

Methods of measuring programming language popularity include: counting the number of job advertisements that mention the language, the number of books sold and courses teaching the language (this overestimates the importance of newer languages), and estimates of the number of existing lines of code written in the language (this underestimates the number of users of business languages such as COBOL). Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. It involves designing and implementing algorithms, step-by-step specifications of procedures, by writing code in one or more programming 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*. Techniques like Code refactoring can enhance readability. 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). Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. 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. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). Programs were mostly entered using punched cards or paper tape. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. 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. Provided the functions in a library follow the appropriate run-time conventions (e.g., method of passing arguments), then these functions may be written in any other language. There are many approaches to the Software development process. By the late 1960s, data storage devices and computer terminals became inexpensive enough that programs could be created by typing directly into the computers. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. 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*. Many programmers use forms of Agile software development where the various stages of formal software development are more integrated together into short cycles that take a few weeks rather than years. Later a control panel (plug board) added to his 1906 Type I Tabulator allowed it to be programmed for different jobs, and by the late 1940s, unit record equipment such as the IBM 602 and IBM 604, were programmed by control panels in a similar way, as were the first electronic computers. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. Following a consistent programming style often helps readability. Use of a static code analysis tool can help detect some possible problems. 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.