

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. 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. 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. 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. Allen Downey, in his book *How To Think Like A Computer Scientist*, writes: Many computer languages provide a mechanism to call functions provided by shared libraries. Unreadable code often leads to bugs, inefficiencies, and duplicated code. 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. 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. New languages are generally designed around the syntax of a prior language with new functionality added, (for example C++ adds object-orientation to C, and Java adds memory management and bytecode to C++, but as a result, loses efficiency and the ability for low-level manipulation). 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. 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. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. 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. Also, specific user environment and usage history can make it difficult to reproduce the problem. The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. 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. Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. Normally the first step in debugging is to attempt to reproduce the problem. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. By the late 1960s, data storage devices and computer terminals became inexpensive enough that programs could be created by typing directly into the computers. 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.