

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. Computer programmers are those who write computer software. 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. Programs were mostly entered using punched cards or paper tape. 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). 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. 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. Implementation techniques include imperative languages (object-oriented or procedural), functional languages, and logic languages. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). Code-breaking algorithms have also existed for centuries. 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. Programs were mostly entered using punched cards or paper tape. 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. Whatever the approach to development may be, the final program must satisfy some fundamental properties. In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. 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. There exist a lot of different approaches for each of those tasks. One approach popular for requirements analysis is Use Case analysis. It is usually easier to code in "high-level" languages than in "low-level" ones. In 1206, the Arab engineer Al-Jazari invented a programmable drum machine where a musical mechanical automaton could be made to play different rhythms and drum patterns, via pegs and cams. The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. 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. Unreadable code often leads to bugs, inefficiencies, and duplicated 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).