

However, Charles Babbage had already written his first program for the Analytical Engine in 1837. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). Following a consistent programming style often helps readability. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). Debugging is often done with IDEs. Standalone debuggers like GDB are also used, and these often provide less of a visual environment, usually using a command line. When debugging the problem in a GUI, the programmer can try to skip some user interaction from the original problem description and check if remaining actions are sufficient for bugs to appear. Normally the first step in debugging is to attempt to reproduce the problem. 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. There exist a lot of different approaches for each of those tasks. They are the building blocks for all software, from the simplest applications to the most sophisticated ones. Computer programmers are those who write computer software. 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. Scripting and breakpointing is also part of this process. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. 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. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. It affects the aspects of quality above, including portability, usability and most importantly maintainability. 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. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. 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. Popular modeling techniques include Object-Oriented Analysis and Design (OOAD) and Model-Driven Architecture (MDA).