

The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). Integrated development environments (IDEs) aim to integrate all such help. Readability is important because programmers spend the majority of their time reading, trying to understand, reusing and modifying existing source code, rather than writing new source code. The academic field and the engineering practice of computer programming are both largely concerned with discovering and implementing the most efficient algorithms for a given class of problems. However, readability is more than just programming style. In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. 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. Programs were mostly entered using punched cards or paper tape. Trade-offs from this ideal involve finding enough programmers who know the language to build a team, the availability of compilers for that language, and the efficiency with which programs written in a given language execute. They are the building blocks for all software, from the simplest applications to the most sophisticated ones. Unreadable code often leads to bugs, inefficiencies, and duplicated code. Different programming languages support different styles of programming (called programming paradigms). Implementation techniques include imperative languages (object-oriented or procedural), functional languages, and logic languages. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. 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. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. By the late 1960s, data storage devices and computer terminals became inexpensive enough that programs could be created by typing directly into the computers. Programmers typically use high-level programming languages that are more easily intelligible to humans than machine code, which is directly executed by the central processing unit. Readability is important because programmers spend the majority of their time reading, trying to understand, reusing and modifying existing source code, rather than writing new source code. Normally the first step in debugging is to attempt to reproduce the problem. 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. For example, when a bug in a compiler can make it crash when parsing some large source file, a simplification of the test case that results in only few lines from the original source file can be sufficient to reproduce the same crash. 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. It involves designing and implementing algorithms, step-by-step specifications of procedures, by writing code in one or more programming languages.