

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	$3 + 5 = 8$ $\neg(A + B) = \neg A * \neg B$
-	Subtraction sign Minus sign	... minus ... Negative...	Difference of two values, negative number	$3 - 5 = -2$
*	Multiplication sign Logical AND symbol	... times and ...	Product of two values Logical conjunction	$3 \times 5 = 15$ $\neg(A * B) = \neg A + \neg B$
x	Multiplication sign	... times ...	Product of two values	$3 \times 5 = 15$
·	Multiplication sign	... times ...	Product of two values	$3 \cdot 5 = 15$
/	Slash	... divided by over ...	Division	$3/4 = 0.75$
÷	Division sign	... divided by ...	Division	$3 \div 4 = 0.75$
^	Carat	... to the power of ...	Exponent	$2^5 = 32$
±	Plus/minus sign	... plus or minus ...	Expression of range, error, or tolerance	$500 \text{ kbps} \pm 10\%$
$f'(x)$	Notation for derivatives	... the derivative of y with respect to x...	Differentiation	$f'(x) = 2x + 5$
$\frac{dy}{dx}$	Notation for derivatives	... the derivative of y with respect to x...	Differentiation	$\frac{dy}{dx} = 3x^2$
y'	Notation for derivatives	... the derivative of y with respect to x...	Differentiation	$y' = 2x^2 + 3x - 5$
$\frac{d}{dx}[f(x)]$	Notation for derivatives	... the derivative of y with respect to x...	Differentiation	$\frac{d}{dx}[f(x)] = 5x$
$D_x[y]$	Notation for derivatives	... the derivative of y with respect to x...	Differentiation	$D_x[y] = \sin(x)$
\int	Integral sign	The integral of ...	Integration	$\int x^2 dx = \frac{x^3}{3} + c$
\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	$\oint F dx$

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\iint_S	Surface integral sign	The surface integral of ...	Integration	$\iint_S F(x, y, z) dx dy$
\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	$A \times B = -(B \times A)$
Σ	Summation sign	The summation of ...	Sum of many or infinitely many values	$\sum_{n=1}^{\infty} \frac{1}{n}$
\prod	Product sign	The product of ...	Product of many or infinitely many values	$\prod_{n=1}^{\infty} \frac{1}{n}$
$!$	Exclamation	... factorial	Product of all positive integers up to a certain value	$5! = 120$
$\sqrt{\quad}$	Square root symbol	The square root of ...	Algebraic expressions	$\sqrt{4} = \pm 2$
$\sqrt[n]{\quad}$	Surd	... root of ...	Algebraic expressions	$z = \sqrt[n]{x + y}$
...	Continuation sign	... and so on up to and so on indefinitely	Extension of sequence	$S = \{1, 2, 3, \dots\}$
%	Percent symbol	... percent ...	Proportion	$0.032 = 3.2 \%$
$\frac{0}{00}$	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	$2:4 = 20:40$ $\exists x : x > 4$ $\forall x : x < 0$ $S = \{x : x < 3\}$
	Vertical line	... such thatit 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) $(3, 5)$

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[]	Square brackets	... the quantity the closed interval ...	Denotes a quantity or a closed interval	$w + [(x + y) + z]$ $[3,5]$
(]	Hybrid brackets	... the half-open interval ...	Denotes a half-open interval	$(3,5]$
[)	Hybrid brackets	... the half-open interval ...	Denotes a half-open interval	$[3,5)$
{ }	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	$-(-5) = 5$ $2z^2 + 4z - 6 = 0$
≠	Inequality sign	... is not equal to ...	Indicates two values are different	$x \neq y$
~	Similarity sign	... is similar to ...	Indicates two objects are geometrically similar	$\triangle ABC \sim \triangle DEF$
≈	Approximate equal sign	... is approximately equal to ...	Indicates two values are close to each other	$x + y \approx z$
≅	Congruency sign	... is congruent to ...	Indicates two geometric figures are identical	$\triangle ABC \cong \triangle DEF$
∝	Proportionality sign	... is proportional to ...	Indicates two variables change in direct proportion	$x \propto y$
<	Inequality sign	... is less than ...	Indicates value on left is smaller than value on right	$3 < 5$ $x < y$
≤	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	$5 > 3$ $x > y$
≥	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	$ -3 = 3$

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$\llbracket \rrbracket$	Greatest integer sign	The greatest integer less than or equal to...	Function notation	$\llbracket 2.5 \rrbracket = 2$ $\llbracket -2.5 \rrbracket = -3$
Δ	Increment sign, Triangle symbol	the change in ... triangle ...	Indicates a small change, Denotes vertices of triangle	$m = \frac{\Delta y}{\Delta x}$ $\Delta ABC \cong \Delta DEF$
\perp	Perpendicularity symbol	... is perpendicular to ...	Geometry	$L \perp M$
\parallel	Parallel symbol	... is parallel to ...	Geometry	$L \parallel M$
\sphericalangle	Angle symbol	Angle ...	Geometry	$\sphericalangle ABC \cong \sphericalangle DEF$
\square	Parallelogram symbol	Parallelogram...	Geometry	$\square MNQP \sim \square XYWZ$
\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	$\neg(\neg A) \Leftrightarrow A$
\Rightarrow	Logical implication symbol	... implies ... If ... then ...	Logical statements	$A \Rightarrow B$
\Leftrightarrow	Logical equivalence symbol	... is logically equivalent to if and only if ..	Logical statements	$A \Leftrightarrow B$
\therefore	Three dots	... therefore it follows that ...	Logical statements or mathematical proofs	$x = y \text{ and } y = z$ $\therefore x = z$
\because	Three inverted dots	... because ...	Logical statements or mathematical proofs	$m\angle A + m\angle B + m\angle C = 180$ $\because \angle A, \angle B, \text{ and } \angle C$ are interior \angle 's $\llbracket -2.5 \rrbracket = -3$ of a Δ
\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	$A \subseteq B$

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\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	$\emptyset = \{ \}$
$^\circ$	Degree symbol	... degree(s)	Angular measure Temperature	$\theta = 45^\circ$ $T = +45^\circ C$
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	$\lambda = 70cm$ $\lambda = 3:1$
μ	Greek mu (lowercase)	micro- (10^{-6})	Prefix multiplier	$C = 0.001\mu F$
π	Greek pi (lowercase)	... pi ...	General science	$\pi \approx 3.14159$
Ω	Greek omega (uppercase)	... omega ...	Volume of an object Ohms (resistance)	$R_2 = 300\Omega$
ω	Greek omega (lowercase)	... omega ...	Transfinite ordinal Angular velocity Period	$\omega = 36,000rad / s$ $\omega = \frac{1}{60}s$
e	Natural base	... e ...	Exponential and logarithmic functions	$e \approx 2.718281828$
i	Imaginary number	... i ...	Complex numbers	$i = \sqrt{-1}$
\mathbf{N}, \mathbf{N}	Enhanced or bold N	The set of natural numbers	Number theory Set theory	$\mathbf{N} = \{0, 1, 2, 3, \dots\}$
\mathbf{Z}, \mathbf{Z}	Enhanced or bold Z	The set of integers	Number theory Set theory	$\mathbf{Z} = \{0, 1, -1, 2, -2, 3, -3, \dots\}$
\mathbf{Q}, \mathbf{Q}	Enhanced or bold Q	The set of rational numbers	Number theory Set theory	$\mathbf{Q} = \{a/b \mid a \text{ and } b \text{ are in } \mathbf{Z}\}$
\mathbf{R}, \mathbf{R}	Enhanced or bold R	The set of real numbers	Number theory Set theory	What is the cardinality of \mathbf{R} ?