

These compiled languages allow the programmer to write programs in terms that are syntactically richer, and more capable of abstracting the code, making it easy to target varying machine instruction sets via compilation declarations and heuristics. In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. Code-breaking algorithms have also existed for centuries. Techniques like Code refactoring can enhance readability. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. However, readability is more than just programming style. For example, when a bug in a compiler can make it crash when parsing some large source file, a simplification of the test case that results in only few lines from the original source file can be sufficient to reproduce the same crash. Debugging is a very important task in the software development process since having defects in a program can have significant consequences for its users. Integrated development environments (IDEs) aim to integrate all such help. 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. Computer programmers are those who write computer software. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. FORTRAN, the first widely used high-level language to have a functional implementation, came out in 1957, and many other languages were soon developed—in particular, COBOL aimed at commercial data processing, and Lisp for computer research. Trial-and-error/divide-and-conquer is needed: the programmer will try to remove some parts of the original test case and check if the problem still exists. 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. 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. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. Programming languages are essential for software development. 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. It is usually easier to code in "high-level" languages than in "low-level" ones. Popular modeling techniques include Object-Oriented Analysis and Design (OOAD) and Model-Driven Architecture (MDA). 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. Expert programmers are familiar with a variety of well-established algorithms and their respective complexities and use this knowledge to choose algorithms that are best suited to the circumstances. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. Programming languages are essential for software development.