

# Contents

<b>Chapter 1 Groups and Generating Sets</b> .....	1
1.1 Binary operations .....	1
1.2 Isomorphic binary structures .....	6
1.3 Groups .....	9
1.4 Subgroups .....	15
1.5 Cyclic groups .....	19
1.6 Generating sets .....	25
1.7 Exercises .....	27
<b>Chapter 2 Permutation Groups and Alternating Groups</b> .....	31
2.1 Permutation groups .....	31
2.2 Alternating groups .....	38
2.3 Exercises .....	43
<b>Chapter 3 Finitely Generated Abelian Groups and Quotient Groups</b> .....	45
3.1 The theorem of Lagrange .....	45
3.2 Finitely generated abelian groups .....	48
3.3 Properties of homomorphisms .....	57
3.4 Quotient groups and isomorphism theorems .....	60
3.5 Automorphism groups .....	67
3.6 Simple groups .....	69
3.7 Exercises .....	74

<b>Chapter 4 Rings, Quotient Rings and Ideal Theory</b>	78
4.1 Basic definitions	78
4.2 Integral domains	84
4.3 Noncommutative rings	88
4.4 Quaternions	95
4.5 Isomorphism theorems	101
4.6 Euler's theorem	107
4.7 Ideal theory	109
4.8 Exercises	115
<b>Chapter 5 Unique Factorization Domains</b>	119
5.1 Basic definitions	119
5.2 Principal ideal domains	122
5.3 Euclidean domains	125
5.4 Polynomial rings over UFDs	129
5.5 Multiplicative norms	134
5.6 Exercises	138
<b>Chapter 6 Extension Fields</b>	141
6.1 Prime fields and extension fields	141
6.2 Algebraic and transcendental elements	145
6.3 Algebraic extensions and algebraic closure	152
6.4 Finite fields	157
6.5 Exercises	162
<b>Appendix A Equivalence Relations and Quotient Set</b>	165
<b>Appendix B Zorn's Lemma</b>	167
<b>Appendix C Quotient field</b>	169
<b>Reference</b>	170
<b>Index</b>	171