

Index

- 9-1-1, 2
- abstract data type, *see* interface
- adjacency list, 252
- adjacency matrix, 249
- algorithmic complexity attack, 132
- amortized cost, 21
- amortized running time, 20
- ancestor, 133
- array
- circular, 38
- ArrayDeque, 40
- ArrayQueue, 36
- arrays, 29
- ArrayStack, 30
- asymptotic notation, 12
- AVL tree, 206
- B^* -tree, 304
- B^+ -tree, 304
- B -tree, 286
- backing array, 29
- Bag, 28
- BDeque, 71
- Bibliography on Hashing, 128
- big-Oh notation, 12
- binary heap, 211
- binary logarithm, 10
- binary search, 272, 289
- binary search tree, 140
- height balanced, 206
 - partial rebuilding, 173
 - random, 154
 - randomized, 169
 - red-black, 185
 - size-balanced, 148
 - versus skip list, 105
- binary search tree property, 140
- binary tree, 133
- complete, 215
 - heap-ordered, 212
 - search, 140
- binary-tree traversal, 136
- BinaryHeap, 211
- BinarySearchTree, 140
- BinaryTree, 135
- BinaryTrie, 266
- binomial coefficients, 12
- binomial heap, 222
- black node, 190
- black-height property, 190
- block, 283, 284
- block store, 285
- BlockStore, 285
- borrow, 298
- bounded deque, 71

- BP1usTree, 307
- breadth-first traversal, 139
- breadth-first-search, 256
- celebrity, *see* universal sink
- ChainedHashTable, 107
- chaining, 107
- child, 133
 - left, 133
 - right, 133
- circular array, 38
- coin toss, 17, 98
- collision resolution, 128
- colour, 190
- Comparator, 226
- compare(a, b), 226
- compare(x, y), 9
- comparison tree, 236
- comparison-based sorting, 226
- complete binary tree, 215
- complexity
 - space, 20
 - time, 20
- conflict graph, 247
- connected components, 263
- connected graph, 263
- contact list, 1
- conted B -tree, 304
- correctness, 20
- CountdownTree, 183
- counting-sort, 239
- credit invariant, 302
- credit scheme, 179, 302
- CubishArrayList, 61
- cuckoo hashing, 129
- cycle, 247
- cycle detection, 260
- DaryHeap, 223
- decreaseKey(u, y), 222
- degree, 254
- dependencies, 22
- depth, 133
- depth-first-search, 258
- deque, 6
 - bounded, 71
- descendant, 133
- dictionary, 8
- directed edge, 247
- directed graph, 247
- disk access model, 304
- divide-and-conquer, 226
- DLList, 67
- doubly-linked list, 67
- DualArrayList, 43
- dummy node, 67
- Dyck word, 28
- DynamiteTree, 183
- e (Euler's constant), 10
- edge, 247
- emergency services, 2
- Euler's constant, 10
- expected cost, 21
- expected running time, 17, 20
- expected value, 17
- exponential, 10
- Ext4, 304
- external memory, 283
- external memory hashing, 305
- external memory model, 284
- external storage, 283

- Eytzinger's method, 211
- factorial, 11
- family tree, 147
- FastArrayStack, 35
- Fibonacci heap, 222
- FIFO queue, 5
- file system, 1
- finger, 103, 171
- finger search
 - in a skip list, 103
 - in a treap, 171
- fusion tree, 281
- general balanced tree, 181
- git, xiv
- Google, 3
- graph, 247
 - connected, 263
 - strongly-connected, 263
- H_k (harmonic number), 154
- hard disk, 283
- harmonic number, 154
- hash code, 107, 122
 - for arrays, 125
 - for compound objects, 123
 - for primitive data, 123
 - for strings, 125
- hash function
 - perfect, 128
- hash table, 107
 - cuckoo, 129
 - two-level, 129
- hash value, 107
- hash(x), 107
- hashing
 - multiplicative, 110, 129
 - multiply-add, 129
 - tabulation, 169
 - universal, 129
- hashing with chaining, 107, 128
- heap, 211
 - binary, 211
 - binomial, 222
 - Fibonacci, 222
 - leftist, 222
 - pairing, 222
 - skew, 222
- heap order, 212
- heap property, 159
- heap-ordered binary tree, 212
- heap-sort, 233
- height
 - in a tree, 133
 - of a skip list, 87
 - of a tree, 133
- height-balanced, 206
- HFS+, 304
- I/O model, 304
- in-order number, 148
- in-order traversal, 148
- in-place algorithm, 243
- incidence matrix, 262
- indicator random variable, 17
- interface, 4
- Java Collections Framework, 26
- Java Runtime Environment, 60
- leaf, 133
- left child, 133
- left rotation, 161

- left-leaning property, 194
- left-leaning red-black tree, 194
- leftist heap, 222
- LIFO queue, 5, *see also* stack
- linear probing, 114
- `LinearHashTable`, 114
- linearity of expectation, 17
- linked list, 63
 - doubly-, 67
 - singly-, 63
 - space-efficient, 71
 - unrolled, *see also* `SEList`
- `List`, 6
- logarithm, 10
 - binary, 10
 - natural, 10
- lower-bound, 235
- map, 8
- matched string, 28
- `MeldableHeap`, 217
- `memcpy(d,s,n)`, 36
- memory manager, 60
- merge, 187, 299
- merge-sort, 84, 226
- min-wise independence, 169
- `MinDeque`, 85
- `MinQueue`, 85
- `MinStack`, 85
- modular arithmetic, 37
- multiplicative hashing, 110, 129
- multiply-add hashing, 129
- `n`, 22
- natural logarithm, 10
- no-red-edge property, 190
- NTFS, 304
- number
 - in-order, 148
 - post-order, 148
 - pre-order, 148
- O notation, 12
- open addressing, 114, 128
- Open Source, xiii
- ordered tree, 133
- pair, 8
- pairing heap, 222
- palindrome, 83
- parent, 133
- partial rebuilding, 173
- path, 247
- pedigree family tree, 147, 222
- perfect hash function, 128
- perfect hashing, 128
- permutation, 11
 - random, 154
- pivot element, 230
- planarity testing, 262
- post-order number, 148
- post-order traversal, 148
- potential, 48
- potential method, 48, 80, 205
- pre-order number, 148
- pre-order traversal, 148
- prime field, 126
- priority queue, 5, *see also* heap
- probability, 15
- queue
 - FIFO, 5
 - LIFO, 5

- priority, 5
- quicksort, 230
- radix-sort, 241
- RAM, 18
- random binary search tree, 154
- random permutation, 154
- randomization, 15
- randomized algorithm, 15
- randomized binary search tree, 169
- randomized data structure, 15
- RandomQueue, 60
- reachable vertex, 247
- recursive algorithm, 136
- red node, 190
- red-black tree, 185, 194
- RedBlackTree, 194
- remix, xiii
- right child, 133
- right rotation, 161
- rooted tree, 133
- RootishArrayList, 49
- rotation, 161
- run, 118
- running time, 20
 - amortized, 20
 - expected, 17, 20
 - worst-case, 20
- scapegoat, 173
- ScapegoatTree, 174
- search path
 - in a BinaryTrie, 266
 - in a binary search tree, 140
 - in a skip list, 88
- secondary structure, 275
- SEList, 71
- sentinel node, 88
- Sequence, 184
- share, xiii
- simple path/cycle, 247
- singly-linked list, 63
- size-balanced, 148
- skew heap, 222
- skip list, 87
 - versus binary search tree, 105
- SkiplistList, 93
- SkiplistSSet, 90
- SLLList, 63
- social network, 1
- solid-state drive, 283
- sorting algorithm
 - comparison-based, 226
- sorting lower-bound, 235
- source, 247
- space complexity, 20
- spanning forest, 263
- speciation event, 147
- species tree, 147
- split, 187, 290
- square roots, 56
- SSet, 9
- stable sorting algorithm, 241
- stack, 5
- `std::copy(a0,a1,b)`, 36
- Stirling's Approximation, 11
- stratified tree, 280
- string
 - matched, 28
- strongly-connected graph, 263
- successor search, 9
- `System.arraycopy(s,i,d,j,n)`, 36

- tabulation hashing, 121, 169
target, 247
tiered-vector, 59
time complexity, 20
traversal
 breadth-first, 139
 in-order, 148
 of a binary tree, 136
 post-order, 148
 pre-order, 148
Treap, 159
TreapList, 172
tree, 133
 d -ary, 222
 binary, 133
 ordered, 133
 rooted, 133
tree traversal, 136
Treque, 60
two-level hash table, 129
- underflow, 295
universal hashing, 129
universal sink, 263
unrolled linked list, *see also* **SList**
USet, 8
- van Emde Boas tree, 280
vertex, 247
- wasted space, 54
web search, 1
WeightBalancedTree, 183
word, 19
word-RAM, 18
worst-case running time, 20