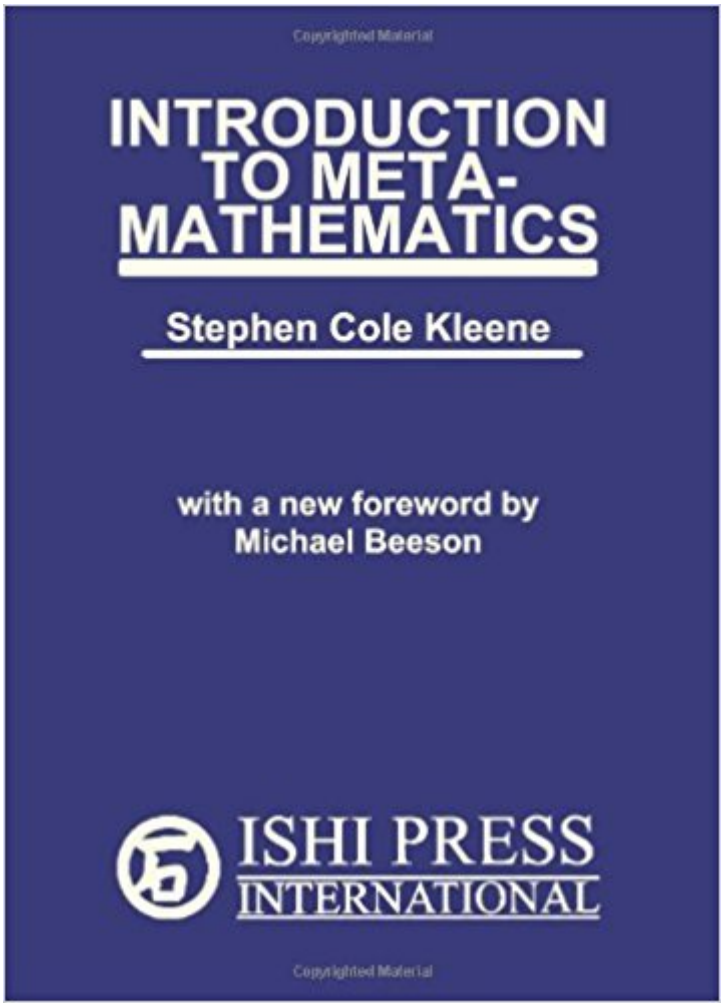
Introduction To Metamathematics



Synopsis

Stephen Cole Kleene was one of the greatest logicians of the twentieth century and this book is the influential textbook he wrote to teach the subject to the next generation. It was first published in 1952, some twenty years after the publication of GÃƒÂ¶del's paper on the incompleteness of arithmetic, which marked, if not the beginning of modern logic, at least a turning point after which Ã¢â ¬Å“nothing was ever the same.Ã¢â ¬Â• Kleene was an important figure in logic, and lived a long full life of scholarship and teaching. The 1930s was a time of creativity and ferment in the subject, when the notion of Ã¢â ¬Å“computableÃ¢â ¬Â• moved from the realm of philosophical speculation to the realm of science. This was accomplished by the work of Kurt GÃƒÂ¶de1, Alan Turing, and Alonzo Church, who gave three apparently different precise definitions of Ã¢â ¬Å“computableÃ¢â ¬Â•. When they all turned out to be equivalent, there was a collective realization that this was indeed the Ã¢â ¬Å“right notionÃ¢â ¬Â•. Kleene played a key role in this process. One could say that he was Ã¢â ¬Å“there at the beginningÃ¢â ¬Â• of modern logic. He showed the equivalence of lambda calculus with Turing machines and with GÃƒÂ¶del's recursion equations, and developed the modern machinery of partial recursive functions. This textbook played an invaluable part in educating the logicians of the present. It played an important role in their own logical education.

Book Information

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Customer Reviews

This 1952 book by Stephen Cole Kleene (1909-1994) is essential for anyone who wants to

understand mathematical logic at the graduate level. The motivating theme driving this book is the consistency question for arithmetic. Both the negative results of GÃƒÂ¶del and the positive result of Gentzen are given as consequences of technically precise formalisms.There are other books which also present the same negative and positive answers to the arithmetic completeness question, but this book by Kleene presents a very thorough basis in propositional and predicate calculus along the way, for which metamathematical theorems are developed towards obtaining these answers.On page 82, a more or less Hilbert-style formal system is given in three parts: first a set of propositional calculus axioms and one rule (modus ponens), then a set of predicate calculus axioms and two rules (universal introduction and existential elimination), and finally a set of non-logical axioms for a first-order language with equality including arithmetic addition and multiplication. This system is developed in Kleene's particular style until GÃƒÂ¶del's theorem can be stated and proved (minus one lemma) on pages 204-213.Pages 217-439 present a broad range of mathematical logic, including recursive functions, the GÃƒÂ¶del numbering, Post's theorem, Church's theorem, computable functions, and Skolem's paradox.Finally Chapter XV (pages 440-516) present Gentzen's system in much the same form as Gentzen's original 1934 paper, within which the consistency of number theory can be proved. (See pages 476-479.)

Kleene's textbook is one of the fundamental texts of mathematical logic. It is easy to see why it is (supposedly) the most cited book in the mathematical logic literature. It is a model of clear explanation, and it does a better job of motivating the subject than any other textbook I have read (I mean deep intellectual and historical motivation of the subject, not the kind of motivation found in introductory logic books about what deduction is, and why learning logic is a good thing to do). Ishi press are to be thanked for making it readily available again at a low price. This edition however is a little on the cheaply made side; this edition was scanned from an older edition, and there are faint copy lines on most pages, so it looks like a photocopy. The pages are glued to the spine, and the binding is not flexible and does not appear all that durable. This means this edition is probably not ideal for serious study as the book will not lay out flat, and forcing it to do so may crack the spine. Nevertheless, if you are interested in mathematical logic this is a must read, and this edition makes it much easier to do so.

The other reviewers have lauded the book enough that any more praise may seem embarrassing to everyone involved; but more praise it deserves. It integrates some philosophy (intuitionism, formalism, and logicism) more than most modern texts, and is very thorough in its coverage. The

annotated bibliography is useful, though the new introductory material added to the Isha edition seems insubstantial (e.g., the introduction cites the wikipedia article on Kleene as a source).Some criticism it surely deserves: the lack of model theory reveals the book's age (though the reviewer Guilherme thinks this alternative perspective to be a strength). Paul E. Mokrzecki's review rather eccentrically pans the text for using the truth-functional definition of implication (we're all familiar with it: false only when the antecendent is true and the consequent false). Achronymous faults the text for its construction, but so far my copy has beautifully suffered my abuse. Sure, there are a few copy lines, but before this edition I would have had to shell out about two hundred dollars for a copy! I was heartbroken.And another miracle has occurred: though Chang and Keisler's Model Theory may be a bit dated too (Hodges or Marker are newer, we know we know...), the Dover Publications reprint means that an affordable model theory text can accompany Kleene. The availability of cheap model theory texts makes Kleene's lack of inclusion of this subject far from disastrous.

The book is a classic one. The rating is about the production. It seems they have produced the book from a copy of the original edition. Maybe the original publisher does not have films anymore... So the the production of the book is not ideal.

One of the greatest contributors to Metamathematics; in particular, tp many-valued logic and its consequences. Very recomendable book, but not for beginners.

I worked in "Foundations" in my thesis(1966) through Wilder. This informed me of intuitionist advances since then. So, it was very helpful.

S. Kleene, probably the first giant among the second generation of computation theorists has provided succeeding generations with a compendium of results that would be very hard to find anywhere else, even in journals. The exposition is carried out with full mathematical rigor and is perhaps the last time the term `metamathematics' is used correctly and at length. For example, see Tarski's use of the term. This work is indispensable to any serious computation theorist if for no other reason than providing an example of full-fledged intellectual integrity.B. Litow

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