

In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. 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. 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. 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. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. 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. 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. Some languages are very popular for particular kinds of applications, while some languages are regularly used to write many different kinds of applications. Many applications use a mix of several languages in their construction and use. It is usually easier to code in "high-level" languages than in "low-level" ones. In 1206, the Arab engineer Al-Jazari invented a programmable drum machine where a musical mechanical automaton could be made to play different rhythms and drum patterns, via pegs and cams. However, readability is more than just programming style. 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 applications use a mix of several languages in their construction and use. 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. 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. Many applications use a mix of several languages in their construction and use. The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. 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. One approach popular for requirements analysis is Use Case analysis. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. Normally the first step in debugging is to attempt to reproduce the problem. Scripting and breakpointing is also part of this process. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs.