
Index

- Abelian group, 54
- absolute, 132, 148
- adjacent angles, 4
- affine space, 110
- affine transformation, 144
- angle, 4
- angle of parallelism, 170
- Artin relation, 63
- axial symmetry, 30
- axiom of Archimedes, 279
- axiom of completeness, 280
- axiom of continuity, 279
- axioms of congruence, 276
- Axioms of connection, 272
- axioms of order, 274

- betweenness relation, 274
- biangle on the sphere, 116

- canonical Grassmann bundle, 249
- Cayley–Klein model, 155
- central symmetry, 8, 30
- circle, 20
- class formula, 43
- classifying space, 251
- common notions, 257
- conic section, 194
- consistency, 280
- convex polyhedron, 29
- convex set, 29

- coset, 58
- Coxeter geometry, 101
- Coxeter polygon, 101
- Coxeter polyhedron, 101
- Coxeter scheme, 105
- cross-ratio of collinear points, 191
- cross-ratio of four complex numbers, 144
- crystallographic group, 95
- cyclic group, 55

- defining relations in a group presentation, 64
- Desargue’s theorem, 194
- discrete group action, 90
- distance function, 2
- distance in the Cayley–Klein model, 154
- dodecahedron, 78
- duality in projective geometry, 193
- duality principle in projective geometry, 193

- elliptic geometry, 121
- embedding of a geometry, 48
- epimorphism, 44
- equivariant map, 47
- Erlangen program, 46
- Euclid, xiv, 10
- Euclidean geometry, 1

- Euclidean plane, 2
 Euclidean space, 111
- Fano plane, 218
 Fedorov group, 87
 Fifth Postulate, 177, 257
 finite affine plane, 217
 finite affine plane over a field, 215
 finite field, 212
 flat cylinder, 245
 flat torus, 244
 free group, 56, 61
 fundamental domain, 43
 fundamental tile, 91
- general linear group, 110
 general linear group $GL(n)$, 56
 general position, 189
 generators of a group, 57
 geometric G -bundle, 250
 geometric sum, 4
 geometry in the sense of Klein, 46
 glide symmetry, 24
 Grassmann manifold, 248
- Hilbert, xiv
 homomorphism, 57
 homomorphism of transformation groups, 43
 honeycomb lattice, 91
 Hopf bundle, 245
 hyperbolic circle, 137
 hyperbolic plane, 132
- incidence, 192
 inverse element, 54
 inversion, 126
 involution, 127
 isometry, 3, 34
 isometry group of the Riemannian elliptic plane, 41
 isomorphic geometries, 48
 isomorphic transformation groups, 44
 isomorphism of transformation groups, 44
- join, 251
- Klein, Felix, xiii, xv, 46
- Lagrange's theorem, 59
 Lie group, 247
 Lie, Sophus, xv
 line at infinity, 188
 Lobachevsky distance, 168
- Möbius distance, 150
 Möbius group, 145
 monomorphism, 44
 morphism of geometries, 47
 morphism of transformation groups, 43
 motion of the plane, 34
- neutral element, 54
 nonintersecting lines in the Caley–Klein model, 157
 nonintersecting lines in the hyperbolic plane, 134
 normal subgroup, 60
- orbit, 42
 order of a transformation group, 45
 order of an element g of a transformation group, 45
 order of an element of a group, 57
 orientation-reversing isometry of the plane, 34
 oriented angle, 7
 orthogonal group, 111
 orthonormed vector space, 110
- Pappus' theorem, 198
 parallel lines, 2
 parallel lines in space, 28
 parallel planes, 28
 parallel translation, 11
 parallelogram, 11
 parallels in the Cayley–Klein model, 157
 parallels in the hyperbolic plane, 134
 Pascal's theorem, 199
 Penrose tiling, 87
 permutation group, 42, 56, 62
 perpendicular line to a plane, 28
 perpendiculars, 4
 Poincaré disk model of the hyperbolic plane, 131

- point at infinity, 126
- polar of a point on the sphere, 115
- poles of a line on the sphere, 115
- presentation of a group, 63
- principal G -bundle, 250
- projective plane, 185
- projective space, 199
- projective space of arbitrary
 - dimension, 187
- pullback, 247

- quotient group, 61

- reflection group, 99
- reflection in a line, 5
- reflection in a plane, 29
- regular tiling, 91
- residues modulo m , 55
- Riemann sphere, 126
- rotation, 7
- rotation about an axis, 30

- Schweikart constant, 171
- stabilizer, 42
- Stiefel manifold, 249
- Stiefel-over-Grassmann bundle, 249
- subgeometry, 48
- subgroup, 58
- subgroup of a transformation
 - group, 45
- symmetry group of the equilateral triangle, 36
- symmetry group of the square, 38

- tessellation, 90
- tiling, 90
- tiling geometry, 91
- tiling group, 91
- transitive action, 91
- triangle, 10

- undefined notions, 272
- universal geometric G -bundle, 251

- vector space, 110
- vector, attached, 11
- vector, free, 12
- vertical angles, 4
- Vorderberg tiling, 86