NOTATION

LOGIC	p, q	statements (or propositions)
	$\neg p$	the negation of (statement) p: *not p*
	$p \wedge q$	the conjunction of p, q: *p and q*
	$p \vee q$	the disjunction of p, q: *p or q*
	$p \rightarrow q$	the implication of q by p: *p implies q*
	$p \leftrightarrow q$	the biconditional of p and q: *p if and only if q*
	iff	if and only if
	$p \Rightarrow q$	logical implication: *p logically implies q*
	$p \Leftrightarrow q$	logical equivalence: p is *logically equivalent* to q
	T_0	tautology
	F_0	contradiction
	$\forall x$	For *all x* (the universal quantifier)
	$\exists x$	For *some x* (the existential quantifier)
SET THEORY	$x \in A$	element x is a member of set A
	$x \notin A$	element x is not a member of set A
	$\mathcal{U}$	the universal set
	$A \subseteq B, B \supseteq A$	A is a subset of B
	$A \subset B, B \supset A$	A is a proper subset of B
	$A \nsubseteq B$	A is not a subset of B
	$A \not\subset B$	A is not a proper subset of B
	$\|A\|$	the cardinality, or size, of set A — that is, the number of elements in A
	$\emptyset = \{\ \}$	the empty, or null, set
	$\mathcal{P}(A)$	the power set of A — that is, the collection of all subsets of A
	$A \cap B$	the intersection of sets A, B: $\{x \mid x \in A \text{ and } x \in B\}$
	$A \cup B$	the union of sets A, B: $\{x \mid x \in A \text{ or } x \in B\}$
	$A \triangle B$	the symmetric difference of sets A, B: $\{x \mid x \in A \text{ or } x \in B, \text{ but } x \notin A \cap B\}$
	$\overline{A}$	the complement of set A: $\{x \mid x \in \mathcal{U} \text{ and } x \notin A\}$
	$A - B$	the (relative) complement of set B in set A: $\{x \mid x \in A \text{ and } x \notin B\}$
	$\bigcup_{i \in I} A_i$	$\{x \mid x \in A_i, \text{ for at least one } i \in I\}$, where I is an index set
	$\bigcap_{i \in I} A_i$	$\{x \mid x \in A_i, \text{ for every } i \in I\}$, where I is an index set
PROBABILITY	S	the sample space for an experiment $\mathcal{E}$
	$A \subseteq S$	A is an event
	$Pr(A)$	the probability of event A
	$Pr(A\|B)$	the probability of A given B; conditional probability
	X	random variable
	$E(X)$	the expected value of X, a random variable
	$\mathrm{Var}(X) = \sigma_X^2$	the variance of X, a random variable
	σ_X	the standard deviation of X, a random variable
NUMBERS	$a\|b$	a divides b, for $a, b \in \mathbf{Z}, a \neq 0$
	$a \nmid b$	a does not divide b, for $a, b \in \mathbf{Z}, a \neq 0$
	$\gcd(a, b)$	the greatest common divisor of the integers a, b
	$\mathrm{lcm}(a, b)$	the least common multiple of the integers a, b
	$\phi(n)$	Euler's phi function for $n \in \mathbf{Z}^+$
	$\lfloor x \rfloor$	the greatest integer less than or equal to the real number x: the greatest integer in x: the *floor* of x

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	$\lceil x \rceil$	the smallest integer greater than or equal to the real number x: the *ceiling* of x
	$a \equiv b \pmod{n}$	a is congruent to b modulo n
RELATIONS	$A \times B$	the Cartesian, or cross, product of sets A, B: $\{(a, b) \| a \in A, b \in B\}$
	$\mathcal{R} \subseteq A \times B$	$\mathcal{R}$ is a relation from A to B
	$a \mathcal{R} b$; $(a, b) \in \mathcal{R}$	a is related to b
	$a \not\mathcal{R} b$; $(a, b) \notin \mathcal{R}$	a is not related to b
	$\mathcal{R}^c$	the converse of relation $\mathcal{R}$: $(a, b) \in \mathcal{R}$ iff $(b, a) \in \mathcal{R}^c$
	$\mathcal{R} \circ \mathcal{S}$	the composite relation for $\mathcal{R} \subseteq A \times B, \mathcal{S} \subseteq B \times C$: $(a, c) \in \mathcal{R} \circ \mathcal{S}$ if $(a, b) \in \mathcal{R}$, $(b, c) \in \mathcal{S}$ for some $b \in B$
	$\text{lub}\{a, b\}$	the least upper bound of a and b
	$\text{glb}\{a, b\}$	the greatest lower bound of a and b
	$[a]$	the equivalence class of element a (relative to an equivalence relation $\mathcal{R}$ on a set A): $\{x \in A \| x \mathcal{R} a\}$
FUNCTIONS	$f: A \to B$	f is a function from A to B
	$f(A_1)$	for $f: A \to B$ and $A_1 \subseteq A$, $f(A_1)$ is the image of A_1 under f—that is, $\{f(a) \| a \in A_1\}$
	$f(A)$	for $f: A \to B$, $f(A)$ is the range of f
	$f: A \times A \to B$	f is a binary operation on A
	$f: A \times A \to B \; (\subseteq A)$	f is a closed binary operation on A
	$1_A: A \to A$	the identity function on A: $1_A(a) = a$ for each $a \in A$
	$f\|_{A_1}$	the restriction of $f: A \to B$ to $A_1 \subseteq A$
	$g \circ f$	the composite function for $f: A \to B$, $g: B \to C$: $(g \circ f)a = g(f(a))$, for $a \in A$
	f^{-1}	the inverse of function f
	$f^{-1}(B_1)$	the preimage of $B_1 \subseteq B$ for $f: A \to B$
	$f \in O(g)$	f is "big Oh" of g; f is of order g
THE ALGEBRA OF STRINGS	$\mathbf{\Sigma}$	a finite set of symbols called an alphabet
	λ	the empty string
	$\|\|x\|\|$	the length of string x
	$\mathbf{\Sigma}^n$	$\{x_1x_2 \cdots x_n \| x_i \in \mathbf{\Sigma}\}, n \in \mathbf{Z}^+$
	$\mathbf{\Sigma}^0$	$\{\lambda\}$
	$\mathbf{\Sigma}^+$	$\bigcup_{n \in \mathbf{Z}^+} \mathbf{\Sigma}^n$: the set of all strings of positive length
	$\mathbf{\Sigma}^*$	$\bigcup_{n \geq 0} \mathbf{\Sigma}^n$: the set of all finite strings
	$A \subseteq \mathbf{\Sigma}^*$	A is a language
	AB	the concatenation of languages $A, B \subseteq \mathbf{\Sigma}^*$: $\{ab \| a \in A, b \in B\}$
	A^n	$\{a_1a_2 \cdots a_n \| a_i \in A \subseteq \mathbf{\Sigma}^*\}, n \in \mathbf{Z}^+$
	A^0	$\{\lambda\}$
	A^+	$\bigcup_{n \in \mathbf{Z}^+} A^n$
	A^*	$\bigcup_{n \geq 0} A^n$: the Kleene closure of language A
	$M = (S, \mathcal{I}, \mathcal{O}, \nu, \omega)$	a finite state machine M with internal states S, input alphabet $\mathcal{I}$, output alphabet $\mathcal{O}$, next state function $\nu: S \times \mathcal{I} \to S$ and output function $\omega: S \times \mathcal{I} \to \mathcal{O}$