

Computer programmers are those who write computer software. Proficient programming usually requires expertise in several different subjects, including knowledge of the application domain, details of programming languages and generic code libraries, specialized algorithms, and formal logic. However, because an assembly language is little more than a different notation for a machine language, two machines with different instruction sets also have different assembly languages. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. Debugging is a very important task in the software development process since having defects in a program can have significant consequences for its users. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. 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. Some languages are more prone to some kinds of faults because their specification does not require compilers to perform as much checking as other languages. Also, specific user environment and usage history can make it difficult to reproduce the problem. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. 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. They are the building blocks for all software, from the simplest applications to the most sophisticated ones. Proficient programming usually requires expertise in several different subjects, including knowledge of the application domain, details of programming languages and generic code libraries, specialized algorithms, and formal logic. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. Their jobs usually involve: Although programming has been presented in the media as a somewhat mathematical subject, some research shows that good programmers have strong skills in natural human languages, and that learning to code is similar to learning a foreign language. 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. 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. 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. 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. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. 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. Later a control panel (plug board) added to his 1906 Type I Tabulator allowed it to be programmed for different jobs, and by the late 1940s, unit record equipment such as the IBM 602 and IBM 604, were programmed by control panels in a similar way, as were the first electronic computers. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. Computer programmers are those who write computer software.