

Programmers typically use high-level programming languages that are more easily intelligible to humans than machine code, which is directly executed by the central processing unit. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. 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. There exist a lot of different approaches for each of those tasks. 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. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). It involves designing and implementing algorithms, step-by-step specifications of procedures, by writing code in one or more programming languages. It affects the aspects of quality above, including portability, usability and most importantly maintainability. 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. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. Readability is important because programmers spend the majority of their time reading, trying to understand, reusing and modifying existing source code, rather than writing new source code. 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. FORTRAN, the first widely used high-level language to have a functional implementation, came out in 1957, and many other languages were soon developed—in particular, COBOL aimed at commercial data processing, and Lisp for computer research. 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. By the late 1960s, data storage devices and computer terminals became inexpensive enough that programs could be created by typing directly into the computers. Whatever the approach to development may be, the final program must satisfy some fundamental properties. Normally the first step in debugging is to attempt to reproduce the problem. 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. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). Some languages are very popular for particular kinds of applications, while some languages are regularly used to write many different kinds of applications. Code-breaking algorithms have also existed for centuries. The academic field and the engineering practice of computer programming are both largely concerned with discovering and implementing the most efficient algorithms for a given class of problems. There exist a lot of different approaches for each of those tasks.