writing style, Koosis' book contains 66 gorgeous diagrams and a sizable bibliography. If you want to learn about H_p spaces, here is an excellent place to start.

PETER W. JONES

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Number theory, by Helmut Hasse, Grundlehren der Mathematischen Wissenschaften, Band 229, A Series of Comprehensive Studies in Mathematics, Springer-Verlag, Berlin and New York, 1980, xvii + 638 pp., $49.00. A corrected and enlarged translation of the third edition of *Zahlentheorie*, Akademie-Verlag, Berlin, 1969, edited and prepared for publication by Horst Günter Zimmer.

The late Helmut Hasse wrote two treatises on number theory. Their first editions appeared in rapid succession in 1949 and 1950. The first, the "blue book", was entitled *Zahlentheorie* and was published by Akademie-Verlag (2nd ed. 1963, 3rd ed. 1969). It was a book on algebraic number theory. The second, the "yellow book", was *Vorlesungen über Zahlentheorie*, a book on elementary number theory published by Springer-Verlag (2nd ed. 1964).

Lovers of number theory will now have to be a little careful: both books are yellow. The volume under review is a translation into English of the third edition of the blue book; in moving from Akademie to Springer it changed color. Beyond that the major change is a recasting of Chapter 16 (on tamely ramified extensions) to remove an error detected by Leicht and Roquette; the rewriting was done by Leicht.

None of the earlier editions was reviewed in this Bulletin. I think a review is still timely, for it is a fine book. It treats algebraic number theory from the valuation-theoretic viewpoint. When it appeared in 1949 it was a pioneer. Now there are plenty of competing accounts. But Hasse has something extra to offer. This is not surprising, for it was he who inaugurated the local-global principle (universally called the Hasse principle). This doctrine asserts that one should first study a problem in algebraic number theory locally, that is, at the completion of a valuation. Then ask for a miracle: that global validity is equivalent to local validity. Hasse proved that miracles do happen in his five beautiful papers on quadratic forms of 1923–1924. But I cannot end this paragraph without calling attention to Hasse's eloquent attribution of the key idea to his teacher Hensel; see vol. 209 (1962) of Crelle and an amplification in his preface to volume I of his *Mathematische Abhandlungen*.

We can now read in English Hasse's disavowal of a "Satz-Beweis" format in favor of a discursive exposition. And indeed the exposition is discursive. The first 100 pages take the reader on a trip through elementary number theory that reaches quadratic reciprocity in the Hilbert product formula version. Then comes a 200-page book within a book on valuation theory. At last, halfway through the book, algebraic number theory begins. Examples and computations are presented on a generous scale. Quadratic fields, cyclotomic fields, units, class numbers, discriminants and differents are among the topics treated with meticulous care. The fundamental theorem–every ideal is uniquely a product of prime ideals–arrives on p. 387 (but in fairness it should be noted that the delay in getting there is due partly to strict adherence to the local-global plan).

At the end of every major episode there is a parallel treatment of the function field case. Where there is a big difference there is appropriate added material, e.g. the Riemann-Roch theorem.

It is trite but true: Every number-theorist should have this book on his or her shelf.

In closing I shall maintain the tradition of the reviewing craft by recording the typos I noticed: pages 99, 309, 388, 575, 616; lines -3, -6, 16, 7, 21; quadratic, been, is, fields, Rogers.

IRVING KAPLANSKY

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Combinatorial problems and exercises, by László Lovász, North-Holland, Amsterdam, 1979, 551 pp., $26.75.

Perhaps combinatorics is no longer deemed to be the slum of topology but it still has a remarkable polarising effect on mathematicians. The practitioners of combinatorics tend to idolise it as the only truly interesting branch of mathematics, while people not active in combinatorics are likely to have no respect for it and dismiss it as a collection of scattered results and trivial artificial problems. This highly unsatisfactory situation cannot be blamed entirely on the youth of the subject, though it is certainly one of the reasons. Those of us who work in combinatorics are also at fault, for most of our journals do publish more than their fair share of below par papers. Furthermore, as combinatorics fails to command the respect of the majority of the mathematical community, some combinatorialists feel entitled to disregard the huge developments in the main branches of mathematics.

There are signs that these lean years for combinatorics will soon be over. This is the hope expressed by Lovász in the Preface of *Combinatorial problems and exercises*. "Having vegetated on the fringes of mathematical science for centuries, combinatorics has now burgeoned into one of the fastest growing branches of mathematics–undoubtedly so if we consider the number of publications in this field, its applications in other branches of mathematics and in other sciences, and also, the interest of scientists, economists and engineers in combinatorial structures. The mathematical world has been attracted by the successes of algebra and analysis and only in recent years has it become clear, due largely to problems arising from economics, statistics, electrical engineering and other applied sciences, that combinatorics, the study of finite sets and finite structures, has its own problems and principles.