

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. 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. 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. There are many approaches to the Software development process. 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. Following a consistent programming style often helps readability. 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. However, because an assembly language is little more than a different notation for a machine language, two machines with different instruction sets also have different assembly languages. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. Code-breaking algorithms have also existed for centuries. Readability is important because programmers spend the majority of their time reading, trying to understand, reusing and modifying existing source code, rather than writing new source code. Some languages are very popular for particular kinds of applications, while some languages are regularly used to write many different kinds of applications. 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. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. The following properties are among the most important: In computer programming, readability refers to the ease with which a human reader can comprehend the purpose, control flow, and operation of source code. Code-breaking algorithms have also existed for centuries. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. 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. 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. It affects the aspects of quality above, including portability, usability and most importantly maintainability. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). 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. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. It affects the aspects of quality above, including portability, usability and most importantly maintainability.