

Contents

Preface	vii
List of Symbols	x
1 Euclidean geometry	1
1.1 Symmetries	2
1.2 Rigid transformations	15
1.3 Invariants under rigid transformations	28
1.4 Cylinders and tori	37
1.5 Finite subgroups of $E(2)$ and $E(3)$	46
1.6 Frieze patterns and tessellations	58
2 Affine geometry	75
2.1 The line at infinity	76
2.2 Affine transformations and their invariants	83
3 Projective geometry	91
3.1 The real projective plane	92
3.2 The Duality Principle	99
3.3 The shape of $P^2(\mathbb{R})$	103
3.4 Coordinate charts for $P^2(\mathbb{R})$ (and for $P^1(\mathbb{C})$)	109
3.5 The projective group	113
3.6 Invariance of the cross ratio	121
3.7 The space of conics	126
3.8 Projective properties of the conics	129
3.9 Poles and polars	134
3.10 Elliptic geometry	141
4 Hyperbolic geometry	149
4.1 Models of the hyperbolic plane	149
4.2 Transformations of the hyperbolic plane	157
4.3 Steiner network	164

4.4	The hyperbolic metric	168
4.5	First results in hyperbolic geometry	177
4.6	Surfaces with hyperbolic structure	183
4.7	Tessellations	192
5	Appendices	199
5.1	Differentiable functions	199
5.2	Equivalence relations	201
5.3	The symmetric group in four symbols: S_4	202
5.4	Euclidean postulates	205
5.5	Topology	206
5.6	Some results on the circle	208
	Bibliography	211
	Index	215



<http://www.springer.com/978-3-7643-7517-1>

Introduction to Classical Geometries

Ramírez Galarza, A.I.; Seade, J.

2007, X, 220 p., Softcover

ISBN: 978-3-7643-7517-1

A product of Birkhäuser Basel