
Contents

Foreword	vii
Preface to Third Edition: Part 2	ix
Chapter C-1. More Groups	1
C-1.1. Group Actions	1
Graphs	16
Counting	20
C-1.2. Sylow Theorems	24
C-1.3. Solvable and Nilpotent Groups	33
Solvable Groups	34
Nilpotent Groups	43
C-1.4. Projective Unimodular Groups	50
General Linear Group $GL(n, k)$	50
Simplicity of $PSL(2, q)$	52
Simplicity of $PSL(n, q)$	58
C-1.5. More Group Actions	66
Projective Geometry	67
Multiple Transitivity	74
PSL Redux	77
C-1.6. Free Groups and Presentations	81
Existence and Uniqueness of Free Groups	82
Presentations	92
C-1.7. Nielsen–Schreier Theorem	97
C-1.8. The Baer–Levi Proof	102
The Categories Simp and Simp *	102
Fundamental Group	104
Covering Complexes	110
Co-Galois Theory	115

C-1.9. Free Products and the Kurosh Theorem	118
C-1.10. Epilog	124
Chapter C-2. Representation Theory	127
C-2.1. Artinian and Noetherian	127
C-2.2. Jacobson Radical	130
C-2.3. Group Actions on Modules	135
C-2.4. Semisimple Rings	137
C-2.5. Wedderburn–Artin Theorems	146
C-2.6. Introduction to Lie Algebras	161
C-2.7. Characters	168
C-2.8. Class Functions	176
C-2.9. Character Tables and Orthogonality Relations	180
C-2.10. Induced Characters	186
C-2.11. Algebraic Integers Interlude	193
C-2.12. Theorems of Burnside and of Frobenius	200
C-2.13. Division Algebras	208
Chapter C-3. Homology	223
C-3.1. Introduction	223
C-3.2. Semidirect Products	226
C-3.3. General Extensions and Cohomology	236
C-3.4. Complexes	255
C-3.5. Homology Functors	262
C-3.6. Derived Functors	271
C-3.7. Right Derived Functors	285
C-3.8. Ext and Tor	292
C-3.9. Cohomology of Groups	309
C-3.10. Crossed Products	326
C-3.11. Introduction to Spectral Sequences	333
Chapter C-4. More Categories	339
C-4.1. Additive Categories	339
C-4.2. Abelian Categories	344
C-4.3. \mathfrak{g} -Sheaves	359
C-4.4. Sheaves	368
C-4.5. Sheaf Cohomology	378
C-4.6. Module Categories	384
C-4.7. Adjoint Functor Theorem for Modules	392

C-4.8.	Algebraic K -Theory	403
	The Functor K_0	404
	The Functor G_0	408
Chapter C-5.	Commutative Rings III	419
C-5.1.	Local and Global	419
	Subgroups of \mathbb{Q}	419
C-5.2.	Localization	427
C-5.3.	Dedekind Rings	445
	Integrality	446
	Algebraic Integers	455
	Characterizations of Dedekind Rings	467
	Finitely Generated Modules over Dedekind Rings	477
C-5.4.	Homological Dimensions	486
C-5.5.	Hilbert's Theorem on Syzygies	496
C-5.6.	Commutative Noetherian Rings	502
C-5.7.	Regular Local Rings	510
	Bibliography	527
	Index	537