Unification

**Unification**, in [computer science](https://en.wikipedia.org/wiki/Computer_science) and [logic](https://en.wikipedia.org/wiki/Logic), is an algorithmic process of [solving](https://en.wikipedia.org/wiki/Equation_solving) [equations](https://en.wikipedia.org/wiki/Equations) between symbolic [expressions](https://en.wikipedia.org/wiki/Expression_%28mathematics%29).

Depending on which expressions (also called *terms*) are allowed to occur in an equation set (also called **unification problem**), and which expressions are considered equal, several **frameworks** of unification are distinguished. If *higher-order variables*, that is, variables representing functions, are allowed in an expression, the process is called **higher-order unification**, otherwise **first-order unification**. If a solution is required to make both sides of each equation literally equal, the process is called **syntactical unification**, otherwise **semantical**, or **equational unification**, or **E-unification**, or **unification modulo theory**.

A **solution** of a unification problem is denoted as a [substitution](https://en.wikipedia.org/wiki/Substitution_%28logic%29), that is, a mapping assigning a symbolic value to each variable of the problem's expressions. A unification **algorithm** should compute for a given problem a **complete**, and **minimal** substitution set, that is, a set covering all its solutions, and containing no redundant members. Depending on the framework, a complete and minimal substitution set may have at most one, at most finitely many, or possibly infinitely many members, or may not exist at all. In some frameworks it is generally impossible to decide whether any solution exists. For first-order syntactical unification, Martelli and Montanarigave an algorithm that reports unsolvability or computes a complete and minimal singleton substitution set containing the so-called **most general unifier**.

The concept of unification is one of the main ideas behind [logic programming](https://en.wikipedia.org/wiki/Logic_programming), best known through the language [Prolog](https://en.wikipedia.org/wiki/Prolog%22%20%5Co%20%22Prolog). It represents the mechanism of binding the contents of variables and can be viewed as a kind of one-time assignment. In Prolog, this operation is denoted by the equality symbol =, but is also done when instantiating variables . It is also used in other languages by the use of the equality symbol =, but also in conjunction with many operations including +, -, \*, /. [Type inference](https://en.wikipedia.org/wiki/Type_inference) algorithms are typically based on unification.