

CONTENTS

<i>Preface</i>	<i>page xi</i>
Preliminaries	1
1 Homogeneous Spaces	13
1.1 Real Metric Spaces	13
1.2 Isometries	18
1.3 Unitary Spaces	24
2 Linear Geometries	27
2.1 Projective Planes	27
2.2 Projective n -Space	39
2.3 Elliptic and Euclidean Geometry	46
2.4 Hyperbolic Geometry	50
3 Circular Geometries	57
3.1 Inversive and Spherical Geometry	57
3.2 Pseudospherical Geometry	61
3.3 Conformal Models	65
3.4 Triangles and Trigonometry	74
3.5 Non-Euclidean Circles	81
3.6 Summary of Real Spaces	86
4 Real Collineation Groups	87
4.1 Linear Transformations	87
4.2 Affine Collineations	91
4.3 Homogeneous Coordinates	96
4.4 Projective Collineations	102

4.5	Projective Correlations	106
4.6	Subgroups and Quotient Groups	110
5	Equiareal Collineations	113
5.1	The Real Affine Plane	113
5.2	Ortholinear Transformations	117
5.3	Paralinear Transformations	121
5.4	Metalinear Transformations	125
5.5	Summary of Equiaffinities	129
5.6	Symplectic Geometry	132
6	Real Isometry Groups	138
6.1	Spherical and Elliptic Isometries	138
6.2	Euclidean Transformations	143
6.3	Hyperbolic Isometries	151
7	Complex Spaces	157
7.1	Antilinear Geometries	157
7.2	Anticircular Geometries	162
7.3	Summary of Complex Spaces	166
8	Complex Collineation Groups	168
8.1	Linear and Affine Transformations	168
8.2	Projective Transformations	175
8.3	Antiprojective Transformations	178
8.4	Subgroups and Quotient Groups	180
9	Circularities and Concatenations	183
9.1	The Parabolic n -Sphere	183
9.2	The Real Inversive Sphere	186
9.3	The Complex Projective Line	194
9.4	Inversive Unitary Geometry	199
10	Unitary Isometry Groups	203
10.1	Unitary Transformations	203
10.2	Transunitary Transformations	206
10.3	Pseudo-unitary Transformations	209
10.4	Quaternions and Related Systems	211
11	Finite Symmetry Groups	223
11.1	Polytopes and Honeycombs	223
11.2	Polygonal Groups	226
11.3	Pyramids, Prisms, and Antiprisms	231

11.4	Polyhedral Groups	238
11.5	Spherical Coxeter Groups	246
11.6	Subgroups and Extensions	254
12	Euclidean Symmetry Groups	263
12.1	Frieze Patterns	263
12.2	Lattice Patterns	266
12.3	Apeirohedral Groups	271
12.4	Torohedral Groups	278
12.5	Euclidean Coxeter Groups	289
12.6	Other Notations	295
13	Hyperbolic Coxeter Groups	299
13.1	Pseudohedral Groups	299
13.2	Compact Hyperbolic Groups	304
13.3	Paracompact Groups in H^3	309
13.4	Paracompact Groups in H^4 and H^5	313
13.5	Paracompact Groups in Higher Space	318
13.6	Lorentzian Lattices	322
14	Modular Transformations	330
14.1	Real Modular Groups	330
14.2	The Gaussian Modular Group	337
14.3	The Eisenstein Modular Group	342
15	Quaternionic Modular Groups	349
15.1	Integral Quaternions	349
15.2	Pseudo-Modular Groups	355
15.3	The Hamilton Modular Group	364
15.4	The Hurwitz Modular Group	368
15.5	The Hybrid Modular Group	372
15.6	Summary of Modular Groups	376
15.7	Integral Octonions	378
15.8	Octonionic Modular Loops	387
	Tables	390
A	Real Transformation Groups	395
B	Groups Generated by Reflections	396
	<i>List of Symbols</i>	<i>406</i>
	<i>Bibliography</i>	<i>411</i>
	<i>Index</i>	<i>425</i>