

Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design 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. Programmable devices have existed for centuries. 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. 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). 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. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. Use of a static code analysis tool can help detect some possible problems. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. 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. 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. Whatever the approach to development may be, the final program must satisfy some fundamental properties. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. 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. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. 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. Unreadable code often leads to bugs, inefficiencies, and duplicated code. 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. 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. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. Normally the first step in debugging is to attempt to reproduce the problem. However, readability is more than just programming style. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug.