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Título: Inevitable Randomness In Discrete Mathematics

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Sinopsis

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Mathematics has been called the science of order. The subject is remarkably good for generalizing specific cases to create abstract theories. However, mathematics has little to say when faced with highly complex systems, where disorder reigns. This disorder can be found in pure mathematical arenas, such as the distribution of primes, the $3n+1$ conjecture, and class field theory.

The purpose of this book is to provide examples--and rigorous proofs--of the complexity law:

(1) discrete systems are either simple or they exhibit advanced pseudorandomness;

(2) a priori probabilities often exist even when there is no intrinsic symmetry.

Part of the difficulty in achieving this purpose is in trying to clarify these vague statements. The examples turn out to be fascinating instances of deep or mysterious results in number theory and combinatorics.

This book considers randomness and complexity. The traditional approach to complexity--computational complexity theory--is to study very general complexity classes, such as P, NP and PSPACE. What Beck does is very different: he studies interesting concrete systems, which can give new insights into the mystery of complexity.

The book is divided into three parts. Part A is mostly an essay on the big picture. Part B is partly new results and partly a survey of real game theory. Part C contains new results about graph games, supporting the main conjecture. To make it accessible to a wide audience, the book is mostly self-contained.