

He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. 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. 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. Programmable devices have existed for centuries. 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. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. There are many approaches to the Software development process. It is usually easier to code in "high-level" languages than in "low-level" ones. Integrated development environments (IDEs) aim to integrate all such help. One approach popular for requirements analysis is Use Case analysis. 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. 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. Unreadable code often leads to bugs, inefficiencies, and duplicated code. The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. 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. 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. By the late 1960s, data storage devices and computer terminals became inexpensive enough that programs could be created by typing directly into the computers. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. Techniques like Code refactoring can enhance readability. 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. It is usually easier to code in "high-level" languages than in "low-level" ones. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. It involves designing and implementing algorithms, step-by-step specifications of procedures, by writing code in one or more programming languages.