

Following a consistent programming style often helps readability. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. While these are sometimes considered programming, often the term software development is used for this larger overall process – with the terms programming, implementation, and coding reserved for the writing and editing of code per se. 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. There are many approaches to the Software development process. Implementation techniques include imperative languages (object-oriented or procedural), functional languages, and logic languages. Following a consistent programming style often helps readability. 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. While these are sometimes considered programming, often the term software development is used for this larger overall process – with the terms programming, implementation, and coding reserved for the writing and editing of code per se. There are many approaches to the Software development process. In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them. 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. 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. Techniques like Code refactoring can enhance readability. Normally the first step in debugging is to attempt to reproduce the problem. Different programming languages support different styles of programming (called programming paradigms). 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. Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. Debugging is a very important task in the software development process since having defects in a program can have significant consequences for its users. In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). They are the building blocks for all software, from the simplest applications to the most sophisticated ones. Programming languages are essential for software development. Integrated development environments (IDEs) aim to integrate all such help.