List of Symbols

Symbol	Meaning	Page
$\sim p$	not p	25
$p \wedge q$	p and q	25
$p \lor q$	p or q	25
$p \oplus q$ or $p \times XOR q$	p or q but not both p and q	28
$P \equiv Q$	P is logically equivalent to Q	30
$p \rightarrow q$	if p then q	40
$p \leftrightarrow q$	p if and only if q	45
∴	therefore	51
P(x)	predicate in x	97
$P(x) \Rightarrow Q(x)$	every element in the truth set for $P(x)$ is in the truth set for $Q(x)$	104
$P(x) \Leftrightarrow Q(x)$	P(x) and $Q(x)$ have identical truth sets	104
\forall	for all	101
3	there exists	103
NOT ~	NOT-gate	67
AND	AND-gate	67
OR	OR-gate	67
NAND 0-	NAND-gate	75
NOR	NOR-gate	75
	Sheffer stroke	74
↓	Peirce arrow	74
		78
		78
		91
		170
		172
		181
		181
		191
		191
		187
		220
gcu(u, v)	x is assigned the value e	214
	$ \begin{array}{c} \sim p \\ p \wedge q \\ p \vee q \\ p \oplus q \text{ or } p \text{ XOR } q \\ P \equiv Q \\ p \rightarrow q \\ p \leftrightarrow q \\ \vdots \\ P(x) \\ P(x) \Rightarrow Q(x) \\ P(x) \Rightarrow Q(x) \\ \forall \\ \exists \\ \hline \qquad \qquad$	

Subject	Symbol	Meaning	Page
Sequences		and so forth	227
	$\sum_{k=m}^n a_k$	the summation from k equals m to n of a_k	230
	$\prod_{k=m}^n a_k$	the product from k equals m to n of a_k	223
	n!	n factorial	237
Set	$a \in A$	a is an element of A	7
Theory	$a \notin A$	a is not an element of A	7
	$\{a_1, a_2, \ldots, a_n\}$	the set with elements a_1, a_2, \ldots, a_n	7
	$\{x \in D \mid P(x)\}$	the set of all x in D for which $P(x)$ is true	8
	$\mathbf{R}, \mathbf{R}^-, \mathbf{R}^+, \mathbf{R}^{nonneg}$	the sets of all real numbers, negative real numbers, positive real numbers, and nonnegative real numbers	7, 8
	$\mathbf{Z},\mathbf{Z}^{-},\mathbf{Z}^{+},\mathbf{Z}^{nonneg}$	the sets of all integers, negative integers, positive integers, and nonnegative integers	7, 8
	Q, Q^-, Q^+, Q^{nonneg}	the sets of all rational numbers, negative rational numbers, positive rational numbers, and nonnegative rational numbers	7, 8
	N	the set of natural numbers	8
	$A\subseteq B$	A is a subset of B	9
	$A \not\subseteq B$	A is not a subset of B	9
	A = B	A equals B	339
	$A \cup B$	A union B	341
	$A\cap B$	A intersect B	341
	B-A	the difference of B minus A	341
	A^c	the complement of A	341
	(x, y)	ordered pair	11
	(x_1, x_2, \ldots, x_n)	ordered <i>n</i> -tuple	346
	$A \times B$	the Cartesian product of A and B	12
	$A_1 \times A_2 \times \cdots \times A_n$	the Cartesian product of A_1, A_2, \ldots, A_n	347
	Ø	the empty set	361
	$\mathscr{P}(A)$	the power set of A	346

List of Symbols

Subject	Symbol	Meaning	Page
Counting and	N(A)	the number of elements in set A	518
Probability	P(A)	the probability of a set A	518
	P(n,r)	the number of r -permutations of a set of n elements	553
	$\binom{n}{r}$	n choose r , the number of r -combinations of a set of n elements, the number of r -element subsets of a set of n elements	566
	$[x_{i_1},x_{i_2},\ldots,x_{i_r}]$	multiset of size r	584
	$P(A \mid B)$	the probability of A given B	612
Functions	$f: X \to Y$	f is a function from X to Y	384
	f(x)	the value of f at x	384
	$x \xrightarrow{f} y$	f sends x to y	384
	f(A)	the image of A	397
	$f^{-1}(C)$	the inverse image of C	397
	I_x	the identity function on X	387
	b^x	b raised to the power x	405, 406
	$\exp_b(x)$	b raised to the power x	405, 406
	$\log_b(x)$	logarithm with base b of x	388
	F^{-1}	the inverse function of F	411
	$f \circ g$	the composition of g and f	417
Algorithm	$x \cong y$	x is approximately equal to y	237
Efficiency	O(f(x))	big-O of f of x	727
	$\Omega(f(x))$	big-Omega of f of x	727
	$\Theta(f(x))$	big-Theta of f of x	727
Relations	x R y	x is related to y by R	14
	R^{-1}	the inverse relation of R	444
	$m \equiv n \pmod{d}$	m is congruent to n modulo d	473
	[<i>a</i>]	the equivalence class of a	465
	$x \leq y$	x is related to y by a partial order relation \leq	502

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List of Symbols

Subject	Symbol	Meaning	Page
Formal Languages	Σ	an alphabet of a language	780
and Finite-State Automata	ϵ	the null string	529
	\sum^n	the set of all strings over Σ of length n	781
	Σ^*	the set of all strings over Σ	781
	Σ^+	the set of all strings over Σ with length at least 1	781
	LL'	the concatenation of languages L and L'	783
	L^*	the Kleene closure of L	783
	$(rs), (r \mid s), (r^*)$	regular expressions	783
	$[x_1-x_n], [\hat{x}_m-x_n]$	character classes	787
	$x+, x?, x\{n\}, x\{m, n\}$	shorthand notations for regular expressions	788
	N(s,m)	the value of the next-state function for a state s and input symbol m	793, 794
	\rightarrow (s_0)	initial state	793
	(\$a)	accepting state	793
	L(A)	language accepted by A	795
	$N^*(s, w)$	the value of the eventual-state function for a state s and input string w	796, 797
	$s R_* t$	s and t are *-equivalent	809
	$s R_k t$	s and t are k -equivalent	810
	\overline{A}	the quotient automaton of A	813
Matrices	A	matrix	661
	I	identity matrix	669, 670
	A + B	sum of matrices A and B	675
	AB	product of matrices A and B	666, 667
	\mathbf{A}^n	matrix \mathbf{A} to the power n	678
Graphs and	V(G)	the set of vertices of a graph G	626
Trees	E(G)	the set of edges of a graph G	626
	$\{v, w\}$	the edge joining v and w in a simple graph	632, 633
	K_n	complete graph on <i>n</i> vertices	633
	$K_{m,n}$	complete bipartite graph on (m, n) vertices	633
	deg(v)	degree of vertex v	635
	$v_0e_1v_1e_2\cdots e_nv_n$	a walk from v_0 to v_n	644
	w(e)	the weight of edge e	704
	w(G)	the total weight of graph G	704

Reference Formulas

Topic	Name	Formula	Page
Logic	De Morgan's law	$\sim (p \land q) \equiv \sim p \lor \sim q$	32
	De Morgan's law	$\sim (p \lor q) \equiv \sim p \land \sim q$	32
	Negation of \rightarrow	$\sim (p \to q) \equiv p \land \sim q$	42
	Equivalence of a conditional and its contrapositive	$p \to q \equiv \sim q \to \sim p$	43
	Nonequivalence of a conditional and its converse	$p \to q \not\equiv q \to p$	44
	Nonequivalence of a conditional and its inverse	$p \to q \not\equiv \sim p \to \sim q$	44
	Negation of a universal statement	$\sim (\forall x \text{ in } D, Q(x)) \equiv \exists x \text{ in } D \text{ such that } \sim Q(x)$	109
	Negation of an existential statement	$\sim (\exists x \text{ in } D \text{ such that } Q(x)) \equiv \forall x \text{ in } D, \sim Q(x)$	109
Sums	Sum of the first <i>n</i> integers	$1+2+\cdots+n=\frac{n(n+1)}{2}$	248
	Sum of powers of r	$1 + 2 + \dots + n = \frac{n(n+1)}{2}$ $1 + r + r^2 + \dots + r^n = \frac{r^{n+1} - 1}{r - 1}$	252
Counting and Probability	Probability in the equally likely case	$P(E) = \frac{N(E)}{N(S)}$	518
·	Number of <i>r</i> -permutations of a set with <i>n</i> elements	$P(n,r) = \frac{n!}{(n-r)!}$	533
	Number of elements in a union	$N(A \cup B) = N(A) + N(B) - N(A \cap B)$	546
	Number of subsets of size <i>r</i> of a set with <i>n</i> elements	$\binom{n}{r} = \frac{n!}{r!(n-r)!}$	568
	Pascal's formula	$\binom{n+1}{r} = \binom{n}{r-1} + \binom{n}{r}$	593

Topic	Name	Formula	Page
Counting and Probability	Binomial theorem	$(a+b)^n = \sum_{k=0}^n \binom{n}{k} a^{n-k} b^k$	598
	Probability of the complement of an event	$P(A^c) = 1 - P(A)$	543
	Probability of a union	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	606
	Conditional probability	$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$	612
	Bayes' formula	$D(A \mid B) D(B)$	616
	$P(B_k A) = \frac{1}{P(A B_1)P(B_1)}$	$\frac{P(A B_k)P(B_k)}{P(A B_2)P(B_2) + \dots + P(A B_n)P(B_n)}$	
Laws of		$b^0 = 1$	405
Exponents		$b^{-x} = \frac{1}{b^x}$	405
		$b^u \cdot b^v = b^{u+v}$	406
		$\frac{b^u}{b^v} = b^{u-v}$	406
		$(b^u)^v = b^{u \cdot v}$	406
		$(bc)^u = b^u \cdot c^u$	406
		$b^u = b^v \Rightarrow u = v$	406
Properties of		$\log_b x = y \Leftrightarrow b^y = x$	406
Logarithms		$\log_b(xy) = \log_b(x) + \log_b(y)$	406
		$\log_b(x^a) = a\log_b(x)$	406
		$\log_b\left(\frac{x}{y}\right) = \log_b(x) - \log_b(y)$	406
		$\log_c(x) = \frac{\log_b(x)}{\log_b(c)}$	406
		$\log_b(u) = \log_b(v) \Rightarrow u = v$	406