

Programs were mostly entered using punched cards or paper tape. 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. 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. Programmers typically use high-level programming languages that are more easily intelligible to humans than machine code, which is directly executed by the central processing unit. Normally the first step in debugging is to attempt to reproduce the problem. 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. Programmable devices have existed for centuries. 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. Computer programming or coding is the composition of sequences of instructions, called programs, that computers can follow to perform tasks. Following a consistent programming style often helps readability. 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. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. Different programming languages support different styles of programming (called programming paradigms). 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. One approach popular for requirements analysis is Use Case analysis. 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). 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. Some languages are very popular for particular kinds of applications, while some languages are regularly used to write many different kinds of applications. 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. 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. Computer programming or coding is the composition of sequences of instructions, called programs, that computers can follow to perform tasks. 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. 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.