

Index

- Algebra, 38, 58, 60, 94, 165-166, 192, 236, 240, 284-288
- Algebraic treatment of proportion, 64-66
- Altitude, 74, 259
on hypotenuse, 86
- Analysis, 5, 21
- And no other(s), 88, 246
- And only one, 89-90, 107
- Angle(s), 38, 39, 45, 46, 55, 146, 173-174
acute, 50
central, 134
complementary, 111
directed, 49, 235-239
division of, 165-166, 168, 170-172, 189-190, 194-195
exterior, 84, 87, 116, 117
inscribed, 145
interior, 55, 116, 117
measure, 45-54
negative, 49, 235-239
obtuse, 50
of polygon, 55
positive, 49, 235-239
right, 50
sides of, 46
straight, 46, 50
sum of, 82-85
supplementary, 111
to prove equal, 99, 111
trisection of, 166, 171, 189-190, 195
vertex of, 46
vertical, 52
- Apothem, 204
- Arc(s), 134
directed, 209, 234-239
equal, 135
intersection of, 173
length of, 135, 209, 223
major, 134
- Arc(s) (*cont.*)
mid-point of, 135
minor, 134
- Area, 198-226
approximate, 200, 202-205, 225-226
notes on, 222-226, 279
of solids, 202, 206-207, 215-216
unit of, 199, 222
See also Circle, Rectangle, Square, Triangle, etc.
- Assumption(s), 17-19, 23, 25, 38, 39, 106, 107, 222, 230, 268-270, 273-278, 282-283
concerning limits, 212
concerning number, 284-288
five fundamental, 38-60, 106, 107, 230
temporary, 5, 71, 106, 198, 199, 278-279
- Axiom(s), 19, 284-288
- Axis, axes
of network, 118-123
of symmetry, 124-126
radical, 262-263
- Basic assumptions, 38-60, 106, 107, 230
- Basic theorems, 71-93, 107
- Begging the question, 31, 32, 280
- Between
for half-lines with common end-point, 53-54
for points on a line, 43
- Betweenness, 146
- Bisect, 44, 48
- Bisector
of angle, 48, 174, 182-183, 251-252, 256, 260
of exterior angle, 116, 117, 260
of interior angle, 116, 117, 260

- Bisector (cont.)**
 perpendicular, 63, 81, 88-89, 172, 181, 250-251, 255
 Broken line, 55
- Center(s)**
 line of, 142
 of a circle, 133
 of inversion, 263
 of regular polygon, 154
 of similitude, 127
 of symmetry, 125, 126
- Chord, 136-137**
 common, 143
- Circle, 15, 133-160, 223-225**
 area of, 210-213, 223-225
 circumference of, 15, 208-213, 223-225
 circumscribed, 138, 181-182
 inscribed, 138, 182-183
 of inversion, 263
 tangent, 143
- Circumscribed**
 circle, 138, 181-182
 polygon, 138, 195
- Clockwise, 48, 235-239**
- Collinear, 125-128**
- Compasses, 165-196**
- Conclusion, 22, 27**
- Concurrent, 126-128, 255, 256, 259**
- Congruent, 59, 60, 135, 242**
- Construction(s), 165-196**
 general *vs.* special, 33
 incorrect, 32
 misleading, 33
 possible, 165-166, 170-172, 189-190, 194-195
- Continuous, 229**
- Continuous variation, 60, 228-240, 242**
 of a point, 231
 of a quantity, 230
 of an angle, 231-234
 of directed angles, 234-238
 of directed lengths, 238-240
- Converse, 26-29, 88, 246-248, 249-251**
- Convex**
 closed curve, 204, 225-226
 polygon, 55
- Coördinate(s), 119-123, 242**
- Corollary, 93**
- Counter-clockwise, 48, 235-239**
- Deduction, 273-277**
- Definition(s), 12-15, 25, 39, 106, 270, 280, 282**
 for area, 198, 199, 222-226
 for circle, 133-135, 208-213, 223-225
 listed in summaries, 67-68, 98-99, 130-131, 156, 220-221
- Degree(s), 46, 49, 50, 52**
- Diagonal, 4, 61, 97**
- Diameter, 15, 136**
- Directed**
 angle(s), 49, 235-239
 arc(s), 209, 234-239
 distance(s), 42-43, 119, 238-240
- Distance(s), 38, 39, 41**
 directed, 42-43, 119, 238-240
 from point to line, 95
 perpendicular, 95
 to prove equal, 99
 unit of, 40-42, 199
- Division**
 external, 116, 260
 internal, 116, 260
 of angle, 165-166, 168, 170-172, 189-190, 194-195
 of line segment, 166-170, 176-178, 192
- End-point(s), 45**
- Equal, 39, 105, 285**
 arcs, 135
 circles, 135
 triangles, 59, 80
- Equation**
 of circle, 133
 of line, 122-124
- Equiangular polygons, 85**
 triangles, 77
- Equilateral polygons, 85**
 triangles, 77
- Euclid, 4**

Euler's Theorem, 219
 Exist, 105, 106, 154, 181, 182, 256
 External
 division, 116, 260
 tangency, 143-144, 184-185

 Factor of proportionality, 57-59
 Fallacy
 geometric, 32, 280

 Geometric figures, 33, 55, 57
 Geometry
 exemplifies logic, 283
 Golden Section, 192
 Grade, 53

 Hadamard, 222
 Half-line(s), 45-49, 53-54
 Hypotenuse, 85
 Hypothesis, 22, 27

 If . . . , then . . . , 22, 27
 If and only if, 28-29, 88, 246
 Included, including, 14, 58
 Incommensurable case, 4, 228-230
 Indirect method, 33-35
 Induction, 273-276
 Inequality, 34, 94, 95, 231-234
 Inscribed
 angle, 145
 circle, 138, 182-183
 polygon, 138, 190-194
 Intercept, 141
 Internal
 division, 116, 260
 tangency, 143-144, 184-185
 Intersect, 45
 Intersection
 of arcs, 173
 of line and circle, 138
 of two circles, 142-143
 of two lines, 44-45
 Inversion, 263-266
 Isosceles, 75-77

 Language
 artificial, 280-283
 Laws of number, 38, 94, 284-288

 Length(s), 41, 198-226
 directed, 42-43, 119, 238-240
 of arc, 135, 209, 223
 of circle, 15, 208-213, 223-225
 to prove equal, 99
 unit of, 40-42, 199
 Line(s), 38-40, 44, 55
 broken, 55
 equation of, 122-124
 half-, 45-49, 53-54
 intersection of, 44-45
 inverse of, 264
 measure, 40-44, 198-226
 of centers, 142
 parallel, 105-123, 108, 168, 174-175
 perpendicular, 50, 54, 74, 89-90, 105, 106, 107, 168, 172, 178-180
 segment, 44, 166-170, 176-178, 192
 skew, 130
 slope of, 120-123
 straight, 39
 symmetry with respect to, 124-126
 Locus, loci, 242-266
 construction of, 253
 contains isolated points, 244
 defined, 242, 246
 of a point, 243
 of all points, 243
 plotting a, 245, 246
 points not included in, 252, 253
 proof of, 246-248, 251, 254
 seven standard theorems, 248-254
 Logical
 chain, 278-279
 deduction, 273-277
 system, 12, 35-36, 106, 268-270, 273-274, 280-283
 terms, 39, 280-283, 285

 Maxima, 218-219
 Mean proportional, 85, 86, 180
 Measure, 40-44, 45-54, 166-170, 198-226, 230

- Method
 - of the scientist, 100, 273
 - See also Deduction, Induction, Proof, Reasoning.
- Mid-point, 20, 23, 44
 - of arc, 135
 - of hypotenuse, 101, 257
 - of line segment, 20, 44
- Mil, 53
- Minima, 218-219
- Motion, 59-60, 242
- Network, 118-123, 200, 202-205, 225-226
- Non-Euclidean geometries, 277-278
- Non sequitur*, 29
- Number, 38, 39, 58, 60, 242, 279, 285
 - integer, 228
 - irrational, 4, 58, 228-229
 - laws of, 38, 94, 284-288
 - rational, 58, 228-229
 - real, 4, 58, 228-230
- Oblique, 95
- One and only one, 89-90, 107
- Opposite, 246-247, 249-251
- Opposite converse, 247, 252
- Optional topics, 6
- Order, 39, 285
- Origin, 118, 122-124, 133
- Original, 100
- Parallel(s), 105-123, 108, 168, 174-175
 - postulate, 106
 - system of, 108, 110, 111, 118
- Parallelogram, 113, 201
- Perimeter
 - of a polygon, 66, 210-212
- Perpendicular(s), 50, 54, 74, 89-90, 105, 106, 107, 168, 172, 178-180
 - bisector, 63, 81, 88-89, 172, 181, 250-251, 255
 - distance, 95
 - foot of, 95, 263
- Petio principii*, 31
- Pi, 212-213, 223-224
- Plane, 39, 128-130
 - of symmetry, 125
- Point(s), 38-40, 43-45, 55
 - infinitude of, 266
 - inverse of, 263
 - of contact, 138
 - of intersection, 45, 138, 143
 - of tangency, 138
 - power of, 261-263
 - symmetry with respect to, 125, 126
- Polygon(s), 55
 - angles of, 55
 - area of, 203-204, 222-226, 279
 - can be reproduced, 59
 - center of regular, 154
 - circumscribed, 138, 195
 - convex, 55
 - diagonal of, 61
 - equiangular, 85
 - equilateral, 85
 - exterior angle of, 87
 - inscribed, 138, 190-194
 - irregular, 203, 222-226
 - perimeter of, 66, 210-212
 - regular, 85, 133-159, 170-172, 190-196, 210-212
 - sides of, 55
 - similar, 57, 205-206
 - vertices of, 55
- Postulate(s), 19, 23, 25, 38, 39, 106, 107, 222, 230, 268-270, 273-278, 282-283
 - concerning limits, 212
 - concerning number, 284-288
 - five fundamental, 38-60, 106, 107, 230
 - parallel, 106
 - temporary, 5, 71, 106, 198, 199, 278-279
- Power of a point, 261-263
- Principle(s)
 - five fundamental, 38-60
 - listed in summaries, 67-68, 98-99
 - numbering of, 107

- Projection, 265-266
- Proof
 - indirect method of, 33-35
 - nature of geometric, 20-23
 - of a locus, 246-248, 251, 254
- Proportion, 57-59, 67
 - algebraic treatment of, 64-66
 - continued, 66
 - laws of, 65, 66
- Proportional, 57
 - fourth, 167, 178
 - mean, 85, 86, 180
- Proposition(s), 17, 18
 - converse, 26-29, 88, 246-248, 249-251
 - opposite, 246-247, 249-251
 - opposite converse, 247, 252
 - original, 100
 - restricted to plane figures, 5, 39
- Protractor, 46, 165-172
- Pythagorean Theorem, 90-98

- Quadrilateral(s), 56

- Radical axis, 262-263
- Radius, 15, 133, 136
 - of regular polygon, 204
- Reasoning
 - begging the question, 31, 32, 280
 - common errors in, 29-32
 - deductive, 273-277
 - in disputes, 9-11, 268
 - in non-mathematical situations, 9-36, 161-163, 268-283
 - necessity for logical, 12
 - non-sequitur*, 29
- Rectangle(s), 118, 199, 222
- Rectangular network, 118-123
- Reductio ad absurdum*, 35
- Refutation, 35
- Regular polygons, 85, 133-159, 170-172, 190-196, 210-212
- Regular polyhedrons, 188-189, 196, 202, 219-220
- Respectively, 14
- Rhombus, 118
- Right angle, 50
- Right triangle, 84, 85-86, 90-93
 - 30° - 60° , 96
- Ruler, 40, 60, 165, 280

- Scale, 40, 60, 165, 280
- Secant, 137, 151
- Sector, 213, 225
- Segment
 - line, 44, 166-170, 176-178, 192
- Semicircle, 134
- Side(s)
 - of angle, 46
 - of polygon, 55
- Similar, 105
- Similar figures, 57
- Similar polygons, 57, 205-206
- Similar right triangles, 85
- Similar triangles
 - Case 1, 58-60
 - Case 2, 72-75
 - Case 3, 78-80
- Skew lines, 130
- Slope, 120-123
- Solid geometry, 5, 39, 61, 75, 82, 101-102, 129-130, 160-161, 188-189, 196, 202, 206-207, 215-217, 219-220, 243-245, 250-252, 260-261, 263-266
- Solids
 - five regular, 188-189, 196, 202, 219-220
- Square, 118, 199, 222
- Starred exercises, 5, 52
- Straight angle, 46, 50
- Straightedge, 60, 165-196
- Straight line, 39
- Summaries, 67-68, 98-99, 130-131, 156, 220-221
- Superposition, 3
- Symbols
 - $<$, $>$, 34, 285
 - \angle , 21
 - Δ , 200
 - $=$, $+$, \times , 285
- Symmetry, 124-126
- System
 - logical, 12, 35-36, 106, 268-270, 273-274, 280-283
 - of parallels, 108, 110, 111, 118

- Tangent, 138, 151, 183-185
 circles, 143
 common external, 144, 184-185
 common internal, 144, 184-185
- Theorem(s), 19
 listed in summaries, 98-99, 130-131, 156, 220-221
 seven basic, 71-93, 107
 various forms of stating, 22, 27-29
- Transversal, 109-113
- Trapezoid, 115-116, 202
- Triangle(s), 38, 56
 acute, 84
 altitude of, 74
 area of, 200-201, 222
 base of, 245
 can be reproduced, 59
 centroid of, 259
 circumcenter of, 255
 construction of, 185-188
 equal ("congruent"), 59, 80
 equiangular, 77
 equilateral, 77
 incenter of, 256
 isosceles, 75-77
 median of, 259
 obtuse, 84
 orthocenter of, 259
 right, 84, 85-86, 90-93, 96
- Triangle(s) (*cont.*)
 similar, Case 1, 58-60
 Case 2, 72-75
 Case 3, 78-80
 spherical, 61, 75, 82
 sum of angles of, 82-85
 sum of two sides of, 94
 the vertex of a, 245
- Trisection of an angle, 166, 171, 189-190, 195
- Truth, 18, 19, 23, 29, 277-278
 of converse, 26, 27
- Undefined terms, 12, 13, 17, 25, 38, 39, 280-283
 list of, 39, 281, 285
- Unit
 of angle measure, 46, 49-50, 52-53
 of area, 199, 222
 of length, 40-42, 199
- Variation, continuous. *See* Continuous variation.
- Vertex, vertices
 of angle, 46
 of a polygon, 55
 of a triangle, 245
- Vertical angle, 52
- Volume, 206-207, 216-217