Programming Languages

A programming language is a machine-readable artificial language designed to express computations that can be performed by a machine, particularly a computer.

Many programming languages have some form of written specification of their syntax and semantics, since computers require precisely defined instructions. Some are defined by a specification document (for example, an ISO Standard), while others have a dominant implementation (such as Perl).

Definitions. Traits often considered important for constituting a programming language:

Function: A programming language is a language used to write computer programs, which involve a computer performing some kind of computation or algorithm and possibly control external devices such as printers, robots, and so on.

Constructs: Programming languages may contain constructs for defining and manipulating data structures or controlling the flow of execution.

Expressive power: The theory of computation classifies languages by the computations they are capable of expressing. All Turing complete languages can implement the same set of algorithms. ANSI/ISO SQL and Charity are examples of languages that are not Turing complete, yet often called programming languages.

Some authors restrict the term “programming language” to those languages that can express all possible algorithms; sometimes the term “computer language” is used for more limited artificial languages.

Non-computational languages, such as markup languages like HTML or formal grammars like BNF, are usually not considered programming languages. A programming language (which may or may not be Turing complete) may be embedded in these non-computational (host) languages.

Usage. A programming language provides a structured mechanism for defining pieces of data, and the operations or transformations that may be carried out automatically on that data. Programs for a computer might be executed in a batch process without human interaction, or a user might type commands in an interactive session of an interpreter. In this case the “commands” are simply programs, whose execution is chained together. When a language is used to give commands to a software application (such as a shell) it is called a scripting language.

Programs must balance speed, size, and simplicity on systems ranging from microcontrollers to supercomputers.