

Expert programmers are familiar with a variety of well-established algorithms and their respective complexities and use this knowledge to choose algorithms that are best suited to the circumstances. One approach popular for requirements analysis is Use Case analysis. Normally the first step in debugging is to attempt to reproduce the problem. 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. For this purpose, algorithms are classified into orders using so-called Big O notation, which expresses resource use, such as execution time or memory consumption, in terms of the size of an input. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. Integrated development environments (IDEs) aim to integrate all such help. Programs were mostly entered using punched cards or paper tape. In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them. Many programmers use forms of Agile software development where the various stages of formal software development are more integrated together into short cycles that take a few weeks rather than years. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. 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. Various visual programming languages have also been developed with the intent to resolve readability concerns by adopting non-traditional approaches to code structure and display. Their jobs usually involve: Although programming has been presented in the media as a somewhat mathematical subject, some research shows that good programmers have strong skills in natural human languages, and that learning to code is similar to learning a foreign language. Popular modeling techniques include Object-Oriented Analysis and Design (OOAD) and Model-Driven Architecture (MDA). 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. 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. Whatever the approach to development may be, the final program must satisfy some fundamental properties. 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. Debugging is a very important task in the software development process since having defects in a program can have significant consequences for its users. New languages are generally designed around the syntax of a prior language with new functionality added, (for example C++ adds object-orientation to C, and Java adds memory management and bytecode to C++, but as a result, loses efficiency and the ability for low-level manipulation). A similar technique used for database design is Entity-Relationship Modeling (ER Modeling).