Hilbert's 11th and 17th problems and the Hasse principle. From the numerous theorems quoted I select just one to give the flavour, namely Siegel's 1945 result that the only totally real fields in which all totally positive integers can be represented by sums of squares of integers in the field are the rational numbers $\mathbb{Q}$ and the field $\mathbb{Q}(\sqrt{5})$.

As one expects from the publisher, the work is well set out, although there are a number of places where the arguments would be easier to follow if formulae had been displayed and not allowed to run beyond the end of a line of text. As is inevitable in such detailed work, there are a few misprints, but these are easily corrected, including the somewhat unfortunate error on the first page of chapter 1, where, presumably, equation (1.2) should read

$$2x^2-5y^2+3z^2=0.$$

There are two extensive bibliographies, the first giving references to the results discussed, and the second being a selection of more recent papers relevant to the subject and its generalizations.

To sum up: this is an excellent book, which will be found of interest to all workers in the theory of numbers. It is not written for specialists and so can be read with enjoyment by other mathematicians.

R. A. RANKIN

Bollobás, B., *Random graphs* (London Mathematical Society Monographs, Academic Press, London, 1985), 447 pp., £52 cloth, £27 paper.

This scholarly and encyclopedic work is the first extensive account of the theory of random graphs. The origins of this rich subject, which applies probability ideas to graphs, can be traced back to a paper of Erdös and Rényi in 1959; this book takes us from these beginnings right up to the most recent results in the subject.

In order to explain briefly what the subject is about, let us concentrate on the concept of a hamiltonian cycle. It is well known that it is extremely difficult to determine whether or not a given graph has a hamiltonian cycle, so let us ask: what proportion of graphs have such a cycle? This rather vague question can be made more definite by the use of one of two models of randomness. We can consider $G(n, M)$, the space of all graphs on n vertices with M edges, each graph being assigned the same probability, or we can consider the space $G(n,p)$ of all graphs on n vertices, with each possible edge independently having probability p of being present. In either space we can then ask how likely it is that a graph is hamiltonian. The probability will, of course, increase as M (or p) increases, i.e. as the random graph grows or evolves. The great discovery of Erdös and Rényi was that many important properties of graphs appear quite suddenly. For example, it has been shown that almost every graph on n vertices with at least $cn \log n$ edges $(c>1)$ has a hamiltonian cycle, so that the hamiltonian property emerges suddenly since almost every graph with $cn \log n$ edges $(c<\frac{1}{2})$ is not even connected! Surprisingly, the main obstruction to a hamiltonian cycle turns out to be the existence of vertices of degree at most 1.

Many such properties of graphs are dealt with in this masterly account (for example, connectivity and matchings, giant components, degree sequences, cliques and diameter), and the final chapter discusses sorting algorithms. There are exercises at the end of each chapter, and over 750 references to the literature, many of them very recent or still to appear. This book will surely establish itself as *the* reference for the subject. It is not an easy book to read, demanding a high level of concentration and sophistication, and someone new to the subject might be advised to warm up by first looking at the chapter on random graphs in the same author's introductory textbook *Graph theory, an introductory course* (Springer-Verlag, 1979). The reviewer notes the announcement of another related book *Graphical evolution, and introduction to the theory of random graphs* by E. M. Palmer (Wiley, 1985); he has not seen it, but notes that, with only 177 pages, it cannot be as exhaustive as Bollobás's account.

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