

Contents*

Preface	vii
About the Author	ix
Chapter 1. Some Set Theoretical Notions	1
1. Introduction. Sets and their Elements	1
2. Operations on Sets	3
Problems in Set Theory	9
3. Logical Quantifiers	12
4. Relations (Correspondences)	14
Problems in the Theory of Relations	19
5. Mappings	22
Problems on Mappings	26
*6. Composition of Relations and Mappings	28
Problems on the Composition of Relations	30
*7. Equivalence Relations	32
Problems on Equivalence Relations	35
8. Sequences	37
Problems on Sequences	42
*9. Some Theorems on Countable Sets	44
Problems on Countable and Uncountable Sets	48
Chapter 2. The Real Number System	51
1. Introduction	51
2. Axioms of an Ordered Field	52
3. Arithmetic Operations in a Field	55
4. Inequalities in an Ordered Field. Absolute Values	58
Problems on Arithmetic Operations and Inequalities in a Field	62
5. Natural Numbers. Induction	63
6. Induction (continued)	68
Problems on Natural Numbers and Induction	71
7. Integers and Rationals	74
Problems on Integers and Rationals	76
8. Bounded Sets in an Ordered Field	77

* “Starred” sections may be omitted by beginners.

9.	The Completeness Axiom. Suprema and Infima.....	79
	Problems on Bounded Sets, Infima, and Suprema.....	83
10.	Some Applications of the Completeness Axiom	85
	Problems on Complete and Archimedean Fields	89
11.	Roots. Irrational Numbers	90
	Problems on Roots and Irrationals	93
*12.	Powers with Arbitrary Real Exponents	94
	Problems on Powers	96
*13.	Decimal and other Approximations.....	98
	Problems on Decimal and q -ary Approximations.....	103
*14.	Isomorphism of Complete Ordered Fields.....	104
	Problems on Isomorphisms.....	110
*15.	Dedekind Cuts. Construction of E^1	111
	Problems on Dedekind Cuts.....	119
16.	The Infinities. *The $\underline{\lim}$ and $\overline{\lim}$ of a Sequence.....	121
	Problems on Upper and Lower Limits of Sequences in E^*	126
Chapter 3. The Geometry of n Dimensions. *Vector Spaces		129
1.	Euclidean n -space, E^n	129
	Problems on Vectors in E^n	134
2.	Inner Products. Absolute Values. Distances	135
	Problems on Vectors in E^n (continued).....	140
3.	Angles and Directions	141
4.	Lines and Line Segments	145
	Problems on Lines, Angles, and Directions in E^n	149
5.	Hyperplanes in E^n . *Linear Functionals on E^n	152
	Problems on Hyperplanes in E^n	157
6.	Review Problems on Planes and Lines in E^3	160
7.	Intervals in E^n . Additivity of their Volume	164
	Problems on Intervals in E^n	170
8.	Complex Numbers	172
	Problems on Complex Numbers	176
*9.	Vector Spaces. The Space C^n . Euclidean Spaces.....	178
	Problems on Linear Spaces.....	182
*10.	Normed Linear Spaces	183
	Problems on Normed Linear Spaces	186
Notation		189
Index		191