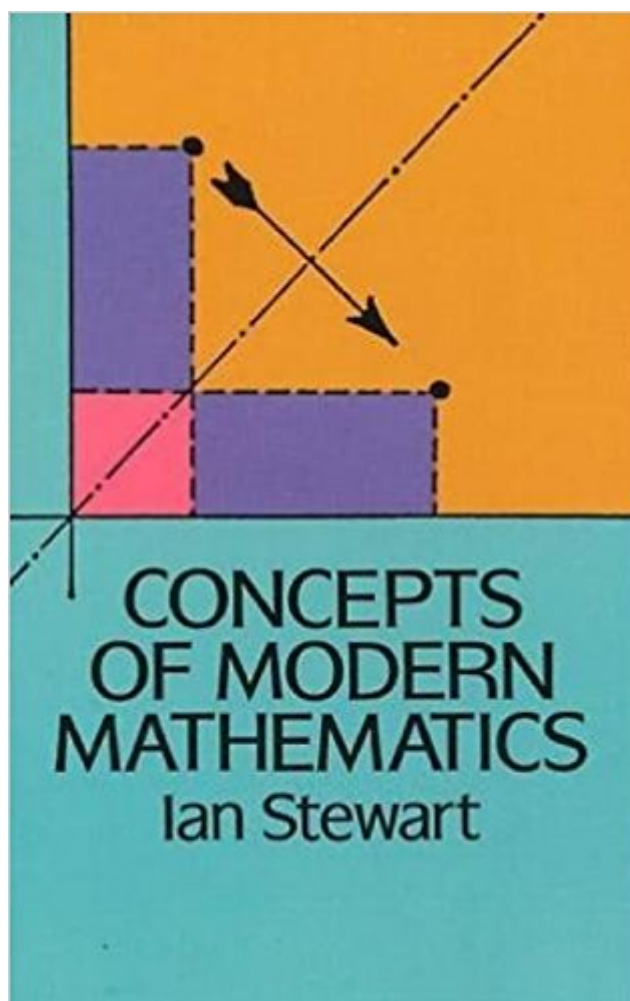


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Concepts Of Modern Mathematics (Dover Books On Mathematics)



Synopsis

Some years ago, "new math" took the country's classrooms by storm. Based on the abstract, general style of mathematical exposition favored by research mathematicians, its goal was to teach students not just to manipulate numbers and formulas, but to grasp the underlying mathematical concepts. The result, at least at first, was a great deal of confusion among teachers, students, and parents. Since then, the negative aspects of "new math" have been eliminated and its positive elements assimilated into classroom instruction. In this charming volume, a noted English mathematician uses humor and anecdote to illuminate the concepts underlying "new math": groups, sets, subsets, topology, Boolean algebra, and more. According to Professor Stewart, an understanding of these concepts offers the best route to grasping the true nature of mathematics, in particular the power, beauty, and utility of pure mathematics. No advanced mathematical background is needed (a smattering of algebra, geometry, and trigonometry is helpful) to follow the author's lucid and thought-provoking discussions of such topics as functions, symmetry, axiomatics, counting, topology, hyperspace, linear algebra, real analysis, probability, computers, applications of modern mathematics, and much more. By the time readers have finished this book, they'll have a much clearer grasp of how modern mathematicians look at figures, functions, and formulas and how a firm grasp of the ideas underlying "new math" leads toward a genuine comprehension of the nature of mathematics itself.

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Customer Reviews

I'm not a mathematician, but i'm enjoying reading this book. I was only going to give it 4 stars, but since it arrived so fast i'm going to go ahead and give it 5!

My review joins the chorus of praise for Dr. Stewart's Concepts of Modern Mathematics ("Concepts"). It has been many years since I put down my slide rule and picked up my math diploma. I wanted a refresher and turned to Concepts for help. Its stated purpose is to spread the concepts underlying the "New Math" to a non-specialized audience. Concepts was the perfect choice. Concepts is organized into twenty short chapters. Dr. Stewart's writing style is informal, enthusiastic, and conversational with a spot of humor. He stresses the primacy of intuition, the role of experimentation in proving utility and the need for rigor when complexity multiplies. In mixing these factors, Dr. Stewart reveals glimpses of how a mathematician works. Abstract algebra, topology and analysis are the "cornerstones" of modern mathematics. The first nine chapters are devoted to an introduction and to teaching axiomatic set-theory at the heart of the "New Math". As Dr. Stewart quips, to study French literature, one must know the French language. Topology is covered in four chapters, real analysis in only one, and applications in five. Dr. Stewart employs his "toolkit" of "...aims, methods, problems and applications..." to illuminate an imposing intellectual structure. For example, complex numbers and infinite sets can cloud the brightest minds. Wielding his tools skillfully, Dr. Stewart demystifies complex numbers by recasting as modular arithmetic and makes cardinals plausible using bijections with natural numbers. Sadly, "Foundations", the final chapter, casts doubt on the reliability of modern mathematics. Dr. Stewart visualizes mathematics as an inverted pyramid balancing precariously on only a few assumptions that cannot be confirmed. The chapter includes outlines of Godel's famous theorems and Dr. Stewart's opinion that "...it proves the impossibility of an arithmetical proof of the consistency of arithmetic". The remedy, says Dr. Stewart, is to trust theorems that should be true and to hope for logic that someday fulfills its promise. Finally, Concepts is just the beginning of a "hard technical grind" for the serious student.

This book is by far the best book on mathematics I have ever read. It teaches the concepts in an intuitive, exciting way, and yet it is able to remain fun and engaging throughout. Technical material is tackled, in depth, without there seeming to be any work done. There are no exercises to be done, you simply follow Stewart along for a tour through modern mathematics. Ian Stewart's writing is flawless and almost turns this book into a thriller. I read this book in one night- I could not put it down! I stayed up until 4 in the morning reading and rereading passages; it is truly a masterpiece.

The chapters are as follows:

Chapter 1- Mathematics in General: Here Stewart describes certain aspects of mathematics, and discusses their purpose and implications. He talks about abstractness and generality, intuition vs. formalism, and pure vs. applied mathematics. He tells the reader the importance of understanding WHY a theorem is true, not simply that it is. He ends with a collection of anecdotes.

Chapter 2- Motion without Motion: This is an example of thinking a bit outside the box. The chapter is devoted to overturning Euclid's proof that the base angles are congruent, and making a new one based on rigid motions. It doesn't sound too engaging, but, somehow, Stewart manages to make it quite exciting!

Chapter 3- Short Cuts in the Higher Arithmetic: A basic introduction to number theory- prime numbers, moduli, congruences, etc. The informal tone makes this the easiest and most understandable read on number theory I've yet encountered.

Chapter 4- The Language of Sets: Throughout the rest of the book, Stewart uses the language of set theory, so he introduces that here in an easy to understand way (using some imagery like bags of items, etc).

Chapter 5- What is a function?: Here Stewart addresses some of the historical problems of defining a function, and then uses the set theory from the previous chapter to define a general function, and the different types of functions.

Chapter 6- The Beginnings of Abstract Algebra: An introduction to groups, fields, rings, etc. Stewart uses the rigid motions from Ch. 2 as an example of the group concept, and then goes on to make a proof about the game solitaire (the British version) using groups. Also an explanation of the proofs about constructibility (trisecting an angle, etc) are given here.

Chapter 7- Symmetry: The Group Concept: This is where we begin to see that Ian Stewart may have a bit of a bias towards abstract algebra and group theory, as that is his specialty. That is perfectly fine, but definitely something to be aware of. The chapter on Real Analysis is certainly less in-depth than this one, but there are many hundreds of books on that you can use to fill the gaps. (Also, Real Analysis is difficult to make accessible to those without a background in calculus, whereas algebra's concepts are fairly natural). In this chapter Stewart discusses groups, subgroups, and isomorphisms with great passion.

Chapter 8- Axiomatics: This is one of my favorite chapters, and it centers on Euclidean geometry and the importance of axiomatics. It discusses models, the parallel postulate, alternate geometries, consistency, and completeness.

Chapter 9- Counting: Finite and Infinite: This is the standard treatment of Cantor and his amazing discovery. I mostly skimmed this chapter, because I had just completed a book specializing in the subject.

Chapter 10- Topology: From Mobius strips, to Klein Bottles, to orientability, to the Hairy Ball Theorem. This chapter keeps to its title. I especially love the last line about the Hairy Ball Theorem (which is a theorem that seems entirely useless at face value). "It has one application in algebra: it can be used to prove that every polynomial equation has solutions in complex numbers (the

so-called 'fundamental theorem of algebra').

Chapter 11- The Power of Indirect Thinking: This is a foray into graph theory and Euler's Formula. A lovely discussion at the end about coloring, as well.

Chapter 12- Topological Invariants: Continues the discussion of topology and proves Euler's generalized formula. Also classifies surfaces, and proves some more coloring theorems.

Chapter 13- Algebraic Topology: You can see that topology is an incredibly important tool in modern mathematics. Here he discusses Holes, Paths, and Loops.

Chapter 14- Into Hyperspace: A short treatment of polytopes and higher dimensions.

Chapter 15- Linear Algebra: A bit on the geometrical, set-theoretic, and matrix views of solving simultaneous linear equations.

Chapter 16- Real Analysis: A light treatment of infinite series, limits, completeness, continuity, and proving analytical theorems.

Chapter 17- The Theory of Probability: Random walks, binomial distribution, etc. Treated informally.

Chapter 18- Computers and Their Uses: Programming and how it works on a mathematical level.

Chapter 19- Applications of Modern Mathematics: A very interesting read about optimization and catastrophe theory.

Chapter 20- Foundations: The best treatment of Godel's proof I have yet to see. It is surprisingly rigorous, but easy to follow.

Appendix- And still it moves...: This was added 5 years after the book was written, and is an absolute gem! Stewart addresses the proof of the four-color theorem, he talks about polynomials and primes, he talks about chaos and attractors, and he ends with a reflection on real mathematics. A great end to a masterpiece.

This book is for everyone and anyone- a modest background in high school algebra and an appreciation for mathematics is all you need. Buy this book! Give it to your friends!

I really loved reading this book. I always felt like my high school & college math classes never gave me an appreciation for math because I could never see the whole picture. This book is about as close as you can get to the ideal mean between math for high school and for math majors. It has proofs, but they're in very digestible language needing only basic algebra, or in Stewarts sublime explanations. He never jumps ahead, as so many textbooks do, through the proofs. There's no "obviously you can see..." or "this exercise is left to the reader..." types of stuff. He brings you straight through the elementary steps behind the essences of these topics. I would recommend this book for anyone who's looking to get a better view of world of math. In my case, I'm trying to get into higher math for fun, and this book really helped me before I started diving deeper into these concepts. This book is like the missing intro chapter to all those texts... Highly recommend this book!

I wish I had discovered Ian Stewart when I was still in school. His texts are accessible but deep enough to give the reader an educated interest in various fields of mathematics. This book kindled a

love for math in me. I think everyone should read at least one book by Ian Stewart.

If you are already a math major then you won't learn much that you don't already know, unless you are behind.

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