

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). In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. 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. Programmable devices have existed for centuries. 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. A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it. In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. Also, specific user environment and usage history can make it difficult to reproduce the problem. Popular modeling techniques include Object-Oriented Analysis and Design (OOAD) and Model-Driven Architecture (MDA). It affects the aspects of quality above, including portability, usability and most importantly maintainability. These compiled languages allow the programmer to write programs in terms that are syntactically richer, and more capable of abstracting the code, making it easy to target varying machine instruction sets via compilation declarations and heuristics. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. Use of a static code analysis tool can help detect some possible problems. Programs were mostly entered using punched cards or paper tape. 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 similar technique used for database design is Entity-Relationship Modeling (ER Modeling). It is usually easier to code in "high-level" languages than in "low-level" ones. 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.