

Index

- %, 111
- |, 98
- =, 20
- ==, 19
- 15 puzzle, 200
- 1-adic, 106
- 5-tuple, 213
- a priori* scheduling, 588
- abstract array, 53
- abstract base class, 256
- abstract data type, 52, 231
- abstract grammar, 297
- abstract-syntax tree, 296
- acceptor, 481
- accumulator, 133
- Ackermann's function, 109, 129, 559
- acyclic, 26
- add, 106
- addition, 106
- address, 39
- adjacency matrix, 41
- ADT, 52, 231
- aggregation, 243
- allocation, 230
- ALU, 569
- Amdahl's law, 426, 615
- anchor variable, 404
- and function, 341
- anonymous function, 67
- antiprefix, 62
- any, 76
- append, 63, 83
- append predicate, 396
- applet, 247
- applicative-order, 148
- apply, 270
- arithmetic series, 429
- arity, 62, 79
- array, 44, 85
- array maximum, 405
- array processor, 593
- array sorting, 406
- assembler, 553
- assembly language, 547, 553
- assignment, 313
- assoc, 61, 64
- association list, 64
- atom, 31
- atomic, 16
- attribute, 229
- auxiliary, 132, 284
- awt (abstract window toolkit), 264
- backtracking, 387
- barrel shifter, 121, 544
- base class, 246
- based addressing, 574
- based indexed addressing, 574
- basis, 101
- BCD, 331
- beta reduction, 103
- binary adder, 493
- binary relation, 25, 64
- binary representation, 49
- binary search, 464
- binary search tree, 465
- binary-coded decimal, 331
- binary-tree representation, 30
- binding, 21, 313
- bit, 49
- bit vector, 466

- Boole/Shannon expansion principle, 352
 Boolean algebra, 327
 bottom up, 211
 bound, 21
 braces-as-alternatives, 299
 breadth-first ordering, 142
 breadth-first search, 140, 186, 500
 breadth-first traversal, 179
 bucket, 181, 450
 built-in functions in rex, 19
 bus structure, 541
 butterfly, 604
 cache coherency, 605
 cache memory, 422
 caching, 61
 calculus, 73
 calling conventions, 556
 Cartesian encoding, 331
 Cartesian product, 75, 197, 213
 cell, 166
 cellular automaton, 594
 chain rule, 73
 channel, 579
 child, 586
 Chinese rings puzzle, 200
 chunk, 238
 Church/Turing Hypothesis, 280
 CISC, 547
 class, 229
 classifier, 473, 481
 client, 229
 client-server, 605
 clock quantization, 517
 clocked latch, 530
 closed list, 14, 168
 closure, 272
 code factoring, 243
 combination lock, 524
 combinational switching principle, 335
 commute, 66
 compiler, 547
 compiler generator, 314
 complexity, 421
 compose, 272
 compose_list, 85
 composition, 71, 72, 243
 computer network, 605
 concat, 271
 concrete, 53
 concurrency, 585
 conditional expression, 112
 conjunction, 348
 connection matrix, 41
 connective, 339
 consensus, 371
 consensus rule, 369
 consing, 22
 constant function, 59
 constructor, 230
 context-free grammar, 285, 290
 controller, 481
 convolution, 160
 copy rule, 103
 copying, 261
 countable, 277
 countably-infinite, 277
 counterexample, 357
 counting principle, 197
 critical section, 602
 crossover point, 432
 cursor, 268
 cyclic, 26
 D flip-flop, 518
 dag, 46
 data container, 239
 database, 381
 decoder, 376

- decoding, 568
- deep copying, 261
- defer, 47, 150
- deferred binding, 47
- define a function, 67
- define operator, 20
- definite iteration, 281
- delay, 151, 152
- DeMorgan's laws for quantifiers, 384
- demultiplexer, 375
- dense, 466
- depth-first ordering, 140
- depth-first search, 139, 388
- deque, 239, 242
- dequeue, 239
- dereference, 165
- derivation tree, 291
- derived class, 246
- derives, 292
- deterministic, 191
- deterministic acceptor, 500
- dictionary, 64
- difference, 137
- digit, 49
- direct addressing, 572
- direct memory access, 579
- directed acyclic graph, 46
- directed graph, 25, 143
- directives, 554
- directory structure, 28
- disjunction, 348
- dispatch, 560
- distributed memory, 603
- distribution sorting, 450
- diverge, 149
- divide, 59, 128
- divide-and-conquer principle, 454
- DMA, 579
- DMUX, 375
- domino problems, 613
- double layer of arguments, 71
- double-ended queue, 242
- doubly-linked list, 166, 177
- drop, 80, 128
- dynamic programming principle, 211
- edge-detector, 474
- edge-triggered, 530
- effective address, 574
- effort, 606
- ellipsis convention, 300
- empty list, 17, 30
- encoder, 376
- encoding, 328
- energy function, 413
- enqueue, 239
- enumerate, 60
- enumeration, 60
- envelope, 430
- environment, 21
- equal, 108
- equal lists, 17
- equality operator, 19
- equation, 60, 112
- equational guard, 112
- error-correcting code, 332
- Euclid's algorithm, 110
- Euler's method, 158
- evolutionary development, 230
- exclusive-or, 341
- existential quantifier, 384
- extends, 246
- factorial, 133, 202
- factorial program in Lisp, 318
- fail, 97
- Fast Fourier Transform, 121
- Fibonacci function, 210, 559
- Fibonacci sequence, 155
- field, 54, 449

file memory, 422
 find, 81
 find_index, 127
 find_indices, 81
 finite, 277
 finite-state automata, 471
 finite-state machine, 471, 610
 foldl, 83, 85, 134
 foldr, 83, 85, 134
 forest, 38
 fork, 586
 formal polynomial, 52
 fractal, 189
 Fredkin automaton, 596
 free variable, 68
 full adder, 373
 function, 58
 functional expression, 67
 fundamental list-dichotomy, 17, 100
 Game of Life, 595
 gather, 81
 gcd, 110, 112
 general recursive function, 219
 generator, 481
 getter, 230
 glitch, 616
 goal, 387
 grammar, 284
 graphical user interface, 162
 grouping, 303
 guarded rule, 110
 Halmos, 276
 Hamming distance, 334
 handshaking, 575
 hash function, 181
 hash table, 181
 hashing, 44, 180, 467
 header, 174
 heap, 456
 heap invariant, 456
 heterogeneous list, 22
 hierarchical list, 26
 higher-order function, 67
 higher-order predicate, 79
 histogram, 162
 homogeneous, 16
 Horner's Rule, 117, 118
 hypercube, 279, 334, 362
 hypertext link, 39
 identifier, 20
 identity, 65
 if, 149
 if function, 341
 iff, 341
 image, 42
 immutable, 260
 implementation inheritance, 253
 implementing finite-state machines, 514
 implies function, 342
 imported, 68, 69
 includes, 137
 indefinite iteration, 129, 281
 indeterminacy, 600
 index, 44
 index register, 573
 indexed addressing, 573
 indirect addressing, 572
 induction rule, 101
 inductive, 101
 inductive argument, 102, 105
 infinite, 277
 infinite list, 151
 Infinity, 60
 inheritance, 245
 in-order traversal, 179
 insertion sort, 122, 453
 instance, 230
 instance variable, 231

- instanceof, 259
- instruction fetch cycle, 565
- instruction pointer, 407, 548
- instruction register, 565
- interface, 132
 - interface inheritance, 253
- internal representation of lists, 32
- Internet, 39
- interpret, 565
- interpretation, 379
- interpreter, 547
- interrupt, 578
 - interrupt mask register, 579
 - interrupt service routine, 578
 - interrupt vector, 578
- intersection, 137, 537
- irreducible, 101
- is a*, 252, 253
- is_integer, 75
- is_number, 75
- ISC, 548
 - ISC internal structure, 567
 - ISCAL, 553
- iterated consensus, 369
- iterative deepening, 146
- Java, 15
- Karnaugh map, 358
- keep, 80, 84, 128
- key, 449
- Kleene's Theorem, 506
- knowledge base, 381
- L'Hopital's Rule, 446
- labeled binary tree, 178
- labeled directed graph, 40
- labeled-tree interpretation, 28
- lambda calculus, 69, 219
- language, 283, 481
- last, 174
- latch, 528
- leaf, 26, 88
 - leafcount, 24
 - left recursion, 305
 - leftmost applicative-order, 148
 - length, 101, 171
 - length, 24
 - less_than_or_equal, 108
 - level-order, 179
 - lexicographic ordering, 63
 - LIFO, 232
 - limit rule, 446
 - linear addressing principle, 44, 180, 182, 560
 - link, 48
 - linked list, 165
 - Lisp, 15
 - list, 59, 67
 - list of functions, 69
 - loader, 548
 - locality, 605
 - loop, 154
 - loop invariant, 408
 - lower bound, 446
 - lower-bound, 609
 - machine language, 547
 - mailbox, 602
 - make_array, 86
 - map, 66, 67, 76, 84, 86, 116, 271, 591
 - mappend, 134
 - mapping, 66
 - maps to, 58
 - Markov algorithm, 219
 - match, 77
 - matrix, 40
 - maximal sub-cubes, 362
 - McCarthy's Transformation Principle, 204
 - Mealy machine, 473
 - meaning of an expression, 313
 - member, 135

memory address register, 565
 memory data register, 565
 memory hierarchy, 422
 memory protection, 582
 memory-mapped I/O, 561
 merge sort, 124, 463
 message, 603
 message queue, 602
 method, 228
 MIDI, 481
 MIMD, 597
 minsort, 453
 minterm, 348
 minterm expansion principle, 349
 mixed radix, 128
 mod, 111, 114, 119
 modulo, 111
 modulo-2 addition, 332
 Moore machine, 473
 Morse code, 40
 multiple-instruction, multiple-data, 597
 multiplexor, 121, 354, 540
 multiplication rule, 438
 multiply, 128
 multiprocessing, 587
 multiply-by-two, 491
 multi-stage interconnect, 604
 mutual exclusion, 602
 mutual recursion, 139
 MUX, 540
 nand, 342
 n-ary, 62
 natural number, 106, 151
 new operator, 231, 235
 nim, 92
 nim sum, 93
 non_zero, 108
 non-deterministic, 191
 non-deterministic transition, 498
 non-terminal, 284
 non-termination, 60
 nor, 341
 normal order, 149
 normalization, 243
 NP, 615
 N-queens problem, 393
 n-tuples, 137
 null, 11
 number, 49
 Number class, 260
 numbering of functions, 340
 numeral, 49
 object, 227
Object class, 259
 object-oriented programming, 52
 oct-tree, 36
 offset, 574
 one-to-one, 59
 open list, 14, 168
 operating system, 185
 or function, 341
 ordered dictionary, 65
 oriented directed graph, 40
 overload, 62, 133
 over-riding, 246, 247
 page table, 183, 580
 pages, 183
 paging memory, 422
 pairs, 70, 75, 161
 parallel, 57
 parallel assignment, 205
 parallel composition, 537
 parallel transfer, 539
 parallelism, 585
 parent, 586
 parity bit, 332
 parsing, 293
 partial correctness, 407
 partial function, 59, 65

- partial function computed by a TM, 213
partial recursive function, 219, 280
partial_sums, 152
pattern, 97, 284
peg solitaire, 198
peripheral processors, 579
permutation, 406, 610
phrase-structure grammar, 219, 285, 290
pid, 586
pigeon-hole principle, 610
pipe, 588, 603
pipe composition, 153
pipeline, 72, 580, 591
pixel, 33
PLA, 350
pointer, 11, 32, 45
Polylist, 264
polymorphic, 76, 264
polynomial rule, 437
pop, 232
post-condition, 409
post-order traversal, 179
power, 210
power set, 135
precedence, 294, 303
pre-condition, 409
predecessor, 107, 187
predicate, 138, 379
predicate logic, 379
prefix, 62
pre-order traversal, 179
prime implicants, 362
primes, 153
primitive recursion, 280
principle of diagonalization, 611
principle of inductive definition, 275
principle of interning, 262
principle of locality, 183
principle of modularity, 229
principle of radix representation, 118
principle of virtual contiguity, 182, 251
priority queue, 239, 457
procedural interpretation, 386
procedure, 58
process, 586
process id, 586
production, 284
profiling, 426
program compaction principle, 208
program counter, 548
program variables, 202
programmable logic array, 350
Prolog, 15, 192, 381
Prolog programmers' manifesto, 392
proper subtraction, 107
proposition logic, 327
proposition logic satisfiability, 610
pseudo-operation, 554
push, 232
quad-tree, 33
quantifier, 79, 383
quantifiers over array indices, 405
queue, 140, 174, 239, 253
Quicksort, 134, 454
quoting, 287
R expression, 51
race condition, 600
radix principle, 120, 125, 450, 544
radix sort, 121, 125
range, 62, 115
raster encoding, 35
reachability matrix, 41
reachability relation, 190
reachable, 26

read/write strobe, 576
 read-only variable, 403
 recognizer, 481
 record, 54
 recursion manifesto, 115
 recursive, 101
 recursive descent, 305, 388
 recursive function theory, 106
 recursive procedures, 557
 recursive type definition, 167
 reduce, 82, 83, 84, 134
 reference, 45, 47, 165, 168, 171, 231
 referential transparency, 57
 register, 534
 register machine (Shepherdson and Sturgis), 219
 register-indirect addressing, 548
 regular expression, 284, 501
 regular expression identities, 503
 regular language, 504
 release (ISCAL), 555
 remove_duplicates, 62, 87, 127
 representation invariant, 23
 resource, 421
 rest, 17
 return-from-interrupt instruction, 579
 reverse, 63
 reverse Polish notation, 316
 rewrite rule, 101
 rex, 15, 19
 Rice's theorem, 614
 ring, 178
 ripple-carry, 373
 RISC, 547
 root, 26
 RPN, 316
 Runge-Kutta, 162
 Russian peasants' principle, 121
 S expression, 51, 77, 264
 satisfy, 79
 scaffolding, 284
 scalability, 604
 scale, 115
 scope, 113
 select, 127, 129
 select_min, 123
 selection sort, 123
 selector, 354
 self-scheduling, 588
 self-similar system, 189
 semantics, 290
 semaphore, 601
 semi-asynchronous, 576
 sequence, 44
 sequencer, 481
 sequences as functions, 85
 sequential behavior of AND-gate, 515
 sequential binary adder, 522
 serial transfer, 539
 set, 22
 set of all subsets of ω , 278
 set selection, 80
 setter, 230
 shallow copying, 261
 shared memory, 598
 shift register, 539
 short-circuit convention, 345
 side effect, 57
 SIMD, 592
 single-instruction stream, multiple data stream, 592
 singly-linked list, 51
 size, 328
 small-integer interning, 262
 Smalltalk, 228
 sockets, 605
 solfege, 65

- some, 84
SOP, 362
sort, 63, 87
sorting, 122, 449
special element, 60
specifying properties of a program, 397
speedup, 606
spreadsheet model, 321
square root, 211
stack, 174, 232
stack, 253
stand-alone convention, 342, 379
star operator, 287
start symbol, 284
state, 185
state transition, 390
static method, 231
static variable, 231
step-counting principle, 422
Stirling's formula, 610
stone age, 106
stored-program computer, 547
straight-line programs, 423
stratifying, 295
stream parallelism, 588
strobe, 575
struct, 54, 449
structural induction, 399
structure sharing, 319
sub-class, 252
sub-cube, 282
substitution principle, 344
subsumption rule, 369
subtract, 107
sub-tree, 26
successor, 187
successor function, 106
suffix, 62
sum rule, 436
sum-of-product, 362
superpower, 109
switch statement, 560
switching logic, 327
symmetric transition relation, 188
synchronize, 602
synchronizer, 616
synchronous design, 519
syntax, 290
syntax diagram, 300
syntax-directed compiler, 314
tag, 151
tag system, 219
tail of a list, 45
tail-recursion, 132
target, 26
target set, 26
tautology, 343
Taylor's series, 160
template, 97
terminal alphabet, 284
termination, 407
three-state buffer, 541, 565, 616
tight upper bound, 431, 447
total correctness, 407
transducer, 473
transition, 187
transition function, 212
transition induction, 401
transition relation, 187
transition rules, 193
transitive closure, 42, 102, 190
transitivity rule, 435
transparent latch, 530
transpose, 52, 78
trap, 579
traveling salesman problem, 610
traversal, 179
tree, 26
tree structuring principle, 456

- trie, 36, 467
truth value, 339
Turing machine, 211
Turing's thesis, 215
two-valued domain, 327
type, 22, 75
type name, 230
unbound, 21, 68
undefined, 59
undirected graph, 43
union, 135
unit, 82
unit delay machine, 492
universal combinational logic synthesis, 347
universal quantifier, 384
universal Turing Machine, 214
UNIX, 72, 586
unlabeled-tree interpretation, 28
unordered array, 464
upper bound, 430
use (ISCAL), 555
valid, 381
verification condition, 408
virtual memory, 580
voxel, 40
wait state, 566, 576
water jugs puzzle, 199, 389
weakest liberal precondition, 416
web browser, 39
window, 252
World-Wide Web, 39
worst-case, 430
wrapper, 174
wrapper, 259
xor, 341
yacc, 314
yields, 58
zig-zagging, 161
zip, 63
 \forall , 384
 \exists , 384
 Ω , 609
 λ transition, 498
 μ operator, 281
 ω , 276