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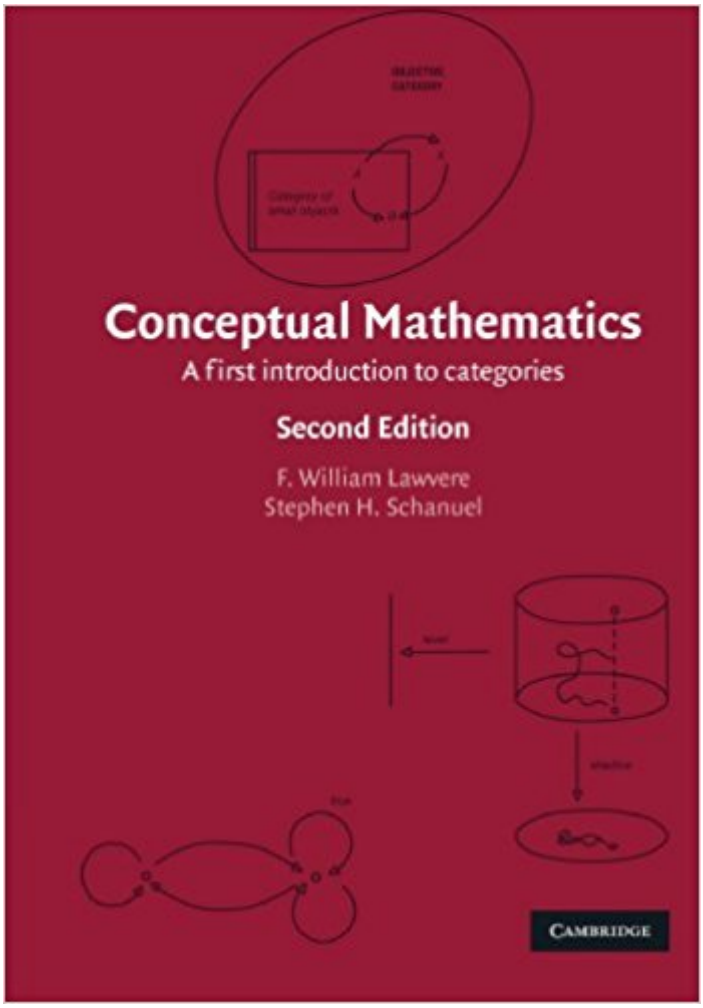
Conceptual Mathematics: A First Introduction To Categories



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Synopsis

In the last 60 years, the use of the notion of category has led to a remarkable unification and simplification of mathematics. Conceptual Mathematics, Second Edition, introduces the concept of 'category' for the learning, development, and use of mathematics, to both beginning students and general readers, and to practicing mathematical scientists. The treatment does not presuppose knowledge of specific fields, but rather develops, from basic definitions, such elementary categories as discrete dynamical systems and directed graphs; the fundamental ideas are then illuminated by examples in these categories.

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Customer Reviews

"This outstanding book on category theory is in a class by itself. It should be consulted at various stages of one's mastery of this fundamental body of knowledge." George Hacken, reviews.com

Conceptual Mathematics introduces the concept of category to beginning students, general readers, and practicing mathematical scientists based on a leisurely introduction to the important categories of directed graphs and discrete dynamical systems. The expanded second edition approaches more advanced topics via historical sketches and a concise introduction to adjoint functors.

This is the best introductory book on Category Theory that I've read.Not a simple read, but far

gentler and more intuitive than the others. Uses illustration’s and even at times an informal conversational style to highlight the concepts.It does use proofs, and even asks you to do them using proper notation. But the notation is reasonable, and the proofs logical, and can be skipped altogether if desired.I might like it to get to be shorter or get to the point quicker. You really do need to start at the beginning and work through the chapters. For the abstract groundwork laid by earlier chapters is essential to understanding the latter ones.Sure, it could be better. It could be clearer and have even better illustrations. But a survey of the alternatives reveals this author’s love for the topic and so clearly shines above similar works, that I give it a 5 star rating.

Possibly a more apt subtitle for this book would be "A First Introduction to Ideas that Underlie Category Theory." Even after spending quite a bit of time with this book, I didn’t really feel like I’d learned much category theory, per se. (Tom Leinster’s Basic Category Theory seems like an excellent choice if you want to jump right into definitions of categories, functors and natural transformations, then start thinking in terms of adjoints, etc. He also makes that book available on arxiv.) But, early on, Lawvere/Schanuel’s book introduced (quite clearly, I think) category-theoretic ideas like sections and retractions, which I hadn’t even realized that I’d encountered before. (I’d spent some time with Tu’s Intro to Manifolds before this book, and at first I wondered if his definition of a section in the discussion of vector bundles had typos in it or what; after some time with Lawvere/Schanuel, that section from Tu makes a lot more sense.)As others have mentioned, the books seems like it might be quite simple, near the beginning. At first, given my lack of familiarity with category theory, this book made me wonder if category theory was the study of the consequences of associativity of composition laws, as that’s a bit of a recurring theme in this book. And speaking of composition laws, if one wants to come up with a list of prerequisites for this book (or to start reading it, at least), I’d dare say that a familiarity with the composition of functions might be all you really need. That said, I should say this: I recently took a first pass at Rotman’s Intro to Algebraic Topology and, after reading his discussion of Brouwer’s fixed point theorem, I went back to Lawvere/Schanuel to revisit their section of the same topic, but still didn’t feel clear about the Lawvere/Schanuel version after re-reading that section. (Rotman, on the other hand, I found quite easy to understand.) So while one could start this book with minimal prerequisites, I don’t expect to feel like I’d understood it all, any time soon (and I’m well past the minimal prerequisites I just offered). And that’s sort of a drawback -- the difficultly level of the book doesn’t exactly scale smoothly, once you’re into the latter half or so of the book. But that’s probably my only criticism, as I find the discussion-driven parts of the book generally quite lucid and insightful.

Having read it myself when it first came out, I bought this copy for my niece, who is graduating the Danish gymnasium (high school equivalent) this summer, and as I had, she found it instructive and exciting. It is exactly what it says on the label: a first introduction to category theory, by one of the founders of the field. Lawvere simply imho does an exemplary job of teaching a different way of thinking about math and logic: this is how it is supposed to be done.

I've been trying to expose myself to category theory through the literature. The literature of course demands a sophistication I have yet to attain. I have found this book to be a perfect primer on the subject. It is not easy, but accessible with some meditation on the examples. The connections the book makes from category theory to the more concrete concepts of the physical sciences are illuminating.

This book is a simple introduction to category theory. It is strictly about categories, examples are easy to understand and relevant to beginners. You will not see references to vector spaces, matrices, algebras or topologies, but you will understand what category theory is about.

Unlike many category theory books that end up drowning you in a notational blizzard, this book starts off at a more basic level and carefully walks you upwards. I have yet to finish it cover-to-cover, but I very much like the material I've read thus far.

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