

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. 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. 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. Different programming languages support different styles of programming (called programming paradigms). 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). 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. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). 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. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. 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. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. Also, specific user environment and usage history can make it difficult to reproduce the problem. The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. Following a consistent programming style often helps readability. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. 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). In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. 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. Debugging is a very important task in the software development process since having defects in a program can have significant consequences for its users. It affects the aspects of quality above, including portability, usability and most importantly maintainability. 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. Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. Computer programming or coding is the composition of sequences of instructions, called programs, that computers can follow to perform tasks. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA.