolved Mysteries: Bizarre Stories That Stumped Us All: What Happened, Where Did They Go? (True Police Stories Book 1)