

I. LAVROV and L. MAKSIMOVA.

Problems in Set Theory, Mathematical Logic, and the Theory of Algorithms.

The University Series in Mathematics, Kluwer Academic/Plenum Publishers, New York, 2003, ix + 282

The title is an exact description of the book. These problems were originally designed to serve as a resource for Russian instructors who lectured in logic, apparently without a text. They provide a full treatment of the basics of naive set theory, propositional and predicate logic, and the rudiments of recursion theory. The emphasis is on the middle topic (85 pages while 50 and 35 pages, respectively, are devoted to the others). The authors express the hope that a student could learn the subject only from this book; such a student would be extremely capable. The book contains the definitions of the notions investigated; there is virtually no exposition. But, major theorems are broken down into quite manageable steps. For example, the Henkin proof of the completeness theorem is outlined in 7 problems in one section (for logic without equality axioms) with a 1/2 page sketch in the solution section for the main step: defining the model. The step to properly interpret the equality symbol is given a section later.

Most of the problems are routine but they cover the basic ideas extremely well. The best way to describe the scope of the book is to remark that it starts at the beginning and briefly gives the stopping point in each area. There is no treatment of independence proofs in set theory; the axioms of *ZFC* are given in the predicate logic section and the student is asked to formalize some simple results. There is an extensive treatment of reduced products and ultraproducts; the notion of a (model theoretic) type does not appear. There is an extensive treatment of Turing machines and of recursive and recursively enumerable sets. The incompleteness theorem is not treated; nor is there any mention of Church's thesis. This book could serve well for a reading course with an extremely strong undergraduate or beginning graduate student. In the United States, its best use may be as a study guide for students preparing for a comprehensive exam in logic.

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