

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	v	upsilon
Φ	ϕ, φ	phi	X	χ	chi	Ψ	ψ	psi	Ω	ω	omega			

Important sets

\emptyset	empty set	
\mathbb{N}	natural numbers	$\{0, 1, 2, \dots\}$
\mathbb{N}^+	positive integer numbers	$\{1, 2, \dots\}$
\mathbb{Z}	integer numbers	$\{\dots, -2, -1, 0, 1, 2, \dots\}$
\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	$\bigwedge_{i \in \mathbb{N}} B_i = B_0 \wedge B_1 \wedge B_2 \wedge \dots$
\vee	or	$(2 > 3) \vee (2 > 1)$
	...over an index set	$\bigvee_{i \in \mathbb{N}} B_i = B_0 \vee B_1 \vee B_2 \vee \dots$
\Rightarrow	implication, if-then	$\forall a, b \in \mathbb{R}, (a = b) \Rightarrow (a \geq b)$
\iff	biimplication, if-and-only-if	$\forall a, b \in \mathbb{R}, (a = b) \iff (b = a)$
\neg	negation, not	$\neg(2 > 3)$
	alternative notations for negation	$\overline{(2 > 3)}, 2 \not> 3$

Arithmetic operators

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

Set operators

\in	in, membership	$a \in \{a, b, c\}$
\cup	union	$\{a, b, c\} \cup \{a, d\} = \{a, b, c, d\}$
\dots	over an index set	$\bigcup_{i \in \mathbb{N}} S_i = S_0 \cup S_1 \cup S_2 \cup \dots$
\cap	intersection	$\{a, b, c\} \cap \{a, d\} = \{a\}$
\dots	over an index set	$\bigcap_{i \in \mathbb{N}} S_i = S_0 \cap S_1 \cap S_2 \cap \dots$
\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	$a^* = \{\epsilon, a, aa, aaa, \dots\}$
$+$	one or more occurrences	$a^+ = \{a, aa, aaa, \dots\}$
$ $	string length	$ abc = 3, a^n = n, \epsilon = 0$
$A \rightarrow x$	A goes to x (grammar production)	
$A \Rightarrow x$	A derives x	
$A \xRightarrow{*} x$	A derives x in some number of steps	
$A \xRightarrow[G]{*} x$	A derives x according to G	
$A \xRightarrow[G]{*} x$	A derives x according to G in some number of steps	
$(q, aa) \vdash (p, a)$	(q, aa) yields (p, a) in one step	
$(q, aa) \vdash^* (p, a)$	(q, aa) yields (p, a) in some number of steps	
$(q, aa) \vdash_M (p, a)$	(q, aa) yields (p, a) in one step according to M	
$(q, aa) \vdash_M^* (p, a)$	(q, aa) yields (p, a) in some 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...

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