

Index

- Aleph null 166
- AND 4
- Axiom of choice 203
- Biconditional 21
- Cantor's theorems
 - Cantor's diagonalization 181
 - Cantor's power set 193
 - Cantor's proof $|\mathbb{R}| = |\mathbb{R}^2|$ 186
 - Cantor theorem 196
- Cardinality 165
- Cartesian product 207
- Combinations 145
- Complex numbers
 - absolute value 317
 - definition 317
 - history of 318
 - modulus 317
 - polar form 321
 - roots 326
- Conditional 21
- Congruence classes 248
- Congruence relation 247
- Conjunction 4
- Conjunctive normal form
- Contrapositive 24
- Continuum 184
- Converse 24
- Countably infinite 163
- Counting
 - aleph null 167
 - cardinality 165
 - combinations 145
 - multiplication principle 139
 - permutations 141
- Dedekind cut 296
- Disjunction 4
- Dynamic programming 361
- Equivalence classes 245
- Equivalence relation 243
- Equivalent sets 164
- Existential quantifier 37
- Field, algebraic
 - definition 471
 - finite fields 477
 - Galois fields 477
 - operations in $\text{GF}(2^2)$ 477
 - special types 472
- Functions
 - algebraic 258
 - bijection 167
 - composition of 259
 - Dirichlet definition of 255
 - domain 256
 - functions on sets 255
 - history of 257
 - injection (1-1) 167
 - image of a set 276
 - range 256
 - surjection (onto) 167
 - transcendental 259
- Graph theory
 - adjacency matrix 354
 - cycle 334
 - definition of 334
 - directed graphs 353
 - edges 334
 - Euler's theorem 342
 - Euler's Characteristic 342
 - Euler tours 335
 - even and odd graphs 335
 - Google's PageRank 358
 - Handshaking problem 338
 - Konigsberg bridge 333
 - Kruskal's algorithm 340
 - path 334
 - planar graphs 341
 - spanning tree 340
 - tournament graphs 354
 - weighted graph 339
 - vertices 334
- Greatest lower bound 296

- Group theory
 - Cayley table 424
 - cryptographics 468
 - cyclic group 427
 - definition of a group 422
 - dihedral groups 432
 - isomorphic groups 430
 - Klein 4-Group 426
 - product of permutations 442
 - subgroup 460
 - subgroup, test for 463
 - symmetric groups 451
- Jordan Curve theorem 373
- Least upper bound 296
- Liar's paradox 4
- Mathematicians
 - Aristotle 2
 - Cantor, Georg 166, 184
 - Descartes, Rene 24
 - Dedekind, Richard 296
 - Dirichlet, Peter Lejeune 255
 - Euler, Leonhard 109
 - Frege, Gotlob 42
 - Galois, Evariste 421
 - Hasse, Helmut 227
 - Hausdorff, Felix 222
 - Hilbert, David 46
 - Jordan, Camille 371
 - Noether, Emmy 473
 - Peano, Guiseppe 115, 259
 - Peirce, Benjamin 21
 - Russell, Bertrand 4
 - Volterra, Vito 263
 - Zermelo, Ernst 200
 - Weierstrass, Karl 39
- Modular arithmetic 246
- NOT 4
- OR 4
- Partition of a set 244
- Permutations
 - cycle notation 446
 - definition 143
 - inverses of 445
 - mappings 441
 - transpositions of 448
- Predicate Logic 37
- Proofs
 - direct proof 55
 - proof by contradiction 55
 - proof by contrapositive 55
 - proof by induction 93
- Propositions 3
- Rational numbers
- Real numbers
 - construction of 289
 - Dedekind cut 297
- Reductio ad absurdum* 53
- Residue classes 247
- Rings 469
- Relations
 - antisymmetric 223
 - partial order 223
 - reflexive relation 223
 - strict order 223
 - total order 226
 - transitive order 224
- Russell's paradox 199
- Sentence 1
- Sentential Logic 1
- Sets
 - continuum hypothesis 197
 - empty set 109
 - cardinality of the irrational numbers 188
 - complement of 109
 - families of 127
 - intersection of 114
 - membership 108
 - power set 111
 - subset 109
 - uncountable sets 181, 184
 - union of 114
- Syllogism 25
- Symmetry

- definition 402
- equilateral triangle 410
- line symmetry 404
- rotational symmetry 404
- rotation transformation 406
- Topology
 - homeomorphism 371
 - point-set topology 385
 - boundary of a set 391
 - closed sets 389
 - definition 387
 - exterior of a set 391
 - interior of a set 391
 - limit points of set 393
 - neighborhood 385
 - open sets 385
 - unions of open sets 388
 - Euler's Equation 376
 - topologically equivalent 369
 - topological invariants 374
- Transcendental numbers 189
- Truth tables 22
- Uncountable sets 184
- Universal quantifier 37
- Venn diagram 22
- Zermelo-Fraenkel axioms 200