

Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. 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. A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it. 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. 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. They are the building blocks for all software, from the simplest applications to the most sophisticated ones. Debugging is a very important task in the software development process since having defects in a program can have significant consequences for its users. 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. One approach popular for requirements analysis is Use Case analysis. For example, COBOL is still strong in corporate data centers often on large mainframe computers, Fortran in engineering applications, scripting languages in Web development, and C in embedded software. A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it. Trial-and-error/divide-and-conquer is needed: the programmer will try to remove some parts of the original test case and check if the problem still exists. Integrated development environments (IDEs) aim to integrate all such help. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. 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. 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 the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. Allen Downey, in his book *How To Think Like A Computer Scientist*, writes: Many computer languages provide a mechanism to call functions provided by shared libraries. Programs were mostly entered using punched cards or paper tape. Many applications use a mix of several languages in their construction and use. It affects the aspects of quality above, including portability, usability and most importantly maintainability. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. Some languages are more prone to some kinds of faults because their specification does not require compilers to perform as much checking as other languages. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards.