

In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. It involves designing and implementing algorithms, step-by-step specifications of procedures, by writing code in one or more programming languages. 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. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. 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. Code-breaking algorithms have also existed for centuries. 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. 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. 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. 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 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. The choice of language used is subject to many considerations, such as company policy, suitability to task, availability of third-party packages, or individual preference. 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. 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. While these are sometimes considered programming, often the term software development is used for this larger overall process – with the terms programming, implementation, and coding reserved for the writing and editing of code per se. It is very difficult to determine what are the most popular modern programming languages. Implementation techniques include imperative languages (object-oriented or procedural), functional languages, and logic languages. Normally the first step in debugging is to attempt to reproduce the problem. 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. Use of a static code analysis tool can help detect some possible problems. Normally the first step in debugging is to attempt to reproduce the problem. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. Normally the first step in debugging is to attempt to reproduce the problem. Programming languages are essential for software development.