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Set Theory and Logic An Introduction to Mathematical Logic and Type Theory A Structuralist Theory of Logic Set Theory, Logic and Their Limitations Mathematical Logic and Model Theory Sets, Logic and Categories Set Theory and Logic Theories in Logic Notes on Logic and Set Theory Logic for Physicists Mathematical Logic and Formalized Theories Proof Theory and Algebra in Logic Categorical Logic and Type Theory The Semantics and Proof Theory of the Logic of Bunched Implications Hybrid Logic and its Proof-Theory A First Course in Logic An Introduction to Mathematical Logic and Type Theory Probability Theory On Logic and the Theory of Science Mathematical Intuitionism Introduction to Logic and Theory of Knowledge Mathematical Logic A First Course in Mathematical Logic and Set Theory An Introduction to Logical Theory Foundations of the Logical Theory of Scientific Knowledge (Complex Logic) Mathematical Logic and Model Theory Problems in Set Theory, Mathematical Logic and the Theory of Algorithms Logic for Use Introduction to Mathematical Logic The Theory of Logical Types (Routledge Revivals) Logic and Relational Theory Learning Music Theory with Logic, Max, and Finale The Logic of Information Groundwork in the Theory of Argumentation Finite Model Theory Computational Logic and Set Theory Lectures in Logic and Set Theory Switching Theory for Logic Synthesis Decidability of Logical Theories and Their Combination Aristotle and Logical Theory

In case you are considering to adopt this book for courses with over 50 students, please contact ties.nijssen@springer.com for more information. This introduction to mathematical logic starts with propositional calculus and first-order logic. Topics covered include syntax, semantics, soundness, completeness, independence, normal forms, vertical paths through negation normal formulas, compactness, Smullyan's Unifying Principle, natural deduction, cut-elimination, semantic tableaux, Skolemization, Herbrand's Theorem, unification, duality, interpolation, and definability. The last three chapters of the book provide an introduction to type theory (higher-order logic). It is shown how various mathematical concepts can be formalized in this very expressive formal language. This expressive notation facilitates proofs of the classical incompleteness and undecidability theorems which are very elegant and easy to understand. The discussion of semantics makes clear the important distinction between standard and nonstandard models which is so important in understanding puzzling phenomena such as the incompleteness theorems and Skolem's Paradox about countable models of set theory. Some of the numerous exercises require giving formal proofs. A computer program called ETPS which is available from the web facilitates doing and checking such exercises. Audience: This volume will be of interest to mathematicians, computer scientists, and philosophers in universities, as well as to computer scientists in industry who wish to use higher-order logic for hardware and software specification and verification. This is an introduction to set theory and logic that starts completely from scratch. The text is accompanied by many methodological remarks and explanations. A rigorous axiomatic presentation of Zermelo-Fraenkel set theory is given, demonstrating how the basic concepts of mathematics have apparently been reduced to set theory. This is followed by a presentation of propositional and first-order logic. Concepts and results of recursion theory are explained in intuitive terms, and the author proves and explains the limitative results of Skolem, Tarski, Church and Gödel (the celebrated incompleteness theorems). For students of mathematics or philosophy this book provides an excellent introduction to logic and set theory. Problems in Set Theory, Mathematical Logic and the Theory of Algorithms by I. Lavrov & L. Maksimova is an English translation of the fourth edition of the most popular student problem book in mathematical logic in Russian. It covers major classical topics in proof theory and the semantics of propositional and predicate logic as well as set theory and computation theory. Each chapter begins with 1-2 pages of terminology and definitions that make the book self-contained. Solutions are provided. The book is likely to become an essential part of curricula in logic. Aristotle was the first and one of the greatest logicians. He not only devised the first system of formal logic, but also raised many fundamental problems in the philosophy of logic. In this book, Dr Lear shows how Aristotle's discussion of logical consequence, validity and proof can contribute to contemporary debates in the philosophy of logic. No background knowledge of Aristotle is assumed. J. Anthony Blair is a prominent international figure in argumentation studies. He is among the originators of informal logic, an author of textbooks on the informal logic approach to argument analysis and evaluation and on critical thinking, and a founder and editor of the journal Informal Logic. Blair is widely recognized among the leaders in the field for contributing formative ideas to the argumentation literature of the last few decades. This selection of key works provides insights into the history of the field of argumentation theory and various related disciplines. It illuminates the central debates and presents core ideas in four main areas: Critical Thinking, Informal Logic, Argument Theory and Logic, Dialectic and Rhetoric. This is a monograph about logic. Specifically, it presents the mathe matical theory of the logic of bunched implications, BI: I consider Bl's proof theory, model theory and computation theory. However, the mono graph is also about informatics in a sense which I explain. Specifically, it is about mathematical models of resources and logics for reasoning about resources. I begin with an introduction which presents my (background) view of logic from the point of view of informatics, paying particular attention to three logical topics which have arisen from the development of logic within informatics: • Resources as a basis for semantics; • Proof-search as a basis for reasoning; and • The theory of representation of object-logics in a meta-logic. The ensuing development represents a logical theory which draws upon the mathematical, philosophical and computational aspects of logic. Part I presents the logical theory of propositional BI, together with a computational interpretation. Part II presents a corresponding devel opment for predicate BI. In both parts, I develop proof-, model- and type-theoretic analyses. I also provide semantically-motivated compu tational perspectives, so beginning a mathematical theory of resources. I have not included any analysis, beyond conjecture, of properties such as decidability, finite models, games or complexity. I prefer to leave these matters to other occasions, perhaps in broader contexts. Mathematical Logic and Model Theory: A Brief Introduction offers a streamlined yet easy-to-read introduction to mathematical logic and basic model theory. It presents, in a self-contained manner, the essential aspects of model theory needed to understand model theoretic algebra. As a profound application of model theory in algebra, the last part of this book develops a complete proof of Ax and Kochen's work on Artin's conjecture about Diophantine properties of p-adic number fields. The character of model theoretic constructions and results differ quite significantly from that commonly found in algebra, by the treatment of formulae as mathematical objects. It is therefore indispensable to first become familiar with the problems and methods of mathematical logic. Therefore, the text is divided into three parts: an introduction into mathematical logic (Chapter 1), model theory (Chapters 2 and 3), and the model theoretic treatment of several algebraic theories (Chapter 4). This book will be of interest to both advanced undergraduate and graduate students studying model theory and its applications to algebra. It may also be used for self-study. This reissue, first published in 1971, provides a brief historical account of the Theory of Logical Types; and describes the problems that gave rise to it, its various different formulations (Simple and Ramified), the difficulties connected with each, and the criticisms that have been directed against it. Professor Copi seeks to make the subject accessible to the non-specialist and yet provide a sufficiently rigorous exposition for the serious student to see exactly what the theory is and how it works. This book gives a rigorous yet 'physics-focused' introduction to mathematical logic that is geared towards natural science majors. We present the science major with a robust introduction to logic, focusing on the specific knowledge and skills that will unavoidably be needed in calculus topics and natural science topics in general (rather than taking a philosophical math fundamental oriented approach that is commonly found in mathematical logic textbooks). Boston Studies in the Philosophy of Science are devoted to symposia, con gresses, colloquia, monographs and collected papers on the philosophical foundations of the sciences. It is now our pleasure to include A. A. Zi nov'ev's treatise on complex logic among these volumes. Zinov'ev is one of the most creative of modern Soviet logicians, and at the same time an innovative worker on the methodological foundations of science. More over, Zinov'ev, although still a developing scholar, has exerted a sub stantial and stimulating influence upon his colleagues and students in Moscow and within other philosophical and logical circles of the Soviet Union. Hence it may be helpful, in bringing this present work to an English-reading audience, to review briefly some contemporary Soviet investigations into scientific methodology. During the 1950's, a vigorous new research program in logic was under taken, and the initial published work -characteristic of most Soviet pub lications in the logic and methodology of the sciences - was a collection of essays, Logical Investigations (Moscow, 1959). Among the authors, in addition to Zinov'ev himself, were the philosophers A. Kol'man and P. V. Tavanec, and the mathematicians and linguists, S. A. Janovskaja, A. S. Esenin-Vol'pin, S. K. Saumjan, G. N. Povarov. A mathematical introduction to the theory and applications of logic and set theory with an emphasis on writing proofs Highlighting the applications and notations of basic mathematical concepts within the framework of logic and set theory, A First Course in Mathematical Logic and Set Theory introduces how logic is used to prepare and structure proofs and solve more complex problems. The book begins with propositional logic, including two-column proofs and truth table applications, followed by first-order logic, which provides the structure for writing mathematical proofs. Set theory is then introduced and serves as the basis for defining relations, functions, numbers, mathematical induction, ordinals, and cardinals. The book concludes with a primer on basic model theory with applications to abstract algebra. A First Course in Mathematical Logic and Set Theory also includes: Section exercises designed to show the interactions between topics and reinforce the presented ideas and concepts Numerous examples that illustrate theorems and employ basic concepts such as Euclid’s lemma, the Fibonacci sequence, and unique factorization Coverage of important theorems including the well-ordering theorem, completeness theorem, compactness theorem, as well as the theorems of Löwenheim–Skolem, Burali-Forti, Hartogs, Cantor–Schröder–Bernstein, and König An excellent textbook for students studying the foundations of mathematics and mathematical proofs, A First Course in Mathematical Logic and Set Theory is also appropriate for readers preparing for careers in mathematics education or computer science. In addition, the book is ideal for introductory courses on mathematical logic and/or set theory and appropriate for upper-undergraduate transition courses with rigorous mathematical reasoning involving algebra, number theory, or analysis. This book is a revised, upgraded, and hugely improved version of an earlier one called Logic and Databases. Although it's effectively a brand new book, therefore, the following remarks from that earlier book are still relevant here. First, logic and databases are inextricably intertwined. The relational model itself is essentially just elementary logic, tailored to database needs. Now, if you're a database professional, this won't be news to you-but you still might not realize just how much everything we do in the database world is (or should be!) affected by logic. Logic is fundamental, and everywhere. As a database professional, therefore, you owe it to yourself to understand the basics of formal logic, and you ought to be able to explain (and perhaps defend) the connections between formal logic and database technology. And that's what this book is about. What it does is show, through a series of partly independent, partly interrelated essays, just how various crucial aspects of database technology-some of them very familiar, others maybe less so-are solidly grounded in formal logic. Overall, the goal is to help you realize the importance of logic in everything you do, and also, I hope, to help you see that logic can be fun. The ability to reason and think in a logical manner forms the basis of learning for most mathematics, computer science, philosophy and logic students. Based on the author's teaching notes at the University of Maryland and aimed at a broad audience, this text covers the fundamental topics in classical logic in an extremely clear, thorough and accurate style that is accessible to all the above. Covering propositional logic, first-order logic, and second-order logic, as well as proof theory, computability theory, and model theory, the text also contains numerous carefully graded exercises and is ideal for a first or refresher course. In the area of mathematical logic, a great deal of attention is now being devoted to the study of nonclassical logics. This book intends to present the most important methods of proof theory in intuitionistic logic and to acquaint the reader with the principal axiomatic theories based on intuitionistic logic. This book reclaims logic as a branch of philosophy, offering a self-contained and complete introduction to the three traditional systems of classical logic (term, sentence, and predicate logic) and the philosophical issues that surround those systems. The exposition is lucid, clear, and engaging. Practical methods are favored over the traditional, and creative approaches over the merely mechanical. The author’s guiding principle is to introduce classical logic in an intellectually honest way, and not to shy away from difficulties and controversies where they arise. Relevant philosophical issues, such as the relation between the meaning and the referent of a proper name, logical versus metaphysical possibility, and the conceptual content of an expression, are discussed throughout. In this way, the book is not only an introduction to the three main systems of classical logic, but also an introduction to the philosophy of classical logic. Switching Theory for Logic Synthesis covers the basic topics of switching theory and logic synthesis in fourteen chapters. Chapters 1 through 5 provide the mathematical foundation. Chapters 6 through 8 include an introduction to sequential circuits, optimization of sequential machines and asynchronous sequential circuits. Chapters 9 through 14 are the main feature of the book. These chapters introduce and explain various topics that make up the subject of logic synthesis: multi-valued input two-valued output function, logic design for PLDs/FPGAs, EXOR-based design, and complexity theories of logic networks. An appendix providing a history of switching theory is included. The reference list consists of over four hundred entries. Switching Theory for Logic Synthesis is based on the author's lectures at Kyushu Institute of Technology as well as seminars for CAD engineers from various Japanese technology companies. Switching Theory for Logic Synthesis will be of interest to CAD professionals and students at the advanced level. It is also useful as a textbook, as each chapter contains examples, illustrations, and exercises. A new translation of the final work of French philosopher Jean Cavaillès. In this short, dense essay, Jean Cavaillès evaluates philosophical efforts to determine the origin—logical or ontological—of scientific thought, arguing that, rather than seeking to found science in original intentional acts, a priori meanings, or foundational logical relations, any adequate theory must involve a history of the concept. Cavaillès insists on a historical epistemology that is conceptual rather than phenomenological, and a logic that is dialectical rather than transcendental. His famous call (cited by Foucault) to abandon "a philosophy of consciousness" for "a philosophy of the concept" was crucial in displacing the focus of philosophical enquiry from aprioristic foundations toward structural historical shifts in the conceptual fabric. This new translation of Cavaillès's final work, written in 1942 during his imprisonment for Resistance activities, presents an opportunity to reencounter an original and lucid thinker. Cavaillès's subtle adjudication between positivistic claims that science has no need of philosophy, and philosophers' obstinate disregard for actual scientific events, speaks to a dilemma that remains pertinent for us today. His affirmation of the authority of scientific thinking combined with his commitment to conceptual creation yields a radical defense of the freedom of thought and the possibility of the new. Mathematical Logic and Formalized Theories: A Survey of Basic Concepts and Results focuses on basic concepts and results of mathematical logic and the study of formalized theories. The manuscript first elaborates on sentential logic and first-order predicate logic. Discussions focus on first-order predicate logic with identity and operation symbols, first-order predicate logic with identity, completeness theorems, elementary theories, deduction theorem, interpretations, truth, and validity, sentential connectives, and tautologies. The text then tackles second-order predicate logic, as well as second-order theories, theory of definition, and second-order predicate logic F2. The publication takes a look at natural and real numbers, incompleteness, and the axiomatic set theory. Topics include paradoxes, recursive functions and relations, Gödel's first incompleteness theorem, axiom of choice, metamathematics of R and elementary algebra, and metamathematics of N. The book is a valuable reference for mathematicians and researchers interested in mathematical logic and formalized theories. This book is an attempt to give a systematic presentation of both logic and type theory from a categorical perspective, using the unifying concept of fibred category. Its intended audience consists of logicians, type theorists, category theorists and (theoretical) computer scientists. This textbook provides a self-contained introduction to decidability of first-order theories and their combination. The technical material is presented in a systematic and universal way and illustrated with plenty of examples and a range of proposed exercises. After an overview of basic first-order logic concepts, the authors discuss some model-theoretic notions like embeddings, diagrams, and elementary substructures. The text then goes on to explore an applicable way to deduce logical consequences from a given theory and presents sufficient conditions for a theory to be decidable. The chapters that follow focus on quantifier elimination, decidability of the combination of first-order theories and the basics of computability theory. The inclusion of a chapter on Gentzen calculus, cut elimination, and Craig interpolation, as well as a chapter on combination of theories and preservation of decidability, help to set this volume apart from similar books in the field. Decidability of Logical Theories and their Combination is ideal for graduate students of Mathematics and is equally suitable for Computer Science, Philosophy and Physics students who are interested in gaining a deeper understanding of the subject. The book is also directed to researchers that intend to get acquainted with first-order theories and their combination. This must-read text presents the pioneering work of the late Professor Jacob (Jack) T. Schwartz on computational logic and set theory and its application to proof verification techniques, culminating in the ÆtnaNova system, a prototype computer program designed to verify the correctness of mathematical proofs presented in the language of set theory. Topics and features: describes in depth how a specific first-order theory can be exploited to model and carry out reasoning in branches of computer science and mathematics; presents an unique system for automated proof verification in large-scale software systems; integrates important proof-engineering issues, reflecting the goals of large-scale verifiers; includes an appendix showing formalized proofs of ordinals, of various properties of the transitive closure operation, of finite and transfinite induction principles, and of Zorn's lemma. Set theory, logic and category theory lie at the foundations of mathematics, and have a dramatic effect on the mathematics that we do, through the Axiom of Choice, Gödel's Theorem, and the Skolem Paradox. But they are also rich mathematical theories in their own right, contributing techniques and results to working mathematicians such as the Compactness Theorem and module categories. The book is aimed at those who know some mathematics and want to know more about its building blocks. Set theory is first treated naively an axiomatic treatment is given after the basics of first-order logic have been introduced. The discussion is su pported by a wide range of exercises. The final chapter touches on philosophical issues. The book is supported by a World Wibe Web site containing a variety of supplementary material. The standard rules of probability can be interpreted as uniquely valid principles in logic. In this book, E. T. Jaynes dispels the imaginary distinction between 'probability theory' and 'statistical inference', leaving a logical unity and simplicity, which provides greater technical power and flexibility in applications. This book goes beyond the conventional mathematics of probability theory, viewing the subject in a wider context. New results are discussed, along with applications of probability theory to a wide variety of problems in physics, mathematics, economics, chemistry and biology. It contains many exercises and problems, and is suitable for use as a textbook on graduate level courses involving data analysis. The material is aimed at readers who are already familiar with applied mathematics at an advanced undergraduate level or higher. The book will be of interest to scientists working in any area where inference from incomplete information is necessary. Professor Koslow advances a new account of the basic concepts of logic. A central feature of the theory is that it does not require the elements of logic to be based on a formal language. Rather, it uses a general notion of implication as a way of organizing the formal results of various systems of logic in a simple, but insightful way. The study has four parts. In the first two parts the various sources of the general concept of an implication structure and its forms are illustrated and explained. Part 3 defines the various logical operations and systematically explores their properties. A generalized account of extensionality and dual implication is given, and the extensionality of each of the operators, as well as the relation of negation and its dual are given substantial treatment because of the novel results they yield. Part 4 considers modal operators and studies their interaction with logical operators. By obtaining the usual results without the usual assumptions this new approach allows one to give a very simple account of modal logic minus the excess baggage of possible world semantics. This is a thoroughly revised and enlarged second edition that presents the main results of descriptive complexity theory, that is, the connections between axiomatizability of classes of finite structures and their complexity with respect to time and space bounds. The logics that are important in this context include fixed-point logics, transitive closure logics, and also certain infinitary languages; their model theory is studied in full detail. The book is written in such a way that the respective parts on model theory and descriptive complexity theory may be read independently. This is the first book-length treatment of hybrid logic and its proof-theory. Hybrid logic is an extension of ordinary modal logic which allows explicit reference to individual points in a model (where the points represent times, possible worlds, states in a computer, or something else). This is useful for many applications, for example when reasoning about time one often wants to formulate a series of statements about what happens at specific times. There is little consensus about proof-theory for ordinary modal logic. Many modal-logical proof systems lack important properties and the relationships between proof systems for different modal logics are often unclear. In the present book we demonstrate that hybrid-logical proof-theory remedies these deficiencies by giving a spectrum of well-behaved proof systems (natural deduction, Gentzen, tableau, and axiom systems) for a spectrum of different hybrid logics (propositional, first-order, intensional first-order, and intuitionistic). Claire Ortiz Hill The publication of all but a small, unfound, part of the complete text of the lecture course on logic and theory of knowledge that Edmund Husserl gave at Göttingen during the winter semester of 1906/07 became a reality in 1984 with the publication of Einleitung in die Logik und Erkenntnistheorie, Vorlesungen 1906/07 edited by 1 Ullrich Melle. Published in that volume were also 27 appendices containing material selected to complement the content of the main text in significant ways. They provide valuable insight into the evolution of Husserl's thought between the Logical Investigations and Ideas I and, therefore, into the origins of phenomenology. That text and all those appendices but one are translated and published in the present volume. Omitted are only the "Personal Notes" dated September 25, 1906, November 4, 1907, and March 6, 1908, which were translated by Dallas Willard and published in his translation of Husserl's Early 2 Writings in the Philosophy of Logic and Mathematics. Introduction to Logic and Theory of Knowledge, Lectures 1906/07 provides valuable insight into the development of the ideas fun- mental to phenomenology. Besides shedding considerable light on the genesis of phenomenology, it sheds needed light on many other dimensions of Husserl's thought that have puzzled and challenged scholars. From the Introduction: "We shall base our discussion on a set-theoretical foundation like that used in developing analysis, or algebra, or topology. We may consider our task as that of giving a mathematical analysis of the basic concepts of logic and mathematics themselves. Thus we treat mathematical and logical practice as given empirical data and attempt to develop a purely mathematical theory of logic abstracted from these data." There are 31 chapters in 5 parts and approximately 320 exercises marked by difficulty and whether or not they are necessary for further work in the book. Mathematical Logic and Model Theory: A Brief Introduction offers a streamlined yet easy-to-read introduction to mathematical logic and basic model theory. It presents, in a self-contained manner, the essential aspects of model theory needed to understand model theoretic algebra. As a profound application of model theory in algebra, the last part of this book develops a complete proof of Ax and Kochen's work on Artin's conjecture about Diophantine properties of p-adic number fields. The character of model theoretic constructions and results differ quite significantly from that commonly found in algebra, by the treatment of formulae as mathematical objects. It is therefore indispensable to first become familiar with the problems and methods of mathematical logic. Therefore, the text is divided into three parts: an introduction into mathematical logic (Chapter 1), model theory (Chapters 2 and 3), and the model theoretic treatment of several algebraic theories (Chapter 4). This book will be of interest to both advanced undergraduate and graduate students studying model theory and its applications to algebra. It may also be used for self-study. Luciano Floridi presents an innovative approach to philosophy, conceived as conceptual design. He explores how we make, transform, refine, and improve the objects of our knowledge. His starting point is that reality provides the data, to be understood as constraining affordances, and we transform them into information, like semantic engines. Such transformation or repurposing is not equivalent to portraying, or picturing, or photographing, or photocopying anything. It is more like cooking: the dish does not represent the ingredients, it uses them to make something else out of them, yet the reality of the dish and its properties hugely depend on the reality and the properties of the ingredients. Models are not representations understood as pictures, but interpretations understood as data elaborations, of systems. Thus, Luciano Floridi articulates and defends the thesis that knowledge is design and philosophy is the ultimate form of conceptual design. Although entirely independent of Floridi's previous books, The Philosophy of Information (OUP 2011) and The Ethics of Information (OUP 2013), The Logic of Information both complements the existing volumes and presents new work on the foundations of the philosophy of information. This book offers a concise introduction to both proof-theory and algebraic methods, the core of the syntactic and semantic study of logic respectively. The importance of combining these two has been increasingly recognized in recent years. It highlights the contrasts between the deep, concrete results using the former and the general, abstract ones using the latter. Covering modal logics, many-valued logics, superintuitionistic and substructural logics, together with their algebraic semantics, the book also provides an introduction to nonclassical logic for undergraduate or graduate level courses.The book is divided into two parts: Proof Theory in Part I and Algebra in Logic in Part II. Part I presents sequent systems and discusses cut elimination and its applications in detail. It also provides simplified proof of cut elimination, making the topic more accessible. The last chapter of Part I is devoted to clarification of the classes of logics that are discussed in the second part. Part II focuses on algebraic semantics for these logics. At the same time, it is a gentle introduction to the basics of algebraic logic and universal algebra with many examples of their applications in logic. Part II can be read independently of Part I, with only minimum knowledge required, and as such is suitable as a textbook for short introductory courses on algebra in logic. This short textbook provides a succinct introduction to mathematical logic and set theory, which together form the foundations for the rigorous development of mathematics. It will be suitable for all mathematics undergraduates coming to the subject for the first time. The book is based on lectures given at the University of Cambridge and covers the basic concepts of logic: first order logic, consistency, and the completeness theorem, before introducing the reader to the fundamentals of axiomatic set theory. There are also chapters on recursive functions, the axiom of choice, ordinal and cardinal arithmetic and the incompleteness theorems. Dr Johnstone has included numerous exercises designed to illustrate the key elements of the theory and to provide applications of basic logical concepts to other areas of mathematics. Consequently the book, while making an attractive first textbook for those who plan to specialise in logic, will be particularly valuable for mathematics and computer scientists whose primary interests lie elsewhere. Learning Music Theory with Logic, Max, and Finale is a groundbreaking resource that bridges the gap between music theory teaching and the world of music software programs. Focusing on three key programs—the Digital Audio Workstation (DAW) Logic, the Audio Programming Language (APL) Max, and the music-printing program Finale—this book shows how they can be used together to learn music theory. It provides an introduction to core music theory concepts and shows how to develop programming skills alongside music theory skills. Software tools form an essential part of the modern musical environment; laptop musicians today can harness incredibly powerful tools to create, record, and manipulate sounds. Yet these programs on their own don’t provide musicians with an understanding of music notation and structures, while traditional music theory teaching doesn’t fully engage with technological capabilities. With clear and practical applications, this book demonstrates how to use DAWs, APLs, and music-printing programs to create interactive resources for learning the mechanics behind how music works. Offering an innovative approach to the learning and teaching of music theory in the context of diverse musical genres, this volume provides game-changing ideas for educators, practicing musicians, and students of music. The author's website at http://www.geoffreykidde.com includes downloadable apps that support this book. This book is intended as an undergraduate senior level or beginning graduate level text for mathematical logic. There are virtually no prere quisites, although a familiarity with notions encountered in a beginning course in abstract algebra such as groups, rings, and fields will be useful in providing some motivation for the topics in Part III. An attempt has been made to develop the beginning of each part slowly and then to gradually quicken the pace and the complexity of the material. Each part ends with a brief introduction to selected topics of current interest. The text is divided into three parts: one dealing with set theory, another with computable function theory, and the last with model theory. Part III relies heavily on the notation, concepts and results discussed in Part I and to some extent on Part II. Parts I and II are independent of each other, and each provides enough material for a one semester course. The exercises cover a wide range of difficulty with an emphasis on more routine problems in the earlier sections of each part in order to familiarize the reader with the new notions and methods. The more difficult exercises are accompanied by hints. In some cases significant theorems are devel oped step by step with hints in the problems. Such theorems are not used later in the sequence. Explores sets and relations, the natural number sequence and its generalization, extension of natural numbers to real numbers, logic, informal axiomatic mathematics, Boolean algebras, informal axiomatic set theory, several algebraic theories, and 1st-order theories.

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