



Index

- \Leftrightarrow , 231
- \sphericalangle , 13
- π , 285
- 3-D Geometry, 356–407
- 30-60-90 triangle, 144
- 45-45-90 triangle, 142

- AA Similarity, 101
 - proof of, 119
- AAS Congruence, 61
- acute, 18
- adjacent angles, 19
- alternate exterior angles, 27
- alternate interior angles, 27
- altitudes, foot of, 86
- AMC, vii
- American Mathematics Competitions, *see* AMC
- American Regions Math League, *see* ARML
- analytic geometry, 435–477
- angle bisector, 171
- Angle Bisector Theorem, 181, 201
- angle of depression, 502
- angle of elevation, 502
- Angle-Angle Similarity, 101
 - proof of, 119
- Angle-Angle-Side Congruence Theorem, 61
- angle-chasing, 29
- Angle-Side-Angle Congruence Theorem, 61
- angles, 13–48
 - acute, 18
 - adjacent, 19
 - alternate exterior, 27
 - alternate interior, 27
 - between a tangent and a chord, 319
 - between a tangent and a secant, 320
 - between two chords, 312
 - between two secants, 313
 - central, 286
 - complementary, 22
 - corresponding, 27
 - dihedral, 359
 - exterior, 36
 - inscribed, 304–310, 320
 - interior, 36
 - reflex, 19
 - remote interior, 37
 - right, 17
 - same-side exterior, 27
 - same-side interior, 27

- straight, 21
- supplementary, 22
- trisection, 338
- vertical, 23
- Annairizi of Arabia, 162
- apex, 366
- apothem, 252
- arc, 6, 284
- Archimedes, 289, 293, 407
- area, 83–88
 - similar figures, 117
- ARML, viii
- Art of Problem Solving, v, 562
- ASA Congruence, 61
- axiom, 10

- base, of a triangle, 86
- bisects, 54
- buckminsterfullerene, 401

- Cartesian plane, 436
- central angle, 307
- centroid, 183
- chord, 6
 - bisected by radius, 54
- circles, 5, 284–304
 - area, 290
 - center, 5
 - chord, 6, 340
 - circumference, 284
 - diameter, 6
 - radius, 5
 - secant, 340
 - tangent, 340
- circular segment, 294, 295
- circumcenter, 175
- circumcircle, 175
- circumference, 284
- circumradius, 175
- circumscribed quadrilateral, 327
- collinear, 4
- compass, 7
- complementary angles, 22
- concave, 206
- concurrent, 4, 174
- cones, 385–390

- congruent, 49
- conjecture, 10
- construction, 7
 - angle bisector, 197
 - copy an angle, 121
 - equilateral triangle, 72
 - parallel lines, 121
 - perpendicular bisector, 73
 - perpendicular lines, 161
- contradiction, 41, 143
- converse, 40
- convex, 206
- coordinate geometry, 435–477
- coordinates, 436
- coplanar, 358
- corresponding angles, 27
- cosecant, 487
- cosine, 480
- cot, 487
- cotangent, 487
- CPCTC, 54
- cross-section, 364
- csc, 487
- cube, 363
- cyclic quadrilateral, 322, 323
- cylinders, 380–384
 - axis, 380

- degenerate triangle, 275
- degree, 14
- Dehn, Max Wilhelm, 369
- Descartes, René, 435
- diagonal, 245
- diagonals, 207
- diameter, 6
- dihedral angle, 359
- dilation, 418–422
- dimensions, 2
- distance formula, 441, 473
- dodecahedron, 372
- doubling the cube, 338

- eight-point circle, 212
- Elements*, 189
- endpoints, 2
- equidistant, 3

INDEX

- equilateral triangle, 68
 Eratosthenes, 302
 Euclid, 189
 Euler line, 191
 Euler, Leonhard, 191
 excenter, 205
 excircle, 205
 exradius, 205
 Extended Law of Sines, 500
 exterior angles, 36, 246

 face diagonal, 362
 Fagnano's Problem, 423
 Fermat numbers, 339
 Fermat prime, 339
 Fermat's Last Theorem, 151
 Fermat, Pierre de, 151
 Fibonacci sequence, 19
 fixed point, 409
 foot, 86
 frustum, 379
 right circular, 389

 Garfield, President James A. , 316
 generalization, 496
 geometric mean, 117
 golden ratio, 12, 19
 Golden Ratio Spiral, 12
 golden rectangle, 12
 graph, 437

 Harvard-MIT Math Tournament, *see* HMMT
 height, 86
 hemisphere, 407
 Heron's Formula, 159
 Hilbert, David, 56, 369
 Hippasus, 143
 HL Congruence, 153
 HL Similarity, 155
 HMMT, vii
 homothety, 422
 hypotenuse, 133
 Hypotenuse-Leg Congruence, 153
 Hypotenuse-Leg Similarity, 155

 icosahedron, 372
 identity, 409

 if and only if, 227
 iff, 231
 image, 408
 incenter, 180
 incircle, 180
 Inner Napoleon Triangle, 214
 inradius, 180
 inscribed angles, 304–320
 interior angles, 245
 invariants, 369
 inversion, 430
 irrational numbers, 143, 285
 isosceles trapezoid, 213
 isosceles triangle, 67

 kite, 240

 lateral surface area, 361
 lattice points, 436
 Law of Cosines, 494–500
 Law of Sines, 494–500
 Leg-Leg Congruence, 153
 Leg-Leg Similarity Theorem, 155
 legs, of a right triangle, 133
 Lincoln, Abraham, 189
 line, 3
 line of symmetry, 414
 line segment, 2
 linear equation, 437
 LL Congruence, 153
 LL Similarity, 155
 locus, 5
 lune, 294, 296

 major arc, 6
 Mandelbrot Competition, vii
 map, 408
 MATHCOUNTS, vii
 medial triangle, 185
 medians, 183
 Midline Theorem, 186
 midpoint, 3
 Millennium Problems, 216
 minor arc, 6
 Mohr-Mascheroni Theorem, 339

 Napoleon's Triangles, 214

- nine-point circle, 193
- noncollinear, 176
- noncoplanar, 358
- nondegenerate triangles, 275

- obtuse, 18
- octahedron, 372
- octave, 157
- ordered pair, 436
- origin, 3, 436
- orthocenter, 189
- orthodiagonal, 236
- Outer Napoleon Triangle, 214

- parallel lines, 24
- Parallel Postulate, 26
- parallelepiped, 360
- parallelograms, 215–219
- parity, 132
- Penrose tilings, 265
- pentomino, 131
- Perelman, Grigori, 216
- perimeter, 81–83
- perpendicular, 17
- perpendicular bisector, 72, 73, 170
- perpendicular, foot of, 86
- pi, 285
- plane of symmetry, 418
- planes, 4, 356–359
 - parallel, 358
 - perpendicular, 359
- Plato, 373
- Platonic solids, 373
- Poincaré Conjecture, 216
- point, 2
- point at infinity, 430
- point-slope form, 439, 473
- polygons, 244–266
 - angles, 246–249
 - area of a regular, 252
 - interior angles, 245
 - regular, 245
- polyhedra, 360
 - regular, 370–374
- polyhedron, *see* polyhedra
- polyomino, 131

- Poncelet-Steiner Theorem, 339
- postulates, 10
- Power of a Point, 340–355
- prisms, 360–366
- problem solving, iii
- proof by contradiction, 41, 143
- protractor, 14
- pyramids, 366–369
- Pythagoras, 142
- Pythagorean Theorem, 134–140, 147–152, 163
- Pythagorean triple, 147
- Pythagoreans, 142

- QED, 311
- quadrants, 490
- quadrilaterals, 206–243
 - circumscribed, 327
 - concave, 206
 - cyclic, 323
 - diagonal, 207
 - parallelogram, 215
 - rectangle, 221

- radian, 289
- radical axis, 352
- Radical Axis Theorem, 352
- radius, 5
 - bisects a chord, 54
- Ramanujan, 298
- rational numbers, 143
- ray, 3
- rectangles, 83, 221–224
 - area, 85
- reflections, 310, 413–418
- reflex angles, 19
- remote interior angles, 37
- resources, v
- rhombi, 219–221
- rhombus, *see* rhombi
- right angle, 17
- right rectangular prism, 360
- right triangles, 84, 133–169
 - area, 84, 85
 - inradius of, 327
- rotations, 411–413

- same-side exterior angles, 27

