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Random mappings, by Valentin F. Kolchin. Optimization Software, Inc., distributed by Springer-Verlag, New York, 1986, xiv+206 pp., $ 80.00. ISBN 0-387-96154-2

In the past few decades we have seen an upsurge of articles and monographs dealing with the applications of probabilistic methods in various fields of mathematics. The best known of these fields are number theory, graph theory, and combinatorics. Probabilistic methods in combinatorics are the subjects of several books, such as P. Erdös and J. Spencer [**2**], V. F. Kolchin, B. A. Sevastyanov, and V. P. Chistyakov [**11**], and V. N. Sachkov [**18**]. V. F. Kolchin's new book is a welcome addition to this list.

The main topics covered in Kolchin's book are allocation (occupancy) problems, random permutations, random mappings, branching processes, random trees, and random forests. Allocation problems have already been discussed in great detail in the book by V. F. Kolchin, B. A. Sevastyanov, and V. P. Chistyakov [**19**], but most of the other topics are published here for the first time in monograph form.

Understanding the book requires only a basic knowledge of the elements of combinatorics and probability theory. The main analytic tool used in the book is the local limit theorem of B. V. Gnedenko [**4**], and some of its extensions. According to Gnedenko's theorem if $\xi_1, \xi_2, \ldots, \xi_n, \ldots$ is a sequence of independent and identically distributed discrete random variables taking on integers only and if $E\{\xi_n\} = a$ ($|a| < \infty$), $\mathrm{Var}\{\xi_n\} = \sigma^2$ ($0 < \sigma < \infty$), and the greatest common divisor of the possible values of ξ_n is 1, then

$$\lim_{n\to\infty}\left[\sigma\sqrt{n}P\{\xi_1 + \cdots + \xi_n = j\} - \phi\left(\frac{j - na}{\sigma\sqrt{n}}\right)\right] = 0 \tag{1}$$

uniformly in j for $|j - na| < K\sqrt{n}$, $0 < K < \infty$. Here $\phi(x)$ is the normal density function, i.e.,

$$\phi(x) = \frac{1}{\sqrt{2\pi}}e^{-x^2/2}. \tag{2}$$

In what follows we shall give a brief description of each topic covered in the book, mention some highlights of the results obtained, and add some historical remarks.

ALLOCATION (OCCUPANCY) PROBLEMS. Allocation problems have their origin in statistical physics (Maxwell-Boltzmann statistics) and date back to the nineteenth century. In the 1930s nonparametric statistical tests led to an interest in allocation problems.

The following model is investigated in the book: n balls are distributed in m boxes in such a way that all the m^n arrangements are equally probable. Denote by $\mu_r(m,n)$ ($r = 0, 1, \ldots, n$) the number of boxes containing exactly r balls.