

Programmable devices have existed for centuries. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in *A Manuscript on Deciphering Cryptographic Messages*. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). Techniques like Code refactoring can enhance 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. 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 following properties are among the most important: In computer programming, readability refers to the ease with which a human reader can comprehend the purpose, control flow, and operation of source code. 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 Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it. 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. 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*. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. Allen Downey, in his book *How To Think Like A Computer Scientist*, writes: Many computer languages provide a mechanism to call functions provided by shared libraries. Auxiliary tasks accompanying and related to programming include analyzing requirements, testing, debugging (investigating and fixing problems), implementation of build systems, and management of derived artifacts, such as programs' machine code. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. Scripting and breakpointing is also part of this process. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. 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. 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. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling).