

## MATH BOOKS RECOMMENDED BY Mr. Brandenburg

You are lucky to be alive during a real boom in good, popular math and science writing. You will need to read and report on two of these books during the next 3 months. Some of these books are very recent, which means that they may or may not be in public libraries yet. Look at Daedalus Books (<http://www.daedalus-books.com/>) or Hamilton Books (<http://www.hamiltonbook.com>) for inexpensive versions if you want to buy a copy. I have provided a review (if it's in quotes, then I did not write the review myself), a publisher, the number of pages, and a copyright date. However, remember that some books, especially popular ones, change publishers and go through several different editions over the years. I have read less than half of these books myself. They are in alphabetical order by author.

1. Edwin A. Abbott: *Flatland: A Romance of Many Dimensions*. "Flatland is one of the very few novels about math and philosophy that can appeal to almost any layperson. Published in 1880, this short fantasy takes us to a completely flat world of two physical dimensions where all the inhabitants are geometric shapes, and who think the planar world of length and width that they know is all there is. But one inhabitant discovers the existence of a third physical dimension, enabling him to finally grasp the concept of a fourth dimension." (A review) (Dover, 128 pp, reprint)
2. Amir D. Aczel: *The Mystery of the Aleph: Mathematics, the Kabbalah, and the Human Mind* "Aczel tells of mathematicians struggling with absolute infinity and some of its mind-bending ramifications. The crown jewel of this struggle was conceived more than a century ago by Georg Cantor and remains an enigma to mathematicians. Cantor spent his life going back and forth between trying to prove and disprove his continuum hypothesis. In the Kabbalah, the aleph "represents the infinite nature, and the oneness, of God." Cantor deliberately picked this symbol for use in his equations: to him, trying to understand the absolute infinite was like trying to touch the face of God." (4 Walls 8 Windows, 258 pp, 2000)
3. Donald J. Albers and G. L. Alexanderson, editors: *Mathematical People: Profiles and Interviews*. This book is a collection of profiles and interviews with twenty-five prominent mathematicians. (NTC, 392 pp, 1986)
4. Donald J. Albers, Gerald L. Alexanderson, and Constance Reid: *More Mathematical People*. Probably a continuation of the previous item. (Academic Press, 375 pp, 1990)
5. Arthur Benjamin and Michael Shermer: *Mathemagics; How to Look like a Genius Without Really Trying*. Teaches you how to calculate in your head faster than you can with a calculator. (Lowell, 218 pp, 1993)
6. David Blatner: *The Joy of  $\pi$* . This is an easy book to read. It has many different parts: breezy narratives of the history of  $\pi$ , and quirky stories of those obsessed with it. There are  $\pi$ -inspired cartoons, poems, limericks, and jokes. Also has the first one million digits of  $\pi$ . (Walker, 129 pp, 1997)
7. Mary Blocksma: *Reading the Numbers: A Survival Guide to the Measurements, Numbers, and Sizes Encountered in Everyday Life*. This is a reference book, but it gives details on all sorts of things, like what the ISBN is, what those last 4 new digits on the Zip Code mean, what all those letters and numbers on automobile tires mean, and so on. (Penguin, 224 pp, 1989)
8. Colin Bruce: *Conned Again, Watson!: Cautionary Tales of Logic, Math, and Probability*. "Some people who think they hate math are lucky to learn that they actually just can't abide its often dry, abstract presentation. Physicist Colin Bruce turns math teaching on its head by using

conflict, drama, and familiar characters to bring probability and game theory to vivid life in *Conned Again, Watson! Cautionary Tales of Logic, Math, and Probability*. Using short stories crafted in the style of Sir Arthur Conan Doyle, he lets Sherlock Holmes guide Watson and his clients through elementary mathematical reasoning." (A review) (Perseus, 320 pp, 2002)

9. Dionys Burger: *Sphereland: A Fantasy About Curved Spaces and an Expanding Universe* "Sphereland, the sequel to *Flatland*, is a great book to help one expand one's mind. This book is a satire, a geometry lesson, and a good exercise for the mind. Sphereland is also useful for helping one to think outside of the box, and the universe for that matter. This book stretches the confines of your mind and imagination." (A review) (International, 1982)

10. John L. Casti, *Five Golden Rules: Great Theories of 20th-Century Mathematics--and Why They Matter*. "Books on mathematics with such beauty, breadth, and insight are rare. *Five Golden Rules* is replete with intriguing information - not only for curious laypeople but also for seasoned mathematicians and scientists. Casti has produced a truly stunning survey of mathematics' manifold consequences." (Review by Clifford Pickover) (Wiley & Sons, 235 pp, 1996)

11. John L. Casti: *Mathematical Mountaintops; The Five Most Famous Problems of All Time*. "The recent boom in mathematics bestsellers has contributed a great deal towards raising the public profile of the subject. But such books ignore a significant section of potential readers, namely those who have more of a mathematical background than the general reader but who are not professional mathematicians. Such mathematical enthusiasts have no doubt enjoyed some of the popular books, but would really prefer a more technical treatment. This is exactly what John Casti provides in *Mathematical Mountaintops*. It is neither a textbook nor a pop math book, rather it is a serious in-depth look at the great problems of mathematics." (Oxford, 196 pp, 2001)

12. Calvin C. Clawson: *Mathematical Mysteries; The Beauty and Magic of Numbers*. "Many of the dazzling beauties of higher mathematics are just as accessible to an ordinary untrained spectator as are similar wonders of great literature, visual art, and music. This well-kept secret is finally blown wide open in Calvin Clawson's latest book." (A review) *Has equations, but explains them well..* (Perseus, 313 pp, 1996)

13. Calvin C. Clawson: *Mathematical Sorcery; Revealing the Secrets of Numbers*. "Few mathematicians today have the ability to write about math more entertainingly, with greater enthusiasm and clarity, than Calvin Clawson. A splendid introduction to the great ideas of mathematics, their powerful magic, and their intricate, mysterious beauty." (Review by Martin Gardner.) ISBN 0-7382-0496-X. (Perseus, 234 pp, 1999)

14. Donald Cohen: *Calculus by and for Young People (Ages 7, Yes 7 and Up)* A description of how young people, Don and some mathematicians, solved problems which involve infinite series, infinite sequences, functions, graphs, algebra, +, - important mathematical ideas. Also available, the Worksheets (some say all you need)... (1989)

15. John Horton Conway and Richard K. Guy: *The Book of Numbers* "A fascinating review of numbers: from Egyptian fractions to surreal numbers; prime numbers, Fibonacci numbers, Catalan numbers, Fermat numbers; from numbers so large they cannot be imagined (and barely be named) to ruler-and-compass." (Copernicus/Springer-Verlag, 310 pp, 1996)

16. Philip J. Davis and Reuben Hersh: *The Mathematical Experience*. "A brilliant and engrossing view of the development of mathematics... wonderful at communicating its beauty and excitement to the general reader." This is the classic introduction for the educated lay

reader to the richly diverse world of mathematics: its history, philosophy, principles, and personalities. Winner of an American Book Award (Houghton-Mifflin, 411 pp, 1998)

17. Keith Devlin: *Life by the Numbers*. "Most of us think mathematics is about numbers and counting. That's just the basics, though, and Keith Devlin's companion book to the PBS series "Life by the Numbers" gives examples of the versatility of math as a tool for understanding just about everything. Devlin loves math--he calls it 'one of the greatest creations of mankind' in a chapter entitled 'It's an M World'--and he wants everyone to love it." (A review) (Wiley, 224 pp, 1999)

18. Keith Devlin: *The Math Gene : How Mathematical Thinking Evolved and Why Numbers are Like Gossip*. "Keith Devlin's book was a revelation to me. For a long time I suspected that there was some connection between our ability to do math and our possession of language. Now, that connection is made dazzlingly clear in a language that even a mathematical ignoramus like myself can understand. A must-read for anyone who has ever wondered what makes us human." (A review) (Basic Books, 328 pp, 2000)

19. Keith Devlin, *Mathematics: The New Golden Age* "Why a "new golden age"? According to Keith Devlin, we are currently witnessing an astronomical amount of mathematical research. Charting the most significant developments that have taken place in mathematics since 1960, Devlin expertly describes these advances for the interested layperson and adroitly summarizes their significance as he leads the reader into the heart of the most interesting mathematical perplexities - from the biggest known prime number to the Shimura-Taniyama conjecture for Fermat's Last Theorem." (Columbia, 2001)

20. Douglas Downing: *Algebra the Easy Way* "An algebra text in the form of a fantasy novel, with the story's characters solving problems by using algebra." (Barron's, 329 pp, 1996)

21. Douglas Downing: *Trigonometry the Easy Way*. "Here's a complete, easy-to-grasp course in trigonometry that takes the form of a fantasy novel. The King of Carmorra and his subjects have many practical problems to solve, and their answers can be found by applying principles of trigonometry. Readers follow along and learn to solve many different problems that can be reduced to triangular diagrams. They learn the laws of sine and cosine, trigonometric functions and inverse functions, waves, conic sections, polynomial approximation, and much more. The book is filled with instructive exercises and their solutions, plus illustrative drawings, graphs, and diagrams. This new edition contains updated coverage on using graphing calculators and computer spreadsheets for solving trigonometric problems." (Barron's, 326 pp, 2001)

22. Apostolos Doxiadis *Uncle Petros and Goldbach's Conjecture* "A novel of mathematical obsession. It is fascinating thus far (80 pages in). Received it as a late holiday gift from close friends. I think it appeared in Greek in '92 and in English just last year. I'd love to hear what others thought of it and to recommend it to those who like literature and mathematics with some history thrown in. A mathematical conjecture unsolved for two centuries; a mathematical genius uncle driven mad trying to solve it; an ambiguous relation with a mathematically-minded nephew; and acute human observation all come together in Uncle Petros to make a very funny, tender, charming and, to my mind, irresistible novel. In the tradition of Fermat's Last Theorem and Einstein's Dreams, a novel about mathematical obsession." (A review) (Bloomsbury, 224 pp, 2001)

23. Underwood Dudley, *Mathematical Cranks* "On the one hand, mathematics is the great leveler of the sciences. Anyone can do mathematical research, with no equipment but pencil and paper. On the other hand, mathematics is the only science where something can be proven,

irrefutably and for all time, to be impossible. These two ingredients make mathematics one of the most fertile grounds for inspiring crankery. This book is not only entertaining, the broadness of its examples provides a fascinating insight into the mind of cranks. I couldn't put it down." (MAA, 384 pp, 1992).

24. William Dunham, *Journey Through Genius: The Great Theorems of Mathematics*. "Strikes an extraordinary balance between the historical and technical. He devotes each chapter to a principal result of mathematics, such as the solution of the cubic series and the divergence of the harmonic series. Not only does this book tell the stories of the people behind the math, but it also includes discussions and rigorous proofs of the relevant mathematical results". (Penguin, 1990)

25. William W. Dunham: *The Mathematical Universe: An Alphabetical Journey Through the Great Proofs, Problems and Personalities*. "Contains a wealth of amusing stories and little known facts from the annals of math. All proofs and equations are introduced through easy-to-follow, step-by-step explanations. Discusses some of the most intriguing mysteries such as Russell's Paradox. Features brief biographies of many great mathematicians including Isaac Newton, Bertrand Russell and Hypatia of Alexandria." (Wiley, 314 pp, 1997)

26. Hans Magnus Enzensberger: *The Number Devil: A Mathematical Adventure*. "In 12 dreams, a 12-year-old boy who hates math discovers the amazing world of numbers: infinite numbers, prime numbers, Fibonacci numbers, numbers that magically appear in triangles, and numbers that expand without end." (Holt, 262 pp, 2000)

27. Clifton Fadiman (ed): *Fantasia Mathematica: Being a Set of Stories, Together With a Group of Oddments and Diversions, All Drawn from the Universe of Mathematics* A review: "What a relief to open the pages of this book. I approach mathematics as a subject necessary, but always painful, to learn. Dare I say I love this book? Some of the short stories are humorous, some are endearing, some have common characters. All deal with mathematics in one way or another. Fadiman's book succeeded where so many others failed--it interested me. His book closely tied math with imagination and fantasy--a connection never clearly drawn in my public education. I think, though, that it's very important to present mathematics as the language for interpreting the world that it is...rather than as a cold and mostly irrelevant subject to get C minus in! IT MADE MATH EXCITING. Yikes, did I say that? It is another way to know why your baseball is going to break the window, how to build a spaceship in your back yard, and how to teleport to Argentina in 0 seconds flat. A real tangible benefit to reading this book was learning the derivation of Pythagoras' Theorem. Not to sound like an idiot, but I think most of us went through high school geometry having no clue where  $a^2 + b^2 = c^2$  came from. In two pages, this book explained it so clearly to me that I laughed out loud. IF ONLY THEY USED THIS TO TEACH ME INSTEAD OF A BRUTAL MATH BOOK!" (Copernicus, 298 pp, 1997)

28. Sarah Flannery: *In Code: A Mathematical Journey* "British best-seller by and about the 16-year-old who stunned the world by inventing a way of making public-key encryption much more efficient; an engaging, almost playful, book in which the reader is encouraged to spend lots of time working out mathematical puzzles." (Workman, 341 pp, 2001)

29. George Gamow: *1, 2, 3, Infinity: Facts and Speculations of Science*. "This book changed lives around the world. Many of us began our journey into science and mathematics with this book. The reviews at the other book site show how many of us were changed in our young lives by this book. Buy it for every child you know." (A review) This book has been in print for over 50 years, because it's GOOD. (Dover, 335 pp, reprint)

30. Martin Gardner: *Knotted Doughnuts and Other Mathematical Entertainments*. One of his many collections of his columns from the *Scientific Americans*, and contains an entirely new set of problems, paradoxes, teasers and tricks. Investigates mathematical games such as Sim, Chomp, and Race Track; also investigates coincidences that seem to violate the laws of probability. (Freeman, 278 pp, 1986)
31. Martin Gardner: any book he wrote on math and science is good!
32. James Gleick: *Chaos: Making a New Science* Chaos records the birth of a new science. This new science offers a way of seeing order and pattern where formerly only the random, the erratic, the unpredictable--in short, the chaotic--had been observed. Chaos is a history of discovery. It chronicles, in the words of the scientists themselves, their conflicts and frustrations, their emotions and moments of revelation. After reading Chaos, you will never look at the world in quite the same way again. (Viking Penguin, 317 pp., 1988)
33. Larry Gonick: *The Cartoon Guide to Statistics* "You'll find lucid explanations of probability, distributions, error functions, hypothesis testing, and other basic tools of statistics." And, best of all, it's written in the form of cartoons. (HarperCollins, 223 pp, 1993)
34. Denis Guedj: *Numbers; the Universal Language*. "Numbers, like letter forms, have a rich and complex history. Who first invented them? How old are they, and how were they developed? How did they come to represent a world of abstract ideas and universal concepts? How do they differ throughout the world today?" (From the cover.) (Abrams, 175 pp, 1996, 1997)
35. Jan Gullberg: *Mathematics: From the Birth of Numbers* "If a family is to have only one mathematics book on the reference shelf, then this is the one..." Not really something you would read from cover to cover, but more like an encyclopedia. Very well written. (Norton, 1120 pp, 1996)
36. Nina Hall, editor: *Exploring Chaos; A guide to the New Science of Disorder*. In the past few years, a new line of scientific inquiry called "chaos theory" has caught the popular imagination. Young people, in particular, have taken to the complex computer-generated patterns that seem to teeter precariously between order and randomness. A dazzling mathematical object, the Mandelbrot set, now decorates posters, record sleeves, and pop videos (as well as the back cover of this book jacket). Chaos theory, it turns out, has a deeper meaning for our understanding of nature. All sorts of phenomena - from dripping faucets to swinging pendulums, from the unpredictability of the weather to the majestic parade of the planets, from heart rhythms to gold futures - are best perceived through the mathematical prism of chaos theory. In this collection of incisive, front-line reports, ably edited by Nina Hall for *New Scientist* magazine, internationally recognized experts such as Ian Stewart, Robert May, and Benoit Mandelbrot draw on the latest research to explain the roots of chaos in modern science and mathematics. (W.W. Norton, 223 pp, 1991)
37. G. H. Hardy, *A Mathematician's Apology* 'Σ is a profoundly sad book, the memoir of a man who has reached the end of his ambition, who can no longer effectively practice the art that has consumed him since he was a boy. But at the same time, it is a joyful celebration of the subject--and a stern lecture to those who would sully it by dilettantism or attempts to make it merely useful. "The mathematician's patterns," G.H. Hardy declares, "like the painter's or the poet's, must be beautiful; the ideas, like the colours or the words, must fit together in a harmonious way. Beauty is the first test: there is no permanent place in the world for ugly mathematics." (Cambridge, 142 pp, reprint 1940.

38. Douglas Hofstadter: *Gödel, Escher, Bach: An Eternal Golden Braid*. "Twenty years after it topped the bestseller charts, Douglas R. Hofstadter's *Gödel, Escher, Bach: An Eternal Golden Braid* is still something of a marvel. Besides being a profound and entertaining meditation on human thought and creativity, this book looks at the surprising points of contact between the music of Bach, the artwork of Escher, and the mathematics of Gödel. It also looks at the prospects for computers and artificial intelligence (AI) for mimicking human thought. For the general reader and the computer techie alike, this book still sets a standard for thinking about the future of computers and their relation to the way we think." (A review) (Basic, 777pp, 1979/1999)

39. Douglas R. Hofstadter, *Metamagical Themas: Questing for the Essence of Mind and Pattern*. "When I was in high school I discovered the joys of reading Martin Gardner's 'Mathematical Games' column in *Scientific American*. After a few years of pleasure he was replaced by someone else who (among other things) wrote on the joys of Rubik's cube and I found myself wasting weeks of time and filling notebooks with my quest to explore and solve the cube. That columnist was Douglas Hofstadter, who brought the same skill at sharing his enthusiasm for his topic that created the amazing, mind shattering 'Gödel, Escher, Bach'. His column, that occupied the same place as 'Mathematical Games', was called 'Metamagical Themas' (looking closely at those two names will tell you a lot about Douglas Hofstadter) and lasted for 13 issues. This book is a compilation of those columns, each with a new endnote by Hofstadter and some letters received by the magazine and his reply." (Basic, 880 pages, 1985)

40. Lancelot Hogben: *Mathematics for the Million*. "The best elementary math book (for algebra, geometry, trig, and spherical trig) Like the Thompson book, it has been in continuous print since the 1930's! There is also lots of history in it. The same author has a history-of-math book, with wonderful illustrations, that I often give to children and arts friends. It really inspired me as a kid." Albert Einstein wrote: "It makes alive the contents of the elements of mathematics." (numerous versions available.)

41. Wendy Isdell: *A Gebra Named AI: A Novel* "Julie hates algebra--until she meets a gebra named AI, and the Periodic horses journey through the Land of Mathematics, where the Orders of Operations are real places and fruits that look like Bohr models grow on chemis-trees." (Free Spirit, 128pp, 1993)

42. Norman Juster: *The Dot and the Line: A Romance in Lower Mathematics*. "My geometry teacher read this story to my class and it is the sweetest story I've ever heard. It may be a tale of a dot and a line, but it means so much more. It says the age is from 4-8 but I think people of all ages will enjoy the story of the dot and the line. Five stars, try six stars. It's great!" (Random, orig. 1963)

43. Robert Kaplan, *The Nothing That Is: A Natural History of Zero*. "It is hard to imagine that an entertaining, informative book could be written about nothing, but Robert Kaplan has done it brilliantly. Starting with the great invention of zero as a place holder, Kaplan takes you through the use of zero in algebra, and in calculus, through the importance of the null set. His book closes with that unthinkable question, 'Why is there something rather than nothing?' about which one cannot long meditate without fear of going mad." (Review by Martin Gardner) (Oxford, 225 pp, 2000)

44. Peggy Kaye: *Afterwards; Folk and Fairy Tales With Mathematical EverAfters* (reading level: ages 9-12) "I enjoyed this book. My students enjoyed the moral lessons that it taught. The stories had a set of mathematical problems at the end for the students to work. Many of the problems could be changed to different grade levels." (Cuisenaire, 128pp, 1997)

45. Margaret Kenda and Phyllis S. Williams: *Math Wizardry for Kids* Over 200 math puzzles, games and designs for kids, also available as a kit with a protractor, various triangles, a ruler, compass, and other essential tools (Ages 8 to 12) (Barron's, 336 pp, 1995)

46. Donald Knuth: *Surreal Numbers: How Two EX-Students Turned on to Pure Mathematics and Found Total Happiness: A Mathematical Novelette* "An astonishing feat of legerdemain. An empty hat rests on a table made of a few axioms of standard set theory. Conway waves two simple rules in the air, then reaches into almost nothing and pulls out an infinitely rich tapestry of numbers that form a real and closed field. Every real number is surrounded by a host of new numbers that lie closer to it than any other "real" value does. The system is truly 'surreal.'" (Addison Wesley, 128 pp, 1982, reprinted many times)

47. Serge Lang, *The Beauty of Doing Mathematics: Three Public Dialogues* This is another book from the famous Yale math professor, Serge Lang. However, this isn't a textbook - it's a collection of 3 dialogues Lang gave in Paris in the 80s. Certainly the discussions are very interesting. The interactions between Lang and the audience, comprising mostly 'ordinary' people but also high-school and college students, set this book apart from a textbook. Lang does a fairly good job at covering the material (relating to primes, Diophantine equations, and a bit of geometry/topology) and explaining it to the non-mathematically-inclined. Of course, with this come problems - Lang only skims over the material and much of what he says is not supported by proof. (Springer-Verlag, 124 pp, 1985)

48. Lawrence S. Leff: *Geometry the Easy Way* "This book will supplement any High School Geometry textbook. The problems in the book range from easy to challenging (some just tedious) that will help and prepare students for tests and other standardized exams. What I really like about this book is that it lays down all of the concepts in a very clear way without using too many words. The book should be used more as a supplement, a reminder, and a guide to help you solve problems. It's not the most colorful and fun book to read, but it is worth all your money if you are looking for a good outlined approach to the subject." (Barron's, 375 pp, 1997)

49. Eli Maor: *e: The Story of a Number* "Until about 1975, logarithms were every scientist's best friend. They were the basis of the slide rule that was the totemic wand of the trade, listed in huge books consulted in every library. Then hand-held calculators arrived, and within a few years slide rules were museum pieces. But  $e$  remains, the center of the natural logarithmic function and of calculus. Eli Maor's book is the only more or less popular account of the history of this universal constant." (Princeton, 232 pp, 1998)

50. Eli Maor: *Trigonometric Delights*, "Maor writes *Trigonometric Delights* from an historical perspective, but it is not a history book. It contains many theorems and results of trigonometry, but it is not a textbook. Rather, Maor achieves a satisfying blend of mathematics and history, creating a work that informs, teaches, and stimulates thought, while underscoring that mathematics is a human endeavor, not a stale collection of facts that exist in a vacuum. His book is the labor of a missionary whose aim is to deepen our appreciation of ideas and the people who developed them, ideas about which we have heard, but have not fully enjoyed. It is evident throughout that Maor is devoted to his subject. His love for trigonometry is contagious. He writes enthusiastically and engagingly." (Princeton, 239 pp, 1998)

51. Leonard Mlodinow: *Euclid's Window: The Story of Geometry from Parallel Lines to Hyperspace*. "Mlodinow reveals how geometry's first revolution began with a 'little' scheme hatched by Pythagoras: the invention of a system of abstract rules that could model the universe. That modest idea was the basis of scientific civilization. But further advance was halted when the Western mind nodded off into the Dark Ages. Finally in the fourteenth century an

obscure bishop in France invented the graph and heralded the next revolution: the marriage of geometry and number  $\Sigma$  "The story of 5 revolutions in geometry." (Free Press, 306 pp, 2001.)

52. Paul J. Nahin: *An Imaginary Tale; The Story of  $\sqrt{-1}$*  tells the 2000-year-old history of one of mathematics' most elusive numbers, the square root of minus one, also known as  $i$ , re-creating the baffling mathematical problems that conjured it up and the colorful characters who tried to solve them. Addressing readers with both a general and scholarly interest in mathematics, Nahin weaves into this narrative entertaining historical facts, mathematical discussions, and the application of complex numbers and functions to important problems." (Princeton, 258 pp, 1998)

53. Paul Nahin: *Duelling Idiots and Other Probability Puzzlers*. "What are your chances of dying on your next flight, being called for jury duty, or winning the lottery? We all encounter probability problems in our everyday lives. In this collection of twenty-one puzzles, Paul Nahin challenges us to think creatively about the laws of probability as they apply in playful, sometimes deceptive, ways to a fascinating array of speculative situations". (Princeton, 256 pp, 2000)

54. Theoni Pappas: *The Adventures of Penrose the Mathematical Cat*. "Penrose, a cat with a knack for math, takes children on an adventurous tour of mathematical concepts from fractals to infinity. When the fractal dragon jumps off the computer screen and threatens to grow larger than the room itself, Penrose must find out if fractal patterns can work in reverse, getting smaller instead of larger." (ages 9-12) (World Wide, 132 pp, 1997)

55. Theoni Pappas: *The Joy of Mathematics*. "Part of the joy of mathematics is that it is everywhere: in soap bubbles, electricity, da Vinci's masterpieces, even in an ocean wave. Written by the well-known mathematics teacher consultant, this two volume collection of over 500 clearly illustrated mathematical ideas, concepts, puzzles, and games shows where they turn up in the 'real' world. You'll find out what a googol is, visit hotel infinity, read a thorny logic problem that was stumping them back in the 8th century." (World Wide, 237 pp, 1989)

56. Theoni Pappas: *More Joy of Mathematics: Exploring Mathematics All Around You*. "Part of the joy of mathematics is that it is everywhere in soap bubbles, electricity, da Vinci's masterpieces, even in an ocean wave. Written by the well-known mathematics teacher consultant, this two volume collection of over 500 clearly illustrated mathematical ideas, concepts, puzzles, and games shows where they turn up in the 'real' world. (World Wide, 304 pp, 1991)

57. John Allen Paulos: *A Mathematician Reads the Newspaper* In my opinion a bit easier to read than his "Innumeracy". Has contents of his numerous articles that are published on-line and in various periodicals, where he investigates the numbers that make the news in economics and politics, health issues, sports, spin-doctoring, recipes, celebrity features, and more. ISBN 0-465-04362-3 (Basic, 212 pp, 1995)

58. Ivars Peterson: *The Mathematical Tourist: Snapshots of Modern Mathematics*. "The only popular book on mathematics that covers many of the really new developments in the field. Ivars is accurate yet accessible, a delicate combination in this subject, particularly." (Freeman, 240 pp, 1988; newer versions are available.)

59. Clifford A. Pickover: *Keys to Infinity*. "A treasure trove of recreational problems." (Martin Gardner) "What could be more appropriate to the subject of infinity than a book like this one, so dense with wonderful puzzles, anecdotes, images, and computer programs that you could pore over it forever?" (Wiley, 332 pp, 1995)



60. George Polya: How to Solve It "This perennial best seller was written by an eminent mathematician, but it is a book for the general reader on how to think straight in any field. In lucid and appealing prose, it shows how the mathematical method of demonstrating a proof or finding an unknown can be of help in attacking any problem that can be "reasoned" out from building a bridge to winning a game of anagrams. Generations of readers have relished G. Polya's deft--indeed, brilliant--instructions on stripping away irrelevancies and going straight to the heart of the problem." (1971; there are many editions)

61. Hans Rademacher and Otto Toeplitz: The Enjoyment of Math . "What is so special about the number 30? How many colors are needed to color a map? Do the prime numbers go on forever? Are there more whole numbers than even numbers? These and other mathematical puzzles are explored in this delightful book by two eminent mathematicians. Requiring no more background than plane geometry and elementary algebra, this book leads the reader into some of the most fundamental ideas of mathematics, the ideas that make the subject exciting and interesting. Explaining clearly how each problem has arisen and, in some cases, resolved, Hans Rademacher and Otto Toeplitz's deep curiosity for the subject and their outstanding pedagogical talents shine through." (Dover, 216 pp, 1966/1990)

62. Constance Reid: From Zero to Infinity: What Makes Numbers Interesting "A classic of popular mathematical literature (since 1955) that combines the mathematics and the history of number theory with descriptions of the mystique that has, on occasion, surrounded the numbers even among great mathematicians." (MAA, 4th edition)

63. Constance Reid: The Search for E. T. Bell An account of one of the century's most colorful mathematicians. Bell's Men of Mathematics (1937) presented mathematics and mathematicians in a way that had never been done before, fascinating many of his colleagues, irritating others, and inspiring young people to become mathematicians. Bell was also widely known as the science fiction writer John Taine. As a result of biographer Reid's discoveries about his early life, almost every statement now in print about Bell's family background and early life will have to be revised, and a new look taken at his extensive mathematical work and his science fiction. (MAA, 384 pp, 1993)

64. Rudy Rucker: Infinity and the Mind A review: "By far the best choice for an educated layperson is this jazzy book which is an excellent introduction to all aspects of the infinite. Rucker does a good job balancing accessibility and sophistication - though the book covers some very sophisticated math, even a high-school student should be able to comprehend most of it. It's a good deal at roughly \$13 and, moreover, widely available - Borders, Barnes and Noble, etc usually have a copy in their math section. Run out and buy a copy - your horizons will be infinitely expanded! also contains one of the best expositions of Godel's incompleteness theorem." (Princeton, 342 pp, 1995)

65. Rudy Rucker: The Fourth Dimension: Toward a Geometry of Higher Reality "Superb! It will hurt your brain if you don't know what you're getting into. On the other hand, if you know what to expect from Science Fact based text then you should be extremely pleased. The Plato's cave story is exceptional, and the tale of Flatland and the contemplation of a 2-D creature seeing/fathoming a 3-D creature is thought provoking. MUST READ." (Houghton Mifflin, 228 pp, 1984)

66. Rudy Rucker: Mind Tools: The Five Levels of Mathematical Reality "This is an amazing book for teaching the concepts of mathematical logic, fractals, number theory, and information theory. I have never seen these concepts introduced in such an easy-to-understand fashion. I

recommend it highly to anyone with an interest in these concepts. Near the end of the book, it does go a little overboard with the information theory and becomes hard to follow."

67. David Salsburg: *The Lady Tasting Tea : How Statistics Revolutionized Science in the Twentieth Century* (In *The Lady Tasting Tea*, David Salsburg tells the fascinating story of how statistics has revolutionized science in the twentieth century. Leading the reader through a maze of randomness and probability, the author clearly explains the nature of statistical models, where they came from, how they are applied to scientific problems, and whether they are true descriptions of reality. Salsburg also discusses the flaws inherent in a statistical model and the serious problems they've created for scientists as we enter the twenty-first century. (Holt, 340 pp, 2001)

68. Bruce Schechter: *My Brain is Open: The Mathematical Journeys of Paul Erdos*. Physicist and science writer Bruce Schechter's biography of legendary Hungarian mathematician Paul Erdős is an engaging portrait, warm and intimate, bringing this strange, happy man to life. Schechter's focus is quite a bit tighter, and more traditionally biographical, than Paul Hoffman's in *The Man Who Loved Only Numbers*. Here, we get to see Erdős's brief childhood transform quickly into a carefree adolescence of solving difficult math problems with his circle of brilliant friends—uniquely encouraged by a country that valued the contributions of mathematics in a way that has never been equaled." (Touchstone, 224 pages, 2000)

69. David M. Schwartz: *On Beyond a Million: An Amazing Math Journey* "Amazing facts about millions, trillions, and much bigger numbers are explained in picture-book cartoon scenarios, contributed by Paul Meisel, that show kids in the classroom, at the seashore, in the rain forest, and all over the place, learning how to count by powers of 10. The design is busy, with sidebars and balloon comments. Each double-page spread is clearly meant to be talked about, and the discussions aren't overwhelming. The sheer numbers are astounding, though, whether they refer to the population of the U.S. or the number of stars in the Milky Way; and the explanation of exponents gives kids a way to count what seems unimaginable." (Ages 9-12) (Bantam, 1999)

70. Dennis Shasha: *The Puzzling Adventures of Dr. Ecco*. "This is an extremely entertaining book written in a lively style. The problems and puzzles are unique and exciting. Dr. Ecco's Holmesian character is insightful and engaging. What is so delightful here is that the problems presented, in addition to being challenging, open up readers to significant and important areas of mathematics and their applications." (Freeman, 181 pp, 1988)

71. Simon Singh: *The Code Book*; The evolution of secrecy from Mary, Queen of Scots to Quantum Cryptography. Codes have decided the fates of empires, countries, and monarchies throughout recorded history. Combining a superb storyteller's sense of drama and a scientist's appreciation for technical perfection, Singh traces the evolution of secret writing from ancient Greek military espionage to the frontiers of computer science. (Doubleday, 402 pp, 1999)

72. Simon Singh: *Fermat's Enigma*; The Epic Quest to Solve the World's Greatest Mathematical Problem. This is the story of the proof of Fermat's Last Theorem by Andrew Wiles, who wrote, "Perhaps I could best describe my experience of doing mathematics in terms of entering a dark mansion. One goes into the first room and it's dark, really dark, and one stumbles around bumping into the furniture. Gradually you learn where each piece of furniture is, and finally, after six months or so, you find the light switch and suddenly it's all illuminated and you can see exactly where you are." (Walker, 315 pp, 1997)

73. Michael Smith: *The Emperor's Codes: The breaking of Japan's Secret Ciphers*. More of a history book than a math book, it shows how important it was in World War 2 for the USA to break the Japanese codes. Gives some details on how it was done. (Arcade, 336 pp, 2000)

74. Sherman Stein: *How The Other Half Thinks; Adventures in Mathematical Reasoning*. "Occasionally, in some difficult musical compositions there are beautiful, but easy, parts - so simple a beginner could play them. So it is with mathematics as well. There are some discoveries in advanced mathematics that do not depend on specialized knowledge, not even on algebra, geometry, or trigonometry. Instead, they may involve, at most, a little arithmetic, such as 'the sum of two odd numbers is even,' and common sense. As I wrote, I kept in mind two types of readers: those who enjoyed until they were turned off by an unpleasant episode, usually around fifth grade; and mathematics aficionados, who will find much that is new throughout the book." (McGraw-Hill, 177 pp, 2001)

75. Ian Stewart: *Does God Play Dice? The New Mathematics of Chaos*. "The science of chaos is forcing scientists to rethink Einstein's fundamental assumptions regarding the way the universe behaves. Chaos theory has already shown that simple systems, obeying precise laws, can nevertheless act in a random manner. Perhaps God plays dice within a cosmic game of complete law and order. Does God Play Dice? reveals a strange universe in which nothing may be as it seems. Familiar geometrical shapes such as circles and ellipses give way to infinitely complex structures known as fractals, the fluttering of a butterfly's wings can change the weather, and the gravitational attraction of a creature in a distant galaxy can change the fate of the solar system." (Blackwell, 416 pp, 2002)

76. Ian Stewart: *Nature's Numbers: The Unreal Reality of Mathematics*. "First-rate popular mathematics writing... Stewart achieves what other popular mathematics writers merely strive for: an accurate, informative portrayal of contemporary mathematics without a single equation in sight... [If] someone you know wants to know what mathematics really is, buy them a copy of *Nature's Numbers*." (Basic, 176 pp, 1997)

77. Malba Tahan: *The Man Who Counted : A Collection of Mathematical Adventures* "The Arabian adventures of a man with remarkable mathematical skills, which he uses to settle conflict and give wise advice." (Norton, 244 pp, 1993)

78. James Tanton *Solve This* . "Jim teaches in the Boston area Math Circle. He is fabulous. The book has plenty of illustrations and lots of engaging problems, some of which would be suitable for bright 8th and 9th graders. Jim has contributed articles to *Math Horizons* which may be accessible online. This is a wonderful book for students and teachers alike. Sophisticated mathematics is made accessible to everyone. Written with humor, thoughtfulness and a real sense of where people have difficulties and how to get around them, Tanton puts his finger on the pleasures and promises of each problem. Not to be missed, no matter how experienced or inexperienced you are." (MAA, 240 pp, 2001)

79. Carol Vonderman: *How Math Works: 100 Ways Parents and Kids Can Share the Wonders of Mathematics*. "Fascinating explanations, activities, profiles of history's most noted mathematical thinkers, and experiments introduce young readers to the world of mathematics." (Putnam, 192 pp, 1999) (Ages 12 +)

80. Norbert Wiener: *Ex-Prodigy: My Childhood and Youth* or *I am a Mathematician or Cybernetics or The Human Use of Human Beings : Cybernetics and Society*. Norbert Wiener was one of the greatest applied mathematicians of this century, and had a great impact on the invention and uses of robots and computers. His writing is clear and elegant. The last book

mentioned does not have a single equation. Anything by him that you can find in a library would be good, if you can understand it.

81. Robert Wright: *Nonzero : The Logic of Human Destiny* "In defiance of the recent scorn heaped on speculations positing progressive or directional laws of history, Robert Wright believes that game theory offers the framework for interpreting such seemingly disparate phenomena as the invention of writing, DNA, and the World Trade Organization as parts of an overarching pattern. The "logic of human destiny" Wright refers to in his subtitle is the logic of non-zero -- that non-zero-sum games inherently provide more fitness for survival than zero-sum games in the long run, and that non-zerosness breeds more non-zerosness by opening up new and more elaborate ways to profit and thrive." (Vintage, 448 pp, 2001)