

Languages form an approximate spectrum from "low-level" to "high-level"; "low-level" languages are typically more machine-oriented and faster to execute, whereas "high-level" languages are more abstract and easier to use but execute less quickly. Provided the functions in a library follow the appropriate run-time conventions (e.g., method of passing arguments), then these functions may be written in any other language. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. Proficient programming usually requires expertise in several different subjects, including knowledge of the application domain, details of programming languages and generic code libraries, specialized algorithms, and formal logic. Provided the functions in a library follow the appropriate run-time conventions (e.g., method of passing arguments), then these functions may be written in any other language. Also, specific user environment and usage history can make it difficult to reproduce the problem. Programmable devices have existed for centuries. Computer programmers are those who write computer software. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. Implementation techniques include imperative languages (object-oriented or procedural), functional languages, and logic languages. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. Programmable devices have existed for centuries. Programming languages are essential for software development. In 1206, the Arab engineer Al-Jazari invented a programmable drum machine where a musical mechanical automaton could be made to play different rhythms and drum patterns, via pegs and cams. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. Assembly languages were soon developed that let the programmer specify instruction in a text format (e.g., ADD X, TOTAL), with abbreviations for each operation code and meaningful names for specifying addresses. However, because an assembly language is little more than a different notation for a machine language, two machines with different instruction sets also have different assembly languages. One approach popular for requirements analysis is Use Case analysis. Different programming languages support different styles of programming (called programming paradigms). Debugging is often done with IDEs. Standalone debuggers like GDB are also used, and these often provide less of a visual environment, usually using a command line. It is usually easier to code in "high-level" languages than in "low-level" ones.