

Contents*

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	50
1. Introduction	50
2. Axioms of an Ordered Field	51
3. Arithmetic Operations in a Field	54
4. Inequalities in an Ordered Field. Absolute Values	57
Problems on Arithmetic Operations and Inequalities in a Field	61
5. Natural Numbers. Induction	62
6. Induction (continued)	67
Problems on Natural Numbers and Induction	70
7. Integers and Rationals	73
Problems on Integers and Rationals	75
8. Bounded Sets in an Ordered Field	76

* “Starred” sections may be omitted by beginners.

9. The Completeness Axiom. Suprema and Infima	78
Problems on Bounded Sets, Infima, and Suprema	82
10. Some Applications of the Completeness Axiom	84
Problems on Complete and Archimedean Fields	88
11. Roots. Irrational Numbers	89
Problems on Roots and Irrationals	91
*12. Powers with Arbitrary Real Exponents	92
Problems on Powers	95
*13. Decimal and other Approximations	97
Problems on Decimal and q -ary Approximations	102
*14. Isomorphism of Complete Ordered Fields	102
Problems on Isomorphisms	109
*15. Dedekind Cuts. Construction of E^1	110
Problems on Dedekind Cuts	118
16. The Infinities. *The $\underline{\lim}$ and $\overline{\lim}$ of a Sequence	120
Problems on Upper and Lower Limits of Sequences in E^*	125
Chapter 3. The Geometry of n Dimensions. *Vector Spaces	127
1. Euclidean n -space, E^n	127
Problems on Vectors in E^n	132
2. Inner Products. Absolute Values. Distances	133
Problems on Vectors in E^n (continued)	138
3. Angles and Directions	139
4. Lines and Line Segments	143
Problems on Lines, Angles, and Directions in E^n	147
5. Hyperplanes in E^n . *Linear Functionals on E^n	150
Problems on Hyperplanes in E^n	155
6. Review Problems on Planes and Lines in E^3	158
7. Intervals in E^n . Additivity of their Volume	162
Problems on Intervals in E^n	168
8. Complex Numbers	170
Problems on Complex Numbers	174
*9. Vector Spaces. The Space C^n . Euclidean Spaces	176
Problems on Linear Spaces	180
*10. Normed Linear Spaces	181
Problems on Normed Linear Spaces	184
Notation	187
Index	188