

However, Charles Babbage had already written his first program for the Analytical Engine in 1837. Many applications use a mix of several languages in their construction and use. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. 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. Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. Programmable devices have existed for centuries. It affects the aspects of quality above, including portability, usability and most importantly maintainability. New languages are generally designed around the syntax of a prior language with new functionality added, (for example C++ adds object-orientation to C, and Java adds memory management and bytecode to C++, but as a result, loses efficiency and the ability for low-level manipulation). Programs were mostly entered using punched cards or paper tape. 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. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. 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. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. Later a control panel (plug board) added to his 1906 Type I Tabulator allowed it to be programmed for different jobs, and by the late 1940s, unit record equipment such as the IBM 602 and IBM 604, were programmed by control panels in a similar way, as were the first electronic computers. 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. 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. Different programming languages support different styles of programming (called programming paradigms). It affects the aspects of quality above, including portability, usability and most importantly maintainability. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. Languages form an approximate spectrum from "low-level" to "high-level"; "low-level" languages are typically more machine-oriented and faster to execute, whereas "high-level" languages are more abstract and easier to use but execute less quickly. There exist a lot of different approaches for each of those tasks. Programs were mostly entered using punched cards or paper tape.