## Table of mathematical symbols

From Wikipedia, the free encyclopedia
For the HTML codes of mathematical symbols see mathematical HTML.
Note: This article contains special characters.
The following table lists many specialized symbols commonly used in mathematics.

## Basic mathematical symbols



| $\begin{aligned} & \geqslant \\ & >= \end{aligned}$ | equal to, is greater than or equal to <br> order theory | $y$. <br> (The symbols $<=$ and $>=$ are primarily from computer science. They are avoided in mathematical texts.) | $\begin{aligned} & 3 \leqslant 4 \text { and } 5 \leqslant 5 \\ & 5 \geqslant 4 \text { and } 5 \geqslant 5 \end{aligned}$ |
| :---: | :---: | :---: | :---: |
| $\propto$ | proportionality | $y \propto x$ means that $y=k x$ for some constant $k$. | if $y=2 x$, then $y \propto x$ |
|  | is proportional to; varies as |  |  |
|  | everywhere |  |  |
| + | addition | $4+6$ means the sum of 4 and 6. | $2+7=9$ |
|  | plus |  |  |
|  | arithmetic |  |  |
|  | disjoint union | $A_{1}+A_{2}$ means the disjoint union of sets $A_{1}$ and $A_{2}$. | $\begin{aligned} & A_{1}=\{1,2,3,4\} \wedge A_{2}=\{2,4,5,7\} \Rightarrow \\ & A_{1}+A_{2}=\{(1,1),(2,1),(3,1),(4,1),(2,2), \\ & (4,2),(5,2),(7,2)\} \end{aligned}$ |
|  | the disjoint union of ... and ... |  |  |
|  | set theory |  |  |
| - | subtraction | 9-4 means the subtraction of 4 from 9 . | $8-3=5$ |
|  | minus |  |  |
|  | arithmetic |  |  |
|  | negative sign | -3 means the negative of the number 3 . | $-(-5)=5$ |
|  | negative ; minus |  |  |
|  | arithmetic |  |  |
|  | set-theoretic complement | $A-B$ means the set that contains all the elements of $A$ that are not in $B$. | $\{1,2,4\}-\{1,3,4\}=\{2\}$ |
|  | minus; without |  |  |
|  | set theory |  |  |
| X | multiplication | $3 \times 4$ means the multiplication of 3 by 4. | $7 \times 8=56$ |
|  | times |  |  |
|  | arithmetic |  |  |
|  | Cartesian product | $X \times Y$ means the set of all ordered pairs with the first element of each pair selected from X and the second element selected from Y. | $\{1,2\} \times\{3,4\}=\{(1,3),(1,4),(2,3),(2,4)\}$ |
|  | the Cartesian product of ... and ...; the direct product of ... and ... |  |  |
|  | set theory |  |  |
|  | cross product | $\mathbf{u} \times \mathbf{v}$ means the cross product of vectors $\mathbf{u}$ and $\mathbf{v}$ | $\begin{aligned} & (1,2,5) \times(3,4,-1)= \\ & (-22,16,-2) \end{aligned}$ |
|  | cross |  |  |
|  | vector algebra |  |  |
|  |  |  |  |


| - | multiplication | 3.4 means the multiplication of 3 by 4. | $7 \cdot 8=56$ |
| :---: | :---: | :---: | :---: |
|  | times |  |  |
|  | arithmetic |  |  |
|  | dot product | $\mathbf{u} \cdot \mathbf{v}$ means the dot product of vectors $\mathbf{u}$ and $\mathbf{v}$ | $(1,2,5) \cdot(3,4,-1)=6$ |
|  | dot |  |  |
|  | vector algebra |  |  |
| $\div$ | division | $6 \div 3$ or $6 / 3$ means the division of 6 by 3 . | $\begin{aligned} & 2 \div 4=.5 \\ & 12 / 4=3 \end{aligned}$ |
|  | divided by |  |  |
| / | arithmetic |  |  |
| $\pm$ | plus-minus | $6 \pm 3$ means both $6+3$ and 6-3. | The equation $x=5 \pm \sqrt{ } 4$, has two solutions, $x=7$ and $x=3$. |
|  | plus or minus |  |  |
|  | arithmetic |  |  |
|  | plus-minus | $10 \pm 2$ or eqivalently 10 $\pm 20 \%$ means the range from $10-2$ to $10+2$. | If $a=100 \pm 1 \mathrm{~mm}$, then $a$ is $\geqslant 99 \mathrm{~mm}$ and $\leqslant 101 \mathrm{~mm}$. |
|  | plus or minus |  |  |
|  | measurement |  |  |
| 耳 | minus-plus | $6 \pm(3 \square 5)$ means both $6+(3-5)$ and $6-(3+$ 5). | $\cos (x \pm y)=\cos (x) \cos (y) \square \sin (x) \sin (y)$. |
|  | minus or plus |  |  |
|  | arithmetic |  |  |
| $\sqrt{ }$ | square root | $\sqrt{ } x$ means the positive number whose square is $x$. | $\sqrt{ } 4=2$ |
|  | the principal square root of; square root |  |  |
|  | real numbers |  |  |
|  | complex square root | if $z=r \exp (i \varphi)$ is represented in polar coordinates with $-\boldsymbol{\pi}<\varphi$ $\leqslant \pi$, then $\sqrt{ } z=\sqrt{ } r \exp$ ( $\boldsymbol{i} \varphi / 2$ ). | $\sqrt{ }(-1)=i$ |
|  | the complex square root of ... <br> square root |  |  |
|  | complex numbers |  |  |
| \| . . . | absolute value or modulus | $\|x\|$ means the distance along the real line (or across the complex plane) between $x$ and zero. | $\left\lvert\, \begin{aligned} & \|3\|=3 \\ & \|-5\|=\|5\| \end{aligned}\right.$ |
|  | absolute value (modulus) of |  | $\|\boldsymbol{i}\|=1$ |
|  | numbers |  |  |
|  | Euclidean distance |  | For $\mathbf{x}=(1,1)$, and $\mathbf{y}=(4,5)$, |
|  | Euclidean distance | $\|\mathbf{x}-\mathbf{y}\|$ means the |  |

\begin{tabular}{|c|c|c|c|}
\hline \& between; Euclidean norm of \& \multirow[t]{2}{*}{Euclidean distance between $\mathbf{x}$ and $\mathbf{y}$.} \& \multirow[t]{2}{*}{$|\mathbf{x}-\mathbf{y}|=\sqrt{ }\left([1-4]^{2}+[1-5]^{2}\right)=5$} <br>
\hline \& Geometry \& \& <br>
\hline \& Determinant \& \multirow[t]{3}{*}{$|A|$ means the determinant of the matrix A} \& \multirow[t]{3}{*}{$\left|\begin{array}{ll}1 & 2 \\ 2 & 4\end{array}\right|=0$} <br>
\hline \& determinant of \& \& <br>
\hline \& Matrix theory \& \& <br>
\hline \multirow{3}{*}{1} \& divides \& \multirow[t]{3}{*}{A single vertical bar is used to denote divisibility. $a l b$ means $a$ divides $b$.} \& \multirow{3}{*}{Since $15=3 \times 5$, it is true that 3115 and 5115.} <br>
\hline \& divides \& \& <br>
\hline \& Number Theory \& \& <br>
\hline \multirow{3}{*}{$!$} \& factorial \& \multirow{3}{*}{$$
\begin{aligned}
& n!\text { is the product } 1 \times \\
& 2 \times \ldots \times n .
\end{aligned}
$$} \& \multirow{3}{*}{$4!=1 \times 2 \times 3 \times 4=24$} <br>
\hline \& factorial \& \& <br>
\hline \& combinatorics \& \& <br>
\hline \multirow{3}{*}{T} \& transpose \& \multirow{3}{*}{Swap rows for columns} \& \multirow{3}{*}{$A_{i j}=\left(A^{T}\right)_{j i}$} <br>
\hline \& transpose \& \& <br>
\hline \& matrix operations \& \& <br>
\hline \multirow{6}{*}{$\sim$} \& probability distribution \& \multirow[t]{3}{*}{$X \sim D$, means the random variable $X$ has the probability distribution $D$.} \& \multirow{3}{*}{$X \sim N(0,1)$, the standard normal distribution} <br>
\hline \& has distribution \& \& <br>
\hline \& statistics \& \& <br>
\hline \& Row equivalence \& \multirow[t]{3}{*}{$A \sim B$ means that $B$ can be generated by using a series of elementary row operations on $A$} \& \multirow[t]{3}{*}{$\left[\begin{array}{ll}1 & 2 \\ 2 & 4\end{array}\right] \sim\left[\begin{array}{ll}1 & 2 \\ 0 & 0\end{array}\right]$} <br>
\hline \& is row equivalent to \& \& <br>
\hline \& Matrix theory \& \& <br>
\hline \multirow[b]{2}{*}{$\Rightarrow$

$\rightarrow$} \& material implication \& \multirow[t]{3}{*}{| $A \Rightarrow B$ means if $A$ is true then $B$ is also true; if $A$ is false then nothing is said about $B$. |
| :--- |
| $\rightarrow$ may mean the same as $\Rightarrow$, or it may have the meaning for functions given below. |
| $\supset$ may mean the same as $\Rightarrow$, or it may have the meaning for superset given below. |} \& \multirow{3}{*}{$x=2 \Rightarrow x^{2}=4$ is true, but $x^{2}=4 \Rightarrow x=$ 2 is in general false (since $x$ could be -2 ).} <br>


\hline \& | implies; if ... |
| :--- |
| then | \& \& <br>

\hline $\bigcirc$ \& propositional logic, Heyting algebra \& \& <br>
\hline \multirow[t]{3}{*}{$\Leftrightarrow$} \& material equivalence \& \multirow[t]{3}{*}{$A \Leftrightarrow B$ means $A$ is true if $B$ is true and $A$ is false if $B$ is false.} \& \multirow{3}{*}{$x+5=y+2 \Leftrightarrow x+3=y$} <br>
\hline \& if and only if; iff \& \& <br>
\hline \& \& \& <br>
\hline
\end{tabular}

| $\longleftrightarrow$ | propositional logic |  |  |
| :---: | :---: | :---: | :---: |
| $\neg$ | logical negation | The statement $\neg A$ is true if and only if $A$ is false. | $\begin{aligned} & \neg(\neg A) \Leftrightarrow A \\ & x \neq y \Leftrightarrow \neg(x=y) \end{aligned}$ |
|  | not | A slash placed through another operator is the same as " $\neg$ " placed in front. |  |
|  | propositional logic | (The symbol ~ has many other uses, so $\neg$ or the slash notation is preferred.) |  |
| $\Lambda$ | logical conjunction or meet in a lattice | The statement $A \wedge B$ is true if $A$ and $B$ are both true; else it is false. <br> For functions $A(\mathrm{x})$ and $B(\mathrm{x}), A(\mathrm{x}) \wedge B(\mathrm{x})$ is used to mean $\min (\mathrm{A}(\mathrm{x})$, $\mathrm{B}(\mathrm{x})$ ). | $n<4 \wedge n>2 \Leftrightarrow n=3$ when $n$ is a natural number. |
|  | and; min |  |  |
|  | propositional logic, lattice theory |  |  |
| V | logical disjunction or join in a lattice | The statement $A \vee B$ is true if $A$ or $B$ (or both) are true; if both are false, the statement is false. <br> For functions $A(\mathrm{x})$ and $B(\mathrm{x}), A(\mathrm{x}) \vee B(\mathrm{x})$ is used to mean $\max (\mathrm{A}$ (x), B(x)). | $n \geqslant 4 \vee n \leqslant 2 \Leftrightarrow n \neq 3$ when $n$ is a natural number. |
|  | or, max |  |  |
|  | propositional logic, lattice theory |  |  |
| $\oplus$$\square$ | exclusive or | The statement $A \oplus B$ is true when either A or B, but not both, are true. $A \square B$ means the same. | $(\neg A) \oplus A$ is always true, $A \oplus A$ is always false. |
|  | xor |  |  |
|  | propositional logic, Boolean algebra |  |  |
|  | direct sum | The direct sum is a special way of combining several one modules into one general module (the symbol $\oplus$ is used, $\square$ is only for logic). | Most commonly, for vector spaces $U, V$, and $W$, the following consequence is used: $U=V \oplus W \Leftrightarrow(U=V+W) \wedge(V \cap W=$ <br> $\varnothing$ ) |
|  | direct sum of |  |  |
|  | Abstract algebra |  |  |
|  | universal quantification | $\forall x: P(x)$ means $P(x)$ is | $\forall n \in \square: n^{2} \geqslant{ }_{n}$. |
|  | for all; for any; |  |  |


| $\forall$ | for each | true for all $x$. |  |
| :---: | :---: | :---: | :---: |
|  | predicate logic |  |  |
| $\exists$ | existential quantification | $\exists x: P(x)$ means there is at least one $x$ such that $P(x)$ is true. | $\exists n \in \square: n$ is even. |
|  | there exists |  |  |
|  | predicate logic |  |  |
| $\exists!$ | uniqueness quantification | $\exists!x: P(x)$ means there is exactly one $x$ such that $P(x)$ is true. | $\exists!n \in \square: n+5=2 n$. |
|  | there exists exactly one |  |  |
|  | predicate logic |  |  |
| $:=$ | definition | $x:=y$ or $x \equiv y$ means $x$ is defined to be another name for $y$ <br> (Some writers use $\equiv$ to mean congruence). | $\begin{aligned} & \cosh x:=(1 / 2)(\exp x+\exp (-x)) \\ & A \text { xor } B: \Leftrightarrow(A \vee B) \wedge \neg(A \wedge B) \end{aligned}$ |
|  | is defined as |  |  |
| $: \Leftrightarrow$ | everywhere | $P: \Leftrightarrow Q$ means $P$ is defined to be logically equivalent to $Q$. |  |
| $\square$ | congruence | $\triangle \mathrm{ABC} \square \triangle \mathrm{DEF}$ means triangle ABC is congruent to (has the same measurements as) triangle DEF. |  |
|  | is congruent to |  |  |
|  | geometry |  |  |
| 三 | congruence relation | $\mathrm{a} \equiv \mathrm{b}(\bmod \mathrm{n})$ means a <br> -b is divisible by n | $5 \equiv 11(\bmod 3)$ |
|  | ... is congruent to ... modulo ... |  |  |
|  | modular arithmetic |  |  |
| $\{$, | set brackets | $\{a, b, c\}$ means the set consisting of $a, b$, and c. | $\square=\{1,2,3, \ldots\}$ |
|  | the set of ... |  |  |
|  | set theory |  |  |
| $\{:\}$ | set builder notation | $\{x: P(x)\}$ means the set of all $x$ for which $P(x)$ is true. $\{x \mid P(x)\}$ is the same as $\{x: P(x)\}$. | $\left\{n_{\in} \square: n^{2}<20\right\}=\{1,2,3,4\}$ |
|  | the set of ... such that |  |  |
|  | set theory |  |  |
| $\varnothing$ | empty set | $\varnothing$ means the set with no elements. \{ \} means the same. | $\left\{n \in \square: 1<n^{2}<4\right\}=\varnothing$ |
|  | the empty set |  |  |


| $\}$ | set theory |  |  |
| :---: | :---: | :---: | :---: |
| $\in$ | set membership | $a \in S$ means $a$ is an element of the set $S ; a \notin$ $S$ means $a$ is not an element of $S$. | $\begin{aligned} & (1 / 2)^{-1} \in \\ & 2^{-1} \notin \square \end{aligned}$ |
|  | is an element of; is not an element of |  |  |
| $\notin$ | everywhere, set theory |  |  |
| $\subseteq$ | subset | (subset) $A \subseteq B$ means every element of $A$ is also element of $B$. <br> (proper subset) $A \subset B$ means $A \subseteq B$ but $A \neq B$. <br> (Some writers use the symbol $\subset$ as if it were the same as $\subseteq$.) | $\left(\begin{array}{l} (A \cap B) \subseteq A \\ \square \subset \square \\ \square \subset \square \end{array}\right.$ |
|  | is a subset of |  |  |
|  | set theory |  |  |
| $?$$\square$ | superset | $A \supseteq B$ means every element of $B$ is also element of $A$. <br> $A \supset B$ means $A \supseteq B$ but $A \neq B$. <br> (Some writers use the symbol $\supset$ as if it were the same as 2 .) | $\left(\begin{array}{l} A \cup B) \supseteq B \\ \square \supset \square \end{array}\right.$ |
|  | is a superset of |  |  |
|  | set theory |  |  |
| U | set-theoretic union | (exclusive) $A \cup B$ means the set that contains all the elements from $A$, or all the elements from $B$, but not both. " $A$ or $B$, but not both." <br> (inclusive) $A \cup B$ means the set that contains all the elements from $A$, or all the elements from $B$, or all the elements from both $A$ and $B$. <br> " $A$ or $B$ or both". | $A \subseteq B \Leftrightarrow(A \cup B)=B$ (inclusive) |
|  | the union of ... and |  |  |
|  | set theory |  |  |
|  | set-theoretic intersection | $A \cap B$ means the set that contains all those elements that $A$ and $B$ | $\left\{x \in \square: x^{2}=1\right\} \cap \square=\{1\}$ |
|  | intersected with; |  |  |


| $\bigcirc$ | intersect | have in common. |  |
| :---: | :---: | :---: | :---: |
|  | set theory |  |  |
| $\triangle$ | symmetric difference | $A \Delta B$ means the set of elements in exactly one of $A$ or $B$. | $\{1,5,6,8\} \Delta\{2,5,8\}=\{1,2,6\}$ |
|  | symmetric difference |  |  |
|  | set theory |  |  |
| $\square$ | set-theoretic complement | $A \square B$ means the set that contains all those elements of $A$ that are not in $B$. | $\{1,2,3,4\} \square\{3,4,5,6\}=\{1,2\}$ |
|  | minus; without |  |  |
|  | set theory |  |  |
| $()$ | function application | $f(x)$ means the value of the function $f$ at the element $x$. | If $f(x):=x^{2}$, then $f(3)=3^{2}=9$. |
|  | of |  |  |
|  | set theory |  |  |
|  | precedence grouping | Perform the operations inside the parentheses first. | $(8 / 4) / 2=2 / 2=1$, but $8 /(4 / 2)=8 / 2=4$. |
|  | parentheses |  |  |
|  | everywhere |  |  |
| $f: X \rightarrow Y$ | function arrow | $f: X \rightarrow Y$ means the function $f$ maps the set $X$ into the set $Y$. | Let $f: \square \rightarrow \square$ be defined by $f(x):=x^{2}$. |
|  | from ... to |  |  |
|  | set theory,type theory |  |  |
| 0 | function composition | $f_{0} g$ is the function, such that $\left(f_{\circ} g\right)(x)=f(g(x))$. | if $f(x):=2 x$, and $g(x):=x+3$, then $\left(f_{\circ} g\right)$ $(x)=2(x+3)$. |
|  | composed with |  |  |
|  | set theory |  |  |
| $\mathbf{N}$ | natural numbers | $\mathbf{N}$ means $\{1,2,3, \ldots\}$, but see the article on natural numbers for a different convention. | $\square=\{\|a\|: a \in \square, a \neq 0\}$ |
|  | N |  |  |
|  | numbers |  |  |
| Z | integers | $\begin{aligned} & \square \text { means }\{\ldots,-3,-2, \\ & -1,0,1,2,3, \ldots\} \text { and } \\ & \square^{+} \text {means }\{1,2,3, \\ & \ldots\}=\square . \end{aligned}$ | $\square=\{p,-p: p \in \square\} \cup\{0\}$ |
|  | Z |  |  |
|  | numbers |  |  |
| $\square$ | rational numbers | $\begin{aligned} & \square \text { means }\{p / q: p \in \square \text {, } \\ & q \in \square\} \text {. } \end{aligned}$ | $\begin{aligned} & 3.14000 \ldots \in \square \\ & \pi \square \square \end{aligned}$ |
|  | Q |  |  |
|  | numbers |  |  |


|  | real numbers | $\square$ means the set of real numbers. |  |
| :---: | :---: | :---: | :---: |
|  | R |  |  |
| R | numbers |  | $\checkmark(-1) \square \square$ |
| C | complex numbers | $\square \text { means }\{a+b i:$ | $\boldsymbol{i}=\sqrt{ }(-1) \in \square$ |
|  | C |  |  |
|  | numbers |  |  |
|  | arbitrary constant | $C$ can be any number, most likely unknown; usually occurs when calculating antiderivatives. | if $f(x)=6 x^{2}+4 x$, then $F(x)=2 x^{3}+2 x^{2}+$ $C$, where $F^{\prime}(x)=f(x)$ |
|  | C |  |  |
|  | integral calculus |  |  |
| $\mathbf{K}$ | real or complex numbers | K means the statement holds substituting $\mathbf{K}$ for $\mathbf{R}$ and also for $\mathbf{C}$. | $\quad x^{2} \in \mathbb{C} \forall x \in \mathbb{K}$becauseand$\quad x^{2} \in \mathbb{C} \forall x \in \mathbb{R}$$x^{2} \in \mathbb{C} \forall x \in \mathbb{C}$ |
|  | K |  |  |
|  | linear algebra |  |  |
| $\infty$ | infinity | $\infty$ is an element of the extended number line that is greater than all real numbers; it often occurs in limits. | $\lim _{x \rightarrow 0} 1 /\|x\|=\infty$ |
|  | infinity |  |  |
|  | numbers |  |  |
| \\| . . . \| | norm | \\| $x \\|$ is the norm of the element $x$ of a normed vector space. | $\\|x+y\\| \leqslant\\|x\\|+\\|y\\|$ |
|  | norm of <br> length of |  |  |
|  | linear algebra |  |  |
| $\sum$ | summation | $\sum_{k=1}^{n} a_{k \text { means }} a_{1}+a_{2}+$ | $\begin{aligned} \sum_{k=1}^{4} k^{2}=1^{2} & +2^{2}+3^{2}+4^{2} \\ = & 1+4+9+16=30 \end{aligned}$ |
|  | $\begin{aligned} & \text { sum over } \ldots \\ & \text { from } \ldots \text { to } \ldots \text { of } \end{aligned}$ |  |  |
|  | arithmetic |  |  |
| $I$ | product | $\prod_{k=1}^{n} a_{k \text { means }}$ | $\begin{aligned} \prod_{k=1}^{4}(k+2) & =(1+2)(2+2)(3+2)(4+2) \\ & =3 \times 4 \times 5 \times 6=360 \end{aligned}$ |
|  | product over ... <br> from ... to ... of |  |  |
|  | arithmetic |  |  |
|  | Cartesian product |  |  |
|  |  |  |  |



|  | boundary of | $\partial M$ means the boundary of $M$ | $\partial\{x:\\|x\\| \leqslant 2\}=\{x:\\|x\\|=2\}$ |
| :---: | :---: | :---: | :---: |
|  | topology |  |  |
| $\perp$ | perpendicular | $x \perp y$ means $x$ is perpendicular to $y$; or more generally $x$ is orthogonal to $y$. | If $l \perp m$ and $m \perp n$ then $l \\| n$. |
|  | is perpendicular to |  |  |
|  | geometry |  |  |
|  | bottom element | $x=\perp$ means $x$ is the smallest element. | $\forall x: x \wedge \perp=\perp$ |
|  | the bottom element |  |  |
|  | lattice theory |  |  |
| $\\|$ | parallel | $x \\| y$ means $x$ is parallel to $y$. | If $l \\| m$ and $m \perp n$ then $l \perp n$. |
|  | is parallel to |  |  |
|  | geometry |  |  |
| $\square$ | entailment | $A \square B$ means the sentence $A$ entails the sentence $B$, that is every model in which $A$ is true, $B$ is also true. | $A \square A \vee \neg A$ |
|  | entails |  |  |
|  | model theory |  |  |
| $\square$ | inference | $x \square y$ means $y$ is derived from $x$. | $A \rightarrow B \square \neg B \rightarrow \neg A$ |
|  | infers or is derived from |  |  |
|  | propositional logic, predicate logic |  |  |
| $\square$ | normal subgroup | $N \square G$ means that $N$ is a normal subgroup of group $G$. | $Z(G) \square G$ |
|  | is a normal subgroup of |  |  |
|  | group theory |  |  |
| / | quotient group | G/H means the quotient of group $G$ modulo its subgroup $H$. | $\begin{aligned} & \{0, a, 2 a, b, b+a, b+2 a\} /\{0, b\}=\{\{0, \\ & b\},\{a, b+a\},\{2 a, b+2 a\}\} \end{aligned}$ |
|  | mod |  |  |
|  | group theory |  |  |
|  | quotient set | A/~ means the set of all ~ equivalence classes in A. | If we define $\sim$ by $x \sim y \Leftrightarrow x-y \in \mathbf{Z}$, then$\mathbf{R} / \sim=\{\{x+n: n \in \mathbf{Z}\}: \mathbf{x} \in(0,1]\}$ |
|  | mod |  |  |
|  | set theory |  |  |
| $\approx$ | isomorphism | $G \approx H$ means that group $G$ is isomorphic to group $H$ | $Q /\{1,-1\} \approx V,$ <br> where $Q$ is the quaternion group and $V$ is the Klein four-group. |
|  | is isomorphic to |  |  |
|  | group theory |  |  |
|  | approximately equal | $x \approx y$ means $x$ is approximately equal to $y$ | $\pi \approx 3.14159$ |
|  | is approximately equal to |  |  |
|  | everywhere |  |  |
|  |  |  |  |



## See also

- Mathematical alphanumeric symbols
- Table of logic symbols
- Physical constants
- Variables commonly used in physics
- ISO 31-11


## External links

- Jeff Miller: Earliest Uses of Various Mathematical Symbols (http://members.aol.com/jeff570/mathsym.html)
- TCAEP - Institute of Physics (http://www.tcaep.co.uk/science/symbols/maths.htm)
- GIF and PNG Images for Math Symbols (http://us.metamath.org/symbols/symbols.html)

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