Universitext

Dirk van Dalen

Logic and Structure

Fourth Edition

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DIRK VAN DALEN studied at the University of Amsterdam, where he obtained his PhD. He has taught since 1960 at Utrecht University, where he is full professor. He also taught at MIT and Oxford. His technical work is mostly in the area of intuitionistic mathematics and logic. He uses to call attention to the benefits and challenges of constructive methods. His current project is a biography of L. E. J. Brouwer and the editing of Brouwer's correspondence.

Logic and Structure

A book which efficiently presents the basics of propositional and predicate logic, van Dalen's popular textbook contains a complete treatment of elementary classical logic, using Gentzen's Natural Deduction. Propositional and predicate logic are treated in separate chapters in a leisured but precise way. Chapter Three presents the basic facts of model theory, e.g. compactness, Skolem-Löwenheim, elementary equivalence, non-standard models, quantifier elimination, and Skolem functions.

The discussion of classical logic is rounded off with a concise exposition of second-order logic.

In view of the growing recognition of constructive methods and principles, one chapter is devoted to intuitionistic logic. Completeness is established for Kripke semantics. A number of specific constructive features, such as apartness and equality, the Gödel translation, the disjunction and existence property have been incorporated.

The power and elegance of natural deduction is demonstrated best in the part of proof theory called 'cut-elimination' or 'normalization'. Chapter 6 is devoted to this topic; it contains the basic facts on the structure of derivations, both classically and intuitionistically.

Finally, this edition contains a new chapter on Gödel's first incompleteness theorem. The chapter is self-contained, it provides a systematic exposition of primitive recursion, partial recursive functions, recursive by enumerable sets, and recursive separability. The arithmetization of Peano's arithmetic is based on the natural deduction system.

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