Math Symbols List

List of all mathematical symbols and signs - meaning and examples.

Basic math symbols

$=$	equals sign	equality
$\neq$	not equal sign	inequality
$\approx$	approximately equal	approximation
$>$	strict inequality	greater than
$<$	strict inequality	less than
$\geq$	inequality	greater than or equal to
$\leq$	inequality	less than or equal to
$( )$	parentheses	calculate expression inside first
$[ ]$	brackets	calculate expression inside first
$+$	plus sign	addition
$-$	minus sign	subtraction
$\pm$	plus - minus	both plus and minus operations
$\mp$	minus - plus	both minus and plus operations
$*$	asterisk	multiplication
$\times$	times sign	multiplication
$\cdot$	multiplication dot	multiplication
$\div$	division sign / obelus	division
$/$	division slash	division
$\frac{}{}$	horizontal line	division / fraction
$\mod$	modulo	remainder calculation
$.$	period	decimal point, decimal separator
a^b	power	exponent
$a^\wedge b$	caret	exponent
$\sqrt{a}$	square root	$\sqrt{a} \cdot \sqrt{a} = a$
$\sqrt[3]{a}$	cube root	$\sqrt[3]{a} \cdot \sqrt[3]{a} \cdot \sqrt[3]{a} = a$
$\sqrt[4]{a}$	fourth root	$\sqrt[4]{a} \cdot \sqrt[4]{a} \cdot \sqrt[4]{a} \cdot \sqrt[4]{a} = a$
$\sqrt[n]{a}$	n-th root (radical)	

MATH SYMBOLS

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RAPID TABLES

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%	percent	1% = 1/100
‰	per-mille	1‰ = 1/1000 = 0.1%
ppm	per-million	1ppm = 1/1000000
ppb	per-billion	1ppb = 1/1000000000
Symbol	Symbol Name	Meaning / definition

Geometry symbols

∠	angle	formed by two rays
∡	measured angle	
∢	spherical angle	
∟	right angle	= 90°
°	degree	1 turn = 360°
deg	degree	1 turn = 360deg
′	prime	arcminute, 1° = 60′
″	double prime	arcsecond, 1′ = 60″
$\overleftrightarrow{AB}$	line	infinite line
$\overline{AB}$	line segment	line from point A to point B
$\overrightarrow{AB}$	ray	line that start from point A
$\overset{\frown}{AB}$	arc	arc from point A to point B
⊥	perpendicular	perpendicular lines (90° angle)
∥	parallel	parallel lines
≅	congruent to	equivalence of geometric shapes and size
~	similarity	same shapes, not same size
Δ	triangle	triangle shape
$\lvert x\text{-}y\rvert$	distance	distance between points x and y
π	pi constant	π = 3.141592654... is the ratio between the circumference and diameter of a circle
rad	radians	radians angle unit
c	radians	radians angle unit
grad	gradians / gons	grads angle unit
Symbol	Symbol Name	Meaning / definition

Algebra symbols

Symbol	Symbol Name	Meaning / definition
x	x variable	unknown value to find

≡	equivalence	identical to
≜	equal by definition	equal by definition
:=	equal by definition	equal by definition
~	approximately equal	weak approximation
≈	approximately equal	approximation
∝	proportional to	proportional to
∞	lemniscate	infinity symbol
≪	much less than	much less than
≫	much greater than	much greater than
( )	parentheses	calculate expression inside first
[ ]	brackets	calculate expression inside first
{ }	braces	set
$\lfloor x \rfloor$	floor brackets	rounds number to lower integer
$\lceil x \rceil$	ceiling brackets	rounds number to upper integer
$x!$	exclamation mark	factorial
$\lvert x \rvert$	vertical bars	absolute value
$f(x)$	function of x	maps values of x to f(x)
$(f \circ g)$	function composition	$(f \circ g)(x) = f(g(x))$
(a,b)	open interval	$(a,b) = \{x \mid a < x < b\}$
$[a,b]$	closed interval	$[a,b] = \{x \mid a \leq x \leq b\}$
Δ	delta	change / difference
Δ	discriminant	$\Delta = b^2 - 4ac$
∑	sigma	summation - sum of all values in range of series
∑∑	sigma	double summation
∏	capital pi	product - product of all values in range of series
e	e constant / Euler's number	$e = 2.718281828...$
γ	Euler-Mascheroni constant	$\gamma = 0.5772156649...$
φ	golden ratio	golden ratio constant
π	pi constant	$\pi = 3.141592654...$ is the ratio between the circumference and diameter of
Symbol	Symbol Name	Meaning / definition

Symbol	Symbol Name	Meaning / definition
·	dot	scalar product
×	cross	vector product

$\times$	cross	vector product
$A \otimes B$	tensor product	tensor product of A and B
$\langle x, y \rangle$	inner product	
$[\ ]$	brackets	matrix of numbers
$(\ )$	parentheses	matrix of numbers
$\mid A \mid$	determinant	determinant of matrix A
$\det(A)$	determinant	determinant of matrix A
$\| x \|$	double vertical bars	norm
A^{T}	transpose	matrix transpose
$A^{\dagger}$	Hermitian matrix	matrix conjugate transpose
A^{*}	Hermitian matrix	matrix conjugate transpose
A^{-1}	inverse matrix	$A\,A^{-1} = I$
$\operatorname{rank}(A)$	matrix rank	rank of matrix A

Symbol	Symbol Name	Meaning / definition

Probability and statistics symbols

Symbol	Symbol Name	Meaning / definition
$P(A)$	probability function	probability of event A
$P(A \cap B)$	probability of events intersection	probability that of events A and B
$P(A \cup B)$	probability of events union	probability that of events A or B
$P(A \mid B)$	conditional probability function	probability of event A given event B occured
$f(x)$	probability density function (pdf)	$P(a \leq x \leq b) = \int f(x)\,dx$
$F(x)$	cumulative distribution function (cdf)	$F(x) = P(X \leq x)$
μ	population mean	mean of population values
$E(X)$	expectation value	expected value of random variable X
$E(X \mid Y)$	conditional expectation	expected value of random variable X given Y
$var(X)$	variance	variance of random variable X
σ^2	variance	variance of population values
$std(X)$	standard deviation	standard deviation of random variable X
σ_X	standard deviation	standard deviation value of random variable X
$\tilde{x}$	median	middle value of random variable x
$cov(X,Y)$	covariance	covariance of random variables X and Y
$corr(X,Y)$	correlation	correlation of random variables X and Y
$\rho_{X,Y}$	correlation	correlation of random variables X and Y
$\sum$	summation	summation - sum of all

$\sum$	summation	values in range of series
$\sum\sum$	double summation	double summation
Mo	mode	value that occurs most frequently in population
MR	mid-range	$MR = (x_{max}+x_{min})/2$
Md	sample median	half the population is below this value
Q_1	lower / first quartile	25% of population are below this value
Q_2	median / second quartile	50% of population are below this value = median of samples
Q_3	upper / third quartile	75% of population are below this value
$\bar{x}$	sample mean	average / arithmetic mean
s^2	sample variance	population samples variance estimator
s	sample standard deviation	population samples standard deviation estimator
z_x	standard score	$z_x = (x-\bar{x}) / s_x$
$X \sim$	distribution of X	distribution of random variable X
$N(\mu,\sigma^2)$	normal distribution	gaussian distribution
$U(a,b)$	uniform distribution	equal probability in range a,b
$exp(\lambda)$	exponential distribution	$f(x) = \lambda e^{-\lambda x}$, $x \geq 0$
$gamma(c, \lambda)$	gamma distribution	$f(x) = \lambda\ c\ x^{c-1} e^{-\lambda x} / \Gamma(c)$, $x \geq 0$
$\chi^2(k)$	chi-square distribution	$f(x) = x^{k/2-1} e^{-x/2} / (2^{k/2} \Gamma(k/2))$
$F(k_1, k_2)$	F distribution	
$Bin(n,p)$	binomial distribution	$f(k) = {}_nC_k\, p^k (1-p)^{n-k}$
$Poisson(\lambda)$	Poisson distribution	$f(k) = \lambda^k e^{-\lambda} / k!$
$Geom(p)$	geometric distribution	$f(k) = p(1-p)^k$
$HG(N,K,n)$	hyper-geometric distribution	
Symbol	Symbol Name	Meaning / definition

Combinatorics Symbols

$n!$	factorial	$n! = 1 \cdot 2 \cdot 3 \cdot \ldots \cdot n$
${}_nP_k$	permutation	${}_nP_k = \frac{n!}{(n-k)!}$
${}_nC_k$ $\binom{n}{k}$	combination	${}_nC_k = \binom{n}{k} = \frac{n!}{k!(n-k)!}$
Symbol	Symbol Name	Meaning / definition

Set theory symbols

Set theory symbols

$\{\ \}$	set	a collection of elements
$A \cap B$	intersection	objects that belong to set A and set B
$A \cup B$	union	objects that belong to set A or set B
$A \subseteq B$	subset	A is a subset of B. set A is included in set B.
$A \subset B$	proper subset / strict subset	A is a subset of B, but A is not equal to B.
$A \not\subset B$	not subset	set A is not a subset of set B
$A \supseteq B$	superset	A is a superset of B. set A includes set B
$A \supset B$	proper superset / strict	A is a superset of B, but B

Symbol	Symbol Name	Meaning / definition
$A \not\supset B$	not superset	set A is not a superset of set B
2^A	power set	all subsets of A
$\mathcal{P}(A)$	power set	all subsets of A
$A = B$	equality	both sets have the same members
A^c	complement	all the objects that do not belong to set A
$A \setminus B$	relative complement	objects that belong to A and not to B
$A - B$	relative complement	objects that belong to A and not to B
$A \Delta B$	symmetric difference	objects that belong to A or B but not to their intersection
$A \ominus B$	symmetric difference	objects that belong to A or B but not to their intersection
$a \in A$	element of, belongs to	set membership
$x \notin A$	not element of	no set membership
(a,b)	ordered pair	collection of 2 elements
$A \times B$	cartesian product	set of all ordered pairs from A and B
$\|A\|$	cardinality	the number of elements of set A
$\#A$	cardinality	the number of elements of set A
$\mid$	vertical bar	such that
$\aleph_0$	aleph-null	infinite cardinality of natural numbers set
$\aleph_1$	aleph-one	cardinality of countable ordinal numbers set
$\emptyset$	empty set	$\emptyset = \{\ \}$
$\mathbb{U}$	universal set	set of all possible values
$\mathbb{N}_0$	natural numbers / whole numbers set (with zero)	$\mathbb{N}_0 = \{0,1,2,3,4,...\}$
$\mathbb{N}_1$	natural numbers / whole numbers set (without zero)	$\mathbb{N}_1 = \{1,2,3,4,5,...\}$
		$\mathbb{Z}$

$\mathbb{Z}$	integer numbers set	$\mathbb{Z} = \{...-3,-2,-1,0,1,2,3,...\}$
$\mathbb{Q}$	rational numbers set	$\mathbb{Q} = \{x \mid x=a/b,\ a,b \in \mathbb{Z}\}$
$\mathbb{R}$	real numbers set	$\mathbb{R} = \{x \mid -\infty < x < \infty\}$
$\mathbb{C}$	complex numbers set	$\mathbb{C} = \{z \mid z=a+bi,$
Symbol	Symbol Name	Meaning / definition

Logic symbols

$\cdot$	and	and
$\wedge$	caret / circumflex	and
$\&$	ampersand	and
$+$	plus	or
$\vee$	reversed caret	or
$\mid$	vertical line	or
x'	single quote	not - negation
$\overline{x}$	bar	not - negation
$\neg$	not	not - negation
$!$	exclamation mark	not - negation
$\oplus$	circled plus / oplus	exclusive or - xor
$\sim$	tilde	negation
$\Rightarrow$	implies	
$\Leftrightarrow$	equivalent	if and only if (iff)
$\leftrightarrow$	equivalent	if and only if (iff)
$\forall$	for all	
$\exists$	there exists	
$\nexists$	there does not exists	
$\therefore$	therefore	
Symbol	Symbol Name	Meaning / definition

Calculus & analysis symbols

$\lim_{x \to x0} f(x)$	limit	limit value of a function
ε	epsilon	represents a very small number, near zero
e	e constant / Euler's number	$e = 2.718281828...$
y'	derivative	derivative - Lagrange's notation
y''	second derivative	derivative of derivative
$y^{(n)}$	nth derivative	n times derivation

$\frac{dy}{dx}$	derivative	derivative - Leibniz's notation
$\frac{d^2y}{dx^2}$	second derivative	derivative of derivative
Symbol	Symbol Name	Meaning / definition
$\frac{d^ny}{dx^n}$	nth derivative	n times derivation
$\dot{y}$	time derivative	derivative by time - Newton's notation
$\ddot{y}$	time second derivative	derivative of derivative
$D_x y$	derivative	derivative - Euler's notation
$D_x{}^2 y$	second derivative	derivative of derivative
$\frac{\partial f(x,y)}{\partial x}$	partial derivative	
$\int$	integral	opposite to derivation
$\iint$	double integral	integration of function of 2 variables
$\iiint$	triple integral	integration of function of 3 variables
$\oint$	closed contour / line integral	
$\oiint$	closed surface integral	
$\oiiint$	closed volume integral	
$[a,b]$	closed interval	$[a,b] = \{x \mid a \leq x \leq b\}$
(a,b)	open interval	$(a,b) = \{x \mid a < x < b\}$
i	imaginary unit	$i \equiv \sqrt{-1}$
z^*	complex conjugate	$z = a+bi \rightarrow z^* = a-bi$
$\overline{z}$	complex conjugate	$z = a+bi \rightarrow \overline{z} = a-bi$
$\mathrm{Re}(z)$	real part of a complex number	$z = a+bi \rightarrow \mathrm{Re}(z) = a$
$\mathrm{Im}(z)$	imaginary part of a complex number	$z = a+bi \rightarrow \mathrm{Im}(z) = b$
$\mid z \mid$	absolute value/magnitude of a complex number	$\lvert z \rvert = \lvert a+bi \rvert = \sqrt{(a^2+b^2)}$
$\arg(z)$	argument of a complex number	The angle of the radius in the complex plane
∇	nabla / del	gradient / divergence operator
$\overrightarrow{x}$	vector	
$\widehat{x}$	unit vector	
$x * y$	convolution	$y(t) = x(t) * h(t)$
$\mathcal{L}$	Laplace transform	$F(s) = \mathcal{L}\{f(t)\}$
$\mathcal{F}$	Fourier transform	$X(\omega) = \mathcal{F}\{f(t)\}$
δ	delta function	
Symbol	Symbol Name	Meaning / definition

Numeral symbols

zero	0		
one	1	I	א
two	2	II	ב
three	3	III	ג
four	4	IV	ד
Symbol	Symbol Name		Meaning / definition
six	6	VI	ו
seven	7	VII	ז
eight	8	VIII	ח
nine	9	IX	ט
ten	10	X	י
eleven	11	XI	יא
twelve	12	XII	יב
thirteen	13	XIII	יג
fourteen	14	XIV	יד
fifteen	15	XV	טו
sixteen	16	XVI	טז
seventeen	17	XVII	יז
eighteen	18	XVIII	יח
nineteen	19	XIX	יט
twenty	20	XX	כ
thirty	30	XXX	ל
forty	40	XL	מ
fifty	50	L	נ
sixty	60	LX	ס
seventy	70	LXX	ע
eighty	80	LXXX	פ
ninety	90	XC	צ
Name	Western Arabic	Roman	Hebrew

Greek alphabet letters

Α	α	Alpha	al-fa
Β	β	Beta	be-ta
Γ	γ	Gamma	ga-ma
Δ	δ	Delta	del-ta
Ε	ε	Epsilon	ep-si-lon
Ζ	ζ	Zeta	ze-ta
Η	η	Eta	eh-ta

Θ	θ	Theta	te-ta
I	ι	Iota	io-ta
K	κ	Kappa	ka-pa
Λ	λ	Lambda	lam-da
M	μ	Mu	m-yoo
N	ν	Nu	noo
Ξ	ξ	Xi	x-ee
O	ο	Omicron	o-mee-c-ron
Π	π	Pi	pa-yee
P	ρ	Rho	row
Σ	σ	Sigma	sig-ma
T	τ	Tau	ta-oo
Y	υ	Upsilon	oo-psi-lon
Φ	φ	Phi	f-ee
X	χ	Chi	kh-ee
Ψ	ψ	Psi	p-see
Upper Case Letter	Lower Case Letter	Greek Letter Name	Letter Name Pronounce

Roman numerals

0	not defined
1	I
2	II
3	III
4	IV
5	V
6	VI
7	VII
8	VIII
9	IX
10	X
11	XI
12	XII
13	XIII
14	XIV
15	XV
16	XVI
17	XVII
18	XVIII
19	XIX
20	XX

30	XXX
40	XL
50	L
60	LX
70	LXX
80	LXXX
90	XC
100	C
200	CC
300	CCC
400	CD
500	D
600	DC
700	DCC
800	DCCC
900	CM
1000	M
5000	$\overline{V}$
10000	$\overline{X}$
50000	$\overline{L}$
100000	$\overline{C}$
500000	$\overline{D}$
Number	Roman numeral

See also

- Algebra symbols
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