Part II
FUNDAMENTALS

We turn now from the “how” of mathematics, which is the methodology of proofs, to the “what,” which is the content of mathematics. In such a vastly broad subject as mathematics, it might be hard to imagine that there is anything common to all aspects of it, but in fact most of modern pure mathematics is based upon a few shared fundamental ideas such as sets, functions and relations. We now discuss the basic features of these ideas. The tone and style of writing in the text now changes correspondingly to the change in our subject matter. We will have less informal discussion, and will write in the more straightforward definition/theorem/proof style used in most advanced mathematics texts (though we will not drop all intuitive explanation). This change in style occurs for several reasons: the need to cover a fairly large amount of material in a reasonable amount of space; the intention of familiarizing the reader with the standard way in which mathematics is written; the fact that with practice (which comes from doing exercises), the reader will not need to be led through the proofs so slowly any more.