

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. Following a consistent programming style often helps readability. Programs were mostly entered using punched cards or paper tape. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. 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. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. 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. By the late 1960s, data storage devices and computer terminals became inexpensive enough that programs could be created by typing directly into the computers. 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. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). 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 applications use a mix of several languages in their construction and use. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). Scripting and breakpointing is also part of this process. The first computer program is generally dated to 1843, when mathematician Ada Lovelace published an algorithm to calculate a sequence of Bernoulli numbers, intended to be carried out by Charles Babbage's Analytical Engine. Computer programmers are those who write computer software. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. 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. It affects the aspects of quality above, including portability, usability and most importantly maintainability. Use of a static code analysis tool can help detect some possible problems. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. 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. For this purpose, algorithms are classified into orders using so-called Big O notation, which expresses resource use, such as execution time or memory consumption, in terms of the size of an input. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them.