Mathematical Symbols

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

Basic math symbols

Symbol	Symbol Name	Meaning / definition	Example
=	equals sign	equality	$5 = 2+3$
≠	not equal sign	inequality	$5 \neq 4$
>	strict inequality	greater than	$5 > 4$
<	strict inequality	less than	$4 < 5$
≥	inequality	greater than or equal to	$5 \geq 4$
≤	inequality	less than or equal to	$4 \leq 5$
( )	parentheses	calculate expression inside first	$2 \times (3+5) = 16$
[ ]	brackets	calculate expression inside first	$[(1+2)*(1+5)] = 18$
+	plus sign	addition	$1 + 1 = 2$
−	minus sign	subtraction	$2 - 1 = 1$
±	plus - minus	both plus and minus operations	$3 \pm 5 = 8$ and -2
∓	minus - plus	both minus and plus operations	$3 \mp 5 = -2$ and 8

*	asterisk	multiplication	$2 * 3 = 6$
×	times sign	multiplication	$2 \times 3 = 6$
·	multiplication dot	multiplication	$2 \cdot 3 = 6$
÷	division sign / obelus	division	$6 \div 2 = 3$
/	division slash	division	$6 / 2 = 3$
—	horizontal line	division / fraction	$\frac{6}{2} = 3$
mod	modulo	remainder calculation	$7 \bmod 2 = 1$
.	period	decimal point, decimal separator	$2.56 = 2+56/100$
a^b	power	exponent	$2^3 = 8$
a^b	caret	exponent	2 ^ 3 = 8
$\sqrt{a}$	square root	$\sqrt{a} \cdot \sqrt{a} = a$	$\sqrt{9} = \pm 3$
$\sqrt[3]{a}$	cube root	$\sqrt[3]{a} \cdot \sqrt[3]{a} \cdot \sqrt[3]{a} = a$	$\sqrt[3]{8} = 2$
$\sqrt[4]{a}$	fourth root	$\sqrt[4]{a} \cdot \sqrt[4]{a} \cdot \sqrt[4]{a} \cdot \sqrt[4]{a} = a$	$\sqrt[4]{16} = \pm 2$
$\sqrt[n]{a}$	n-th root (radical)		for n=3, $\sqrt[n]{8} = 2$
%	percent	1% = 1/100	10% × 30 = 3
‰	per-mille	1‰ = 1/1000 = 0.1%	10‰ × 30 = 0.3
ppm	per-million	1ppm = 1/1000000	10ppm × 30 = 0.0003
ppb	per-billion	1ppb = 1/1000000000	$10\text{ppb} \times 30 = 3 \times 10^{-7}$
ppt	per-trillion	$1\text{ppt} = 10^{-12}$	$10\text{ppt} \times 30 = 3 \times 10^{-10}$

Geometry symbols

Symbol	Symbol Name	Meaning / definition	Example
∠	angle	formed by two rays	∠ABC = 30°
∡	measured angle		∡ABC = 30°
◁	spherical angle		◁AOB = 30°
∟	right angle	= 90°	α = 90°
°	degree	1 turn = 360°	α = 60°

$'$	arcminute	$1^\circ = 60'$	$\alpha = 60^\circ 59'$
$''$	arcsecond	$1' = 60''$	$\alpha = 60^\circ 59' 59''$
$\overleftrightarrow{AB}$	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	$\overset{\frown}{AB} = 60^\circ$
$\perp$	perpendicular	perpendicular lines (90° angle)	$\overline{AC} \perp \overline{BC}$
$\parallel$	parallel	parallel lines	$\overline{AB} \parallel \overline{CD}$
$\cong$	congruent to	equivalence of geometric shapes and size	$\Delta ABC \cong \Delta XYZ$
$\sim$	similarity	same shapes, not same size	$\Delta ABC \sim \Delta XYZ$
Δ	triangle	triangle shape	$\Delta ABC \cong \Delta BCD$
$\lvert x\text{-}y \rvert$	distance	distance between points x and y	$\lvert x\text{-}y \rvert = 5$
π	pi constant	$\pi = 3.141592654...$ is the ratio between the circumference and diameter of a circle	$c = \pi \cdot d = 2 \cdot \pi \cdot r$
rad	radians	radians angle unit	$360^\circ = 2\pi$ rad
grad	grads	grads angle unit	$360^\circ = 400$ grad

Algebra symbols

Symbol	Symbol Name	Meaning / definition	Example
x	x variable	unknown value to find	when $2x = 4$, then $x = 2$
$\equiv$	equivalence	identical to	
$\triangleq$	equal by definition	equal by definition	
$:=$	equal by definition	equal by definition	
$\sim$	approximately equal	weak approximation	$11 \sim 10$
$\approx$	approximately equal	approximation	$sin(0.01) \approx 0.01$
$\propto$	proportional to	proportional to	$f(x) \propto g(x)$
∞	lemniscate	infinity symbol	

$\ll$	much less than	much less than	$1 \ll 1000000$
$\gg$	much greater than	much greater than	$1000000 \gg 1$
$( )$	parentheses	calculate expression inside first	$2 * (3+5) = 16$
$[ ]$	brackets	calculate expression inside first	$[(1+2)*(1+5)] = 18$
$\{ \}$	braces	set	
$\lfloor x \rfloor$	floor brackets	rounds number to lower integer	$\lfloor 4.3 \rfloor = 4$
$\lceil x \rceil$	ceiling brackets	rounds number to upper integer	$\lceil 4.3 \rceil = 5$
$x!$	exclamation mark	factorial	$4! = 1*2*3*4 = 24$
$\vert x \vert$	single vertical bar	absolute value	$\vert -5 \vert = 5$
$f(x)$	function of x	maps values of x to f(x)	$f(x) = 3x+5$
$(f \circ g)$	function composition	$(f \circ g)(x) = f(g(x))$	$f(x)=3x, g(x)=x-1 \Rightarrow (f \circ g)(x)=3(x-1)$
(a,b)	open interval	$(a,b) = \{x \mid a < x < b\}$	$x \in (2,6)$
$[a,b]$	closed interval	$[a,b] = \{x \mid a \leq x \leq b\}$	$x \in [2,6]$
Δ	delta	change / difference	$\Delta t = t_1 - t_0$
Δ	discriminant	$\Delta = b^2 - 4ac$	
$\sum$	sigma	summation - sum of all values in range of series	$\sum x_i = x_1 + x_2 + ... + x_n$
$\sum\sum$	sigma	double summation	$\sum_{j=1}^{2} \sum_{i=1}^{8} x_{i,j} = \sum_{i=1}^{8} x_{i,1} + \sum_{i=1}^{8} x_{i,2}$
$\prod$	capital pi	product - product of all values in range of series	$\prod x_i = x_1 \cdot x_2 \cdot ... \cdot x_n$
e	e constant / Euler's number	$e = 2.718281828...$	$e = \lim (1+1/x)^x , x \to \infty$
γ	Euler-Mascheroni constant	$\gamma = 0.527721566...$	
φ	golden ratio	golden ratio constant	
π	pi constant	$\pi = 3.141592654...$ is the ratio between the circumference and diameter of a	$c = \pi \cdot d = 2 \cdot \pi \cdot r$

		circle	

Linear Algebra Symbols

Symbol	Symbol Name	Meaning / definition	Example
$\cdot$	dot	scalar product	$a \cdot b$
$\times$	cross	vector product	$a \times b$
$A \otimes B$	tensor product	tensor product of A and B	$A \otimes B$
$\langle x, y \rangle$	inner product		
$[\ ]$	brackets	matrix of numbers	
$(\ )$	parentheses	matrix of numbers	
$\vert A \vert$	determinant	determinant of matrix A	
$\det(A)$	determinant	determinant of matrix A	
$\Vert x \Vert$	double vertical bars	norm	
A^{T}	transpose	matrix transpose	$(A^{\mathrm{T}})_{ij} = (A)_{ji}$
$A^{\dagger}$	Hermitian matrix	matrix conjugate transpose	$(A^{\dagger})_{ij} = (\overline{A})_{ji}$
A^{*}	Hermitian matrix	matrix conjugate transpose	$(A^{*})_{ij} = (\overline{A})_{ji}$
A^{-1}	inverse matrix	$A\,A^{-1} = I$	
$\operatorname{rank}(A)$	matrix rank	rank of matrix A	$\operatorname{rank}(A) = 3$
$\dim(U)$	dimension	dimension of matrix A	$\operatorname{rank}(U) = 3$

Probability and statistics symbols

Symbol	Symbol Name	Meaning / definition	Example
$P(A)$	probability function	probability of event A	$P(A) = 0.5$
$P(A \cap B)$	probability of events intersection	probability that of events A and B	$P(A \cap B) = 0.5$
$P(A \cup B)$	probability of events union	probability that of events A or B	$P(A \cup B) = 0.5$
$P(A \mid B)$	conditional probability function	probability of event A given event B occured	$P(A \mid B) = 0.3$

$f(x)$	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	$\mu = 10$
$E(X)$	expectation value	expected value of random variable X	$E(X) = 10$
$E(X \mid Y)$	conditional expectation	expected value of random variable X given Y	$E(X \mid Y=2) = 5$
$var(X)$	variance	variance of random variable X	$var(X) = 4$
σ^2	variance	variance of population values	$\sigma^2 = 4$
$std(X)$	standard deviation	standard deviation of random variable X	$std(X) = 2$
σ_X	standard deviation	standard deviation value of random variable X	$\sigma_X = 2$
$\tilde{x}$	median	middle value of random variable x	$\tilde{x} = 5$
$cov(X,Y)$	covariance	covariance of random variables X and Y	$cov(X,Y) = 4$
$corr(X,Y)$	correlation	correlation of random variables X and Y	$corr(X,Y) = 0.6$
$\rho_{X,Y}$	correlation	correlation of random variables X and Y	$\rho_{X,Y} = 0.6$
$\sum$	summation	summation - sum of all values in range of series	$\sum_{i=1}^{4} x_i = x_1 + x_2 + x_3 + x_4$
$\sum\sum$	double summation	double summation	$\sum_{j=1}^{2}\sum_{i=1}^{8} x_{i,j} = \sum_{i=1}^{8} x_{i,1} + \sum_{i=1}^{8} x_{i,2}$
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	50% of population are	

	quartile	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	$\bar{x} = (2+5+9) / 3 = 5.333$
s^2	sample variance	population samples variance estimator	$s^2 = 4$
s	sample standard deviation	population samples standard deviation estimator	$s = 2$
z_x	standard score	$z_x = (x-\bar{x}) / s_x$	
$X \sim$	distribution of X	distribution of random variable X	$X \sim N(0,3)$
$N(\mu,\sigma^2)$	normal distribution	gaussian distribution	$X \sim N(0,3)$
$U(a,b)$	uniform distribution	equal probability in range a,b	$X \sim U(0,3)$
$exp(\lambda)$	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		
$Bern(p)$	Bernoulli distribution		

Combinatorics Symbols

Symbol	Symbol Name	Meaning / definition	Example
$n!$	factorial	$n! = 1 \cdot 2 \cdot 3 \cdot \ldots \cdot n$	$5! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 = 120$

$_nP_k$	permutation	$_nP_k = \frac{n!}{(n-k)!}$	$_5P_3 = 5! / (5-3)! = 60$
$_nC_k$ $\binom{n}{k}$	combination	$_nC_k = \binom{n}{k} = \frac{n!}{k!(n-k)!}$	$_5C_3 = 5!/[3!(5-3)!]=10$

Set theory symbols

Symbol	Symbol Name	Meaning / definition	Example
$\{\ \}$	set	a collection of elements	A = {3,7,9,14}, B = {9,14,28}
$A \cap B$	intersection	objects that belong to set A and set B	$A \cap B = \{9,14\}$
$A \cup B$	union	objects that belong to set A or set B	$A \cup B = \{3,7,9,14,28\}$
$A \subseteq B$	subset	subset has fewer elements or equal to the set	$\{9,14,28\} \subseteq \{9,14,28\}$
$A \subset B$	proper subset / strict subset	subset has fewer elements than the set	$\{9,14\} \subset \{9,14,28\}$
$A \not\subset B$	not subset	left set not a subset of right set	$\{9,66\} \not\subset \{9,14,28\}$
$A \supseteq B$	superset	set A has more elements or equal to the set B	$\{9,14,28\} \supseteq \{9,14,28\}$
$A \supset B$	proper superset / strict superset	set A has more elements than set B	$\{9,14,28\} \supset \{9,14\}$
$A \not\supset B$	not superset	set A is not a superset of set B	$\{9,14,28\} \not\supset \{9,66\}$
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={3,9,14}, B={3,9,14}, A=B
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 = {3,9,14}, B = {1,2,3}, A-B = {9,14}
$A - B$	relative	objects that belong to A	A = {3,9,14}, B = {1,2,3},

	complement	and not to B	$A-B = \{9,14\}$
$A \Delta B$	symmetric difference	objects that belong to A or B but not to their intersection	$A = \{3,9,14\}$, $B = \{1,2,3\}$, $A \Delta B = \{1,2,9,14\}$
$A \ominus B$	symmetric difference	objects that belong to A or B but not to their intersection	$A = \{3,9,14\}$, $B = \{1,2,3\}$, $A \ominus B = \{1,2,9,14\}$
$a \in A$	element of	set membership	$A=\{3,9,14\}, 3 \in A$
$x \notin A$	not element of	no set membership	$A=\{3,9,14\}, 1 \notin A$
(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	$A=\{3,9,14\}, \|A\|=3$
$\#A$	cardinality	the number of elements of set A	$A=\{3,9,14\}, \#A=3$
$\aleph_0$	aleph-null	infinite cardinality of natural numbers set	
$\aleph_1$	aleph-one	cardinality of countable ordinal numbers set	
$\emptyset$	empty set	$\emptyset = \{\ \}$	$C = \{\emptyset\}$
$\mathbb{U}$	universal set	set of all possible values	
$\mathbb{N}_0$	natural numbers / whole numbers set (with zero)	$\mathbb{N}_0 = \{0,1,2,3,4,...\}$	$0 \in \mathbb{N}_0$
$\mathbb{N}_1$	natural numbers / whole numbers set (without zero)	$\mathbb{N}_1 = \{1,2,3,4,5,...\}$	$6 \in \mathbb{N}_1$
$\mathbb{Z}$	integer numbers set	$\mathbb{Z} = \{...-3,-2,-1,0,1,2,3,...\}$	$-6 \in \mathbb{Z}$
$\mathbb{Q}$	rational numbers set	$\mathbb{Q} = \{x \mid x=a/b, a,b \in \mathbb{Z}\}$	$2/6 \in \mathbb{Q}$
$\mathbb{R}$	real numbers set	$\mathbb{R} = \{x \mid -\infty < x < \infty\}$	$6.343434 \in \mathbb{R}$
$\mathbb{C}$	complex numbers set	$\mathbb{C} = \{z \mid z=a+bi, -\infty<a<\infty, \quad -\infty<b<\infty\}$	$6+2i \in \mathbb{C}$

Logic symbols

Symbol	Symbol Name	Meaning / definition	Example

$\cdot$	and	and	$x \cdot y$
$\wedge$	caret / circumflex	and	$x \wedge y$
$\&$	ampersand	and	$x \,\&\, y$
$+$	plus	or	$x + y$
$\vee$	reversed caret	or	$x \vee y$
$\vert$	vertical line	or	$x \vert y$
x'	single quote	not - negation	x'
$\overline{x}$	bar	not - negation	$\overline{x}$
$\neg$	not	not - negation	$\neg x$
$!$	exclamation mark	not - negation	$! x$
$\oplus$	circled plus / oplus	exclusive or - xor	$x \oplus y$
$\sim$	tilde	negation	$\sim x$
$\Rightarrow$	implies		
$\Leftrightarrow$	equivalent	if and only if	
$\forall$	for all		
$\exists$	there exists		
$\nexists$	there does not exists		
$\therefore$	therefore		
$\because$	because / since		

Calculus & analysis symbols

Symbol	Symbol Name	Meaning / definition	Example
$\lim_{x \to x0} f(x)$	limit	limit value of a function	
ε	epsilon	represents a very small number, near zero	$\varepsilon \to 0$
e	e constant / Euler's number	$e = 2.718281828...$	$e = \lim_{x \to \infty} (1+1/x)^x$,
y'	derivative	derivative - Leibniz's notation	$(3x^3)' = 9x^2$
y''	second derivative	derivative of derivative	$(3x^3)'' = 18x$

$y^{(n)}$	nth derivative	n times derivation	$(3x^3)^{(3)} = 18$
$\frac{dy}{dx}$	derivative	derivative - Lagrange's notation	$d(3x^3)/dx = 9x^2$
$\frac{d^2y}{dx^2}$	second derivative	derivative of derivative	$d^2(3x^3)/dx^2 = 18x$
$\frac{d^ny}{dx^n}$	nth derivative	n times derivation	
$\dot{y}$	time derivative	derivative by time - Newton notation	
$\ddot{y}$	time second derivative	derivative of derivative	
$\frac{\partial f(x,y)}{\partial x}$	partial derivative		$\partial(x^2+y^2)/\partial x = 2x$
$\int$	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	$i \equiv \sqrt{-1}$	$z = 3 + 2i$
z^*	complex conjugate	$z = a+bi \rightarrow z^*=a-bi$	$z^* = 3 + 2i$
$\overline{z}$	complex conjugate	$z = a+bi \rightarrow \overline{z} = a-bi$	$\overline{z} = 3 + 2i$
∇	nabla / del	gradient / divergence operator	$\nabla f(x,y,z)$
$\overrightarrow{x}$	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		
∞	lemniscate	infinity symbol	

Numeral symbols

Name	European	Roman	Hindu Arabic	Hebrew
zero	0		٠	
one	1	I	١	א
two	2	II	٢	ב
three	3	III	٣	ג
four	4	IV	٤	ד
five	5	V	٥	ה
six	6	VI	٦	ו
seven	7	VII	٧	ז
eight	8	VIII	٨	ח
nine	9	IX	٩	ט
ten	10	X	١٠	י
eleven	11	XI	١١	יא
twelve	12	XII	١٢	יב
thirteen	13	XIII	١٣	יג
fourteen	14	XIV	١٤	יד
fifteen	15	XV	١٥	טו
sixteen	16	XVI	١٦	טז
seventeen	17	XVII	١٧	יז
eighteen	18	XVIII	١٨	יח
nineteen	19	XIX	١٩	יט
twenty	20	XX	٢٠	כ
thirty	30	XXX	٣٠	ל
fourty	40	XL	٤٠	מ
fifty	50	L	٥٠	נ

sixty	60	LX	٦٠	ס
seventy	70	LXX	٧٠	ע
eighty	80	LXXX	٨٠	פ
ninety	90	XC	٩٠	צ
one hundred	100	C	١٠٠	ק

Greek alphabet letters

Greek Symbol		Greek Letter Name	English Equivalent	Pronunciation
Upper Case	Lower Case			
Α	α	Alpha	a	al-fa
Β	β	Beta	b	be-ta
Γ	γ	Gamma	g	ga-ma
Δ	δ	Delta	d	del-ta
Ε	ε	Epsilon	e	ep-si-lon
Ζ	ζ	Zeta	z	ze-ta
Η	η	Eta	h	eh-ta
Θ	θ	Theta	th	te-ta
Ι	ι	Iota	i	io-ta
Κ	κ	Kappa	k	ka-pa
Λ	λ	Lambda	l	lam-da
Μ	μ	Mu	m	m-yoo
Ν	ν	Nu	n	noo
Ξ	ξ	Xi	x	x-ee
Ο	ο	Omicron	o	o-mee-c-ron
Π	π	Pi	p	pa-yee
Ρ	ρ	Rho	r	row
Σ	σ	Sigma	s	sig-ma
Τ	τ	Tau	t	ta-oo

Υ	υ	Upsilon	u	oo-psi-lon
Φ	φ	Phi	ph	f-ee
Χ	χ	Chi	ch	kh-ee
Ψ	ψ	Psi	ps	p-see
Ω	ω	Omega	o	o-me-ga

Roman numerals

Number	Roman numeral
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	$\overline{\text{V}}$
10000	$\overline{\text{X}}$
50000	$\overline{\text{L}}$
100000	$\overline{\text{C}}$
500000	$\overline{\text{D}}$
1000000	$\overline{\text{M}}$

See also

- Algebra symbols
- Geometry symbols
- Statistical symbols
- Logic symbols
- Set theory symbols
- Calculus & analysis symbols
- Number symbols
- Greek alphabet symbols
- Roman numerals
- Infinity symbol
- Math calculators

Write how to improve this page

Your Name Name

your@email.com E-mail

Submit Feedback

MATH SYMBOLS

- Basic math symbols
- Algebra symbols
- Geometry symbols
- Statistical symbols
- Logic symbols
- Set symbols
- Calculus symbols
- Number symbols
- Greek symbols
- Roman numerals

RAPID TABLES

- Add to Favorites
- Recommend Site
- Send Feedback
- About