

Computer programming or coding is the composition of sequences of instructions, called programs, that computers can follow to perform tasks. Their jobs usually involve: Although programming has been presented in the media as a somewhat mathematical subject, some research shows that good programmers have strong skills in natural human languages, and that learning to code is similar to learning a foreign language. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. 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. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. 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. Following a consistent programming style often helps readability. By the late 1960s, data storage devices and computer terminals became inexpensive enough that programs could be created by typing directly into the computers. Implementation techniques include imperative languages (object-oriented or procedural), functional languages, and logic languages. 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. 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. 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. Code-breaking algorithms have also existed for centuries. 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. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. 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). It involves designing and implementing algorithms, step-by-step specifications of procedures, by writing code in one or more programming languages. 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. Programming languages are essential for software development. 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.