List of logic symbols

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(Redirected from Table of logic symbols)

See also: Logical connective

In logic, a set of symbols is commonly used to express logical representation. As logicians are familiar with these symbols, they are not explained each time they are used. So, for students of logic, the following table lists many common symbols together with their name, pronunciation, and the related field of mathematics. Additionally, the third column contains an informal definition, and the fourth column gives a short example.

Be aware that, outside of logic, different symbols have the same meaning, and the same symbol has, depending on the context, different meanings.

Basic logic symbols

Symbol	Name Should be read as Category	Explanation	Examples	Unicode Value	HTML Entity	LaTeX symbol
$\Rightarrow$ $\rightarrow$ $\supset$	material implication implies; if .. then propositional logic, Heyting algebra	$A \Rightarrow B$ is true just in the case that either A is false or B is true, or both. $\rightarrow$ may mean the same as $\Rightarrow$ (the symbol may also indicate the domain and codomain of a function; see table of mathematical symbols). $\supset$ may mean the same as $\Rightarrow$ (the symbol may also mean superset).	$x = 2 \Rightarrow x^2 = 4$ is true, but $x^2 = 4 \Rightarrow x = 2$ is in general false (since x could be −2).	**U+21D2** **U+2192** **U+2283**	**⇒** **→** **⊃**	$\Rightarrow$**\Rightarrow** $\rightarrow$**\to** $\supset$**\supset** $\Longrightarrow$**\implies**
$\Leftrightarrow$ $\equiv$	material equivalence if and only if; iff; means the same as	$A \Leftrightarrow B$ is true just in case either both A and B are false, or both	$x + 5 = y + 2 \Leftrightarrow x + 3 = y$	**U+21D4** **U+2261**	**⇔** **≡**	$\Leftrightarrow$ **\Leftrightarrow** $\equiv$**\equiv** $\leftrightarrow$ **\leftrightarrow**

↔	propositional logic	*A* and *B* are true.		**U+2194**	**↔**	⟺**\iff**
¬ ~ !	negation not propositional logic	The statement ¬*A* is true if and only if *A* is false. A slash placed through another operator is the same as "¬" placed in front.	¬(¬*A*) ⇔ *A* *x* ≠ *y* ⇔ ¬(*x* = *y*)	**U+00AC** **U+02DC**	**¬** **˜ ~**	¬**\lnot or \neg** ∼**\sim**
∧ • &	logical conjunction and propositional logic, Boolean algebra	The statement *A* ∧ *B* is true if *A* and *B* are both true; else it is false.	*n* < 4 ∧ *n* >2 ⇔ *n* = 3 when *n* is a natural number.	**U+2227** **U+0026**	**∧** **&**	∧**\wedge or \land** **\&**[1]
∨ + ‖	logical disjunction or propositional logic, Boolean algebra	The statement *A* ∨ *B* is true if *A* or *B* (or both) are true; if both are false, the statement is false.	*n* ≥ 4 ∨ *n* ≤ 2 ⇔ *n* ≠ 3 when *n* is a natural number.	**U+2228**	**∨**	∨**\lor or \vee**
⊕ ⊻	exclusive disjunction xor propositional logic, Boolean algebra	The statement *A* ⊕ *B* is true when either A or B, but not both, are true. *A* ⊻ *B* means the same.	(¬*A*) ⊕ *A* is always true, *A* ⊕ *A* is always false.	**U+2295** **U+22BB**	**⊕**	⊕**\oplus** ⊻**\veebar**
⊤ T	Tautology top, verum propositional logic,	The statement ⊤ is unconditionally true.	*A* ⇒ ⊤ is always true.	**U+22A4**	**T**	⊤**\top**

1	Boolean algebra					
$\bot$ F 0	Contradiction bottom, falsum propositional logic, Boolean algebra	The statement $\bot$ is unconditionally false.	$\bot \Rightarrow A$ is always true.	**U+22A5**	**⊥** **F**	$\bot$**\bot**
$\forall$ $()$	universal quantification for all; for any; for each first-order logic	$\forall\, x\colon P(x)$ or $(x)\ P(x)$ means $P(x)$ is true for all x.	$\forall\, n \in \mathbb{N}\colon n^2 \geq n$.	**U+2200**	**∀**	$\forall$**\forall**
$\exists$	existential quantification there exists first-order logic	$\exists\, x\colon P(x)$ means there is at least one x such that $P(x)$ is true.	$\exists\, n \in \mathbb{N}\colon n$ is even.	**U+2203**	**∃**	$\exists$**\exists**
$\exists!$	uniqueness quantification there exists exactly one first-order logic	$\exists!\, x\colon P(x)$ means there is exactly one x such that $P(x)$ is true.	$\exists!\, n \in \mathbb{N}\colon n + 5 = 2n$.	**U+2203 U+0021**	**∃ !**	$\exists$**\exists !**
$:=$ $\equiv$ $:\Leftrightarrow$	definition is defined as everywhere	$x := y$ or $x \equiv y$ means x is defined to be another name for y (but note that $\equiv$ can also mean other things, such as congruence). $P :\Leftrightarrow Q$ means P is defined to be logically equivalent to Q.	$\cosh x := (1/2)(\exp x + \exp(-x))$ $A \operatorname{XOR} B :\Leftrightarrow (A \vee B) \wedge \neg(A \wedge B)$	**U+2254** **(U+003A U+003D)** **U+2261** **U+003A U+229C**	**:=** **:** **≡** **⇔**	**:=:=** $\equiv$**\equiv** $\Leftrightarrow$ **\Leftrightarrow**

		Q.				
( )	precedence grouping parentheses, brackets everywhere	Perform the operations inside the parentheses first.	$(8 \div 4) \div 2 = 2 \div 2 = 1$, but $8 \div (4 \div 2) = 8 \div 2 = 4$.	**U+0028 U+0029**	**( )**	**( ) ( )**
⊢	Turnstile provable propositional logic, first-order logic	$x \vdash y$ means y is provable from x (in some specified formal system).	$A \to B \vdash \neg B \to \neg A$	**U+22A2**	**⊢**	**⊢\vdash**
⊨	double turnstile entails propositional logic, first-order logic	$x \models y$ means x semantically entails y	$A \to B \models \neg B \to \neg A$	**U+22A8**	**⊨**	**⊨\models**

Advanced and rarely used logical symbols

These symbols are sorted by their Unicode value:

- U+00B7 · MIDDLE DOT, an outdated way for denoting AND[*citation needed*], still in use in electronics; for example "A·B" is the same as "A&B"
- ·̄: Center dot with a line above it. Outdated way for denoting NAND, for example "A·̄B" is the same as "A NAND B" or "A|B" or "¬(A & B)". See also Unicode U+22C5 ⋅ DOT OPERATOR.

- U+0305 ◌̅ COMBINING OVERLINE, used as abbreviation for standard numerals. For example, using HTML style "4̅" is a shorthand for the standard numeral "SSSS0".
- Overline, is also a rarely used format for denoting Gödel numbers, for example "$\overline{AVB}$" says the Gödel number of "(AVB)"
- Overline is also an outdated way for denoting negation, still in use in electronics; for example "$\overline{AVB}$" is the same as "¬(AVB)"

- U+2191 ↑ UPWARDS ARROW or U+007C | VERTICAL LINE: Sheffer stroke, the sign for the NAND operator.
- U+2201 ∁ COMPLEMENT
- U+2204 ∄ THERE DOES NOT EXIST: strike out existential quantifier same as "¬∃"
- U+2234 ∴ THEREFORE
- U+2235 ∵ BECAUSE
- U+22A7 ⊧ MODELS: is a model of
- U+22A8 ⊨ TRUE: is true of
- U+22AC ⊬ DOES NOT PROVE: negated ⊢, the sign for "does not prove", for example $T \nvdash P$ says "P is not a theorem of T"
- U+22AD ⊭ NOT TRUE: is not true of

- U+22BC ⊼ NAND: another NAND operator, can also be rendered as $\overline{\wedge}$
- U+22BD ⊽ NOR: another NOR operator, can also be rendered as $\overline{\vee}$
- U+22C4 ◇ DIAMOND OPERATOR: modal operator for "it is possible that", "it is not necessarily not" or rarely "it is not provable not" (in most modal logics it is defined as "¬□¬")
- U+22C6 ⋆ STAR OPERATOR: usually used for ad-hoc operators
- U+22A5 ⊥ UP TACK or U+2193 ↓ DOWNWARDS ARROW: Webb-operator or Peirce arrow, the sign for NOR. Confusingly, "⊥" is also the sign for contradiction or absurdity.

- U+2310 ⌐ REVERSED NOT SIGN

- U+231C ⌜ TOP LEFT CORNER and U+231D ⌝ TOP RIGHT CORNER: corner quotes, also called "Quine quotes"; for quasi-quotation, i.e. quoting specific context of unspecified ("variable") expressions;[2] also the standard symbol[*citation needed*] used for denoting Gödel number; for example "⌜G⌝" denotes the Gödel number of G. (Typographical note: although the quotes appears as a "pair" in unicode (231C and 231D), they are not symmetrical in some fonts. And in some fonts (for example Arial) they are only symmetrical in certain sizes. Alternatively the quotes can be rendered as ⌈ and ⌉ (U+2308 and U+2309) or by using a negation symbol and a reversed negation symbol ⌐ ¬ in superscript mode.)

- U+25FB □ WHITE MEDIUM SQUARE or U+25A1 □ WHITE SQUARE: modal operator for "it is necessary that" (in modal logic), or "it is provable that" (in provability logic), or "it is obligatory that" (in deontic logic), or "it is believed that" (in doxastic logic).

Note that the following operators are rarely supported by natively installed fonts. If you wish to use these in a web page, you should always embed the necessary fonts so the page viewer can see the web page without having the necessary fonts installed in their computer.

- U+27E1 ✧ WHITE CONCAVE-SIDED DIAMOND
- U+27E2 ✧ WHITE CONCAVE-SIDED DIAMOND WITH LEFTWARDS TICK: modal operator for was never
- U+27E3 ✧ WHITE CONCAVE-SIDED DIAMOND WITH RIGHTWARDS TICK: modal operator for will never be
- U+27E4 ⟢ WHITE SQUARE WITH LEFTWARDS TICK: modal operator for was always
- U+27E5 ⟣ WHITE SQUARE WITH RIGHTWARDS TICK: modal operator for will always be
- U+297D ⥽ RIGHT FISH TAIL: sometimes used for "relation", also used for denoting various ad hoc relations (for example, for denoting "witnessing" in the context of Rosser's trick) The fish hook is also used as strict implication by C.I.Lewis $p \backsimeq q \equiv \Box(p \rightarrow q)$, the corresponding LaTeX macro is \strictif. See here (http://www.fileformat.info/info/unicode/char/297d/index.htm) for an image of glyph. Added to Unicode 3.2.0.

See also

- Logic Alphabet, a suggested set of logical symbols
- Mathematical operators and symbols in Unicode
- Polish notation
- List of mathematical symbols

Notes

1. ^ Although this character is available in LaTeX, the MediaWiki TeX system doesn't support this character.
2. ^ Quine, W.V. (1981): *Mathematical Logic*, §6

External links

- Named character entities (http://www.w3.org/TR/WD-html40-970708/sgml/entities.html) in HTML 4.0