BOOK REVIEWS

ROSENSTIEHL, P., AND MOTHES, J., *Mathematics in Management*, translated from the French by Mrs A. Silvey (North Holland Publishing Co., Amsterdam, 1968), xvi + 392 pp.

The authors have based their work on courses of instruction they have given to students in l'Ecole des Hautes Etudes Commerciales whose interests lay mainly in the business and commercial world. The original, published by Dunod, Paris, was entitled *Mathématiques de l'action.* It is the first volume of a projected two-volume work, and deals with set theory, combinatorial techniques, probability theory, and statistics. Volume 2 is to deal with " programming ". The authors do not make clear to me just what they mean by this term.

In a preliminary note it is stated that the book " assumes no preliminary mathematical training on the part of the reader ". This phrase must be interpreted with caution. Certainly the reader must be prepared for elementary algebraic symbolism including the use of the Σ notation. In chapter V knowledge of the exponential limit $\lim_{n\to\infty} (1-u/n)^n = e^{-u}$ is also assumed, as well as familiarity with the notation of the calculus.

The book begins with a section on naïve set theory followed by expositions of the structure of the Boolean algebra of the subsets of a finite set and of the lattice of partitions of a finite set. The first chapter is concluded with a section of examples and a fully worked illustrative example concerned with a survey of the circulations of journals in a certain population. Other chapters have the same general pattern of theoretical exposition followed by problem examples followed by a long illustrative example.

The second chapter is concerned with many detailed combinatorial results, the third with an introduction to probability theory and the last two chapters with random variables and some of the more frequently encountered probability distributions, including the normal, chi-squared, Poisson and bivariate normal distributions. Their use in statistical testing is also discussed.

A very valuable feature of the book is the large variety of combinatorial results which are treated so thoroughly and whose computation is aided by much skilful deployment of graphs of various sorts and lattice arrangements of numerical results in schemes comparable with the familiar Pascal triangle. Nevertheless I myself was perhaps unduly disappointed by the contents of the book. It seems to me that, particularly in the initial chapters, the authors have provided too much laborious detailed exposition without being in any way rigorous. At the same time many of the mathematical techniques used nowadays in the business world such as critical path analysis and applications of vector and matrix methods to such fields as linear programming and the theory of games are not mentioned although they lend themselves to an elementary presentation. Perhaps volume 2 will see these omissions rectified.

The layout of the material is pleasant although the postponement of worked examples till after the completion of the theoretical exposition does not make for easy reading. Some of the notations and technical terms used are non-standard in this country. $\binom{\vec{n}}{r}$ is used to denote $n!/(n-r)!$ with the alternatives $A\binom{n}{r}$ or A_n^r (rather than ${}^nP_r$). $\begin{bmatrix} y \\ x \end{bmatrix}$ is used for $\binom{y+x-1}{x}$. "Non-symmetric" is used as a name

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for a property of the order-relation of a partially ordered set (rather than " anti-symmetric ") and the symbol $<$ is used for this (reflexive) relation. The term " radius of rotation " on p. 297 is more commonly known here as " radius of gyration ". In addition there are some infelicities such as the double meaning of $\Rightarrow$ on p. 124 and the poor layout of the table at the foot of p. 116, as well as a rather large collection of misprints (Pascal triangle on p. 132, omission of the word *no* on p. 249, line 6, reference to p. 000 on p. 356 and others).

The problems for solution (with sketch solutions) are thought-provoking and more open-ended than is usual in a mathematical textbook, but are none the worse for that.

The translation is pleasant and Mrs Silvey is obviously at home with her material although her use of " landing-net " on p. 191 shows that she is no trout-fisher.

M. PETERSON

LEKKERKERKER, C. G., *Geometry of Numbers* (North-Holland Publishing Company, 1969), 510 pp, 210s.

This book gives a systematic account of the present state of knowledge in what might be called the classical field of the geometry of numbers. Analogues of the geometry of numbers in spaces over the field of complex numbers, non-archimedean fields or the ring of adèles are not considered. Some indication of the topics and results included is obtained from the following brief list of some of the chapter and section headings: convex bodies; star bodies; lattices; theorems of Minkowski, Blichfeldt, Rédei and Hlawka, Mordell-Siegel-Hlawka-Rogers, and Macbeath; successive minima of convex bodies and of non-convex sets; reduction theory; inhomogeneous minima; polar reciprocal convex bodies; critical lattices; packings and coverings; the functions $\Delta(S)$, $T(S)$, $f(\Lambda)$, $g(\Lambda)$; reduction of automorphic star bodies; density functions; homogeneous forms; sums of powers and products of linear forms; extreme forms; asymmetric and one-sided inequalities; diophantine approximation. There are $32\frac{1}{2}$ pages of bibliography containing an almost complete list of work published in the field during the period 1935-1965. This has been arranged to knit well with the famous 1935 Ergebnisse report of Koksma. For this enormous task alone the author deserves grateful thanks from all workers in the field and all others interested in this beautiful piece of mathematics.

The author has shown considerable skill in organisation of the work, in selection of results and in choice of proofs. He has throughout emphasised geometric rather than arithmetic and analytic ideas. His historical notes and remarks on related work by various authors are interesting and illuminating. One slight point of criticism might be that in certain places these explanatory paragraphs tend to break the thread of the main development. This could have been avoided by having these paragraphs in different type. However, the book is essentially a text for specialists and they will not object to the undoubtedly heavy task of going through the work in detail.

All concerned with the production of this attractive and much needed volume deserve congratulations.

J. HUNTER

VAN DER WAERDEN, B. L., *Mathematical Statistics* (George Allen & Unwin Ltd., 1969), xi+367 pp., £7, 7s.

This is a translation into English of a book first published in German by Springer-Verlag in 1956. The translators are to be congratulated on the excellence of their work, since there is little if any indication that the book was not written originally in English.