Gradually the form and meaning of *algorism* became corrupted; as explained by the *Oxford English Dictionary*, the word "passed through many pseudo-etymological perversions, including a recent *algorithm*, in which it is learnedly confused" with the Greek root of the word *arithmetic*. This change from "algorism" to "algorithm" is not hard to understand in view of the fact that people had forgotten the original derivation of the word. An early German mathematical dictionary, *Vollständiges mathematisches Lexicon* (Leipzig: 1747), gave the following definition for the word *Algorithmus*: "Under this designation are combined the notions of the four types of arithmetic calculations, namely addition, multiplication, subtraction, and division." The Latin phrase *algorithmus infinitesimalis* was at that time used to denote "ways of calculation with infinitely small quantities, as invented by Leibniz."

By 1950, the word algorithm was most frequently associated with Euclid's algorithm, a process for finding the greatest common divisor of two numbers that appears in Euclid's *Elements* (Book 7, Propositions 1 and 2). It will be instructive to exhibit Euclid's algorithm here:

Algorithm E (*Euclid's algorithm*). Given two positive integers m and n, find their *greatest common divisor*, that is, the largest positive integer that evenly divides both m and n.

E1. [Find remainder.] Divide m by n and let r be the remainder. (We will have $0 \le r < n$.)

E2. [Is it zero?] If $r = 0$, the algorithm terminates; n is the answer.

E3. [Reduce.] Set $m \leftarrow n$, $n \leftarrow r$, and go back to step E1. ∎

Of course, Euclid did not present his algorithm in just this manner. The format above illustrates the style in which all of the algorithms throughout this book will be presented.

Each algorithm we consider has been given an identifying letter (E in the preceding example), and the steps of the algorithm are identified by this letter followed by a number (E1, E2, E3). The chapters are divided into numbered sections; within a section the algorithms are designated by letter only, but when algorithms are referred to in other sections, the appropriate section number is attached. For example, we are now in Section 1.1; within this section Euclid's algorithm is called Algorithm E, while in later sections it is referred to as Algorithm 1.1E.

Each step of an algorithm, such as step E1 above, begins with a phrase in brackets that sums up as briefly as possible the principal content of that step. This phrase also usually appears in an accompanying *flow chart*, such as Fig. 1, so that the reader will be able to picture the algorithm more readily.

After the summarizing phrase comes a description in words and symbols of some *action* to be performed or some decision to be made. Parenthesized *comments*, like the second sentence in step E1, may also appear. Comments are included as explanatory information about that step, often indicating certain invariant characteristics of the variables or the current goals. They do not specify