

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. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it.

Trial-and-error/divide-and-conquer is needed: the programmer will try to remove some parts of the original test case and check if the problem still exists. There are many approaches to the Software development process. It affects the aspects of quality above, including portability, usability and most importantly maintainability. Also, specific user environment and usage history can make it difficult to reproduce the problem. By the late 1960s, data storage devices and computer terminals became inexpensive enough that programs could be created by typing directly into the computers. 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. It involves designing and implementing algorithms, step-by-step specifications of procedures, by writing code in one or more programming languages. Normally the first step in debugging is to attempt to reproduce the problem. 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. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. However, readability is more than just programming style.

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). Programming languages are essential for software development.

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, 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. 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. Various visual programming languages have also been developed with the intent to resolve readability concerns by adopting non-traditional approaches to code structure and display. 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. Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. 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. 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.