

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. Unreadable code often leads to bugs, inefficiencies, and duplicated code. 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). Programs were mostly entered using punched cards or paper tape. 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. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. 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. 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. 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. It is usually easier to code in "high-level" languages than in "low-level" ones. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). 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). It is very difficult to determine what are the most popular modern programming languages. 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. There exist a lot of different approaches for each of those tasks. 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. It affects the aspects of quality above, including portability, usability and most importantly maintainability. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it. Techniques like Code refactoring can enhance readability. Normally the first step in debugging is to attempt to reproduce the problem. However, readability is more than just programming style. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. It affects the aspects of quality above, including portability, usability and most importantly maintainability.