In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages..  
Programming languages are essential for software development.  
 Debugging is a very important task in the software development process since having defects in a program can have significant consequences for its users.  
 Implementation techniques include imperative languages (object-oriented or procedural), functional languages, and logic languages.  
 Different programming languages support different styles of programming (called programming paradigms).  
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).  
 Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation.  
 Following a consistent programming style often helps readability.  
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.  
Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards.  
  
 High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware.  
In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them.  
 The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging).  
However, because an assembly language is little more than a different notation for a machine language, two machines with different instruction sets also have different assembly languages.