

In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. For example, COBOL is still strong in corporate data centers often on large mainframe computers, Fortran in engineering applications, scripting languages in Web development, and C in embedded software. 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. 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. Programming languages are essential for software development. Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. It is very difficult to determine what are the most popular modern programming languages. 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. There exist a lot of different approaches for each of those tasks. Popular modeling techniques include Object-Oriented Analysis and Design (OOAD) and Model-Driven Architecture (MDA). Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. 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. Whatever the approach to development may be, the final program must satisfy some fundamental properties. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them. 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). Integrated development environments (IDEs) aim to integrate all such help. Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. For this purpose, algorithms are classified into orders using so-called Big O notation, which expresses resource use, such as execution time or memory consumption, in terms of the size of an input. Some languages are very popular for particular kinds of applications, while some languages are regularly used to write many different kinds of applications. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. 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. Unreadable code often leads to bugs, inefficiencies, and duplicated code. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware.