A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it.  
Also, specific user environment and usage history can make it difficult to reproduce the problem.  
To produce machine code, the source code must either be compiled or transpiled.  
Integrated development environments (IDEs) aim to integrate all such help.  
Relatedly, software engineering combines engineering techniques and principles with software development.  
Compiling takes the source code from a low-level programming language and converts it into machine code.  
It is usually easier to code in "high-level" languages than in "low-level" ones.  
This is interpreted into machine code.  
One approach popular for requirements analysis is Use Case analysis.  
In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages.  
Proficient programming thus usually requires expertise in several different subjects, including knowledge of the application domain, specialized algorithms, and formal logic.  
For this purpose, algorithms are classified into orders using so-called Big O notation, which expresses resource use, such as execution time or memory consumption, in terms of the size of an input.  
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.  
The purpose of programming is to find a sequence of instructions that will automate the performance of a task (which can be as complex as an operating system) on a computer, often for solving a given problem.  
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.