

Unreadable code often leads to bugs, inefficiencies, and duplicated code. Whatever the approach to development may be, the final program must satisfy some fundamental properties. It affects the aspects of quality above, including portability, usability and most importantly maintainability. As early as the 9th century, a programmable music sequencer was invented by the Persian Banu Musa brothers, who described an automated mechanical flute player in the Book of Ingenious Devices. FORTRAN, the first widely used high-level language to have a functional implementation, came out in 1957, and many other languages were soon developed—in particular, COBOL aimed at commercial data processing, and Lisp for computer research. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. It involves designing and implementing algorithms, step-by-step specifications of procedures, by writing code in one or more programming languages. It is usually easier to code in "high-level" languages than in "low-level" ones. These compiled languages allow the programmer to write programs in terms that are syntactically richer, and more capable of abstracting the code, making it easy to target varying machine instruction sets via compilation declarations and heuristics. 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. These compiled languages allow the programmer to write programs in terms that are syntactically richer, and more capable of abstracting the code, making it easy to target varying machine instruction sets via compilation declarations and heuristics. 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. By the late 1960s, data storage devices and computer terminals became inexpensive enough that programs could be created by typing directly into the computers. In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them. 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). Programming languages are essential for software development. Scripting and breakpointing is also part of this process. These compiled languages allow the programmer to write programs in terms that are syntactically richer, and more capable of abstracting the code, making it easy to target varying machine instruction sets via compilation declarations and heuristics. Auxiliary tasks accompanying and related to programming include analyzing requirements, testing, debugging (investigating and fixing problems), implementation of build systems, and management of derived artifacts, such as programs' machine code. 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. Computer programming or coding is the composition of sequences of instructions, called programs, that computers can follow to perform tasks. A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it. 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. Programs were mostly entered using punched cards or paper tape.