List of mathematical symbols by subject

This **list of mathematical symbols by subject** shows a selection of the most common symbols that are used in modern mathematical notation within formulas, grouped by mathematical topic. As it is virtually impossible to list all the symbols ever used in mathematics, only those symbols which occur often in mathematics or mathematics education are included. Many of the characters are standardized, for example in DIN 1302 *General mathematical symbols* or DIN EN ISO 80000-2 *Quantities and units – Part 2: Mathematical signs for science and technology*

The following list is largely limited to non-alphanumeric characters. It is divided by areas of mathematics and grouped within sub-regions. Some symbols have a different meaning depending on the context and appear accordingly several times in the list. Further information on the symbols and their meaning can be found in the respective linked articles.

Contents

Guide

The following information is provided for each mathematical symbol:

Symbol
The symbol as it is represented by LaTeX. If there are several typographic variants, only one of the variants is shown.

Usage
An exemplary use of the symbol in a formula. Letters here stand as a placeholder for numbers, variables or complex expressions. Different possible applications are listed separately.

Interpretation
A short textual description of the meaning of the formula in the previous column.

Article
The Wikipedia article that discusses the meaning (semantics) of the symbol.

LaTeX
The LaTeX command that creates the icon. Characters from the ASCII character set can be used directly, with a few exceptions (pound sign #, backslash \, braces {}, and percent sign %). High-and low-position is indicated via the characters ^ and _ and is not explicitly specified.

HTML
The icon in HTML, if it is defined as a named mark. Non-named characters can be indicated in the form can &#xnnnn by specifying the Unicode code point of the next column. High-and low-position can be indicated via and .

Unicode
The code point of the corresponding Unicode character. Some characters are combining and require the entry of additional characters. For brackets, the code points of the opening and the closing forms are specified.

Set theory

Definition symbols

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
:	$A:B$	A is defined by B	Definition	\colon		U+003A
	$A:=B$	A is defined as equal to B				
	$A:\Leftrightarrow B$	A is defined as equivalent to B				

Set construction

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\varnothing$		Empty set	Empty set	\varnothing, \emptyset	∅	U+2205
$\{\}$	$\{a,b,\ldots\}$	Set consisting of the elements a, b and so on	Set (mathematics)	\{ \}		U+007B/D
|	$\{a \mid T(a)\}$	Set of elements a, that satisfy the condition $T(a)$		\mid		U+007C
:	$\{a : T(a)\}$			\colon		U+003A

Set operations

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\cup$	$A \cup B$	Union of the sets A and B	Union (set theory)	\cup	∪	U+222A
$\cap$	$A \cap B$	Intersection of the sets A and B	Intersection (set theory)	\cap	∩	U+2229
$\setminus$	$A \setminus B$	Difference of sets A and B	Difference (set theory)	\setminus		U+2216
$\triangle$	$A \triangle B$	Symmetric difference of sets A and B	Symmetric difference	\triangle	Δ	U+2206
$\times$	$A \times B$	Cartesian product of sets A and B	Cartesian product	\times	×	U+2A2F
$\dot\cup$	$A \dot\cup B$	Disjoint union of sets A and B	Disjoint union	\dot\cup		U+228D
$\sqcup$	$A \sqcup B$	Disjoint union of sets A and B		\sqcup		U+2294
C	A^{C}	Complement of the set A	Complement (set theory)	\mathrm{C}		U+2201
–	$\overline{A}$			\bar		U+0305
$\mathcal{P}$	$\mathcal{P}(A)$	Power set of the set A	Power set	\mathcal{P}		U+1D4AB
$\mathfrak{P}$	$\mathfrak{P}(A)$			\mathfrak{P}		U+1D513
$\wp$	$\wp(A)$			\wp		U+2118
$\bigvee$	$\bigvee_{x \in A}$	This is the least upper bound, supremum, or join of all elements operated on. [1]	Infimum and supremum	\bigvee		U+22C1

Set relations

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\subset$	$A \subset B$	A is a proper subset of B	Subset	`\subset`	`⊂`	U+2282
$\subsetneq$	$A \subsetneq B$			`\subsetneq`		U+228A
$\subseteq$	$A \subseteq B$	A is a subset of B		`\subseteq`	`⊆`	U+2286
$\supset$	$A \supset B$	A is a proper superset of B	Superset	`\supset`	`⊃`	U+2283
$\supsetneq$	$A \supsetneq B$			`\supsetneq`		U+228B
$\supseteq$	$A \supseteq B$	A is a superset of B		`\supseteq`	`⊇`	U+2287
$\in$	$a \in A$	Element a is in the set A	Element (mathematics)	`\in`	`∈`	U+2208
$\ni$	$A \ni a$			`\ni`, `\owns`	`∋`	U+220B
$\notin$	$a \notin A$	Element a is not in the set A		`\notin`	`∉`	U+2209
$\not\ni$	$A \not\ni a$			`\not\ni`		U+220C

Note: The symbols $\subset$ and $\supset$ are used inconsistently and often do not exclude the equality of the two quantities.

Number sets

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\mathbb{N}$		Natural numbers	Natural number	`\mathbb{N}`		U+2115
$\mathbb{Z}$		Integers	Integer	`\mathbb{Z}`		U+2124
$\mathbb{Q}$		Rational numbers	Rational number	`\mathbb{Q}`		U+211A
$\mathbb{A}$		Algebraic numbers	Algebraic number	`\mathbb{A}`		U+1D538
$\mathbb{R}$		Real numbers	Real number	`\mathbb{R}`		U+211D
$\mathbb{C}$		Complex numbers	Complex number	`\mathbb{C}`		U+2102
$\mathbb{H}$		Quaternions	Quaternion	`\mathbb{H}`		U+210D

Cardinality

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\vert\ \vert$	$\vert A \vert$	Cardinality of the set A	Cardinality	`\vert`		U+007C
$\#$	$\#A$			`\#`		U+0023
$\mathfrak{c}$		Cardinality of the continuum	Cardinality of the continuum	`\mathfrak{c}`		U+1D520
$\aleph$	$\aleph_0$, $\aleph_1$, ...	Infinite cardinals	Aleph number	`\aleph`		U+2135
$\beth$	$\beth_0$, $\beth_1$, ...	Beth numbers	Beth number	`\beth`		U+2136

Arithmetic

Arithmetic operators

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
+	$a + b$	a added to b	Addition	+		U+002B
−	$a - b$	b subtracted from a	Subtraction	-		U+2212
·	$a \cdot b$	a multiplied by b	Multiplication	\cdot	·	U+22C5
×	$a \times b$			\times	×	U+2A2F
:	$a : b$	a divided by b	Division (mathematics)	:		U+003A
/	a/b			/	⁄	U+2215
÷	$a \div b$			\div	÷	U+00F7
−	$\frac{a}{b}$			\frac		U+2044
−	$-a$	Negative of the number a or the additive inverse of a	Unary minus	-	−	U+2212
±	$\pm a$	Plus or minus a	Plus or minus sign	\pm	±	U+00B1
∓	$\mp a$	Minus or plus a		\mp		U+2213
( )	(a)	Term a is evaluated first	Bracket	( )		U+0028/9
[ ]	$[a]$			[ ]		U+005B/D

Equality signs

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
=	$a = b$	a equals b	Equality (mathematics)	=		U+003D
≠	$a \neq b$	a does not equal b	Inequality (mathematics)	\neq	≠	U+2260
≡	$a \equiv b$	a is identical to b	Identity (mathematics)	\equiv	≡	U+2261
≈	$a \approx b$	a is approximately equal to b	Approximation	\approx	≈	U+2248
∼	$a \sim b$	a is proportional to b	Proportionality (mathematics)	\sim	∼	U+223C
∝	$a \propto b$			\propto	∝	U+221D
≙	$a \mathrel{\widehat{=}} b$	a corresponds to b	Correspondence (mathematics)	\widehat{=}		U+2259

Comparison

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
<	$a < b$	a is less than b	Comparison (mathematics)	<	<	U+003C
>	$a > b$	a is greater than b		>	>	U+003E
≤	$a \leq b$	a is less than or equal to b		\le, \leq	≤	U+2264
≦	$a \leqq b$			\leqq		U+2266
≥	$a \geq b$	a is greater than or equal to b		\ge, \geq	≥	U+2265
≧	$a \geqq b$			\geqq		U+2267
≪	$a \ll b$	a is much smaller than b		\ll		U+226A
≫	$a \gg b$	a is much bigger than b		\gg		U+226B

Divisibility

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\mid$	$a \mid b$	a divides b	Divisibility	`\mid`		U+2223
$\nmid$	$a \nmid b$	a does not divide b		`\nmid`		U+2224
$\perp$	$a \perp b$	a and b are relatively prime	Relatively prime	`\perp`	`⊥`	U+22A5
$\sqcap$	$a \sqcap b$	Greatest common divisor of a and b	Greatest common divisor	`\sqcap`		U+2293
$\wedge$	$a \wedge b$			`\wedge`		U+2227
$\sqcup$	$a \sqcup b$	Least common multiple of a and b	Least common multiple	`\sqcup`		U+2294
$\vee$	$a \vee b$			`\vee`		U+2228
$\equiv$	$a \equiv b \pmod{m}$	a and b are congruent modulo m	Modular arithmetic	`\equiv`	`≡`	U+2261

Intervals

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
[ ]	$[a,b]$	Closed interval between a and b	Interval (mathematics)	`( )` `[ ]`		U+0028/9 U+005B/D
] [	$]a,b[$	Open interval between a and b				
( )	(a,b)					
[[	$[a,b[$	Right-open interval between a and b				
[ )	$[a,b)$					
]]	$]a,b]$	Left-open interval between a and b				
( ]	$(a,b]$					

Elementary functions

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\vert\ \vert$	$\vert x \vert$	Absolute value of x	Absolute value	`\vert`		U+007C
[ ]	$[x]$	Biggest whole number less than or equal to x	Floor and ceiling functions	`[ ]`		U+005B/D
$\lfloor\ \rfloor$	$\lfloor x \rfloor$			`\lfloor` `\rfloor`	`⌊` `⌋`	U+230A/B
$\lceil\ \rceil$	$\lceil x \rceil$	Smallest whole number greater than or equal to x		`\lceil` `\rceil`	`⌈` `⌉`	U+2308/9
$\sqrt{}$	$\sqrt{x}$	Square root of x	Square root	`\sqrt`	`√`	U+221A
	$\sqrt[n]{x}$	n-th root of x	nth root			
%	$x\,\%$	x percent	Percent	`\%`		U+0025

Note: the power function is not represented by its own icon, but by the positioning of the exponent as a superscript.

Complex numbers

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\Re$	$\Re(z)$	Real part of complex number z	Complex number	\Re		U+211C
$\Im$	$\Im(z)$	Imaginary part of complex number z		\Im		U+2111
¯	$\bar{z}$	Complex conjugate of z	Complex conjugate	\bar		U+0305
*	z^*			\ast	∗	U+002A
| |	$\|z\|$	Absolute value of complex number z	Absolute value	\vert		U+007C

Remark: real and imaginary parts of a complex number are often also denoted by Re and Im.

Mathematical constants

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
π		Pi, or Archimedes' constant	Pi	\pi	{{pi}}	U+03C0
e or e		Euler's constant	e (mathematics)	e or \rm{e}	{{mvar|e}} or {{math|e}}	U+0065
φ		Golden ratio	Golden ratio	\varphi	φ	U+03C6
i or i		Imaginary unit (square root of −1)	Imaginary unit	i or \rm{i}	{{mvar|i}} or {{math|i}}	U+0069

See also: mathematical constant for symbols of additional mathematical constants.

Calculus

Sequences and series

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\sum$	$\sum_{i=1}^{n}, \sum_{i \in I}$	Sum from $i = 1$ to n or over all elements i in set I	Summation	\sum	∑	U+2211
$\prod$	$\prod_{i=1}^{n}, \prod_{i \in I}$	Product from $i = 1$ to n or over all elements i in set I	Product (mathematics)	\prod	∏	U+220F
$\coprod$	$\coprod_{i=1}^{n}, \coprod_{i \in I}$	Coproduct from $i = 1$ to n or over all elements i in set I	Coproduct	\coprod		U+2210
( )	(a_n)	Sequence of elements $a_1, a_2, \ldots$	Sequence	( )		U+0028/9
→	$a_n \to a$	Sequence (a_n) tends to limit a	Limit of a sequence	\to	→	U+2192
∞	$n \to \infty$	n tends to infinity	Infinity	\infty	∞	U+221E

Functions

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\to$	$f\colon A \to B$ $A \xrightarrow{f} B$	Function f maps from set A to set B	Function (mathematics)	`\to`	`→`	`U+2192`
$\mapsto$	$f\colon x \mapsto y$ $x \xmapsto{f} y$	Function f maps element x to element y		`\mapsto`		`U+21A6`
$(\ )$	$f(x)$	Image of element x under function f	Image (mathematics)	`( )`		`U+0028/9`
	$f(X)$	Image of set X under function f				
$[\ ]$	$f[X]$			`[ ]`		`U+005B/D`
$\vert$	$f\vert_X$	Restriction of function f to set X	Restriction (mathematics)	`\vert`		`U+007C`
$\cdot$	$f(\cdot)$	Placeholder for a variable as argument of function f	Free variable	`\cdot`		`U+22C5`
$^{-1}$	f^{-1}	Inverse function of f	Inverse function	`-1`		`U+207B`
$\circ$	$f \circ g$	Composition of functions f and g; $f(g(x))$	Function composition	`\circ`	`∘`	`U+2218`
$*$	$f * g$	Convolution of functions f and g	Convolution	`\ast`	`∗`	`U+2217`
$\hat{}$	$\hat{f}$	Fourier transform of function f	Fourier transform	`\hat`		`U+0302`

Limits

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\uparrow$	$\lim_{x \uparrow a} f(x)$	Limit of function f as x approaches a from below	Limit of a function	`\uparrow`	`↑`	`U+2191`
$\nearrow$	$\lim_{x \nearrow a} f(x)$			`\nearrow`		`U+2197`
$\to$	$\lim_{x \to a} f(x)$	Limit of function f as x approaches a		`\to`	`→`	`U+2192`
$\searrow$	$\lim_{x \searrow a} f(x)$	Limit of function f as x approaches a from above		`\searrow`		`U+2198`
$\downarrow$	$\lim_{x \downarrow a} f(x)$			`\downarrow`	`↓`	`U+2193`
$+$	$\lim_{x \to a^+} f(x)$	Limit of a function f as x approaches a from the right		`^+`	`⁺`	`U+207A`
$-$	$\lim_{x \to a^-} f(x)$	Limit of a function f as x approaches a from the left		`^-`	`⁻`	`U+207B`

Asymptotic behaviour

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\sim$	$f \sim g$	Function f is asymptotically equal to function g	Asymptotic analysis	`\sim`	`∼`	U+223C
o	$f \in o(g)$	Function f grows slower than g	Big O notation	o		U+006F
$\mathcal{O}$	$f \in \mathcal{O}(g)$	Function f grows not substantially faster than g		`\mathcal{O}`		U+1D4AA
Θ	$f \in \Theta(g)$	Function f grows as fast as g		`\Theta`	`Θ`	U+0398
Ω	$f \in \Omega(g)$	Function f grows not substantially slower than g		`\Omega`	`Ω`	U+03A9
ω	$f \in \omega(g)$	Function f grows faster than g		`\omega`	`ω`	U+03C9

Differential calculus

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$'$	f', f''	First or second derivative of function f	Lagrange's notation	`\prime`	`′`	U+2032,U+2033
V	f^{IV}, f^{V}, f^{VI}	Alternative notation for fourth, fifth, or sixth derivative of function f		`^{V}`	`<sup>Ⅳ</sup>`	
$()$	$f^{(4)}, f^{(5)}, f^{(n)}$	Alternative notation for fourth, fifth, or n-th derivative of function f		`( )`	`<sup>( )</sup>`	U+0028/9
$\cdot$	$\dot{f}, \ddot{f}$	First or second derivative of function f with respect to time (in physics)	Newton's notation	`\dot`, `\ddot`		U+0307
d	dx	An infinitesimally small change in x	Leibniz's notation	d	d	U+0064
	$\frac{df}{dx}$	Derivative of function f with respect to variable x				
	$\frac{d}{dx}f$					
	$\frac{d^2}{dx^2}f$	Second derivative of function f with respect to variable x				
	df	Total differential of function f				
∂	$\frac{\partial f}{\partial x}$	Partial derivative of function f with respect to variable x	Partial derivative	`\partial`	`∂`	U+2202

Integral calculus

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\int$	$\int_a^b$, $\int_G$	Definite integral between a and b or over set G	Integral	`\int`	`∫`	U+222B
$\oint$	$\oint_\gamma$	Curve integral along curve γ	Curve integral	`\oint`		U+222E
$\iint$	$\iint_{\mathcal{F}}$	Surface integral over surface $\mathcal{F}$	Surface integral	`\iint`		U+222C
$\iiint$	$\iiint_V$	Volume integral over volume V	Volume integral	`\iiint`		U+222D

Vector calculus

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
∇	∇f	Gradient of function f	Gradient	`\nabla`	`∇`	U+2207
	$\nabla \cdot F$	Divergence of vector field F	Divergence			
	$\nabla \times F$	Curl of vector field F	Curl (mathematics)			
Δ	Δf	Laplace operator of function f	Laplace operator	`\Delta`	`Δ`	U+2206
$\square$	$\square f$	D'Alembert operator of function f	D'Alembert operator	`\square`		U+25A1

Topology

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
∂	∂U	Boundary of set U	Boundary (topology)	`\partial`	`∂`	U+2202
°	U°	Interior of set U	Interior (topology)	`\circ`	`°`	U+02DA
–	$\overline{U}$	Closure of set U	Closure (topology)	`\overline`		U+0305
˙	$\dot{U}(x)$	Punctured neighbourhood U of point x	Punctured neighbourhood	`\dot`		◌̇ U+0307

Functional analysis

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
′	V'	Topological dual space of topological vector space V	Dual space	`\prime`	`′`	U+2032
″	V''	Bidual space of normed vector space V				
ˆ	$\hat{X}$	Completion of metric space X	Complete metric space	`\hat`		U+0302
↪	$X \hookrightarrow Y$	Embedding of topological vector space X into Y	Embedding	`\hookrightarrow`		U+21AA

Linear algebra and geometry

Elementary geometry

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
[ ]	$[AB]$	Line segment between points A and B	Line segment	`[ ]`		U+005B/D
| |	$\|AB\|$	Length of line segment between points A and B		`\vert`		U+007C
–	$\overline{AB}$			`\overline`		U+0305
→	$\overrightarrow{AB}$	Vector between points A and B	Euclidean vector and Affine space	`\vec`		U+20D7
∠	$\angle ABC$	Angle between line segments BA and BC	Angle	`\angle`	`∠`	U+2220
△	$\triangle ABC$	Triangle with vertices A, B and C	Triangle	`\triangle`		U+25B3
□	$\square ABCD$	Quadrilateral with vertices A, B, C and D	Quadrilateral	`\square`		U+25A1
∥	$g \parallel h$	Lines g and h are parallel	Parallel (geometry)	`\parallel`		U+2225
∦	$g \nparallel h$	Lines g and h are not parallel		`\nparallel`		U+2226
⊥	$g \perp h$	Lines g and h are orthogonal	Orthogonality	`\perp`	`⊥`	U+27C2

Vectors and matrices

Symbol	Usage	Article	LaTeX

$(v_1, \ldots, v_n)$	Row vector comprising elements v_1 through v_n	Vector (mathematics and physics)	`\begin{pmatrix}`
			`...`
			`\end{pmatrix}`
			
			or
			
			`\left(`
			`\begin{array}{...}`
			`...`
			`\end{array}`
			`\right)`

$\begin{pmatrix} v_1 \\ \vdots \\ v_m \end{pmatrix}$	Column vector comprising elements v_1 through v_m		
$\begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{pmatrix}$	Matrix comprising elements a_{11} through a_{mn}	Matrix (mathematics)	

Vector calculus

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
·	$\boldsymbol{v} \cdot \boldsymbol{w}$	Dot product of vectors $\boldsymbol{v}$ and $\boldsymbol{w}$	Dot product	`\cdot`	`·`	U+22C5
( )	$(\boldsymbol{v}, \boldsymbol{w})$			`( )`		U+0028/9
⟨ ⟩	$\langle \boldsymbol{v}, \boldsymbol{w} \rangle$ $\langle \boldsymbol{v} \mid \boldsymbol{w} \rangle$			`\langle` `\rangle`	`⟨` `⟩`	U+27E8/9
×	$\boldsymbol{v} \times \boldsymbol{w}$	Cross product of vectors $\boldsymbol{v}$ and $\boldsymbol{w}$	Cross product	`\times`	`×`	U+2A2F
[ ]	$[\boldsymbol{v}, \boldsymbol{w}]$			`[ ]`		U+005B/D
( )	$(\boldsymbol{u}, \boldsymbol{v}, \boldsymbol{w})$	Triple product of vectors $\boldsymbol{u}$, $\boldsymbol{v}$ and $\boldsymbol{w}$	Triple product	`( )`		U+0028/9
⊗	$\boldsymbol{v} \otimes \boldsymbol{w}$	Dyadic product of vectors $\boldsymbol{v}$ and $\boldsymbol{w}$	Dyadic product	`\otimes`	`⊗`	U+2297
∧	$\boldsymbol{v} \wedge \boldsymbol{w}$	Wedge product of vectors $\boldsymbol{v}$ and $\boldsymbol{w}$	Wedge product	`\wedge`		U+2227
| |	$\lvert \boldsymbol{v} \rvert$	Length of vector $\boldsymbol{v}$	Euclidean norm	`\vert`		U+007C
‖ ‖	$\lVert \boldsymbol{v} \rVert$	Norm of vector $\boldsymbol{v}$	Norm (mathematics)	`\Vert`, `\\|`		U+2016
^	$\hat{\boldsymbol{v}}$	Normalized vector of vector $\boldsymbol{v}$	Unit vector	`\hat{}`		U+0302

Matrix calculus

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
·	$\boldsymbol{A} \cdot \boldsymbol{B}$	Product of matrices $\boldsymbol{A}$ and $\boldsymbol{B}$	Matrix multiplication	`\cdot`	`·`	U+22C5
∘	$\boldsymbol{A} \circ \boldsymbol{B}$	Hadamard product of matrices $\boldsymbol{A}$ and $\boldsymbol{B}$	Hadamard product (matrices)	`\circ`		U+2218
⊗	$\boldsymbol{A} \otimes \boldsymbol{B}$	Kronecker product of matrices $\boldsymbol{A}$ and $\boldsymbol{B}$	Kronecker product	`\otimes`	`⊗`	U+2297
T	$\boldsymbol{A}^{\mathrm{T}}$	Transposed matrix of matrix $\boldsymbol{A}$	Transposed matrix	`T`		U+0054
H	$\boldsymbol{A}^{\mathrm{H}}$	Conjugate transpose of matrix $\boldsymbol{A}$	Conjugate transpose	`H`		U+0048
*	$\boldsymbol{A}^*$			`\ast`	`∗`	U+002A
†	$\boldsymbol{A}^\dagger$			`\dagger`	`†`	U+2020
−1	$\boldsymbol{A}^{-1}$	Inverse matrix of matrix $\boldsymbol{A}$	Inverse matrix	`-1`		U+207B
+	$\boldsymbol{A}^+$	Moore–Penrose pseudoinverse of matrix $\boldsymbol{A}$	Moore–Penrose pseudoinverse	`+`		U+002B
| |	$\lvert \boldsymbol{A} \rvert$	Determinant of Matrix $\boldsymbol{A}$	Determinant	`\vert`		U+007C
‖ ‖	$\lVert \boldsymbol{A} \rVert$	Norm of matrix $\boldsymbol{A}$	Matrix norm	`\Vert`, `\\|`		U+2016

Vector spaces

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$+$	$V+W$	Sum of vector spaces V and W	Direct sum of modules	+		U+002B
$\oplus$	$V\oplus W$	Direct sum of vector spaces V and W		\oplus	⊕	U+2295
$\times$	$V\times W$	Direct product of vector spaces V and W	Direct product	\times	×	U+2A2F
$\otimes$	$V\otimes W$	Tensor product of vector spaces V and W	Tensor product	\otimes	⊗	U+2297
$/$	V/U	Quotient space of vector space V by subspace U	Quotient space (linear algebra)	/	⁄	U+002F
$^\perp$	$U^\perp$	Orthogonal complement of subspace U	Orthogonal complement	\perp	⊥	U+27C2
*	V^*	Dual space of vector space V	Dual space	\ast	∗	U+002A
^{0}	X^0	Annihilator space of the set of vectors X		0		U+0030
$\langle\ \rangle$	$\langle X\rangle$	Linear hull of the set of vectors X	Linear hull	\langle \rangle	⟨ ⟩	U+27E8/9

Algebra

Relations

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\circ$	$R\circ S$	Composition of relations R and S	Composition of relations	\circ		U+2218
	$a\circ b$	Operation of elements a and b (general)	Operation (mathematics)			
$\bullet$	$a\bullet b$			\bullet	•	U+2219
$*$	$a*b$			\ast	∗	U+2217
$\leq$	$a\leq b$	Order relation between elements a and b	Order relation	\leq	≤	U+2264
$\prec$	$a\prec b$	Element a is a predecessor of element b	Successor ordinal	\prec		U+227A
$\succ$	$a\succ b$	Element a is a successor of element b		\succ		U+227B
$\sim$	$a\sim b$	Equivalence relation between elements a and b	Equivalence relation	\sim	∼	U+223C
[ ]	$[a]$	Equivalence class of element a	Equivalence class	[ ]		U+005B/D
$/$	$M/\sim$	Quotient set of set M by equivalence relation $\sim$	Quotient set	/	⁄	U+002F
$^{-1}$	R^{-1}	Inverse relation of relation R	Inverse relation	-1		U+207B
$^+$	R^+	Transitive closure of relation R	Transitive closure	+		U+002B
*	R^*	Reflexive closure of relation R	Reflexive closure	\ast	∗	U+002A

Group theory

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\simeq$	$G \simeq H$	Groups G and H are isomorphic	Group isomorphism	`\simeq`		U+2243
$\cong$	$G \cong H$			`\cong`	`≅`	U+2245
$\times$	$G \times H$	Direct product of groups G and H	Direct product	`\times`	`×`	U+2A2F
$\rtimes$	$G \rtimes H$	Semidirect product of groups G and H	Semidirect product	`\rtimes`		U+22CA
$\wr$	$G \wr H$	Wreath product of groups G and H	Wreath product	`\wr`		U+2240
$\leq$	$U \leq G$	U is a subgroup of group G	Subgroup	`\leq`	`≤`	U+2264
$<$	$U < G$	U is a proper subgroup of group G		`\lt`	`<`	U+003C
$\triangleleft$	$N \triangleleft G$	N is a normal subgroup of group G	Normal subgroup	`\vartriangleleft`		U+22B2
$/$	G/N	Quotient group of group G by normal subgroup N	Quotient group	`/`	`⁄`	U+002F
$:$	$(G:U)$	Index of subgroup U in group G	Index of a subgroup	`\colon`		U+003A
$\langle\ \rangle$	$\langle E \rangle$	Subgroup generated by set E	Generating set of a group	`\langle` `\rangle`	`⟨` `⟩`	U+27E8/9
[ ]	$[g, h]$	Commutator of elements g and h	Commutator	`[ ]`		U+005B/D

Field theory

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$/$	L/K	Extension of field L over field K	Field extension	`/`	`⁄`	U+002F
$\mid$	$L \mid K$			`\mid`		U+007C
$:$	$L:K$			`\colon`		U+003A
	$[L:K]$	Degree of field extension L over K	Degree of a field extension			
–	$\overline{K}$	Algebraic closure of field K	Algebraic closure	`\overline`		U+0305
()	$K(\alpha)$	Extension of a field K by adding an algebraic element α	Field extension, Algebraic number field	`( )`		U+0028/9
$\mathbb{K}$		Field of real or complex numbers	Field (mathematics)	`\mathbb{K}`		U+1D542
$\mathbb{F}$		Finite field	Finite field	`\mathbb{F}`		U+1D53D

Ring theory

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
*	R^*	Group of units of ring R	Group of units	\ast	∗	U+2217
×	$R^\times$			\times	×	U+2A2F
◁	$I \triangleleft R$	I is an ideal of ring R (Uncommon, needs to be defined before the first use)	Ideal (ring theory)	\vartriangleleft		U+22B2
/	R/I	Quotient ring of ring R by ideal I	Quotient ring	/	⁄	U+002F
[ ]	$R[X]$	Polynomial ring over ring R with variable X	Polynomial ring	[ ]		U+005B/D
[[ ]]	$R[[X]], R((X))$	Ring of formal power series and ring of formal Laurent series	Formal power series	[[ ]]		U+005B/D

Combinatorics

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
!	$n!$	Number of permutations of n elements	Factorial	!		U+0021
	$!n$	Number of derangements of n elements (permutations without fixed points)	Derangement			
	$n!!$	Number of involutions without fixed points (n odd)	Double factorial			
( )	$\binom{n}{k}$	Number of k-combinations of n elements without repetition	Combination	\binom		U+0028/9
	$\binom{n}{k_1,\ldots,k_r}$	Number of permutations of n elements of which $k_1, \ldots, k_r$ are identical	Multinomial coefficient			
(( ))	$\left(\!\binom{n}{k}\!\right)$	Number of k-combinations of n elements with repetition	Multiset	(( ))		U+0028/9
‾	$n^{\overline{m}}$	Rising factorial from n with m factors	Pochhammer symbol	\overline		U+0305
	$n^{\underline{m}}$	Falling factorial from n with m factors		\underline		U+0332
#	$n\#$	Product of all primes up to n	Primorial	\#		U+0023

Stochastics

Probability theory

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
P	$P(A)$	Probability of event A	Probability measure	`P`		`U+2119`
$\mid$	$P(A \mid B)$	Probability of event A given event B	Conditional probability	`\mid`		`U+007C`
E	$E(X)$	Expected value of the random variable X	Expected value	`E`		`U+1D53C`
V	$V(X)$	Variance of the random variable X	Variance	`V`		`U+1D54D`
σ	$\sigma(X)$	Standard deviation of the random variable X	Standard deviation	`\sigma`	`σ`	`U+03C3`
	$\sigma(X,Y)$	Covariance of random variables X and Y	Covariance			
ρ	$\rho(X,Y)$	Correlation of random variables X and Y	Correlation	`\rho`	`ρ`	`U+03C1`
$\sim$	$X \sim F$	Random variable X has distribution F	Probability distribution	`\sim`	`∼`	`U+223C`
$\approx$	$X \approx F$	Random variable X has distribution F approximately		`\approx`	`≈`	`U+2248`
$\perp$	$A \perp B$	Event A is independent from event B	Independence (probability theory)	`\perp`	`⊥`	`U+22A5`

Remark: for operators there are several notational variants; instead of round brackets also square brackets are used

Statistics

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\bar{}$	$\bar{x}$	Average of the values $x_1, \ldots, x_n$	Average	`\bar`		`U+0305`
$\langle\ \rangle$	$\langle X \rangle$	Average over all values in the set X (in physics)		`\langle` `\rangle`	`⟨` `⟩`	`U+27E8/9`
$\hat{}$	$\hat{p}$	Estimator for parameter p	Estimator	`\hat`		`U+0302`

Logic

Operators

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\wedge$	$A \wedge B$	Proposition A and proposition B	Logical conjunction	`\land`	`∧`	U+2227
$\vee$	$A \vee B$	Proposition A or proposition B (or both)	Logical disjunction	`\lor`	`∨`	U+2228
$\Leftrightarrow$	$A \Leftrightarrow B$	Proposition A follows from proposition B and vice versa	Logical equivalence	`\Leftrightarrow`	`⇔`	U+21D4
$\leftrightarrow$	$A \leftrightarrow B$			`\leftrightarrow`	`↔`	U+2194
$\Rightarrow$	$A \Rightarrow B$	From proposition A follows proposition B	Logical consequence	`\Rightarrow`	`⇒`	U+21D2
$\rightarrow$	$A \rightarrow B$			`\rightarrow`	`→`	U+2192
$\oplus$	$A \oplus B$	Either proposition A or proposition B	Exclusive or	`\oplus`	`⊕`	U+2295
$\veebar$	$A \veebar B$			`\veebar`		U+22BB
$\dot{\vee}$	$A \dot{\vee} B$			`\dot\lor`		U+2A52
$\neg$	$\neg A$	Not proposition A	Logical negation	`\lnot`	`¬`	U+00AC
$-$	$\overline{A}$			`\bar`		U+0305
$\leftarrow$	$A \leftarrow B$	If B then A, or not B without A. It is not to be confused with the assignment operator in computer science.	Converse implication	`\leftarrow`	`←`	U+2190

Quantifiers

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
$\forall$	$\forall x$	For all elements x	Universal quantification	`\forall`	`∀`	U+2200
$\bigwedge$	$\bigwedge_x$			`\bigwedge`		U+22C0
$\exists$	$\exists x$	At least one element x exists	Existential quantification	`\exists`	`∃`	U+2203
$\bigvee$	$\bigvee_x$			`\bigvee`		U+22C1
$\exists!$	$\exists! x$	Exactly one element x exists	Uniqueness quantification	`\exists!`	`∃!`	U+2203
$\dot{\bigvee}$	$\dot{\bigvee}_x$			`\dot\bigvee`		U+2A52
$\nexists$	$\nexists x$	No element x exists	Existential quantification	`\nexists`		U+2204

Deduction symbols

Symbol	Usage	Interpretation	Article	LaTeX	HTML	Unicode
		Proposition B can be syntactically derived from proposition A	Propositional calculus	`\vdash`		U+22A2
		Proposition B follows semantically from proposition A	Inference	`\models`		U+22A8
		Proposition A is universally true	Tautology (logic)			
				`\top`		U+22A4
		Proposition A is contradictory	Contradiction	`\bot`	`⊥`	U+22A5
		Proposition A is true, therefore proposition B is true	Deductive reasoning	`\therefore`		U+2234
		Proposition A is true, because B is true		`\because`		U+2235
		End of proof	Q.E.D.	`\blacksquare`		U+220E
				`\Box`		U+25A1

See also

- List of mathematical symbols
- Greek letters used in mathematics, science, and engineering
- ISO 31-11 (Mathematical signs and symbols for use in physical sciences and technology)
- Latin letters used in mathematics
- List of mathematical abbreviations
- Mathematical alphanumeric symbols
- Mathematical constants and functions
- Mathematical notation
- Mathematical operators and symbols in Unicode
- Notation in probability and statistics
- Physical constants
- Table of logic symbols
- Table of mathematical symbols by introduction date
- Unicode block

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- Wolfgang Hackbusch (2010) (in German), *Taschenbuch der Mathematik, Band 1* (3. ed.), Springer, pp. 1275ff., ISBN 3-835-10123-4
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Note: This article is a translation of the German Wikipedia article de:Liste mathematischer Symbole

External links

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