

Useful Mathematical Symbols

Symbol	What it is	How it is read	How it is used	Sample expression
+	Addition sign Logical OR symbol	... plus or ...	Sum of a few values Logical disjunction	$2 + 6 = 8$ $\neg(A + B) = \neg A * \neg B$
*	Multiplication sign Logical AND symbol	... times and ...	Product of two values Logical conjunction	$2 \times 6 = 12$ $\neg(A * B) = \neg A + \neg B$
x	Multiplication sign	... times ...	Product of two values	$4 \times 2 = 8$
.	Multiplication sign	... times ...	Product of two values	$4 \cdot 2 = 8$
Σ	summation sign	The summation of ...	Sum of many or infinitely many values	$\sum_{n=1}^{\infty} \frac{1}{n}$
\int	Integral sign	The integral of ...	integration	$\int x^2 dx = x^3/3 + C$
\iint	double integral sign	The double integral of ...	integration	$\iint f(x,y) dx dy$
\iiint	Triple integral sign	The triple integral of ...	integration	$\iiint f(x,y,z) dx dy dz$
\oint	Line integral sign	The line integral of ...	integration	$\oint F \cdot dx$
\iint_S	Surface integral sign	The surface integral of ...	integration	$\iint_S s F(x,y,z) dx dy$
-	Subtraction sign Minus sign	... minus ... Negative...	Difference of two values, negative number	$2 - 6 = -4$
\pm	Plus/minus sign	... plus or minus ...	Expression of range, error, or tolerance	$540 \text{ kbps} \pm 10\%$
\bullet	Dot product sign	... dot ...	Scalar (dot) product of two vectors	$A \bullet B = B \bullet A$
\times	Cross product sign	... cross ...	Vector (cross) product of two vectors	$A \times B = - (B \times A)$
\prod	Product sign	The product of ...	Product of three up to infinitely many values	$\prod_{n=1}^{\infty} \frac{1}{n}$
\wedge	Carat	... to the power of ...	exponent	$2 \wedge 4 = 16$

!	Exclamation	... factorial	Product of all positive integers up to a certain value	$3! = 6$
$\sqrt[n]{}$	surd	... root of ...	Algebraic expressions	$z = \sqrt[n]{(x+y)}$
$\sqrt{}$	square root symbol	The square root of ...	Algebraic expressions	$\sqrt{4} = \pm 2$
...	Continuation sign	... and so on up to ... and so on indefinitely	Extension of sequence	$S = \{1, 2, 3, \dots\}$
/	Slash	... divided by ... over ...	Division	$3/4 = 0.75$
\div	Division sign	... divided by ...	Division	$3 \div 4 = 0.75$
%	Percent symbol	... percent ...	Proportion	$0.032 = 3.2\%$
$\frac{0}{100}$	Per mil symbol	... per mil ...	Proportion	$0.032 = 32\text{\%}$
:	Colon, ratio sign	... is to such that it is true that ...	Division or ratio, symbol following logical quantifier or used in defining a set	$2:4 = 20:40$ $\exists x : x > 4 \text{ and } x < 5$ $\forall x : x < 0 \text{ or } x > -1$ $S = \{x : x < 3\}$
	Vertical line	... such that it is true that ...	Symbol following logical quantifier or used in defining a set	$\exists x x > 4 \text{ and } x < 5$ $\forall x x < 0 \text{ or } x > -1$ $S = \{x x < 3\}$
::	Double colon	... averaged with ...	arithmetic mean	$3 :: 11 = 7$
∞	lemniscate	... infinity ... increases without limit	Infinite summations Infinite sequence Limit	$\forall x : x < \infty$
()	Parentheses	... quantity... ... list... ... set of coordinates... ... open interval	Denotes a quantity, list, set of coordinates, or an open interval	$(x+y) + z$ (a_1, a_2, a_3, a_4) (x, y, z) $(3, 5)$
[]	Square brackets	... the quantity the closed interval ...	Denotes a quantity or a closed interval	$w + [(x+y) + z]$ $[2, 4]$
(]	Hybrid brackets	... the half-open interval ...	Denotes a half-open interval	$(2, 4]$
[)	Hybrid brackets	... the half-open interval ...	Denotes a half-open interval	$[2, 4)$
{ }	Curly brackets	... the quantity the set ...	Denotes a quantity or a set	$E = \{2, 4, 6, 8, \dots\}$

=	Equal sign	... equals ...	Indicates two values are the same	$z = -(-6) = 6$ $2z^2 + 4z - 6 = 0$
\propto	Proportionality sign	... is proportional to ...	Indicates two variables change in direct proportion	$x \propto y$
\sim	Similarity sign	... is similar to ...	Indicates two objects are geometrically similar	$\triangle ABC \sim \triangle DEF$
\approx	Approximate equal sign	... is approximately equal to ...	Indicates two values are close to each other	$x + y \approx z$
\neq	Inequality sign	... is not equal to ...	Indicates two values are different	$x \neq y$
<	Inequality sign	... is less than ...	Indicates value on left is smaller than value on right	$2 < 4$ $x < y$
\leq	Inequality sign	... is less than or equal to is at most equal to ...	Indicates value on left is smaller than or equal to value on right	$x \leq y$
>	Inequality sign	... is greater than ...	Indicates value on left is larger than value on right	$4 > 1$ $x > y$
\geq	Inequality sign	... is greater than or equal to ...	Indicates value on left is larger than or equal to value on right	$x \geq y$
$ $	absolute value sign	The absolute value of ...	Distance of value from origin in number line, plane, or space	$ -5 = 5$
Δ	increment sign, Triangle symbol	the change in ... triangle ...	Indicates a small change, Denotes vertices of triangle	$m = \Delta y / \Delta x$ $\triangle ABC = \triangle DEF$
\perp	Perpendicularity symbol	... is perpendicular to ...	Geometry	$L \perp M$
$//$	Parallel symbol	... is parallel to ...	Geometry	$L // M$
\angle	angle symbol	Angle ...	Geometry	$\angle ABC = \angle DEF$
\exists	Existential quantifier	For some ... There exists a(n) ...	Logical statements	$\exists x : x > 4 \text{ and } x < 5$
\forall	Universal quantifier	For all ... For every ...	Logical statements	$\forall x : x < 0 \text{ or } x > -1$

\neg	Logical negation symbol	not ...	Logical statements	$\neg(\neg A) \iff A$
\implies	logical implication symbol	... implies ... If ... then ...	Logical statements	$A \implies B$
\iff	logical equivalence symbol	... is logically equivalent to if and only if ...	Logical statements	$A \iff B$
\therefore	Three dots	... therefore it follows that ...	Logical statements or mathematical proofs	$x = y \text{ and } y = z$ $\therefore x = z$
\in	Element-of symbol	... is an element of a set ...	Sets	$a \in A$
\notin	Not-element-of symbol	... is not an element of a set ...	Sets	$b \notin A$
\subseteq	Subset symbol	... is a subset of ...	Sets	$A \subseteq B$
\subset	Proper subset symbol	... is a proper subset of ...	Sets	$A \subset B$
\cup	Union symbol	... union ...	Sets	$A \cup B = B \cup A$
\cap	Intersection symbol	... intersect intersected with ...	Sets	$A \cap B = B \cap A$
\emptyset	Null symbol	The null set The empty set	Sets	$\emptyset = \{ \}$
\aleph	Hebrew aleph (uppercase)	Aleph ...	Transfinite cardinal	$\aleph_1 + \aleph_0 = \aleph_1$
$^\circ$	Degree symbol	... degree(s)	Angular measure Temperature	$\phi = 45^\circ$ $T = +20^\circ\text{C}$
θ	Greek theta (lowercase)	... theta ...	Angular variable	$\theta = 90^\circ$
ϕ	Greek phi (lowercase)	... phi ...	Angular variable	$\phi = 45^\circ$
λ	Greek lambda (lowercase)	... lambda ...	wavelength Ratio Eigenvalue Lebesgue measure	$\lambda = 70 \text{ cm}$ $\lambda = 3:1$
μ	Greek mu (lowercase)	micro- (10^{-6})	prefix multiplier	$C = 0.001 \mu\text{F}$
π	Greek pi (lowercase)	... pi ...	General science	$\pi \approx 3.14159$
Ω	Greek omega (uppercase)	... omega ...	Volume of an object Ohms (resistance)	$R_2 = 330 \Omega$
ω	Greek omega (lowercase)	... omega ...	Transfinite ordinal Angular velocity Period	$\omega = 36,000 \text{ rad/s}$ $\omega = 1/60 \text{ s}$

\mathbb{N}, \mathbf{N}	Enhanced or bold N	The set of natural numbers	Number theory Set theory	$\mathbb{N} = \{0, 1, 2, 3, \dots\}$
\mathbb{Z}, \mathbf{Z}	Enhanced or bold Z	The set of integers	Number theory Set theory	$\mathbb{Z} = \{0, 1, -1, 2, -2, 3, -3, \dots\}$
\mathbb{Q}, \mathbf{Q}	Enhanced or bold Q	The set of rational numbers	Number theory Set theory	$\mathbb{Q} = \{a/b \mid a \text{ and } b \text{ are in } \mathbb{Z}\}$
\mathbb{R}, \mathbf{R}	Enhanced or bold R	The set of real numbers	Number theory Set theory	What is the cardinality of \mathbb{R} ?