

Logic

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Propositional logic

Propositional logic (also called sentential logic) is logic that includes sentence letters (A,B,C) and logical connectives, but not quantifiers. The semantics of propositional logic uses truth assignments to the letters to determine whether a compound propositional sentence is true.

- Propositional logic is decidable, for example by the method of truth tables:
- Propositional logic is an axiomatization of Boolean logic.

Predicate logic

Predicate logic is usually used as a synonym for first-order logic, but sometimes it is used to refer to other logics that have similar syntax. Syntactically, first-order logic has the same connectives as propositional logic, but it also has variables for individual objects, quantifiers, symbols for functions, and symbols for relations. The semantics include a domain of discourse for the variables and quantifiers to range over, along with interpretations of the relation and function symbols.

- Predicate logic (also called predicate calculus and first-order logic) is an extension of propositional logic to formulas involving terms and predicates. The full predicate logic is undecidable:

Example:

A proposition is a statement that is having a truth value (either true or false) associated with it. Where a predicate is a statement whose truth value is dependent upon the variables.

Example: $P(n)$: n is an odd integer. Where a n . domain is a set of all integers. Here, $P(n)$ is n . dependent upon Example $3+3=6$ is a proposition.

In predicate logic, due to the availability of individual variables, predicate letters and quantifiers we have more “resources” to analyze statements: instead of atoms like p, q etc, we have $Px, x=y, \forall x Qx, \exists x Rx$ that allow us to model mathematical theorems and theories.

Propositional logic studies what is logically true or implied on the basis of truth-functional operators (\neg , \wedge , \vee , etc)

Predicate logic studies what is logically true or implied on the basis of truth-functional operators (\neg , \wedge , \vee , etc) and predicates, and individual constants, and quantifiers (using variables).

If you throw in identity as well, you get first-order logic (some people make a distinction between predicate logic and first-order logic).