

High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. 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. Some languages are very popular for particular kinds of applications, while some languages are regularly used to write many different kinds of applications. Also, specific user environment and usage history can make it difficult to reproduce the problem. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. 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. They are the building blocks for all software, from the simplest applications to the most sophisticated ones. 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. Programming languages are essential for software development. Programmable devices have existed for centuries. Normally the first step in debugging is to attempt to reproduce the problem. Popular modeling techniques include Object-Oriented Analysis and Design (OOAD) and Model-Driven Architecture (MDA). However, with the concept of the stored-program computer introduced in 1949, both programs and data were stored and manipulated in the same way in computer memory. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). Assembly languages were soon developed that let the programmer specify instruction in a text format (e.g., ADD X, TOTAL), with abbreviations for each operation code and meaningful names for specifying addresses. Many applications use a mix of several languages in their construction and use. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. 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. 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. 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. Computer programming or coding is the composition of sequences of instructions, called programs, that computers can follow to perform tasks. In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them.