

LIST OF SYMBOLS

TOPIC	SYMBOL	MEANING	NOTES
LOGIC	$\neg p$	negation of p	
	$p \wedge q$	conjunction of p and q	
	$p \vee q$	disjunction of p and q	
	$p \oplus q$	exclusive or of p and q	
	$p \rightarrow q$	implication p implies q	
	$p \leftrightarrow q$	biconditional of p and q	
	$p \equiv q$	equivalence of p and q	
	T	tautology	
	F	contradiction	
	$P(x_1, \dots, x_n)$	propositional function	
	$\forall x P(x)$	universal quantification of $P(x)$	
	$\exists x P(x)$	existential quantification of $P(x)$	
	$\exists! x P(x)$	uniqueness quantification of $P(x)$	
	\therefore	therefore	
	$p(S)q$	partial correctness of S	
SETS	$x \in S$	x is a member of S	
	$x \notin S$	x is not a member of S	
	$\{a_1, \dots, a_n\}$	list of elements of a set	
	$\{x \mid P(x)\}$	set builder notation	
	\mathbf{N}	set of natural numbers	
	\mathbf{Z}	set of integers	
	\mathbf{Z}^+	set of positive integers	
	\mathbf{Q}	set of rational numbers	
	\mathbf{R}	set of real numbers	
	$[a, b], (a, b)$	closed, open intervals	
	$S = T$	set equality	
	\emptyset	empty (or null) set	
	$S \subseteq T$	S is a subset of T	
	$S \subset T$	S is a proper subset of T	
	$ S $	cardinality of S	
	$P(S)$	power set of S	
	(a_1, \dots, a_n)	n -tuple	
	(a, b)	ordered pair	
	$A \times B$	Cartesian product of A and B	
	$A \cup B$	union of A and B	
	$A \cap B$	intersection of A and B	
	$A - B$	difference of A and B	
	\bar{A}	complement of A	
	$\bigcup_{i=1}^n A_i$	union of A_i , $i=1, 2, \dots, n$	
	$\bigcap_{i=1}^n A_i$	intersection of A_i , $i=1, 2, \dots, n$	
	$A \oplus B$	symmetric difference of A and B	
	\aleph_0	cardinality of a countable set	
	\mathfrak{c}	cardinality of \mathbf{R}	

TOPIC	SYMBOL	MEANING	NOTES
FUNCTIONS	$f(a)$	value of function f at a	
	$f:A \rightarrow B$	function from A to B	
	f_1+f_2	sum of functions f_1 and f_2	
	$f_1 \cdot f_2$	product of functions f_1 and f_2	
	$f(S)$	image of set S under function f	
	$I_A(s)$	Identity function of A	
	$f^{-1}(x)$	inverse of f	
	$f \circ g$	composition of f and g	
	$\lfloor x \rfloor$	floor function of x	
	$\lceil x \rceil$	ceiling function of x	
	a_n	Term of $\{ a_i \}$ with subscript n	
	$\sum_{i=1}^n a_i$	sum of a_1, a_2, \dots, a_n	
	$\sum_{\alpha \in S} a_\alpha$	sum of a_α over $\alpha \in S$	
	$\prod_{i=1}^n a_i$	product of a_1, a_2, \dots, a_n	
	$f(x)$ is $O(g(x))$	$f(x)$ is big- O of $g(x)$	
	$n!$	n factorial	
	$f(x)$ is $\Omega(g(x))$	$f(x)$ is big- Ω of $g(x)$	
	$f(x)$ is $\Theta(g(x))$	$f(x)$ is big- Θ of $g(x)$	
	\sim	asymptotic to	
	$\min(x,y)$	minimum of x and y	
$\max(x,y)$	maximum of x and y		
\approx	approximately equal to		
INTEGERS	$a \mid b$	a divides b	
	$a \nmid b$	a does not divide b	
	$a \text{ div } b$	quotient when a is divided by b	
	$a \text{ mod } b$	remainder when a is divided by b	
	$a \equiv b \pmod{m}$	a is congruent to b modulo m	
	$a \not\equiv b \pmod{m}$	a is not congruent to b modulo m	
	\mathbf{Z}_m	integers modulo m	
	$(a_k a_{k-1} \dots a_1 a_0)_b$	base b representation	
	$\text{gcd}(a,b)$	greatest common divisor of a and b	
	$\text{lcm}(a,b)$	least common multiple of a and b	
MATRICES	$[a_{ij}]$	matrix with entries a_{ij}	
	$\mathbf{A}+\mathbf{B}$	matrix sum of \mathbf{A} and \mathbf{B}	
	\mathbf{AB}	matrix product of \mathbf{A} and \mathbf{B}	
	I_n	identity matrix of order n	
	\mathbf{A}^t	transpose of \mathbf{A}	
	$\mathbf{A} \vee \mathbf{B}$	join of \mathbf{A} and \mathbf{B}	
	$\mathbf{A} \wedge \mathbf{B}$	meet of \mathbf{A} and \mathbf{B}	
	$\mathbf{A} \circ \mathbf{B}$	Boolean product of \mathbf{A} and \mathbf{B}	
	$\mathbf{A}^{[n]}$	Boolean power of \mathbf{A}	

TOPIC	SYMBOL	MEANING	NOTES
COUNTING AND PROBABILITY	$P(n,r)$	number of r-permutations of a set with n elements	
	$C(n,r)$	umber of r-combinations of a set with n elements	
	$\binom{n}{r}$	binomial coefficient n choose r	
	$C(n;n_1,n_2,\dots,n_m)$	multinomial coefficient	
	$p(E)$	probability of E	
	$p(E F)$	conditional probability of E given F	
	$E(X)$	expected value of random variable X	
	$V(X)$	variance of random variable X	
	C_n	Catalan number	
	$N(p_{i_1} \cdots p_{i_n})$	number of elements having all the properties	
	$N(p'_{i_1} \cdots p'_{i_n})$	number of elements having none of the properties	
D_n	number of derangements of n object		
RELATIONS	SoR	composite of relations R and S	
	R^n	n th power of relation R	
	R^{-1}	inverse relation	
	${}^S C$	selection operator for condition C	
	p_{i_1,i_2,\dots,i_m}	projection	
	$J_p(R,S)$	join	
	Δ	diagonal relation	
	R^*	connectivity relation of R	
	$a \sim b$	a is equivalent to b	
	$[a]_R$	equivalence class of a with respect to R	
	$[a]_m$	congruence class modulo m	
	(S,R)	poset consisting of set S and partial ordering R	
	$a < b$	a is less than b	
	$a > b$	a is greater than b	
$a \leq b$	a is less than or equal to b		
$a \geq b$	a is greater than or equal to b		
GRAPHS AND TREES	(u,v)	directed edge	
	$G=(V,E)$	graph with vertex set V and edge set E	
	$\{u,v\}$	undirected edge	
	$\deg(v)$	degree of vertex v	
	$\deg^-(v)$	in-degree of vertex v	
	$\deg^+(v)$	out-degree of vertex v	
	K_n	complete graph on n vertices	
	C_n	cycle of size n	
	W_n	wheel of size n	
	Q_n	n -cube	
	$K_{m,n}$	complete bipartite graph of size m,n	
	$G-e$	subgraph of G with edge e removed	
	$G+e$	graph produced by adding edge e to graph G	

TOPIC	SYMBOL	MEANING	NOTES
GRAPHS AND TREES(cont.)	$G_1 \cup G_2$	union of G_1 and G_2	
	$a, x_1, \dots, x_{n-1}, b$	path from a to b	
	$a, x_1, \dots, x_{n-1}, a$	circuit	
	$\kappa(G)$	vertex connectivity of G	
	$\lambda(G)$	edge connectivity of G	
	r	number of regions of the plane	
	$\deg(R)$	degree of region R	
	$\chi(G)$	chromatic number of G	
	m	greatest number of children of an internal vertex in a rooted tree	
	n	number of vertices of a rooted tree	
	i	number of internal vertices of a rooted tree	
	l	number of leaves of a rooted tree	
	h	height of a rooted tree	
BOOLEAN ALGEBRA	\bar{x}	complement of Boolean variable x	
	$x+y$	Boolean sum of x and y	
	$x \cdot y$ (or xy)	Boolean product of x and y	
	B	$\{0,1\}$	
	F^d	dual of F	
	$x y$	x NAND y	
	$x \downarrow y$	x NOR y	
LANGUAGES AND FINITE- STATE MACHINES	λ	empty string	
	xy	concatenation of x and y	
	$l(x)$	length of string	
	w^R	reversal of w	
	(V,T,S,P)	phrase-structure grammar	
	S	start symbol	
	$w \rightarrow w_1$	production	
	$w_1 \Rightarrow w_2$	w_2 is directly derivable from w_1	
	$w_1 \stackrel{*}{\Rightarrow} w_2$	w_2 is derivable from w_1	
	$\langle A \rangle ::= \langle B \rangle c d$	Backus–Naur form	
	(S,I,O,f,g,s_0)	finite-state machine with output	
	s_0	initial or start state	
	AB	concatenation of sets A and B	
	A^*	Kleene closure of A	
	(S,I,f,s_0,F)	finite-state machine automaton with no output	
(S,I,f,s_0)	Turing machine		