

In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. By the late 1960s, data storage devices and computer terminals became inexpensive enough that programs could be created by typing directly into the computers. However, with the concept of the stored-program computer introduced in 1949, both programs and data were stored and manipulated in the same way in computer memory. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. 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. 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. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. Use of a static code analysis tool can help detect some possible problems. Unreadable code often leads to bugs, inefficiencies, and duplicated code. Unreadable code often leads to bugs, inefficiencies, and duplicated code. 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. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. 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. 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. Popular modeling techniques include Object-Oriented Analysis and Design (OOAD) and Model-Driven Architecture (MDA). When debugging the problem in a GUI, the programmer can try to skip some user interaction from the original problem description and check if remaining actions are sufficient for bugs to appear. 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. Whatever the approach to development may be, the final program must satisfy some fundamental properties. 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. Ideally, the programming language best suited for the task at hand will be selected. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in *A Manuscript on Deciphering Cryptographic Messages*. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). Unreadable code often leads to bugs, inefficiencies, and duplicated code. 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.