

Notation Index

- \exists (there exists) Fn-4
- \forall (for all) Fn-4
- \ni (such that) Fn-4
- B_n (Bell numbers) CL-27
- $s \sim t$ (equivalence relation) GT-5
- $\binom{n}{k}$ (binomial coefficient) CL-15
- $\binom{n}{m_1, m_2, \dots}$ (multinomial coefficient) CL-20
- BFE(T) (breadth first vertex sequence) DT-8, GT-29
- BFV(T) (breadth first vertex sequence) DT-8, GT-29
- $C(n, k)$ (binomial coefficient) CL-15
- Cov(X, Y) (covariance) Fn-25
- DFV(T) (depth first vertex sequence) DT-8, GT-29
- $x|y$ (x divides y) GT-24
- DFE(T) (depth first edge sequence) DT-8, GT-29
- μ_X (expectation or mean) Fn-24
- $E(X)$ (expectation) Fn-24
- $f \circ g$ (composition) Fn-7
- $(n)_k$ (falling factorial) CL-9
- F_n (Fibonacci numbers) DT-48
- $\lfloor x \rfloor$ (floor) DT-50
- (V, E) (simple graph) GT-2
- (V, E, ϕ) (graph) GT-2
- \mathbb{N} (natural numbers) CL-13
- \underline{n} (first n integers) Fn-1
- $O(\)$ (Big oh notation) GT-38
- $o(\)$ (little oh notation) GT-40
- $\mathcal{P}_k(A)$ (k -subsets of A) CL-15, Fn-1
- $\mathcal{S}(A)$ (permutations of A) Fn-7
- PER(A) (permutations of A) Fn-7
- Probability notation
 - μ_X (expectation, or mean) Fn-24
 - $\rho(X, Y)$ (correlation) Fn-25
 - σ_X (standard deviation) Fn-25
 - $E(X)$ (expectation) Fn-24
 - Cov(X, Y) (covariance) Fn-25
 - Var(X) (variance) Fn-25
- $P(A|B)$ (conditional probability) DT-27
- POSV(T) (postorder sequence of vertices) DT-8
- PREV(T) (preorder sequence of vertices) DT-8
- \mathbb{Q} (rational numbers) Fn-1
- \mathbb{R} (real numbers) CL-28, Fn-1
- $\rho(X, Y)$ (correlation) Fn-25
- Set notation
 - $\sim A$ (complement) CL-14, Fn-1
 - \in and \notin (in and not in) CL-14
 - A' (complement) CL-14, Fn-1
 - $A - B$ (difference) CL-14, Fn-1
 - $A \cap B$ (intersection) CL-14, Fn-1
 - $A \cup B$ (union) CL-14, Fn-1
 - $A \oplus B$ (symmetric difference) Fn-1
 - $A \setminus B$ (difference) CL-14, Fn-1
 - $A \subseteq B$ (subset) CL-14
 - $A \times B$ (Cartesian product) CL-4, Fn-1
 - A^c (complement) CL-14, Fn-1
 - $\mathcal{P}_k(A)$ (k -subsets of A) CL-15, Fn-1
 - $|A|$ (cardinality) CL-3, CL-14
- σ_X (standard deviation) Fn-25
- $S(n, k)$ (Stirling numbers) CL-25
- $\Theta(\)$ (rate of growth) GT-38
- Var(X) (variance) Fn-25
- \mathbb{Z} (integers) CL-13, Fn-1

Subject Index

- Absorption rule CL-15
- Adjacent vertices GT-3
- Algebraic rules for sets CL-15
- Algorithm
 - backtracking DT-7
 - divide and conquer DT-16, GT-45
 - Kruskal's (minimum weight spanning tree) GT-32
 - lineal (= depth-first) spanning tree GT-33
 - partial GT-45
 - polynomial time (tractable) GT-43
 - Prim's (minimum weight spanning tree) GT-31
 - which is faster? GT-43
- Antisymmetric binary relation GT-24
- Associative rule CL-15
- Asymptotic GT-40
- Average running time GT-41

- Backtracking DT-7
- Base (simplest) cases for induction DT-42
- Bayes' Theorem DT-28, DT-32
- Bell numbers CL-27
- Bicomponents GT-22
- Biconnected components GT-22
- Bijection Fn-3
- Binary relation GT-5
 - antisymmetric GT-24
 - covering GT-24
 - equivalence relation GT-5
 - order relation GT-24
 - reflexive GT-5
 - symmetric GT-5
 - transitive GT-5
- Binary tree GT-36
 - full GT-36
- Binomial coefficients CL-15
 - recursion CL-23
- Binomial distribution Fn-34
- Binomial theorem CL-18
- Bipartite graph GT-22
 - cycle lengths of GT-34
- Blocks of a partition CL-20, CL-25, Fn-15
- Boolean variables DT-36
- Breadth first vertex (edge) sequence DT-8, GT-29

- Card hands
 - and multinomial coefficients CL-23
 - full house CL-19
 - straight CL-26
 - two pairs CL-19
- Cardinality CL-3
- Cardinality of a set CL-14
- Cartesian product CL-4, Fn-1
- Central Limit Theorem Fn-38
- Characteristic equation DT-47
- Characteristic function DT-23
- Chebyshev's inequality Fn-27
- Child vertex DT-2, GT-27
- Chromatic number GT-41, GT-44
- Circuit in a graph GT-18
 - Eulerian GT-20
- Clique GT-44
- Clique problem GT-44
- Codomain (range) of a function Fn-2
- Coimage of a function Fn-14
- Coloring a graph GT-41, GT-44
- Coloring problem GT-43

Index

- Commutative rule CL-15
- Comparing algorithms GT-43
- Complement of a set Fn-1
- Complete simple graph GT-15
- Component connected GT-19
- Composition of an integer CL-8
- Composition of functions Fn-7
- Conditional probability DT-27
- Conjunctive normal form DT-36
- Connected components GT-19
- Correlation Fn-25
- Covariance Fn-25
- Covering relation GT-24
- Cycle in a graph GT-18
 - Hamiltonian GT-21
- Cycle in a permutation Fn-9

- Decision tree DT-1
 - see also* Rooted tree
 - ordered tree is equivalent GT-27
 - probabilistic DT-30
 - RP-tree is equivalent GT-27
 - Towers of Hanoi DT-18
 - traversals DT-8, GT-28
- Decreasing (strictly) function or list Fn-17
- Decreasing (weakly) function or list Fn-17
- Degree of a vertex DT-2, GT-4
- Degree sequence of a graph GT-4
- DeMorgan's rule CL-15
- Density function Fn-22
- Depth first vertex (edge) sequence DT-8, GT-29
- Derangement Fn-12
- Deviation
 - standard Fn-25
- Dictionary order CL-4
- Digraph GT-14
 - functional GT-29
- Direct (Cartesian) product CL-4, Fn-1
- Direct insertion order for permutations DT-6
- Directed graph GT-14
- Directed loop GT-15
- Disjunctive normal form DT-36
- Distribution Fn-22
 - binomial Fn-34
 - hypergeometric CL-32
 - joint Fn-28
 - marginal Fn-28
 - normal Fn-36
 - Poisson Fn-35
 - uniform CL-28
- Distribution function
 - see* Distribution
- Distributive rule CL-15
- Divide and conquer DT-16, GT-45
- Domain of a function Fn-2
- Domino covering DT-11
- Double negation rule CL-15
- Down degree of a vertex DT-2

- Edge DT-2, GT-2
 - directed GT-14
 - incident on vertex GT-3
 - loop GT-4, GT-11
 - parallel GT-11
- Edge sequence
 - breadth first DT-8, GT-29
 - depth first DT-8, GT-29
- Elementary event CL-29
- Envelope game Fn-2
- Equation
 - characteristic DT-47
- Equivalence class GT-5
- Equivalence relation GT-5
- Error
 - percentage CL-10
 - relative CL-10
- Eulerian circuit or trail GT-20

- Event CL-28, Fn-21
 - elementary=simple CL-29
 - independent pair Fn-29, DT-28
- Expectation of a random
 - variable Fn-24
- Factorial
 - falling CL-9
- Factorial estimate (Stirling's
 - formula) CL-10
- Falling factorial $(n)_k$ CL-9
- Fibonacci recursion DT-48
- First Moment Method DT-37
- Full binary tree GT-36
- Function
 - bijection Fn-3
 - characteristic DT-23
 - codomain (range) of Fn-2
 - coimage of Fn-14
 - composition of Fn-7
 - decreasing: decision tree DT-14
 - density Fn-22
 - distribution, *see* Distribution
 - domain of Fn-2
 - generating CL-16
 - image of Fn-14
 - image of and Stirling numbers
 - (set partitions) Fn-15
 - injective (one-to-one) Fn-3
 - inverse Fn-3
 - inverse image of Fn-14
 - monotone Fn-17
 - one-line notation Fn-2
 - partial DT-3
 - probability Fn-21
 - range of Fn-2
 - restricted growth and set
 - partitions Fn-20
 - strictly decreasing Fn-17
 - strictly increasing Fn-17
 - surjective (onto) Fn-3
 - two-line notation Fn-5
 - weakly decreasing Fn-17
 - weakly increasing Fn-17
- Functional relation Fn-4
- Gambler's ruin problem DT-51
- Generating function CL-16
- Geometric probability CL-34
- Geometric series DT-50
- Graph GT-2
 - see also* specific topic
 - biconnected GT-22
 - bipartite GT-22
 - bipartite and cycle
 - lengths GT-34
 - complete simple GT-15
 - connected GT-19, GT-19
 - directed GT-14
 - incidence function GT-3
 - induced subgraph (by edges or
 - vertices) GT-17
 - isomorphism GT-7
 - oriented simple GT-24
 - random GT-7
 - rooted GT-27
 - simple GT-2
 - subgraph of GT-17
- Gray code for subsets DT-23
- Growth
 - rate of, *see* Rate of growth
- Hamiltonian cycle GT-21
- Hasse diagram GT-24
- Height of a tree GT-35
- Height of a vertex DT-3
- Hypergeometric probability CL-32
- Idempotent rule CL-15
- Identity permutation Fn-7
- Image of a function Fn-14
 - Stirling numbers (set partitions)
 - and Fn-15
- Incidence function of a graph GT-3

Index

- Inclusion and exclusion CL-31, CL-39
- Increasing (strictly) function or list Fn-17
- Increasing (weakly) function or list Fn-17
- Independent events Fn-29, DT-28
- Independent random variables Fn-29
- Induced subgraph (by edges or vertices) GT-17
- Induction Fn-8, DT-41
 - base (simplest) cases DT-42
 - induction hypothesis DT-42
 - inductive step DT-42
- Inequality
 - Tchebycheff Fn-27
- Injection Fn-3
- Internal vertex DT-2, GT-27
- Intersection of sets Fn-1
- Inverse image of a function Fn-14
- Involution Fn-10
- Isolated vertex GT-11
- Isomorph rejection DT-14
- Isomorphic graphs GT-7

- Joint distribution function Fn-28

- Kruskal's algorithm for minimum weight spanning tree GT-32

- Leaf vertex DT-2, GT-27
 - rank of DT-4
- Lexicographic order (lex order) CL-4

- List CL-2
 - circular CL-10
 - strictly decreasing Fn-17
 - strictly increasing Fn-17
 - weakly decreasing Fn-17
 - weakly increasing Fn-17
 - with repetition CL-3
 - without repetition CL-3, CL-9
 - without repetition are injections Fn-3
- Little oh notation GT-40
- Local description DT-16
 - Gray code for subsets DT-25
 - merge sorting DT-15
 - permutations in lex order DT-17
 - Towers of Hanoi DT-19
- Loop GT-4, GT-11
 - directed GT-15

- Machine independence GT-37
- Marginal distribution Fn-28
- Matrix
 - permutation Fn-11
- Merge sorting DT-15, GT-45
- Merging sorted lists DT-15
- Monotone function Fn-17
- Multinomial coefficient CL-20
- Multiset CL-3
 - and monotone function Fn-17

- Nondecreasing function or list Fn-17
- Nonincreasing function or list Fn-17
- Normal distribution Fn-36
- Normal form
 - conjunctive DT-36
 - disjunctive DT-36
- NP-complete problem GT-44
- NP-easy problem GT-44
- NP-hard problem GT-44

- Numbers
 - Bell CL-27
 - binomial coefficients CL-15
 - Fibonacci DT-48
 - Stirling (set partitions) CL-25, Fn-15
- Odds CL-32
- One-line notation Fn-2
- One-to-one function (injection) Fn-3
- Onto function (surjection) Fn-3
- Order
 - direct insertion for
 - permutations DT-6
 - lexicographic (lex) CL-4
- Order relation GT-24
- Oriented simple graph GT-24
- Parallel edges GT-11
- Parent vertex DT-2, GT-27
- Partial function DT-3
- Partition
 - set CL-25, Fn-14
 - set (ordered) CL-20
 - set and restricted growth
 - function Fn-20
- Path in a (directed) graph GT-16
- Permutation CL-3, Fn-3, Fn-7
 - cycle Fn-9
 - cycle form Fn-9
 - cycle length Fn-9
 - derangement Fn-12
 - direct insertion order DT-6
 - identity Fn-7
 - involution Fn-10
 - is a bijection Fn-3
 - matrix Fn-11
 - powers of Fn-7
 - random generation Fn-33
- Poisson distribution Fn-35
- Polynomial multiplication GT-47
- Polynomial time algorithm
 - (tractable) GT-43
- Postorder sequence of vertices DT-8
- Preorder sequence of vertices DT-8
- Prime factorization DT-42
- Prim's algorithm for minimum
 - weight spanning tree GT-31
- Probabilistic decision tree DT-30
- Probability
 - conditional DT-27
 - conditional and decision
 - trees DT-30
 - function CL-28
 - probability space CL-28
- Probability distribution function
 - see* Distribution
- Probability function CL-28, Fn-21
 - see also* Distribution
- Probability space CL-28, Fn-21
 - see also* Distribution
- Random generation of
 - permutations Fn-33
- Random graphs GT-7
- Random variable Fn-22
 - binomial Fn-34
 - correlation of two Fn-25
 - covariance of two Fn-25
 - independent pair Fn-29
 - standard deviation of Fn-25
 - variance of Fn-25
- Range of a function Fn-2
- Rank (of a leaf) DT-4
- Rate of growth
 - Big oh notation GT-38
 - comparing GT-43
 - exponential GT-43
 - little oh notation GT-40
 - polynomial GT-40, GT-43
 - Theta notation GT-38
- Rearranging words CL-20
- Recurrence
 - see* Recursion

Index

- Recursion DT-43
 - see also* Recursive procedure
 - binomial coefficients CL-23
 - Fibonacci DT-48
 - guessing solutions DT-45
 - inductive proofs and DT-40
 - set partitions (Bell numbers) CL-27
 - set partitions (Stirling numbers) CL-25
 - sum of first n integers DT-42
- Recursive equation
 - see* Recursion
- Recursive procedure
 - see also* Recursion
 - 0-1 sequences DT-15
 - Gray code for subsets DT-25
 - merge sorting DT-15
 - permutations in lex order DT-17
 - Towers of Hanoi DT-19
- Reflexive relation GT-5
- Relation Fn-4
 - see perhaps* Binary relation
- Relative error CL-10
- Restricted growth function and set partitions Fn-20
- Root DT-2
- Rooted graph GT-27
- Rooted tree
 - child DT-2, GT-27
 - down degree of a vertex DT-2
 - height of a vertex DT-3
 - internal vertex DT-2, GT-27
 - leaf DT-2, GT-27
 - parent DT-2, GT-27
 - path to a vertex DT-3
 - siblings GT-27
- RP-tree (rooted plane tree)
 - see* Decision tree
- Rule
 - absorption CL-15
 - associative CL-15
 - commutative CL-15
 - DeMorgan's CL-15
 - distributive CL-15
 - double negation CL-15
 - idempotent CL-15
- Rule of Product CL-3
- Rule of Sum CL-5
- Sample space CL-28, Fn-21
- SAT problem DT-36
- Satisfiability problem DT-36
- Sequence CL-2
- Series
 - geometric DT-50
- Set CL-2, CL-14
 - algebraic rules CL-15
 - and monotone function Fn-17
 - cardinality CL-3
 - cardinality of CL-14
 - Cartesian product CL-14
 - complement CL-14
 - complement of Fn-1
 - difference CL-14
 - intersection CL-14
 - intersection of two Fn-1
 - partition, *see* Set partition
 - subset CL-14
 - subsets of size k CL-15
 - symmetric difference CL-14
 - symmetric difference of two Fn-1
 - union CL-14
 - union of two Fn-1
 - with repetition (multiset) CL-3
- Set partition CL-25, Fn-14
 - ordered CL-20
 - recursion (Bell numbers) CL-27
 - recursion (Stirling numbers) CL-25
 - restricted growth function Fn-20
- Simple event CL-29

- Simple graph GT-2
- Simplest (base) cases for induction DT-42
- Sorting (merge sort) DT-15, GT-45
- Space
 - probability CL-28
- Spanning tree GT-30
 - lineal (= depth first) GT-34
 - minimum weight GT-31
- Stacks and recursion DT-21
- Standard deviation Fn-25
- Stirling numbers (set partitions) CL-25
 - image of a function Fn-15
- Stirling's approximation for $n!$ CL-10
- Strictly decreasing function or list Fn-17
- Strictly increasing (or decreasing) function or list Fn-17
- Strictly increasing function or list Fn-17
- String
 - see* List
- Subgraph GT-17
 - cycle GT-18
 - induced by edges or vertices GT-17
- Subset of a set CL-14
- Surjection Fn-3
- Symmetric difference of sets Fn-1
- Symmetric relation GT-5

- Tchebycheff's inequality Fn-27

- Theorem
 - Bayes' DT-28, DT-32
 - binomial coefficients CL-16
 - binomial theorem CL-18
 - bipartite and cycle lengths GT-34
 - Central Limit Fn-38
 - conditional probability DT-28
 - correlation bounds Fn-26
 - covariance when independent Fn-32
 - cycles and multiple paths GT-18
 - equivalence relations GT-5
 - expectation is linear Fn-24
 - expectation of a product Fn-32
 - induction DT-41
 - lists with repetition CL-3
 - lists without repetition CL-9
 - minimum weight spanning tree GT-31
 - monotone functions and (multi)sets Fn-18
 - permutations of set to fixed power Fn-10
 - Prim's algorithm GT-31
 - properties of Θ and O GT-38
 - Rule of Product CL-3
 - Rule of Sum CL-5
 - Stirling's formula CL-10
 - systematic tree traversal DT-9
 - Tchebycheff's inequality Fn-27
 - variance of sum Fn-32
 - walk, trail and path GT-16
- Towers of Hanoi DT-18
 - four pole version DT-26
- Tractable algorithm GT-43
- Trail in a (directed) graph GT-16
- Transitive relation GT-5
- Traveling salesman problem GT-44
- Traversal
 - decision tree DT-8, GT-28

Index

Tree

see also specific topic

binary GT-36

decision, *see* Decision tree

height GT-35

ordered tree, *see* Decision tree

rooted, *see* Rooted tree

RP-tree (rooted plane tree), *see*
Decision tree

spanning GT-30

spanning, lineal (= depth
first) GT-34

spanning, minimum
weight GT-31

Two-line notation Fn-5

Uniformly at random CL-28

Union of sets Fn-1

Variance Fn-25

Venn diagram CL-31

Vertex DT-2

adjacent pair GT-3

child DT-2, GT-27

degree of DT-2, GT-4

down degree of DT-2

height of DT-3

internal DT-2, GT-27

isolated GT-11

leaf DT-2, GT-27

parent DT-2, GT-27

Vertex sequence GT-16

breadth first DT-8, GT-29

depth first DT-8, GT-29

Walk in a graph GT-16

Weakly decreasing function or
list Fn-17

Weakly increasing function or
list Fn-17

Words CL-11, CL-20

Index-10