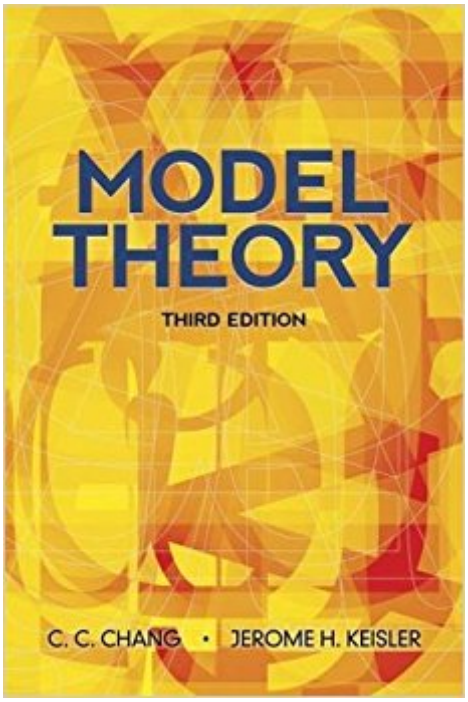
Model Theory: Third Edition (Dover Books On Mathematics)



Synopsis

Model theory deals with a branch of mathematical logic showing connections between a formal language and its interpretations or models. This is the first and most successful textbook in logical model theory. Extensively updated and corrected in 1990 to accommodate developments in model theoretic methods Ã¢â ¬â • including classification theory and nonstandard analysis Ã¢â ¬â • the third edition added entirely new sections, exercises, and references.Each chapter introduces an individual method and discusses specific applications. Basic methods of constructing models include constants, elementary chains, Skolem functions, indiscernibles, ultraproducts, and special models. The final chapters present more advanced topics that feature a combination of several methods. This classic treatment covers most aspects of first-order model theory and many of its applications to algebra and set theory.

Book Information

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Customer Reviews

This is a heavy book, not a gentle first introduction to model theory. I am not an expert in this subject, but since no one else has reviewed this book yet, I'll say what I can.In this Dover book, "Model Theory: Third Edition, by Chang and Keisler, the first paragraph of page x, "How to use this book as a text", is a bit misleading in my opinion. (You can see this page in the preview.) This paragraph is such an understatement, I think it deserves to be quoted here.* "This book is written at a level appropriate to first year graduate students in mathematics. The only prerequisite is some

exposure to elementary logic including the notion of a formal proof. It would be helpful if the student has had undergraduate-level courses in set theory and modern algebra. All the set theory needed for the book is presented in the Appendix which the student can use to fill in any gaps in his knowledge. The first four chapters proceed at a leisurely pace. The last three chapters proceed more rapidly and require more sophistication on the part of the student."My comments:* The "first year graduate" level is accurate.* Their prerequisite of "some exposure" to elementary logic and formal proofs seems a bit inadequate. I think a fairly thorough-going course on mathematical logic would be more suitable.* I think it would not be just "helpful" to have studied undergraduate set theory. It's really essential, and not just ZFC set theory. One really needs to know quite a lot about ordinal arithmetic beforehand too.* The idea that "all the set theory needed for the book is presented in the Appendix" is a bit surprising to me. There is a really, really quick summary of Z, ZF, ZFC, Bernays and Bernays-Morse set theory in the 18-page Appendix A. To understand this, one would need at least a good prior familiarity with ZF, ZFC and NBG set theories.* The claim that "the first four chapters proceed at a leisurely pace" is, I think, intended to be humorous. They cannot be serious!* They must have been laughing a lot when they wrote the final sentence about the more rapid pace and the need for more sophistication in the last 3 chapters!The style of the book is quite dry. It's quite business-like, not chatty and conversational like some mathematical logic books.The content.* All of propositional calculus is defined and summarised in Section 1.2 in 14 pages. For this "'toy' model theory" (to use their own words), they define a model to be any subset of a set of statements, which may seem somewhat minimalist. But they want to get it out of the way quickly because this is not the real business of the book. They define sentences in a formal language in terms of sentence symbols and the usual logical operators Ãƒâ Ã Â¬ and Ã¢Ë†Â§. Other binary operators are defined in terms of these. (I mention this because they have used my preferred set of basic logical operators.) Then they give a completeness theorem and a compactness theorem. They define a "theory", "axioms", "validity", "deducibility", and so forth, for this "toy model theory".* Then they do the same thing for predicate calculus (first-order languages) in Section 1.3 (18 pages), defining an interpretation of a language as a map from the relations, functions and constants of the language to corresponding structures on a universe (which is assumed to be a set, although maybe they later imply that it can be a proper class). They formalise these languages in terms of variables, parentheses, Ã¢Ë†Â§, Ãƒâ Ã Â¬ and Ã¢Ë†â ¬. (These also happen to be my favourite basic logical primitives for the predicate calculus! Some people use Ã¢Ë†Æ', for example.) They carefully define terms, atomic formulas, and formulas in terms of these. They give axioms and deduction rules (including modus ponens). And then they give lots of basic results for such languages.The

reason I give so much detail about the first 36 pages is to indicate that most of a basic introduction to mathematical logic is covered very quickly indeed, and from a fairly advanced viewpoint. And then you have 500 pages of the really serious model theory to wade through. (You can read the table of contents in the preview to see the topics which are covered.)Set theory doesn't start to come explicitly into the picture until you get to Section 7.4 (page 558), the last section of the book! They only start to talk about set theory here because it is needed for some material on large cardinals. Since they need the constructible universe, they require the reader to get this from somewhere else, like Shoenfield'sÃ Â Mathematical Logic, pages 270-281, or Paul Cohen'sÃ Â Set Theory and the Continuum Hypothesis, pages 95-106, both of which are elementary books compared to this one!On page 560, they then finally say something about what they mean by a "set". They mention that all of their book requires a UST (Underlying Set Theory), and they say that it doesn't matter much which one you use, either ZFC or Bernays-GÃƒÂ¶del or Bernays-Morse. (They assume AC throughout the book, by the way.) But at this point, for talking about large cardinals, they decide that the UST must be explicit, and they choose Bernays-Morse. Then they proceed with the results they want to present in Section 7.4, the last section of the book. However,..... there's more!For those readers who are a bit rusty on their set theory, they present the set theories Z, ZF, Bernays-GÃƒÂ¶del and Bernays-Morse (all assuming AC) in 17 pages in Appendix A. If you don't know this material already, you're going to find this a bit "fast". (By the way, they do not assume CH or GCH.)I hope this gives some hint of the level at which this book is pitched. I don't understand 90% of it. But I must say that I think this book is well organised. It has lots of exercises for anyone who wants to spend the necessary year studying this book. If you study this book, you will definitely learn something about model theory!

This review is for the Kindle edition, and will focus on those aspects of the text. Chang's book is a classic which stood as THE standard text book for upper-division undergrad/first year graduate courses, for a great many years. While some texts have superseded the Chang/Keisler work with newer materials (the Chang says almost nothing about game-theoretic methods due to Ehrenfeucht-Frasse, for example), as an intro to the basic methods and motivations of Model Theory, this remains a superb book.What I particularly wish to highlight here is the functionality that Dover has brought into play with this Kindle edition. The formatting is quite good, and one does not see the strange symbols or out of place arrangements that have dogged early attempts at logic/mathematics books in the Kindle format. There is, of course, an active table of contents that links to chapters and sections. But what I find so spectacularly exciting about this book is that it

electronically links back to theorems and propositions referenced in the text. Thus, for example, when theorem 1.3.18 is referred to in a later section of the book, there is a link that takes you directly back to that theorem so that you can remind yourself what is being stated, and how it is being proved! This is an extraordinarily useful feature, and the first time that I've encountered it in a Kindle book. For the first time in my experience, the eBook is MORE useful than the woodpulp original. Given that as of 5+ years ago, customer service at Dover Publications told me they had no plans to migrate into the eBook world, this is an outstanding example of how things ought to be done. They are to be commended for their excellent work here.As other reviewers have noted, this book is an "intro" only for people who are already moderately facile with formal logic and set theory. However, as an eBook, this volume is now the standard that all others in the logic/mathematics field must live up to.

This wonderful book should be on the shelf of every mathematical logician. It is a wonderful read and is now in a third edition. I couldn't recommend the book more highly.

A classic in the field

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