A partial list of mathematical symbols and how to read them

Greek alphabet

A	α	alpha	B	β	beta	Γ	γ	gamma	Δ	δ	delta	E	ϵ, ε	epsilon
Z	ζ	zeta	H	η	eta	Θ	θ, ϑ	theta	I	ι	iota	K	κ	kappa
Λ	λ	lambda	M	μ	mu	N	ν	nu	Ξ	ξ	xi	O	o	omicron
Π	π,ϖ	pi	P	ρ, ϱ	rho	Σ	σ, ς	sigma	T	τ	tau	Υ	υ	upsilon
Φ	ϕ, φ	phi	X	χ	chi	Ψ	ψ	psi	Ω	ω	omega			

Important sets

$\emptyset$	empty set		
$\mathbb{N}$	natural numbers	$\{0, 1, 2, \ldots\}$	
$\mathbb{N}^+$	positive integer numbers	$\{1, 2, \ldots\}$	
$\mathbb{Z}$	integer numbers	$\{\ldots, -2, -1, 0, 1, 2, \ldots\}$	
$\mathbb{Q}$	rational numbers	$\{m/n : m \in \mathbb{Z}, n \in \mathbb{N}^+\}$	
$\mathbb{R}$	real numbers	$(-\infty, +\infty)$	
$\mathbb{R}^+$	positive real numbers	$(0, +\infty)$	
$\mathbb{C}$	complex numbers	$\{x + iy : x, y \in \mathbb{R}\}$	(i is the imaginary unit, $i^2 = -1$)

Logical operators

$\forall$	for all, universal quantifier	$\forall n \in \mathbb{N}, n \geq 0$
$\exists$	exists, there is, existential quantifier	$\exists n \in \mathbb{N}, n \geq 7$
$\exists!$	there is exactly one	$\exists! n \in \mathbb{N}, n < 1$
$\wedge$	and	$(3 > 2) \wedge (2 > 1)$
	. . . over an index set	$\bigwedge_{i \in \mathbb{N}} B_i = B_0 \wedge B_1 \wedge B_2 \wedge \cdots$
$\vee$	or	$(2 > 3) \vee (2 > 1)$
	. . . over an index set	$\bigvee_{i \in \mathbb{N}} B_i = B_0 \vee B_1 \vee B_2 \vee \cdots$
$\Rightarrow$	implication, if-then	$\forall a, b \in \mathbb{R}, (a = b) \Rightarrow (a \geq b)$
$\Longleftrightarrow$	biimplication, if-and-only-if	$\forall a, b \in \mathbb{R}, (a = b) \Longleftrightarrow (b = a)$
$\neg$	negation, not	$\neg(2 > 3)$
	alternative notations for negation	$\overline{(2 > 3)}$, $2 \not> 3$

Arithmetic operators

$\lvert\ \rvert$	absolute value	$\lvert -7 \rvert = \lvert 7 \rvert = 7$
$\sum$	summation	$\sum_{i \in \mathbb{N}^+} 2^{-i} = 1$
$\prod$	product	$\prod_{i=1}^{n} i = n!$
!	factorial	$7! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 = 5040$
$\begin{pmatrix} n \\ m \end{pmatrix}$	n choose m, combinatorial number	$\begin{pmatrix} n \\ m \end{pmatrix} = \dfrac{n!}{(n-m)!m!}$
mod	modulo, remainder	7 mod 3 = 1, -8 mod 5 = 2
div	integer quotient	7 div 3 = 2, -8 div 5 = -2

Set operators

$\in$	in, membership	$a \in \{a, b, c\}$
$\cup$	union	$\{a, b, c\} \cup \{a, d\} = \{a, b, c, d\}$
	... over an index set	$\bigcup_{i \in \mathbb{N}} S_i = S_0 \cup S_1 \cup S_2 \cup \cdots$
$\cap$	intersection	$\{a, b, c\} \cap \{a, d\} = \{a\}$
	... over an index set	$\bigcap_{i \in \mathbb{N}} S_i = S_0 \cap S_1 \cap S_2 \cap \cdots$
$\setminus$	difference	$\{a, b, c\} \setminus \{a, d\} = \{b, c\}$
$\supset$	strict superset	$\mathbb{Z} \supset \mathbb{N}$
$\supseteq$	superset	$\mathbb{N} \supseteq \mathbb{N}$
$\subset$	strict subset	$\mathbb{N} \subset \mathbb{Z}$
$\subseteq$	subset	$\mathbb{N} \subseteq \mathbb{N}$
2^A	power set of A	if $A = \{a, b, c\}$, then $2^A = \{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, A\}$

String, grammar, and formal language notation

λ	empty string (at times, ϵ is used instead of λ)	$\lambda a = a$
*	Kleene star, zero or more occurrences	$a^* = \{\epsilon, a, aa, aaa, \ldots\}$
$^+$	one or more occurrences	$a^+ = \{a, aa, aaa, \ldots\}$
$\|w\|$	length of string w	$\|abc\| = 3$, $\|a^n\| = n$, $\|\epsilon\| = 0$
$\|w\|_a$	number of occurrences of a in string w	$\|aab\|_a = 2$, $\|aab\|_b = 1$, $\|aab\|_d = 0$
$A \to x$	A goes to x (grammar production)	
$A \Longrightarrow x$	A derives x	
$A \overset{*}{\Longrightarrow} x$	A derives x in a number of steps	
$A \underset{G}{\Longrightarrow} x$	A derives x according to G	
$A \overset{*}{\underset{G}{\Longrightarrow}} x$	A derives x according to G in a number of steps	
$(q, aa) \vdash (p, a)$	(q, aa) yields (p, a) in one step	
$(q, aa) \overset{*}{\vdash} (p, a)$	(q, aa) yields (p, a) in a number of steps	
$(q, aa) \underset{M}{\vdash} (p, a)$	(q, aa) yields (p, a) in one step according to M	
$(q, aa) \overset{*}{\underset{M}{\vdash}} (p, a)$	(q, aa) yields (p, a) in a number of steps according to M	
$M \searrow w$	the Turing machine M halts on string w	
$M \nearrow w$	the Turing machine does not M halt on string w	

And remember...

$0! = 1$
$\forall n \in \mathbb{Z}, \forall m \in \mathbb{N}, m > 0 \Rightarrow n = (n \text{ div } m)m + (n \text{ mod } m)$
$\bigcup_{i \in \emptyset} S_i = \emptyset$
$\sum_{i \in \emptyset} n_i = 0$
$\prod_{i \in \emptyset} n_i = 1$

LaTeXsource available at `http://web.cs.iastate.edu/~ciardo/Notation.tex`