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Sinopsis

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This book deals with the characterization of probability distributions. It is well known that both the sum and the difference of two Gaussian independent random variables with equal variance are independent as well. The converse statement was proved independently by M. Kac and S. N. Bernstein. This result is a famous example of a characterization theorem. In general, characterization problems in mathematical statistics are statements in which the description of possible distributions of random variables follows from properties of some functions in these variables. In recent years, a great deal of attention has been focused upon generalizing the classical characterization theorems to random variables with values in various algebraic structures such as locally compact Abelian groups, Lie groups, quantum groups, or symmetric spaces. The present book is aimed at the generalization of some well-known characterization theorems to the case of independent random variables taking values in a locally compact Abelian group X. The main attention is paid to the characterization of the Gaussian and the idempotent distribution (group analogs of the Kac-Bernstein, Skitovich-Darmois, and Heyde theorems). The solution of the corresponding problems is reduced to the solution of some functional equations in the class of continuous positive definite functions defined on the character group of X. Group analogs of the Cramer and Marcinkiewicz theorems are also studied. The author is an expert in algebraic probability theory. His comprehensive and self-contained monograph is addressed to mathematicians working in probability theory on algebraic structures, abstract harmonic analysis, and functional equations. The book concludes with comments and unsolved problems that provide further stimulation for future research in the theory.